FABRICS and FIBERS

for

PASSENGER CARS

AUTOMOBILE MANUFACTURERS' VIEWS

1955 • COMPARED WITH • 1950

U. S. DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service
Marketing Research Division

MARKETING RESEARCH REPORT NO. 152

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FABRICS and FIBERS

for PASSENGER CARS

AUTOMOBILE MANUFACTURERS' VIEWS • 1955 COMPARED WITH 1950

by Milton Jacobs, project director, Market Development Branch
Agricultural Marketing Service

Selected Highlights

Below are summarized some of the major shifts in consumption of materials, especially fabrics and fibers, used in passenger cars between 1950 and 1955 as well as key opinions and attitudes of automobile manufacturers relating to the future use of these materials.

The Fiber Picture

1. **Cotton.**—In 1955, 210,623,188 pounds (421,246 bales of 500 lbs.) of cotton (including lint cotton and waste cotton) were used in passenger cars as compared with 197,288,556 pounds (394,577 bales) in 1950. Cotton's relative position has declined from 62 percent of total poundage in 1950 to 55 percent in 1955. In terms of non-waste cotton (mostly lint cotton) in this end use, there has been a gain from 36 percent in 1950 to 43 percent in 1955.

Cotton usage by the automobile industry for visible interior trim is expected to remain the same or to increase slightly in the immediate future.

For upholstery, even if nylon blends replace to some extent cotton-backed vinyls, cotton is likely to be a principal filler in the nylon blends. In blends with other synthetics, cotton probably will be used extensively as backing.

For sidewalls, cotton consumption is expected to increase because of the expected trend toward more extensive use of cotton-backed vinyl for this application.

For headlining, cotton consumption may decrease somewhat because of the replacement of 100-percent cotton fabrics by cotton-backed vinyls.

2. **Wool.**—The total amount of wool used in passenger cars has decreased from 33,215,962 pounds in 1950 to 1,378,092 pounds in 1955. Its relative position declined from 10 percent in 1950 to less than 1 percent in 1955.

Indications are that wool will not improve its current position as a fiber for visible interior trims. Some wool will continue to be used, primarily in blends for upholstery in high-priced cars.

3. **Nylon.**—Nylon has shown some increase from 4,097,688 pounds in 1950 to 7,257,970 pounds in 1955. Its relative position has moved from 1 percent in 1950 to 2 percent in 1955 of the total poundage of interior materials used in passenger cars.

Nylon likely will enjoy substantial growth as an upholstery material, primarily through increased proportions of this synthetic in blends already in use and through wider use of nylon blends in low- and medium-priced cars.

4. **Vinyl.**—In terms of poundage, vinyl used in passenger cars amounted to 5,001,465 pounds in 1950 and to 45,424,351 pounds in 1955. Vinyl's relative position has increased from 2 percent in 1950 to 13 percent in 1955.

Less vinyl probably will be used for trimming cars in the future. For upholstery, other synthetics are likely to replace vinyl in the low- and medium-priced fields, primarily because of vinyl's lack of porosity.

In some of the lowest priced models, and in some specialty models, however, vinyl is expected to remain as a seat covering material because of its favorable price. In addition, most of the models presently using vinyl bolsters are likely to continue to do so. Therefore, the general trend for vinyl as an upholstery material seems to be an immediate reduction in consumption followed by a leveling-off and subsequent maintenance of a fairly stable position.

For sidewalls, however, expectations of increased use of both supported and unsupported vinyls indicate growth for vinyl in this application.

For headlining, increased use of perforated cotton-backed vinyls is predicted. The long-range future of vinyl for headlining purposes, however, depends largely on the success or failure of preformed, snap-in units.

Importance of Appearance in Car Interiors

The intensely competitive situation since 1950 has increased the emphasis on creating style trends with new materials as a sales stimulant.

As a result, the stylists in the automotive industry have greater influence in the selection of fabrics. More effort is devoted to finding and developing new and interesting trim styles than ever before. The number of materials and various combinations of fibers used to create interesting effects is many times what it was 5 years ago. This would appear to indicate a dynamic rather than a stable situation with respect to interior trims and the fibers which comprise them. Also, with

increased emphasis on styling, the former price limitations for fabrics have become less rigid.

Styling Preferences

Stylists were able to define clearly their preferences for fabrics and were consistent in their predictions on the various aspects of style considered, e. g., color, shade, design, etc.

The colors for future interior trim fabrics are likely to be brighter and more intense, with medium shades predominating. Light shades will be used but to a much lesser extent.

Almost all of the fabrics selected for use in the immediate future will be unusually styled, achieving different effects from those used in previous models. Large nongeometric patterns, modern or abstract, will predominate. Unusual textured effects, for example, matelasses, brocades and counterpoints, will be used to a lesser extent for some models where large nongeometric patterns are undesirable.

Materials for trimming probably will become more lustrous since high lustrous sheen, with its rich look and showroom appeal, seemed to be a desirable sales stimulant.

Flat woven fabrics will undoubtedly be the major type used for future trim materials. Pile is no longer considered a factor in the trim market.

Soil Resistance and Cleanability

Second only to appearance, soil resistance and cleanability were the principal characteristics desired by automobile manufacturing executives for trim materials. Interest in obtaining an easily cleaned fabric that will maintain its appearance and provide lasting trim beauty is universal. At present, many materials used have fair cleanability, but not enough to withstand repeated washings without adverse effect.

Interest in Preformed Trim

Future use of preformed headlinings, door panels, and seat cushions was predicted by many executives. Preformed headlinings seem the most imminent of the ideas advanced. One company reported using a preformed snap-in headlining experimentally in one of its 1955 models. Other companies are currently experimenting with materials such as hardboard rubber resins and plastics for snap-in headlinings.

Molded door panels are being seriously considered by the industry although their use does not seem likely for several years. Experiments with unsupported vinyls and rubber resins are currently underway in a few companies. In addition, a major change in the concept of seat fabrication is envisioned for the distant future. The interest in developing a molded one-piece seat is motivated by a strong desire to reduce production costs. Di-iso-cyanates and foam rubber are presently being used experimentally in molded seats by a few companies.

General Observations

Analysis of the results of both the 1950 and the 1955 studies permits several overall observations to be drawn about the character of responses given by automobile executives:

1. By and large, the short-range trends envisioned by executives in 1950 have been realized. However, in interpreting the trends anticipated by executives in 1955, it should be borne in mind that, in some instances, expectations of radically new developments apply to the long-range future. These reflect the direction in which the automobile industry is moving rather than specific changes which will take place within the next few years.

2. In both the 1950 and the 1955 studies, considerable emphasis was placed on determining the characteristics which, in the opinions of key automobile executives, comprise ideal fabrics for each pertinent part of the car. It is apparent that discussions of "ideal" properties are, to some degree, contingent upon present and past experience of the industry. Thus, although a particular fabric quality—designated "x"—may not be currently specified, executives would undoubtedly report in future years that "x" was necessary should a new desirable material have been developed containing that quality.

Introduction

In October 1951, the United States Department of Agriculture published a report[1] which described in detail the attitude, opinions, and preferences of key executives in the automobile industry with respect to fibers and fabrics used in selected parts of the interior of closed passenger cars. In addition, data on the quantities and fiber content of materials used in the 1950-model year for the various parts of automobile interiors covered by the study were presented.

In the light of the major changes that have taken place in the styling of automobile interiors since 1950, a comparable study was undertaken to determine the opinions and attitudes toward fibers and fabrics held by key automobile executives in 1955 and to assemble fiber consumption data for the 1955-model year.

Accordingly, in March 1955, Assistant Secretary of Agriculture Butz addressed a letter to the presidents of all automobile companies that manufactured closed passenger models. An excerpt from the letter follows:

> The automobile industry has always consumed large amounts of fibers of agricultural origin. The industry continues to consume natural fibers but the competitive positions of the various textile materials has undergone a considerable change. At present, no accurate information is available on the extent of these changes or

[1] United States Bureau of Agriculture Economics. AUTOMOBILE MANUFACTURERS DISCUSS FABRICS AND FIBERS FOR PASSENGER CARS. Agr. Inform. Bul. No. 45, Oct. 1951.

the opinions of industry leaders about the extent and direction of the changes.

Accurate and detailed information of this sort can be obtained only from the automobile industry itself. It is needed to aid us in estimating the effect of changing patterns of usage on the markets for the natural fibers and to assist our experimental laboratories in determining the lines of technological research that might be most helpful in finding ways to improve automotive fabrics.

In order to bring the 1950 study up to date, the Department is planning to study again the characteristics and amounts of various textile materials consumed by manufactureres in the automotive industry and the reasons for present patterns of consumption. The main objectives of the study will again be:

I. To discover what characteristics manufacturers want in the fabrics used for upholstery, headlining, sidewalls . . . and convertible tops.

II. As an indication of preference to discover what materials automobile manufacturers are now using in high-priced, medium-priced, and low-priced cars.

III. To discover what changes are taking place in the use of textile materials and the reasons for those changes.

IV. To discover who makes decisions about textile materials and what are the bases for decisions.

All the companies that were approached agreed to cooperate in providing consumption data and time for interviews with key executives. Information was obtained from five companies: American, Chrysler, Ford, General Motors, and Studebaker-Packard. In addition, separate information on preferences and consumption was obtained from the following divisions within companies:

Company	*Division*
American	Hudson, Nash.
Chrysler	Chrysler, De Soto, Dodge, Plymouth.
Ford	Ford, Lincoln, Mercury.
Studebaker-Packard	Packard, Studebaker.

The basic design of the 1955 study is identical with that of the 1950 study. Thus, in addition to presenting the information as it pertains to the 1955-model year and to future trends, this report includes comparisons between the 1950 and the 1955 findings.

Since the 1950 study predated the mergers of Hudson with Nash and Studebaker with Packard, the earlier report was based on findings among 8 companies. In both the 1950 and 1955 studies, the entire passenger car industry in this country is represented.

How the Study Was Made

In response to the letter from the Assistant Secretary of Agriculture, each of the five participating companies designated an executive to act as a liaison between the company and the personnel who participated in the study.

Who Was Interviewed

With the guidance and help of the executives designated as liaisons, the individuals chiefly responsible for decisions regarding textile materials were interviewed.

In total, 50 executives—including company and division presidents, stylists, trim engineers, laboratory technicians, purchasing agents, buyers, sales executives, and other members of management—were interviewed during June and July 1955. Style consultants engaged by companies to assist in the interior design of the 1955 models were not interviewed since they were not permanent employees of the automobile companies and since their ideas and preferences had been communicated to the executives and thus are reflected in the findings. Each person was interviewed only on those items in the study for which he had some degree of responsibility.

In cases of executives who were concerned with all items covered, the interviews occupied a total of 3 to 8 hours; such interviews usually spread over several days. In order to maintain interest on the part of the executives, however, the number of people interviewed was increased, and the duration of the interview with each was reduced. The average length of interview was 2 hours. Various topics were explored thoroughly with executives to whom they pertained directly while others, less pertinent, were not discussed. Accordingly, the number of executives interviewed varies from question to question.

Within 4 of the 5 participating companies, at least 5 and as many as 20 interviews were conducted with officials of each company, depending on the organizational structure and the number of independent divisions. In one company, the views of all executives involved in decisions related to interior materials were communicated to one individual who made a synthesis of these views and reported to an interviewer.

Parts Included in the Study

Since this study was designed to be directly comparable with the 1950 study, the same parts were included. These are: upholstery, sidewalls, headlining, padding in seats, foundation sheeting, and thermal and sound insulation used in closed passenger cars. Information was also obtained for convertible tops. This list of parts, while it does not include all those in an automobile in which textile materials are employed, represents those considered in 1950 to be the most important to study.

Development of the Interview Schedule

The schedule used is virtually identical with the interview guide developed for the 1950 study. The original study was planned as follows:

Detailed objectives for this study were developed in consultation with officers of the Automobile Manufacturers Association; the National Association of Wool Manufacturers; National Cotton Council; executives in the Ford Motor Company and in General Motors Corporation; and executives in several textile mills which manufacture automobile fabrics, including the American Woolen Company, Collins and Aikman, Sidney Blumenthal and Company, and Pacific Mills. Professor C. B. Gordy in the College of Engineering of The University of Michigan also assisted in the planning of the study.

Technical and marketing specialists in the Department of agriculture and textile experts in the Department of Commerce participated in the defining of objectives and advised on the subject matter of the study.[2]

Interview Method

Some of the questions included in the interview schedule were direct and had fixed alternative answers. Interviewers, as in the 1950 study, asked these just as worded in the questionnaire. This was particularly important in insuring comparability of the results of the two studies.

Other questions were open. These were intended to start a discussion in the course of which the interviewer could freely probe to clarify responses and go more deeply into reasons. This technique was particularly important in developing precise definitions of the terms and concepts under discussion.

It was sometimes desirable to break up the interview into two or more conferences, depending on the time schedule of the respondent. The interviewers maintained contact with the respondents after the completion of the field work and communicated with them as necessary for amplification or clarification of responses by telephone, mail, or personal calls.

Treatment of Results

The analysis and presentation of data obtained in this study pose some problems owing to the size and character of the sample involved. The number of companies comprising the universe is 5, a number too small to permit the usual statistical techniques of percentage distributions. Giving the number of companies with particular preferences or practices would be misleading because of the relatively greater influence of the larger companies. The case history method had a major limitation in that the organizational structure and policies of each company are so well known that disguise is impracticable, and each company was guaranteed anonymity.

Furthermore, within each company several executives might be interviewed in regard to the same part of the automobile if all contributed to decisions on fabric selection. Sometimes, differences of opinion were found with respect to preferences, expected trends, and what constituted an ideal material. Moreover, the number of executives interviewed varied from company to company and there was no correlation between the size of a company and the number of interviews.

All of the problems described above were also faced in processing the data obtained for the earlier study conducted on the 1950-model year. To achieve comparability, the same procedure was followed in the two studies. In summary:

a. Where pertinent, percentages of the number of executives interviewed are presented except where this number drops below 20. In these cases, whole numbers are used in the tables rather than percentages.

The decision to use 20 as the minimum base for percentaging is postulated on the fact that this is not a sample study but rather a study encompassing the entire universe. Thus, the base can be smaller than for a sample study.

b. The relative influence of the different companies was taken into account by weighting the information according to production of 1955 models. Production data furnished by all companies indicated that the following weights should be applied to information obtained from each.

Company	*Percent of total production of the 5 companies*
General Motors	52
Ford	27
Chrysler	17
Studebaker-Packard	2
American	2
Total	100

c. As in the 1950 study, it was necessary to avoid giving extra weight to companies in which more executives happened to have been interviewed. Also, some technique was required to represent division of opinion among executives in the same company.

To accomplish the weighting outlined above, the following method was used. First, in each company the answers from all interviewed executives to any particular question were pooled. The number of answers falling in each category of response was expressed as a percentage of the total answers to that question from all executives in the company. This figure was then multiplied by the production weight of the company to arrive at the weighted percentage of all answers from that company.

For example, suppose that on a certain question 7 executives of General Motors gave answers. The number of these answers which fall into one particular response category was then expressed as a percentage of the total answers to that question from the 7 executives. This figure was then multiplied by 0.45 (the weight for General Motors)[3] to give the weighted percentage for this response category. The same procedure was carried through for this particular response category of that question for each company and the respective differential weights applied. The sum of these weighted percentages for all of the companies that gave answers to that particular question is taken as the weighted percentage for that response category of that question for the total group of companies responding.

Of course, such data as consumption figures, which are complete in themselves, are not weighted. In the following tables, data to which weights have been applied are clearly indicated. Most of these tables also give the raw percentage of all executives who replied to a particular question and whose answers fall into any particular category. These figures, of course, have nothing to do with the weighted percentages given in the same table in a parallel column. The 2 columns are to be read separately, for they are really 2 separate tabulations with the same stubs. Because the stubs are the same, the 2 columns of percentages of executives and weighted percentages have been combined in one table in order to

[2] See footnote 1, page 2.

[3] 1950 share of automobile production. The weight used for 1955 was 0.52.

save space and unnecessary duplication of the table stubs.[4]

As in 1950, those parts of the analyses which did not lend themselves to statistical analysis have been handled qualitatively, documented by direct quotations.

Comparisons between 1950 and 1955 data are presented statistically where feasible.

Consumption of and Fibers Competing Materials for Selected Parts of Automobiles

Consumption for 1955-Model Year

The data developed on consumption of fibers and other materials used in the pertinent interior parts of automobiles apply to the 1955-model year. Purchasing for the 1955-model year was completed in all 5 companies and the information is based on purchase records. It was estimated that 99 percent or more of the materials purchased for the 1955-model year was actually consumed for those automobiles.

Forms were adopted to conform to the different record systems of each company. In some instances, actual specification sheets were provided by the company and the amounts purchased were computed after consultation with automobile company executives.

The consumption data have been assembled in terms of total pounds of each fiber contained in the materials purchased; with the exception of padding, figures refer to processed fibers. This method of reporting was adopted to conform to the consumption data presented in the 1950 report.

Table 1 presents the fibers and materials used, poundage for each, and the percent each accounts for of total consumption for 5 interior parts—upholstery, sidewalls, headlining, seat padding, and sheeting. Poundage is presented in 2 ways: (1) total poundage based on upholstery, sidewalls, headlining, and sheeting (excluding seat padding) and (2) total poundage based on the 4 items just mentioned and including seat padding.

In 1955, cotton-backed vinyl was the leading material used for **upholstery,** 40 percent of the total poundage consumed being vinyl, while the cotton backing accounted for 20 percent. An additional 9 percent of cotton poundage was reported over and above the application for backing. Thus, vinyl was the most important upholstery material (40 percent), cotton ranked second (28 percent), rayon ranked third (13 percent), and nylon fourth (10 percent). Wool accounted for 1 percent of the upholstery poundage consumed.

For **sidewalls,** cotton accounted for more poundage than any other fiber—50 percent of all sidewall materials being cotton. Two-thirds of this poundage, however, was in cotton used in vinyl backing. Vinyl was second in importance with 42 percent of all sidewall poundage.

For **headlining,** cotton was by far the leading material.

For **seat padding,** cotton was again a clear leader, accounting for 61 percent of this poundage. Foam rubber ranked second with 22 percent.

Cotton is virtually the only fiber used in **sheeting,** 99 percent of all poundage being cotton.

For all 5 parts combined, cotton accounted for 55 percent of the poundage used in 1955-model year cars. About 11 percent of this cotton was used for vinyl backing. Foam rubber and vinyl were second and third: 15 percent and 13 percent respectively.

If the total poundage excludes materials and fibers used in seat padding, cotton (fabric made from lint cotton) accounted for 43 percent of poundage used in 1955-model year. Vinyl ranked second with 36 percent followed by rayon with 9 percent and nylon with 6 percent.

The estimated number of cars to which these data apply is 6,858,177.

Consumption, 1955 Compared With 1950

Some noteworthy changes have taken place since 1950 in the materials used in automobile interiors, particularly in those used for upholstery, sidewalls, and headlinings.

Perhaps the most important contrast between 1950 and 1955 is the virtual exclusion of wool in 1955 for upholstery and sidewalls. In 1950, 51 percent of the upholstery poundage was wool; in 1955, 1 percent was wool. Similarly, 42 percent of the sidewall poundage in 1950 was wool; in 1955, 1 percent was wool.

Cotton-backed vinyl, the primary material used in 1955 for both upholstery and sidewalls, was a minor factor in 1950. Because of the substantially increased use of vinyl with cotton backing, the cotton poundage consumed for both upholstery and sidewalls has substantially increased—a relative increase of 145 percent in usage of cotton for upholstery and of 32 percent in usage of cotton for sidewalls.

In the light of these major shifts between wool and vinyl, and the implications increased use of vinyl have for cotton consumption, it is interesting that the relative positions of rayon and nylon have remained virtually unchanged since 1950, as applied to upholstery and sidewalls.

Limited use in 1955 of some materials not used at all in 1950, for upholstery in particular, is also noteworthy, e. g., Saran, linen, Dacron, Orlon, etc.

The variations in headlining materials used between the 1950- and 1955-model years also point up the growth of vinyl. From 1 percent of total headlining poundage in 1950, vinyl had increased to 14 percent in 1955. Although this vinyl is primarily cotton-backed, the overall position of cotton in headlining had declined. Ninety-six percent of all poundage in 1950 was cotton; in 1955,

[4] Agriculture Information Bulletin No. 45, page 6.

TABLE 1.—*Quantity and percentage of components in materials purchased for upholstery, sidewall, headlining, seat padding, and foundation sheeting in 1955 passenger cars*

Materials	Upholstery [1]		Sidewall [1]		Headlining [1]		Seat padding		Sheeting		Total poundage excluding seat padding		Total poundage including seat padding	
	Pounds	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*
Cotton	19, 677, 104	28	17, 864, 569	50	11, 402, 530	76	[2] 157, 185, 778	61	4, 493, 207	99	53, 437, 410	43	210, 623, 188	55
Backing	13, 972, 658	20	11, 965, 313	33	1, 181, 414	8					27, 119, 385	22	27, 119, 385	7
All other	5, 704, 446	8	5, 899, 256	17	10, 221, 116	68	157, 185, 778	61	4, 493, 207	99	26, 318, 025	21	183, 503, 803	48
Foam rubber							57, 890, 387	22					57, 890, 387	15
Vinyl	28, 301, 110	40	14, 988, 739	42	2, 074, 502	14	4, 342, 125	2			45, 424, 351	36	49, 766, 476	13
Jute	208, 685	1	51, 646	(3)			23, 182, 234	9			260, 331	(3)	23, 442, 565	6
Rayon [4]	9, 451, 082	13	2, 193, 628	6	42, 101	(3)	72, 886	(3)			11, 686, 811	9	11, 759, 697	3
Nylon	6, 830, 165	10	444, 680	1	1, 125	(3)	90, 282	(3)			7, 275, 970	6	7, 366, 252	2
Sisal							7, 143, 553	3					7, 143, 553	2
Burlap (unspecified)	184, 801	(3)					6, 061, 318	2	23, 513	1	208, 314	(3)	6, 269, 632	2
Leather	3, 645, 422	5									3, 645, 422	3	3, 645, 422	1
Hair							2, 005, 310	1					2, 005, 310	1
Paper	9, 887	(3)			1, 396, 326	9					1, 406, 213	1	1, 406, 213	(3)
Wool	813, 793	1	491, 322	1	72, 977	1	14, 631	(3)			1, 378, 092	1	1, 392, 723	(3)
Metallic yarn (incl. Lurex)	372, 669	1	5, 149	(3)							377, 818	1	377, 818	(3)
Rubber backing (latex-butyl)	254, 732	1	55, 610	(3)							310, 342	(3)	310, 342	(3)
Saran [5]	144, 175	(3)	77, 236	(3)							221, 411	(3)	221, 411	(3)
Orlon	63, 754	(3)									63, 754	(3)	63, 754	(3)
Pyroxylin	58, 074	(3)			5, 635	(3)					63, 709	(3)	63, 709	(3)
Linen	33, 957	(3)									33, 957	(3)	33, 957	(3)
Mohair	23, 017	(3)									23, 017	(3)	23, 017	(3)
Dacron	15, 742	(3)									15, 742	(3)	15, 742	(3)
Asphalt	2, 855	(3)									2, 855	(3)	2, 855	(3)
Mylar			485	(3)							485	(3)	485	(3)
Total poundage	70, 151, 024	100	36, 173, 064	100	14, 995, 196	100	257, 988, 504	100	4, 516, 720	100	125, 836, 004	100	383, 824, 508	100
Estimated number of passenger cars	6, 858, 177		6, 858, 177		[6] 6, 660, 886		6, 858, 177		6, 858, 177		6, 858, 177			

[1] Reports indicate that in unusual circumstances vinyl coated cotton purchased for one purpose, e. g., sidewalling, was used for another purpose. Therefore, the upholstery, sidewalling, or headlining poundages may include some vinyl belonging under other headings.

[2] Mostly cotton mill waste and cotton linters.

[3] Less than 1 percent.

[4] Material components reported as acetate, viscose, and rayon were grouped as rayon.

[5] Companies did not differentiate Saran from vinyl in all cases. Some Saran is probably included under vinyl.

[6] An estimated 197,291 convertibles produced in the 1955-model year are not included.

TABLE 2.—*Relative importance of materials used 1950 versus 1955*

Material	Upholstery		Sidewall		Headlining		Seat padding		Sheeting		Total poundage excluding seat padding		Total poundage including seat padding	
	1950	1955	1950	1955	1950	1955	1950	1955	1950	1955	1950	1955	1950	1955
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Cotton	11	28	38	50	96	76	[1] 71	[1] 61	100	99	36	43	62	55
Foam rubber							17	22					12	15
Vinyl	4	40	12	42	1	14		2			6	36	2	13
Jute		1		(2)			3	9				(2)	2	6
Rayon	18	13	7	6	(2)	(2)		(2)			12	9	3	3
Nylon	9	10	1	1		(2)		(2)			5	6	1	2
Sisal							9	3					7	2
Burlap (unspecified)[3]		(2)						2		1		(2)		2
Leather	7	5									3	3	1	1
Hair							(2)	1					(2)	1
Paper	(2)	(2)				9					(2)	1	(2)	(2)
Wool	51	1	42	1	3	1	(2)	(2)			38	1	10	(2)
Metallic yarn (incl. Lurex)[3]		(2)		(2)								1		(2)
Rubber backing (latex-butyl)[3]		(2)		(2)								(2)		(2)
Saran [3]		(2)		(2)								(2)		(2)
Orlon [3]		(2)										(2)		(2)
Pyroxylin [3]		(2)				(2)						(2)		(2)
Linen [3]		(2)										(2)		(2)
Mohair	(2)	(2)	(2)								(2)	(2)	(2)	(2)
Dacron [3]		(2)										(2)		(2)
Asphalt [3]		(2)										(2)		(2)
Mylar [3]				(2)								(2)		(2)
Total poundage	100	100	100	100	100	100	100	100	100	100	100	100	100	100

[1] Mostly cotton mill waste and cotton linters.
[2] Less than 1 percent.
[3] Figures for 1950 not available.

cotton accounted for 76 percent—a decrease of 21 percent. Not only is increased use of vinyl responsible for the lower cotton consumption for headlining, but use of paper in headlining is noted in 1955 (9 percent of all poundage) whereas this material was not used in 1950.

In seat padding, use of foam rubber has increased since 1950 at the expense of cotton. A 29-percent increase in foam rubber is noted along with a 14-percent decline in cotton. Use of sisal has declined, while use of jute has grown.

Virtually no change is noted between 1955 and 1950 in the materials used for foundation sheeting. Cotton accounted for 99 percent and 100 percent of the consumption in 1955 and 1950 respectively.

Table 2 presents the comparison in the relative position of the fibers used between 1950 and 1955.

Although cotton's relative position in consumption for upholstery, sidewall, headlining, seat padding, and sheeting has declined somewhat since 1950 (62 percent of poundage in 1950 as opposed to 55 percent in 1955), its absolute consumption has increased. Whereas 197,288,556 pounds of cotton were used in 1950, 210,623,188 pounds of cotton were used in 1955. This is due essentially to the increase in automobiles produced rather than to any minor variations in yardage used in automobile interiors.

When considering total poundage excluding seat padding, cotton fabrics show a gain from 36 percent in 1950 to 43 percent in 1955. In absolute pounds, cotton, excluding seat padding, amounted to 30.527,170 pounds in 1950 and to 53,437,410 pounds in 1955.

Convertible Tops

The estimated number of 1955 convertibles (not including hard tops) was 197,291. Cotton accounted for more poundage than any other material used in convertible tops, 43 percent. Of this cotton poundage, 17 percent was consumed in vinyl backing. Latex and butyl accounted for 35 percent of the convertible top poundage. The other materials named were vinyl (12 percent), jute (8 percent), and rayon and Orlon, 1 percent each (table 3).

Despite the increase in total automobile production since 1950, the number of convertibles in the 1955-model year was less than in the 1950 year—197,291 in 1955 as opposed to 234,121 in 1950. This is undoubtedly a reflection of the wide consumer acceptance of hard top convertibles.

The relative position of cotton in convertible tops has remained virtually the same as in 1950, but in 1955 about 17 percent of the cotton poundage was used for vinyl backing. Vinyl, jute, and Orlon—not used in 1950—accounted for 21 percent of the poundage in 1955. Rayon, which was 3 percent of the poundage in 1950, accounted for 1 percent in 1955, while nylon was not reported at all in 1955. (Table 4.)

TABLE 3.—*Quantity and percentage of components in materials purchased for convertible tops for 1955 convertible automobiles* [1]

Material	Pounds	Percent of total
Cotton	1, 214, 023	43
Backing	200, 688	7
Other	1, 013, 335	36
Vinyl	334, 859	12
Jute	224, 053	8
Rayon	44, 919	1
Orlon	19, 147	1
Latex and butyl	992, 558	35
Total	2, 829, 559	100

[1] Estimated number of 1955 convertibles, 197,291.

TABLE 4.—*Relative importance of materials used for convertible tops*

Material	1950	1955
	Percent	*Percent*
Cotton	45	43
Backing	----------	7
Other	----------	36
Vinyl	----------	12
Jute	----------	8
Rayon	3	1
Orlon	----------	1
Nylon	(1)	----------
Latex-butyl	52	35
Total poundage	100	100

[1] Less than 1 percent.

How the Automobile Industry Makes Decisions On Interior Trims

As in the 1950 study, the line of inquiry followed with automobile executives in 1955 was designed to determine the methods being used to evaluate and select the fabrics they use for car interiors. Generally, information of this type is important to any group interested in furthering the competitive position of a particular fiber or fabric.

All of the executives who participated in this study were asked to describe in some detail their part in making decisions pertaining to the selection of specific materials for car trim purposes. All those acknowledging active participation in the selection of materials for car interiors were asked:

In a big operation like yours, a lot of people must be involved in any decision. Let's take *upholstery* fabric, for example. Just how did (name of company) go about selecting the upholstery fabric for its 1955 models?

The interviewers, in this phase of the study, were instructed to draw out the respondents on such pertinent matters as who determines price ranges and type and style of fabrics to be used, who makes initial and final selections and who controls decisions based on performance tests.

In general, the overall character of the selection process has changed very little between 1950 and 1955. Consistent with the findings of the earlier survey, the details involved in selecting interior fabrics in 1955 varied only slightly among the various companies. Depending upon the size of the company, there were some variations primarily in the scope of the selection process and in the degree of emphasis placed upon certain stages. Specific information on differences among companies will be found later on in this section.

In addition, both surveys revealed that the selection of fabrics is not based on the personal preferences of 1 or 2 executives within a company. The people within any one company who influence some phase of fabric selection may number from dozens to hundreds. Obviously the degree of influence of each of these people in the selection process may vary greatly according to their function and position but there are indications that each opinion expressed is carefully considered.

Actually, there have been few changes of major consequence in the specific selection methods employed by the automotive industry since 1950. The changes which have occurred do not concern the overall procedural process but rather involve the relative influence of various personnel upon the selection of fabrics and the degree of emphasis placed on particular characteristics of fabrics.

The Selection Process, 1955

In order to obtain clear understanding of the fabric selection process, it was considered desirable to describe the typical flow of activity which constitutes the selection as it is currently executed. The selection process has been divided into the 5 following stages:

1. **Initial Selection.**—As much as a year and a half before a car is produced, the styling experts of the automobile industry begin to accumulate numerous samples of trim fabrics of every conceivable type and style. Typically, collecting these swatches requires more than communicating with the various mills which have successfully produced automotive fabrics in the past; it also involves accumulation of sample goods from almost every conceivable source. However, the mills play an important part in this initial phase of trim selection. Automotive companies rely heavily on the mills to anticipate fabric needs by keeping abreast of the public's taste.

Aside from the many hundreds of samples the styling people receive from the mills, many more are submitted from outside styling consultants, division executives, personnel in advertising and public relations, dealers, swatch houses, European stylists, and factory workers.

The problem of selecting the most interesting styles from as many as 1,000 possibilities belongs generally to the head stylist of the company and his assistants. In some companies, the head stylist is assisted by the chief trim or fabric engineer, but in smaller companies the stylist assumes full responsibility.

The principal basis for selection and elimination at this point is appearance, i. e., the style of the fabric must be consistent with the styling department's conceptions of what is new and interesting. Price and general suitability (weight and construction) are also considered but are not of paramount importance. Generally, if a fabric is suitable in appearance but too high in price, the company's fabric engineers may substitute cheaper fibers. An interesting drapery or dress fabric will not be disqualified until the trimming department determines the possibility of having the same style produced in suitable weight and grade.

This first screening may eliminate 90 percent of the swatches originally submitted, usually leaving approximately 75 to 100 pieces for further consideration.

At this point, the styling department has pretty firm convictions as to the most desirable fabrics for the different priced cars made by the company. Before the first style show, however, product planning personnel representing the company's various makes, lines, and models are asked to make a preliminary screening of the samples.

2. **First Style Show.**—A preliminary style show is generally held for each division of a company. Top executives representing each car manufactured meet with the head of the fabric and trim engineering department and with the chief stylist. Their purpose is to review the swatches which have successfully passed previous screenings. As has already been stated, many of these swatches may not be of automotive weight and, in some instances, only drawings of the designs are included. In one company, however, all the fabrics presented at the first show are tested for performance before the first style show.

At this stage the principal interest is to establish the general direction for the final styling of the car interior. Most of the swatches are discarded because they are not in keeping with basic concepts of the general character of the car's interior.

Although the price of a fabric is not a principal consideration at this meeting, division management may reject a fabric on this basis. The management of each specific car division has a prefixed idea as to how much money can be allotted for trimming purposes. This figure is based on the cost of trimming of the previous year's model and every attempt is made to keep within the same budget.

This first show may be held as much as a year

or more before the car is scheduled to go into production in order to allow the mills sufficient time to produce the fabrics. Another reason for the early scheduling is that between the first and second style shows a great deal of laboratory testing of fabrics has to be done both by the mills and by the companies.

3. **Testing the Fabrics' Suitability.**—After the first showing, all of the fabrics which were considered acceptable in appearance and price are tested for performance. The styling department of some of the larger companies has swatches tested which are considered too expensive by management. If such a swatch is particularly attractive and also performs well, cheaper fillers may be substituted or threads subtracted, and the price reduced sufficiently to comply with budgetary restrictions. Also, if the styling department has strong inclinations toward the appearance of a particular fabric, it will make every attempt to convince division management that the fabric's merits outweigh the cost factor. Reports indicate that industry stylists have become increasingly successful in this respect in recent years. It was pointed out, however, that stylists generally make every effort to adhere to fixed budgetary considerations.

Details of the various fabric tests employed by the automobile industry are presented in the section dealing with upholstery materials. Often these tests reveal that a particular attractive fabric is unsuitable for trim purposes because of one weakness or another. The styling and trim departments may then make a special effort to obtain the desired characteristics without influencing its overall cost. Generally the cloth is taken back to the mill to determine whether desired characteristics can be achieved.

The mills play another important role in the selection process at this time. When a fabric not of automotive weight or construction is selected at the first style show the mills are asked to bring it up to expected standards while maintaining appearance. Members of the automotive industry may spend months in cooperative effort with the mills to achieve success in this respect.

Reports of test results on fabrics are received from the laboratories by styling and trim personnel. The various management groups of each car division are not directly informed of the success or failure of a particular piece of goods and generally have little to do with this phase of the operation. When management is asked to review the fabrics again for final decision, it is assumed that all samples submitted to them for inspection are suitable for use.

After all tests are completed, the remaining samples are collected and preparations are started for the second style show.

4. **Second Style Show.**—The first step in preparing for this show is to have the mills supply a small bolt of each of the materials under consideration. This is necessary because those fabrics which are considered to be the most likely selections will be used to trim cars to present a more realistic display. The show generally consists of 3 or 4 upholstered cars and a display of the remaining fabrics. During the interviewing period of this study, 1955 models were being draped with fabrics that may be used in 1957. Generally the reason offered for actually trimming cars with the fabrics was simply a desire to see the designs as they will look to the consumer. Such factors as the appearance of the material in a confined area and the possible change in appearance because of the lighting effects or shadows inside a car are also considered.

Before the actual show, the product planning people for each division are invited to review the selections which the styling department is readying for the second show. In accordance with suggestions offered by the division personnel, ideas are developed for selecting bolster cloths to go along with the body cloths, where pleats should be located, and other style and trim details.

When the second style show is completely arranged, the top division executives and various department heads are invited. Included in this group may be the division president, vice president, advertising manager, purchasing agent, product planning manager, sales manager, and several others. At this point usually all questions of price and performance have been settled and appearance is the principal basis for judging.

At the completion of the show there are generally 3 or 4 fabrics which are not eliminated. If a cloth is selected which was in bolt form it is immediately trimmed into a car.

The 3 or 4 cars upholstered in the fabric "candidates," are driven by a top executive for 2 or 3 weeks. Many times a fabric that had been an indicated choice proves unsatisfactory to the executive. After this test, the division management and stylists decide which of the fabrics to use.

At this point the corporation's president and other top people are invited to look at the selections. This is always done before final plans are made. The selections which have been made are usually approved by the corporation's management. It was reported that rarely will a top executive take so strong a dislike to a fabric at this point as to insist on its elimination.

5. **Implementation of Selection.**—After final selection is made, the company's fabric engineers examine the fabric once again with an eye toward reducing its cost while maintaining its quality and appearance. The actual price paid for a fabric is often below the figure which was approved originally. The purchasing departments are now informed of the final decision and start to work with the original suppliers. The suppliers work along with the companies' technicians in an effort to

reduce the cost of the goods to a minimum. The purchasing department tries to find at least 2 other mills capable of producing the same cloth at the same price. Comments indicate that 3 suppliers are standard; however, for an unusual cloth for a limited production model, 1 or 2 suppliers are satisfactory.

The mill submitting the original sample gets the first and usually the largest order. The other mills are selected on the basis of their cooperation with the company and their ability to produce the desired cloth. Many of the executives placed emphasis on the fact that at least 3 sources are necessary for a large quantity of fabric. Sometimes in the past one supplier alone could not meet production schedules.

The fabric selection process described above is representative of the larger companies in the automobile industry. For the most part, the same procedure is also practiced by the smaller companies. Of course the largest companies' selection process might involve 10 times as many people as that of the smallest concerns.

Perhaps the outstanding difference between the various sized companies is the matter of final selection. In the smaller companies, top management takes a much more active part in selection of sample fabrics: usually, an executive committee consisting of the company president, vice president, and 1 or 2 other top personnel work closely with the chief stylist throughout the selection routine.

Another difference is that the smaller organizations test their samples but do not go to extensive efforts to redesign materials to give them desired characteristics. In addition, if a fabric is too costly, these companies do not go to the same amount of trouble to bring down the cost by redesigning the sample. These are the major differences which exist among large and small companies, and it is fairly evident that although company size is somewhat of a factor, the overall procedural plan is not greatly affected.

As stated earlier, the step-by-step procedure deals largely with the selection of fabrics to be used for upholstery. Since the headlining and sidewall fabrics chosen are dependent to a great extent on the final choice made for upholstery, the selection procedure for these parts is considerably less formal than for upholstery fabric. Based on the final selection for upholstery, the styling and engineering departments cooperate in finding good complementary sidewall and headlining materials of suitable prices. The effects to be achieved in trimming the sidewalls are usually presented to division management for final approval in the form of artists' sketches.

The trim engineering department is largely responsible for the selection of padding and sheeting materials and consults management only if the price of the materials selected is in excess of the levels set. The same holds true for the engineers who are the sole judges of what is to be used for insulation purposes.

Convertible tops are selected by engineering and styling groups. This is usually a relatively simple process. In the event of a change in materials, the selection is subject to the division management's approval—with particular emphasis on price and performance.

Variations in the Selection Process, 1955 Compared with 1950

In general, the procedure employed by the automotive industry in selecting interior trim fabrics did not change significantly in the 5 years. The listing of the various steps in the selection process (table 5) demonstrates the similarity of operations in the 1950 and the 1955 studies.

TABLE 5.—*Steps taken by the automobile companies in selecting upholstery materials, 1955 compared with 1950*

Steps reported	Companies mentioning in—	
	1950	1955
	Number	*Number*
Initial elimination of some of the samples offered by or obtained from vendors	8	5
Trip to mill to select samples	5	5
Ideas for new fabrics suggested to mills	6	4
Prices set	8	5
Cooperation between mill and company on fabric development	6	5
Performance tests applied	8	5
Review and weed out fabrics in sample form	8	5
Trim cars with materials to detect production problems	7	4
Make road tests	4	4
Preview fabrics trimmed into cars for appearance	6	4
Consumer survey with scientific sampling	2	4
Poll consumers at auto shows, etc	1	5
Poll factory employees on reaction to trims	2	2
Estimate public reaction through sales records	5	5
Receive dealer reports on public reactions	5	5
Considered complaints	2	5
Final decision	8	5
Further attempts to reduce cost of selected fabric	---	3
Insure adequate sources of supply	---	5
Total companies reporting	8	5

The difference between the selection process in 1955 and 1950 is primarily one of emphasis. Although fabric styling was a very important consideration to the executives in 1950, the 1955 study shows an even greater interest in obtaining new and interesting styles and patterns to present to the buying public.

For example, in 1955 the industry took a keen interest in fashions and style trends in such fields as home furnishing and apparel. Some companies are subsidizing schools of design, and young creative people are being sought for their fresh approach to style and design. European fashion centers are watched carefully and note is made of all new and interesting designs. The use of outside style and color consultants has apparently increased. Also automotive advertising dwells upon interior and exterior beauty to a greater extent than ever before.

Illustrative of the increased emphasis on style leadership are the following comments from key executives in the automotive industry:

Since selling has become increasingly competitive we have to stress something new to the public. The public took the mechanical features of the car for granted since it knew they were developed to a high degree in all cars and the spotlight of merchandising was turned on body trim and color. It used to be that we would provide one trim for an entire car model. Now we have a variety of offers for every line—with new and different colors and patterns in each. We're no better off since it costs more money to do this and the trim engineers fought against it. Styling and sales were for it, however, and it paid off in public acceptance. Now the biggest fight in the industry is to get new and interesting styles and colors for interior trim.

Styling is being done today by a group of people who are young and have no carriage trade background to influence them. The modern look is the keynote of the cars being produced today. We have even subsidized a number of various art schools in order to develop new and fresh fabric designs.

This heightened interest in style and style leadership has apparently affected the emphasis placed on price. In 1955, there was a tendency upon the part of the industry to be somewhat more lenient in enforcing price controls in making fabric selections than in 1950. Although every effort is made by executives who select fabrics for trim purposes to stay within their allotted sum, there is evidence that when the fabric in question has a distinctive appearance and obvious sales appeal, price concessions are made more often than they were 5 years ago.

With the increased sales emphasis on appearance, it is currently considered wiser to go beyond set prices, if necessary, to obtain something desirable.

Generally we make every effort to keep to last year's price range. If there is any increase, we don't go along with it unless we feel sure it gives us a better selling position than other selections would.

If we have to spend more for a particular fabric, we may take it out of the bolster used. If we increase the bolster area, which is generally low cost vinyl, costs usually average close to the previous years.

We try to keep the same price pattern as in the preceding years—but if this is not possible, the chief stylists, car division and engineering groups can authorize an increase to get something particularly desirable.

Along with the increased emphasis on obtaining new and interesting styles, the stylists in the automotive industry have become increasingly important in selecting these fabrics. Although the stylist's role was important at the time of the 1950 study, in the ensuing period they have gained even more influence in determining the fabrics to be selected.

The findings of the former study pictured stylists as important in the selection process, along with such specialists as buyers, fabric engineers, sales personnel, etc. Specialists other than the stylist had active parts in the selection process and enjoyed considerable influence in selecting fabric styles and designs. Top management was also reported to have taken a fairly active part in the selection of trim fabrics in 1950, particularly in the final decisions. While these non-stylists are still active in the selection process, the 1955 findings indicate that they participate mainly in highly specialized ways and are not as influential in determining styles as formerly.

As a rule, the stylist is currently the principal judge of what samples are new and interesting. At times during the selection process, the stylist will seek the opinions of various department heads and associates on the choices he has made. The stylist, however, has screened the samples and only those considered interesting to him are submitted for further consideration. Although the stylist has apparently gained in influence in the overall selection process, various other departments still play essential roles in performing their specialties.

The following comments illustrate and lend emphasis to the increased influence of the stylist in the selection process:

The overall sales department has the option of criticizing the line but top management has expressed the feeling that the people at styling have a better idea of what the trends are going to be. The stylists can vote sales personnel down in a disagreement pertaining to the suitability of a sample. The training of the sales personnel does not really equip them to make a well-based decision. Styling tries to show them the samples when they are trimmed into cars so as not to cause confusion by offering them too many ranges of selection.

Styling shows what they are considering before company thinking on the concept or character of the car is crystallized—usually when the seats have been draped in automotive weight cloth. Usually division management goes along with the top stylists' ideas but if they have some violent objections to a piece, it is rejected.

After the swatches are assembled by the styling department the executive stylist screens them carefully. They put aside for further consideration only those patterns which fit into their collective concept for the new car.

The next step brings in the head stylist for the specific make of car under consideration. Together with the executive stylist he reviews the remaining swatches and can exert his own influence in rejecting fabrics if he desires. Usually, however, the top stylists are in complete agreement on which are the most desirable pieces.

Shortly after, the production planning people representing the specific make of car are asked to help styling prepare a swatch show for their department heads and management. They have some influence in suggesting further rejections but the chief stylist can do as he pleases. He may either agree or overrule them.

Later the top stylists and division management form an agreement on what the general character of the car should be and further eliminations are made on this basis.

If the stylist likes a design extremely well that has been rejected in performance tests he can request engineering assistance in altering the fabric's contents to obtain

satisfactory performance. He can also approve a fabric's use despite its limitations. Division management is not usually bothered with test results—they leave this entirely up to the stylist and performance testing engineers. However, if production time is close and there is no chance to sufficiently test a fabric they get worried and may rely on the guesstimate of the engineers and stylists as to whether the fabric in question could or could not pass the tests successfully.

The purchasing department has no function of any importance in the selection process. They merely follow orders in procuring materials after they are approved. If they find that a fiber is not available due to strikes, wars, etc.—they ask for alternates.

When there are 15 to 20 fabrics offered for a particular purpose—and one is selected—purchasing is given the specifications and must get at least three or four different mills to produce it. Their principal job is to get the mills to turn out good automotive weight fabrics in the right price bracket.

Another variation between 1950 and 1955 procedures concerns the measuring of consumer opinions and reactions to selected fabrics by population surveys or polls at auto shows. Although these practices were reported in 1950, executives appear to be more concerned with them in 1955. Many comments were made which indicate that stylists and other groups are constantly trying to measure public reactions to the interior designs they have introduced. Stylists endeavor to interpret coming trends in consumer tastes by keeping abreast of all the latest trends in the fashion industry. This they do through consultation with the various mills and with style consultants both here and in European fashion centers, and through visits to furniture and textile expositions. The increased interest expressed by the industry in testing the consumer acceptance of fabric choices is undoubtedly a reflection of the desire to validate stylists' projections of future style trends.

The chief stylist with one of the automobile companies offered the following pertinent comment:

Our selections are based in part on the trends in the French and Italian style markets. We send our representatives to these places in hopes that they will bring back new and interesting designs. They are far ahead of the styles currently popular in this country. In addition, we have independent style consultants predicting style trends for us. They provide us with information regarding the trends in cloths, upholstery and other fields which tend to bear upon the automotive market.

After the cars are introduced to the public, market research studies are conducted to determine the degree of acceptance accorded the new trim styles.

One executive summed up the extent to which his company explores the public's reaction to newly introduced styles, as follows:

Style is the hottest thing there is right now in selling a car—compared with quality of transmission, etc. The more lush the interior, the better. We want to keep showing the public new and different materials. We study the changing moods of the public by following the trends in clothing and housing interiors and matching competition in our own industry.

To measure the success of our work we go to considerable effort to measure the reaction and the degree of acceptance by the public. Some of the methods used include direct mail questionnaires, personnel interviews, soliciting dealer comments, consumer panel observations, employee reaction and opinions rendered by consulting firms and advertising agencies.

Upholstery Materials

Definition

Upholstery material, or body cloth, is the external covering for seat backs and seat cushions. Coverings for the interior sides of the car are discussed in the section entitled "Sidewall Materials" and coverings for the ceiling of the car are considered in the section entitled "Headlining Materials."

Consumption

Over 70,000,000 pounds of upholstery materials were purchased by the automobile industry for use in the 1955 passenger cars. [Of this poundage, 40 percent was vinyl, 28 percent was cotton, 13 percent was rayon, 10 percent was nylon, and other, 9 percent.] About 71 percent of the cotton poundage, or 20 percent of all poundage, was consumed as backing for the vinyl; the remaining cotton poundage was primarily used in mixtures or blends with other materials.

In 1950, 43,381,486 pounds of upholstery materials were used. Of this total, wool accounted for 51 percent; rayon, 18 percent; and cotton, 11 percent; and other, 20 percent.

It is apparent from the statements above that several major shifts have taken place since 1950 in the position of various fibers for upholstering.

TABLE 6.—*Change in consumption of key materials for upholstery, 1955 compared with 1950*

Material	Change in relative position			Change in absolute pounds		
	1950	1955	Change	1950	1955	Change
	Percent	*Percent*	*Percent*	*Pounds*	*Pounds*	*Percent*
Wool	51	1	−98	21, 885, 986	813, 793	−96
Cotton	11	28	+155	4, 740, 149	19, 677, 104	+315
Nylon	9	10	+11	3, 890, 607	6, 830, 165	+76
Rayon	18	13	−28	8, 008, 806	9, 451, 082	+18
Vinyl	4	40	+900	1, 807, 985	28, 361, 110	+1, 469
Leather	7	5	−29	2, 703, 774	3, 645, 422	+35

Table 6 presents a summary of the percent of loss or gain for all fibers which account for 5 percent or more of the upholstery poundage consumed in either 1950 or 1955.

Nylon, rayon, leather, and more significantly cotton and vinyl show increases in absolute poundage between 1950 and 1955 while wool shows a decrease of 96 percent in absolute pounds. Taking into account increased car production between 1950 and 1955 as well as the use of cotton-backed vinyl, the actual pounds of cotton consumed in automobile upholstery in 1955 represents an increase of 315 percent over cotton poundage in 1950.

This pattern of increased use of cotton-backed vinyl to the virtual exclusion of wool will also be noted with respect to sidewalls.

Characteristics the Automobile Industry Wanted in Upholstery Materials, 1955

Executives were questioned about characteristics an upholstery material should have to make it ideal. This question was also asked with respect to materials used in other parts of the car, e. g., sidewalls, headlining, padding, sheeting, etc.

The criteria used for judging sidewalls and headlining were to a marked extent dependent upon the upholstery material selected. Thus, the characteristics reported as desirable for upholstery have implications not only for upholstery *per se*, but also for other trim fabrics, since the upholstery is the decisive factor with which other fabrics must be coordinated.

The question of ideal upholstery characteristics was discussed with 40 executives. Responses to the question were grouped into 3 basic categories:

1. Performance over a period of normal use by the car owner.
2. Attractiveness to the customer.
3. Ease of handling and tailoring in production.

Virtually all of the executives mentioned characteristics related to performance, 9 out of 10 discussed appearance factors, while 6 out of 10 mentioned characteristics related to production. Weighting the replies of executives according to company production does not effect the order of importance of the 3 basic categories: performance considerations rank first with 51 percent, appearance factors second with 34 percent, and production properties third with 15 percent. (Table 7.)

A number of specific characteristics were reported as desirable within the framework of the basic categories of performance, appearance and production. The following list presents in the order of their importance the key upholstery properties executives discussed (table 7).

Soil resistance; cleanability (performance)
Permanency of color (performance)
Wear resistance, general (performance)
Elasticity (performance)
Expensive looking, lustrous (appearance)
Ease of handling, tailoring (production)
Cool, smooth feel (appearance)
Appealing texture and weave (appearance)

TABLE 7.—*Characteristics the automobile industry wanted in upholstery materials*

Characteristics mentioned	Executives mentioning	Weighted percentage of total replies
	Percent	*Percent*
Performance over a period of normal use by car owner	**98**	**51**
Soil resistance, cleanability	83	11
Permanency of color	73	10
Wear resistance, general	65	10
Elasticity	38	9
Slidability (without slickness)	38	2
Resistance to water spotting, moisture	38	2
Porosity; breathability	20	1
Resistance to abrasion	18	1
No harsh finish; not hard on clothes	18	1
Low static charge; shockproof	8	1
Not susceptible to snagging	8	(1)
Should not pill; not mat up in little balls	5	(1)
Warm to sit on; not cold or hard to the touch	5	(1)
Dimensional stability in humid weather	5	(1)
Must have low melting point	5	(1)
Must lack bow	3	(1)
Should resist punctures	3	(1)
No "flop" (no effect on color or sheen when angle of light changes)	3	(1)
Attractiveness to the customer	**90**	**34**
Appearance, general	40	2
Expensive looking; lustrous	35	9
Soft hand, feel; rich feel	35	2
New, novel, interesting patterns	33	2
Cool feel; smooth feel	25	8
Modern, contemporary styling	20	1
Appealing texture and weave	18	8
Coolness in appearance; not hot looking	13	1
Dye consistency; no color variations	10	1
Clear color; clean looking	10	(1)
Plush, pillow look of comfort	3	(1)
Light colors, but with flash	3	(1)
Should harmonize with exterior	3	(1)
Ease of handling and tailoring in production	**60**	**15**
Ease of handling, tailoring, working	43	9
Tensile strength	35	2
Easily cut without slipping	10	1
Not susceptible to raveling or fraying	10	1
Acceptance of piece, vat dyeing	8	1
Must take vulcanizing for pleats	5	(1)
Should withstand industrial cleaners	5	(1)
Should resist puncture	3	(1)
Fit without skewed lines, uneven patterns	3	(1)
Dye consistency for matching	3	(1)
Total	(2)	100
Number answering question	40	

[1] Less than 1 percent.

[2] Column adds to more than 100 percent because most executives named more than one characteristic.

Thus, of the 8 most important specific properties discussed, 4 fall into the area of performance, while only 1 is a production concern.

Soil resistance and cleanability was apparently of paramount concern to the industry. This characteristic was also considered critical for sidewalls and headlining.

In addition to reporting the characteristics needed to make an upholstery material "ideal," executives were asked to name the characteristics which, in their judgment were in greatest need of improvement: of the 25 executives who discussed this question, three quarters named soil resistance and cleanability.

Table 8 presents a summary of the characteristics considered to be in greatest need of improvement. Note that for the most part performance characteristics are mentioned rather than appearance or production considerations.

TABLE 8.—*Characteristics which need improvement most*

Characteristics mentioned	Executives mentioning	Weighted percentage of total replies
	Percent	*Percent*
Soil resistance, cleanability	76	45
Permanency of color	32	34
Resistance to moisture, water spotting	20	5
Wear resistance	12	4
Resistance to wrinkles	12	5
Ease of tailoring synthetics	4	1
Elasticity	4	1
Resistance to fraying	4	1
Resistance to puncturing	4	1
Less pilling	4	1
Broader color range (with solution dyed yarn)	4	1
Easier binding (trouble interlocking nylons, rayons, and Orlon)	4	1
Total	(1)	100
Number answering question	25	

[1] The column adds to more than 100 percent since many of the executives named more than one characteristic as needing improvement.

In addition to characteristics deemed necessary by automobile executives for an ideal upholstery fabric, the general factors currently exerting the greatest influence in upholstery selection were determined by asking executives to rank 6 designated factors in their order of importance. Thirty-three executives were shown a card listing the following 6 factors:

1. Appearance (eye appeal) at time of sale.
2. Availability of supply.
3. Cost, both initial cost of material and labor cost.
4. Comfort (slidability, coolness, feel).
5. Performance or appearance after a period of normal use.
6. Prestige of material with customer.

The average rank-order scores for each factor is given below. A score of 1.00 would mean that all executives agreed in rating the factor thus scored as most important. A score of 6.00, on the other hand, would mean that all had rated that factor as least important among the 6. In other words, the closer the average rank-order score is to 1.00 the greater is the importance of the pertinent factor in the judgment of the executives.

Average rank order of factors entering into decisions on the fabrics to be used in upholstery:

Factors	*Average rank order*
Appearance	1.27
Cost	2.21
Performance	2.61
Comfort	2.76
Prestige with customer	3.97
Availability	4.73
Number answering question	33

The rank scoring indicated that appearance was clearly the leading factor on the basis of this rank-order technique, thus confirming the earlier evidence of the importance of styling in the selection of interior trim materials.

Most of the executives commented that the factors under study were so closely interrelated that it was virtually impossible to assign ranks to each in realistic terms. The following 3 comments were typical:

> These things cannot be evaluated too easily. Appearance is essential. If it doesn't look good, we won't make the sale. Performance is a must in order to provide a reasonable life to the car; we wouldn't consider anything that wasn't possible in this regard. Cost is another factor which cannot be overlooked, although we will go beyond our normal costs to get something which might help us sell.
>
> Appearance might be regarded as of prime importance. But we're only asking for trouble if the fabric isn't in the right price range and won't stand up in performance. Thus, all of the factors are more or less equal in importance. Even prestige is important. The sales department knows that nylon has a magic connotation to the public and like to plug it.
>
> Everything depends on the degree to which it is present. For example, no matter how good a fabric looks and how little it costs, we won't use it if it doesn't give at least minimum performance. However, once proper performance is there (minimum only is required—if more than minimum we will examine it to see if there are some elements we can change to reduce costs) cost and appearance come up in importance.
>
> In reality, we make our decisions ususally on appearance because we assume we can get the necessary cost and performance. Prestige of material is of some importance—but less so than the other factors. We know that a certain amount of nylon or a nylon-faced material is very attractive and enhances the fabric. However, 100 percent nylon is not necessary. As long as we have even 2 percent nylon, we merchandise the word nylon.

Characteristics the Automobile Industry Wanted in Upholstery Materials, 1955 Compared with 1950

Throughout the discussions of desirable characteristics of interior materials, changes in emphasis between 1950 and 1955 reflect 2 situations:

1. A new material has been adopted for use, for

a specific set of desirable characteristics, and that new material presents problems not associated with the materials it replaced. An example of this situation is found in the discussion of headlining when the increased use of vinyl focused attention on the desirability of a headlining with sound-absorbing properties, which vinyl—in a nonperforated form—reportedly does not have.

2. A new material has been adopted which possesses an attribute formerly considered virtually impossible to achieve, based on the properties of the materials which it supplanted. An example of this is cleanability, a property associated with vinyl, which was not foremost in executives' minds when wool was the leading fiber used in upholstery and sidewalls.

Regarding specific characteristics, there has been increased emphasis on styling; executives in 1955 placed greater stress on appearance as a desired characteristic of upholstery materials than in 1950. Conversely, less emphasis was placed on ease of production in 1955. This shift in executives' thinking was also noted with respect to sidewall materials.

Table 9 presents the relative importance of the 3 basic categories (appearance, performance and production) for upholstery, sidewalls, and headlining in 1955 in contrast with 1950.

For all 3 parts of the car, concern over ease of production has apparently diminished, but less so in the case of headlining than for upholstery or sidewalls. The particular importance of production considerations with respect to headlining is fully discussed in a subsequent section of this report.

TABLE 9.—*Relative importance of major factors pertaining to upholstery, sidewall, and headlining materials, 1955 compared with 1950*

Factor	Weighted percentage of total replies	
	1950	1955
Upholstery:		
Performance	50	51
Appearance	19	34
Production	31	15
Sidewalls:		
Performance	40	50
Appearance	10	28
Production	50	22
Headlining:		
Performance	35	44
Appearance	16	16
Production	49	40

Concern with performance of upholstery over a period of normal use by the car owner has remained at the same level of importance between 1955 and 1950, 50 percent and 51 percent of the weighted replies respectively. However, there has been considerable shifting as to the specific characteristics which comprise the performance category.

Table 10 presents a comparison between the most important specific performance properties named as desirable in each year (as much as 3 percent of weighted replies in either 1950 or 1955).

TABLE 10.—*Principal specific performance characteristics considered desirable for upholstery, 1955 compared with 1950*

Performance characteristics	Weighted percentage of total replies	
	1950	1955
Soil resistance, cleanability	5	11
Permanency of color	7	10
Wear resistance, general	8	10
Elasticity	4	9
Slidability	7	2
Porosity; breathability (coolness)	6	1
No hard finish; not hard on clothes	3	1

Soil resistance was of considerably greater importance as a property of upholstery in 1955 than it was in 1950. On the other hand, coolness was of less concern. The diminished attention to coolness is discussed in the section dealing with padding materials.

In summary, the relative rank order of factors entering into the selection of upholstery fabrics remained unchanged between 1950 and 1955 (table 11).

TABLE 11.—*Average rank order of factors entering into decisions on the fabrics to be used in upholstery, 1955 compared with 1950*

Factor	Average rank order	
	1950	1955
Appearance	1. 84	1. 27
Cost	2. 84	2. 21
Performance	2. 89	2. 61
Comfort	4. 16	2. 76
Prestige with customer	4. 48	3. 97
Availability	4. 98	4. 73
Number answering question	22	33

Measurement of Characteristics for Performance Over a Period of Normal Use, 1950 and 1955

In 1955 as in 1950 the automobile firms tested fabrics to measure some of their performance characteristics and their suitability for specific uses. In both years, all of the companies employed laboratory tests of wear resistance, color permanence, soil resistance, stretch, and tensile strength.

In addition, some of the companies tested for other attributes such as resistance to water spotting, bleeding, etc., when these were important for specific fabric applications. Several of the companies also observed performance under actual field conditions. Test drivers were said to be very valuable in evaluating such factors as slideability, coolness, overall comfort, and the general suitability of interior fabrics. In general, company policies varied regarding the total amount of time and money to be spent on testing. Whereas one company might check every characteristic with great precision, another relied heavily on vendors to meet predetermined standards and checked only the most important attributes in their own laboratories.

1. **Wear Resistance.**—Although several mechanisms were reported for testing the wear resistance of automotive fabrics (Taber, Wizenbeck, Stoll), each performs a similar function, that of abrading the material for a specified time and under a particular weight load, after which the fabric was examined visually for signs of excess wear. Essentially the test methods did not change between 1950 and 1955. Machines either pressed an abrasive substance (such as emery cloth) against the material and rotated one or the other, or they rubbed the abrasive back and forth across the fabric. These motions, generally referred to as revolutions or cycles, were sometimes combined. The duration of contact, coarseness of the abrasive and degree of pressure were varied depending upon the fiber content and end use of the fabric being tested.

It is not feasible to list every test situation. For example, in one test the revolutions to which fabrics were subjected ranged from 250 to 3,500 and weight loads from 500 to 1,000 grams. In another, the cycles ranged from 2,500 to 25,000 at an average pressure of 7 pounds per square inch. One firm reported that in their tests, fabrics withstanding a standardized test of 10,000 cycles at 3 pounds pressure were presumed able to last the life of the car. In general, woven fabrics were subjected to less severe tests than vinyls. In the first test mentioned above, for example, woven fabrics were required to withstand 500 to 1,000 and vinyls up to 3,500 revolutions, and in the second test described woven fabrics needed to withstand 2,500 cycles, vinyls 20,000 to 25,000. Furthermore, upholstery textiles were usually required to withstand more abrading than others so that headlining, let us say, might be given 250 to 1,500 revolutions and seat bolsters 1,500 to 3,500 by the same firm.

If, in the judgment of company engineers, a fabric had withstood the abrasion test, it was considered satisfactory for use with regard to wear resistance.

2. **Permanency of Color.**—The same tests for color fastness were used in 1955 and 1950. Essentially, these consisted of placing fabric swatches under the light of the Florida sun or of a fadometer, and then examining them to determine the degree of fade. In the fadometer test, the swatch was exposed to an ultraviolet light for a specific time period under controlled temperature and humidity conditions. Woven fabrics were exposed for as few as 40 hours and vinyls for as many as 100 hours. Using the actual Florida sunlight, exposure times ranged from 25 to 100 hours. In addition to the above methods, in 1955 one firm reported another test in which the fabrics were immersed in water for 80 hours under controlled conditions. This test, it was stated, simulated actual sunlight better than the fadometer.

In judging the amount of fade, great stress was placed on change in hue; less on changes in shade. A dark blue fabric, for example, would be rejected if it turned to a purplish hue whereas it might be suitable if it merely faded slightly to a lighter blue.

3. **Tensile Strength.**—All of the automobile companies tested fabrics for resistance to tear in warp and fill directions, using the Scott tester. The requirements again varied with the specific fabrics and their intended application. Warp strength requirements for woven goods ranged between 80 and 90 pounds per square inch, and for vinyls between 100 and 130 pounds. The fill of woven fabrics were generally tested at about 70 pounds per square inch, and of vinyls at 80 to 120 pounds.

4. **Soil Resistance—Moisture Resistance.**—Most companies tested a fabric's reaction to soil by applying dirt or grease smudges and then using a cleaning fluid to remove them. For a particular fabric to be considered satisfactory, the grease and dirt were required to come off easily and without leaving stains.

Resistance to water spotting was tested by sprinkling distilled water on the fabric, letting it dry, and then checking visually for streaks, spots, and other changes in appearance.

5. **Stretch.**—The stretch and "set" characteristics of automotive fabrics were measured either by a laboratory stretching mechanism or by fitting fabrics into cars and judging these qualities with respect to actual contouring in position. There were various laboratory procedures. One, for example, consisted of attaching a 27-pound weight to a suspended 2- by 9-inch swatch for 10 minutes and then measuring the degree of elongations. The degree of "set" was determined by removing the weight and remeasuring the swatch.

For the most part, companies were unable to define the required elasticity of new fabrics. It was pointed out that stretch and "set" depend upon the fiber content and the application of the fabric and that last year's standards of stretch cannot be applied to next year's materials if there are significant changes in fiber content or proportions. One firm indicated general requirements for woven fabrics of 3 to 7 percent stretch and 0 to 2 percent set and gave greater latitude to vinyls where stretches of 1 to 8 percent in the warp and as high as 30 percent in the fill were permissible.

This same firm established a maximum "set" for coated fabrics of 3 percent or, in the case of stretchy vinyls, no more than 25 percent of total stretch.

6. **Shrinkage.**—Some manufacturers in 1955 tested upholstery fabrics for shrinkage under controlled conditions. One such examination consisted of submerging a sample swatch in water at 70° Fahrenheit, and then drying it in air of the same temperature at 65 percent relative humidity. The maximum allowable shrinkage in this particular test was 2 percent in the warp and 10 percent in the fill.

7. **Other Tests.**—Numerous other measurements were made on automotive fabrics to ascertain the amount of bleeding, cracking, coolness and porosity, slidability, snagging, bow, wicking, resistance to aging and cold, etc. In addition, vinyl-coated fabrics were widely tested to determine the strength of adhesion of their backings. Although all of these additional tests were not universally employed, the various companies placed a great deal of stress on one or more of them.

Styling Preferences for Upholstery Materials, 1950 and 1955

While performance characterictics of a given fabric can be judged for the most part by objective technical tests, decisions and reactions to style and appearance of a fabric are essentially reflections of personal taste. In that regard, executives were asked to express their opinions on trends in color, shade, pattern, design, sheen, etc. Industry preferences and expectations in these areas may be of assistance in anticipating the character of upholstery materials which will be in future demand.

TABLE 12.—*Comparison of opinions on trends in color for upholstery materials, 1955 compared with 1950*

Opinion	Executives mentioning		Weighted percentage of total replies	
	1950	1955	1950	1955
	Per-cent	*Per-cent*	*Per-cent*	*Per-cent*
Trends toward:				
Brighter, more intense colors	53	83	33	89
Bright but less intense colors	------	10	------	7
Not as bright, more subdued	------	7	------	4
Neutral colors	23	------	47	------
Relation to body color	27	------	12	------
Mostly neutral, a little color	4	------	2	------
Pastels	4	------	1	------
Don't know	4	------	5	------
Total	(1)	100	100	100
Number answering question	26	29	26	29

[1] Column adds to more than 100 percent because some officials gave more than 1 answer.

Trends in Color.—To obtain opinions on trends in color, 29 executives were asked:

> Now as to what you want your upholstery to look like, what are the trends in color?

Most executives stated that future trim fabrics will be in brighter, more intense colors (table 12). Of the 29 executives responding, 83 percent envisioned brighter, more intense colors for future interior trim materials. Bright but less intense colors were mentioned by 10 percent, and the remaining group held the opinion that future trim fabrics would be rather more subdued. Considered in terms of percentages weighted by company production, brighter, more intense colors received 89 percent; bright but less intense drew 7 percent; with the remaining 4 percent going to more subdued colors. In 1950, neutral colors accounted for almost half of the weighted replies and brighter, more intense colors accounted for only one third.

The executives who discussed color trends were also asked: "What accounts for these (color) trends?"

Among the executives who anticipated a decided trend to brighter, more intense colors, 75 percent explained that they have become increasingly aware of consumers' preference for these colors in such fields as furniture, upholstery, clothing, draperies, and other fashion indicators. Their reasoning is reflected in the following quotations:

> People are getting used to having color in their lives. Watching trends in draperies, furniture upholstery, clothing, etc., has convinced us of this. Brighter, more intense colors are common everywhere; we assume people will want them in their cars as well.
>
> The general trend in America seems to be toward bright interiors in modern homes, office buildings, etc.

Another reason offered by executives for anticipating brighter, more intense colors deals with their conception of the public's attitude toward the present economy.

> When times are good, people want life, excitement in their fabrics, they don't want to be soothed. In poor times, more subdued colors take over.
>
> Colors reflect the national attitude. During prosperity, brighter colors reflect good times but dull colors will come back if the economic picture changes.

Other comments supporting the reported trend to brighter colors indicate that because automobile exterior colors will stay bright due to their appeal on the showroom floor, interior trim materials will follow suit in keeping with the effort to integrate the appearance of the car as a whole.

The primary reason for the expected trend to bright, but less intense colors, is that the public demands change and trim colors cannot get brighter. Executives expressing this opinion reason that trim colors are as bright as they can get and should become less intense to satisfy the public's wish for something new. One executive expressed his opinion in this manner:

Trends in trim color will remain bright, but will be less intense than they are now. We've been too bright with our colors and we can't go any further. We will soften down our colors but stay a long way from anything like neutral. We want to obsolete our old models to give the new car buyer something new and interesting that the neighbor can't miss.

Essentially the same attitude was expressed by the executives expecting a trend to more subdued colors that are not as bright. One executive expressing his opinion put it this way:

It's the only way we can go. We have gotten so bright and light now that the only way we can give a new look next year is to go to darker, more subdued colors.

In comparing the reasons for color trends in 1950 with the findings for 1955, little change since 1950 was noted. Executives in both studies expressed their opinions that trends would be toward brighter colors. Although this opinion is much more widespread today, it is still motivated by a desire to gain public acceptance by keeping up with color trends in related style fields.

On the other hand, 2 of the major reasons offered by executives expecting a trend to neutral colors in 1950 were as follows:

One was the production economies possible with the use of upholstery in neutral colors. Such upholstery will blend with all external colors and fewer alternatives are required. The other reason was the belief, based on sales data, that the public had liked and accepted neutral colors in the past.[5]

The general tendency at that time was to keep trim costs down, create production efficiencies, and give the public what they had liked and accepted in the past. In contrast, current findings emphasize that trim styles and colors have gained considerable importance and are a significant key to achieving sales appeal. Stylists and color experts are not willing to accept a fabric today because it sold well in previous years but are constantly trying to find ways to give car interiors a fresh contemporary appearance.

One comment expressed by an executive discussing the importance of style and color today was as follows:

There has been a color revolution in the last 5 years—based on the need for selling cars after the postwar market subsided. Up until 1951, we could sell all the cars we wanted—no one bothered much about color. Now there's an industry-wide fight on to get new and varied color schemes. It costs more but it creates sales appeal and public acceptance.

It is interesting to evaluate the trend predictions made by executives in the 1950 study. It is obvious that both major groups advocating neutral and bright colors were fairly accurate.

Neutral shades, predominating at the time the last report was written, continued to enjoy extensive usage in the years immediately after. At the same time, however, brighter shades began to make inroads and become very popular. In the last 2 or 3 years, bright, intense colors have become more and more in evidence until, in 1955, they predominated.

Trends in Shade.—The 29 executives were then asked—"Is the trend to light shades, dark shades, or medium shades?"

Executives apparently believe that medium or light shades will prevail with dark shades receiving very little emphasis. (Table 13.) While medium shades were designated as the most likely to be used in future trim fabrics by only 17 percent of the executives, when weighted by production, they accounted for over half of the total replies. Light shades, on the other hand, were specified by over half of the executives, but in terms of weighted replies, amounted to only 25 percent. Ten percent of the executives (weighted 6 percent) envisioned no specific shades predominating in the future but reported a trend to mixed shades for contrast and variety. Dark shades were visualized as being used extensively in the future by only 7 percent of the executives, accounting for a weighted total of 5 percent.

TABLE 13.—*Comparison of opinions on trends in shades for upholstery materials, 1955 compared with 1950*

Opinion	Executives mentioning		Weighted percentage of total replies	
	1950	1955	1950	1955
Trends toward:	*Percent*	*Percent*	*Percent*	*Percent*
Medium	23	17	53	59
Light	54	56	33	25
Range from light to dark	------	10	------	6
Dark	8	7	6	5
Away from medium	4	------	1	------
Don't know	11	10	7	5
Total	100	100	100	100
Number answering question	26	29	26	29

It will be noted that in 1950, as well as 1955, medium shades were selected by a relatively small percentage of executives but these accounted for over half of the weighted replies on this point. On the other hand, while light shades were selected by more than half of the executives, these dropped in importance when weighted by company production. As in 1950, this circumstance was brought about because executives with one of the largest corporations in the industry were united in their choice of medium shades as the likely trend.

Executives who expressed shade trends were asked, "What accounts for these trends?"

Among those who thought that medium shades would be used extensively, the primary reasons given were soil resistance, better visual impact than dark or light shades, the desire to satisfy pub-

[5] Information Bulletin No. 45, p. 28.

lic preference, and the fact that medium shades represented something new since, in their opinion, lightness has been overdone.

Almost all of the executives indicating a trend to light shades reasoned that lightness was in line with the public's taste for bright colors, as indicated in this statement:

> Light colors make the car look longer, in keeping with the fashions in sport clothes, home interiors and the general atmosphere of modern living.
>
> Lighter colors just seem to be in with the bright exteriors better—they match the tenor of the times in household and clothing trends—i. e., colored refrigerators, pastel kitchens, etc.

Considerable similarity is noted between the comments above and the reasons offered by executives discussing this subject in 1950. Behind the expected trend toward light shades in 1950, the primary reasons were suitability with bright colors, women's preference for light interiors and a desire for more cheerful styling. Ease of blending and soil resistances were the most common reasons offered for predicting medium shades. Thus, by and large, little change has taken place in the thinking of executives with respect to shade over the past 5 years.

Trends in Pattern or Design.—Twenty-seven executives were asked: "What are the trends in pattern or design?"

Over 40 percent of the executives visualized a trend toward large, modern, nongeometric patterns or designs (table 14).

These executives frequently described nongeometric patterns as being abstracts, foreign motifs, free forms, large florals, curlicues, wiggles, mosaics and leaves. Mentions of these nongeometric patterns accounted for 75 percent of the production-weighted replies. Only 2 of 27 executives stated that they had no awareness of what the trends would be.

One-third of the executives discussing trends in patterns and designs anticipated unusual textured effects. This category amounted to 18 percent of the production-weighted replies. Unusual textures were defined as tweeds, brocades, 3 dimensional effects, matelasses, counterpoint, etc.

Stripes and small geometric patterns were also mentioned as trend possibilities, each receiving 8 percent of the executives' replies or 4 percent of the production-weighted replies.

In contrast, the findings in 1950 showed stripes accounting for 42 percent of the executives' responses or 19 percent when weighted. Small patterns were also relatively important in 1950, ranking third with 11 percent of the weighted replies.

While future use of plain upholstery materials was not anticipated by executives in 1955, plain patterns were the leading prediction in 1950.

Substantiating the expectations of executives in 1950, plain, striped, and small patterns enjoyed wide usage for trim purposes in the years immediately before and after 1950. In more recent years, however, and apparently for some time to come, the emphasis will be toward large nongeometric designs and unusual textured effects for automobile trim purposes.

The principal reason offered for the trends anticipated by executives was that the public is tired of plain-looking car interiors and wants modern, interesting patterns as a change. It was also pointed out that the mills have been an influence, featuring new and interesting patterns from their Jacquard looms which are popular with the public in other fields.

A minor reason given was that modern patterns are desirable because they permit simplification of the installation process. In contrast, ease of installation was the reason most frequently given by executives in 1950 for trends in pattern and design of fabrics. Appearance and consumer preferences were also mentioned at that time but with relatively little emphasis, while the principal factors reported in 1955 are concerned with innovations for the consumer and increased emphasis on style.

The following comments illustrate executive thinking on patterns and designs:

> Nongeometric designs have the novelty and new look that the public wants. All competitive makes of cars will look different, not like before when they all looked the same. Thus we will all be distinctive. We will increase the use of metallic threads such as silver to add highlights to the designs. We are happy that the public has shown an interest in getting away from plain cloths, stripes and checks because trimming the new patterns is even less trouble than the old ones. Random, nongeometric patterns are not only popular with the public but mitigate our problems in installation.
>
> Stripes are outdated; the public has no more interest in them; they want new, unusual patterns. The Jacquard loom gave the mills the chance to show us a variety of new design ideas and we are following them up enthusiastically.
>
> Textured effects give us a clean, contemporary look which the public likes. The car interior is passing through the same cycle as household furniture. Today's home furnishings are simple but have a beautiful appearance.
>
> Right now we're passing through a period when synthetics and other new materials can be produced in many different effects. We are sure the eventual outcome will

TABLE 14.—*Opinions on trends in pattern or design for upholstery material, 1955*

Opinion	Executives mentioning	Weighted percentage of total replies
Trends toward:	*Percent*	*Percent*
Nongeometric patterns (large, modern, abstract)	43	75
Unusual textured effects (matelasses, counterpoint, brocades)	33	18
Small geometric patterns	8	3
Stripes	8	1
Don't know	8	3
Total	100	100
Number of executives answering	27	

be the use of more simple textured effects (not checks or stripes) which are attractive to look at and not tiresome.

Executives discussing trends in designs and patterns were also asked:

As a rule, would you favor an exclusive or unusual design, or one that was not too different from what the industry had been using?

Consistent with the industry's expressed interest in finding new contemporary designs, the response to this question was overwhelmingly in favor of unusual styling. Of the 27 executives responding, 81 percent favored unusual patterns, amounting to more than 90 percent of the total production-weighted replies. Only 11 percent of the executives (weighted, 5 percent) favored patterns and designs which are not too different from those now in use (table 15).

By comparison, executives in 1950 were almost evenly divided between preference for unusual and not too different designs; in terms of weighted replies, over 70 percent favored designs which were not too different. At that time, there was a desire for plain, striped, or checked patterns which had already been used with success in previous models while increasing competition has brought about a trend toward new and modern motifs.

TABLE 15.—*Comparison of opinions on the degree of unusualness in design of upholstery materials, 1955 compared with 1950*

Opinion	Executives mentioning		Weighted percentage of total replies	
	1950	1955	1950	1955
	Percent	*Percent*	*Percent*	*Percent*
Trends toward:				
Unusual	52	81	22	92
Not too different	44	11	73	5
Don't know	4	8	5	3
Total	100	100	100	100
Number answering question	23	27	23	27

Trends in Sheen.—Executives participating in this phase of the study were asked: "Is the trend toward fabrics with more sheen or with dull surfaces?" Over 80 percent of the executives, almost 90 percent of the production-weighted replies, anticipate extensive use of trim fabrics which have a luster or sheen. Fifteen percent of the executives, or 9 percent weighted, look forward to fabrics which are neither lustrous nor dull but somewhere in between (table 16).

Basically these findings parallel the opinions expressed in 1950, the one exception being that dull fabrics were not mentioned in 1955.

TABLE 16.—*Comparison of opinions on trends in sheen for upholstery, 1955 compared with 1950*

Opinion	Executives mentioning		Weighted percentage of total replies	
	1950	1955	1950	1955
	Percent	*Percent*	*Percent*	*Percent*
Trends toward:				
Lustrous, more sheen	52	81	43	89
In between lustrous and dull	5	15	1	9
Bright without sheen	------	4	------	2
Dull	27	------	4	------
No trend	5	------	1	------
Don't know	11	------	51	------
Total	100	100	100	100
Number answering question	26	26	26	26

The reasoning offered by executives interested in fabrics with more sheen reflects their desire for more striking appearance, showroom appeal, rich, modern looking materials, and a general acceptance of synthetics which have a wide range of luster. Basically, the same reasons motivated executives expressing an interest in more sheen in 1950. An executive with one of the largest manufacturers expressed his interest in lustrous fabrics this way:

We want a brilliant type of sheen—not soft. This can be obtained from metallic threads like Lurex or with nylon. They give us a lustrous, rich satiny look for upholstery.

The distinction made by executives in 1950 between sheen or luster on the one hand and shiny surfaces was evident in many of the comments made in 1955. In both studies, it was repeatedly stated that upholstery fabrics should not be shiny because this was cheap looking. One executive, desirous of more lustrous fabrics, stated:

We definitely want sheen because it has sales appeal and a modern look but don't want something that makes the car look like a 5 and 10¢ counter.

Trend Toward Pile or Flat-Woven Fabrics.—Executives were asked:

Is the trend toward the use of more pile fabrics, or more flat-woven fabrics? [6]

Of the 27 executives answering this question, 2 stated that they had no impression of what the trends would be. Twenty-four of the remaining 25 executives visualized a trend toward the increased use of flat-woven fabrics for automobile

[6] As stated in the Information Bulletin No. 45 (page 32): "A pile fabric has a velvety covering on the surface, formed by an extra series of warp or filling yarns that stand out from the ground structure to which it has been added. Pile may be in the form of loops (terry cloth) or the loops may be cut and sheared and termed "cut pile."

upholstery. Types of flat weaves such as Jacquard and matelasse were frequently mentioned by these executives as being increasingly popular. For the most part, the current findings are very similar to those of the 1950 study. It will be noted that pile received slightly more attention at that time but not enough to indicate a trend (table 17).

TABLE 17.—*Comparison of opinions on trends in fabric construction for upholstery, 1955 compared with 1950*

Opinion given	Executives mentioning		Weighted percentage of total replies	
	1950	1955	1950	1955
Construction of fabric:	*Percent*	*Percent*	*Percent*	*Percent*
Flat	75	89	89	98
Pile	12	4	4	1
Heavy texture	5	------	1	------
Don't know	8	7	6	1
Total	100	100	100	100
Number answering question	25	27	25	27

The most frequently mentioned reasons for favoring flat-woven fabrics are the public's rejection of pile as too old-fashioned and not in harmony with today's styles. Comfort and slidability were also mentioned frequently as being contributing factors in the trend toward flat-woven fabrics.

A few other reasons offered were better wear, cool to sit on, no static charge, and extensive use by competition.

The following comments made by executives answering this question illustrate their reasoning on this subject.

The trend is to flat-woven fabrics. Pile is out of style, expensive, uncomfortably warm, has poor slidability and old-fashioned appearance. Can't see it coming back in style.

Flat weaves and woven synthetics on the Jacquard loom are the popular items today and should last a long time. Pile is passé—people associate it with the horsehair parlor furniture of years ago.

Pile is completely out of date—too old-fashioned. Only flat weaves—Jacquard types and matelasses are desired by the buying public.

As in 1950, executives were also asked:

What is your reaction to material that is constructed with a stripe of flat and a stripe of pile? How about a stripe of flat and a stripe of nylon pile?

The response to both questions was almost completely negative. Only one executive thought there might be some merit to a nylon striped pile, whereas more than 20 others expressed complete disinterest in either possibility for upholstery trim. This attitude confirms the resistance to the use of pile in any form for trim purposes; it is generally regarded as a hot, uncomfortable, unpopular, costly and poor-performing type of material by executives in the industry.

Preferences in Upholstery Materials When Cost Considerations Are Eliminated, 1955

Thirty-nine executives were asked which automotive upholstery materials they would prefer when the element of cost is minimized. Cotton-backed vinyl, the most heavily consumed upholstery fabric in 1955, was not mentioned as a preferred material when cost considerations were minimized. Vinyl's cost is one of the principal factors contributing to its extensive use as an upholstery trim, particularly for low-priced cars. Indications are, however, that although industry stylists found vinyl an extremely versatile material for trim purposes, they did not consider it the most desirable from the point of view of general attractiveness.

The most popular materials, with respect to appearance and performance, were nylons, either alone or blended with rayon and either unbacked or backed by cotton. The one material most often designated as preferred, was a cotton-backed blend of nylon and rayon, accounting for 59 percent of the total replies when weighted by company production (table 18).

TABLE 18.—*Preference for upholstery materials regardless of cost, 1955*

Material	Executives mentioning	Weighted percentage of total replies
	Percent	*Percent*
Nylon, rayon blend with cotton back	15	59
Nylon, rayon blend	10	7
Nylon face with cotton back	20	5
Nylon, rayon, wool blend	5	3
Nylon, wool blend	5	2
Cotton, rayon blend	3	2
100 percent wool	3	2
Nylon with Lurex	3	2
Leather	3	2
100-percent nylon	7	1
Cotton, wool, rayon blend	3	(1)
Don't know	23	15
Total	100	100
Number answering question	39	

[1] Less than 1 percent.

Generally, similar reasons were advanced for each preference no matter which specific fabric was involved. The major ones were: best appearance, best wear, resistance to soiling, ease of cleaning, and strength and flexibility facilitating easy production, in that order. Officials were also influenced by color, design, and pattern flexibility, by soft and rich hand, and by the ability of a fabric

to retain its color. In addition, slidability, dyeing qualities, light weight, and prestige with customers were of some importance although least often mentioned.

Nylon was highly regarded for its great versatility. "It is," one executive stated, "the most versatile fabric we have. It has very good dye qualities and scrubbed nylon looks like wool and is tougher, easier to work with, has good lively colors, and is generally very attractive."

Another official, again emphasizing versatility, said, "We can dress up nylon with metallic threads in it. It also can be brocaded like silk and give as excellent an appearance." The remainder of this official's remarks, however, pointed up the difficulty of divorcing cost consideration from preference. "The only reason," he continued, "for putting in rayon is to cut down cost while retaining the appearance." Another respondent commented on the difficulty of isolating a specific preferred fabric, as follows: "The nylon-rayon blend with a cotton back has turned out to be very attractive and is as durable a fabric as any we have encountered. But there is very little difference between this particular fabric and other blends. It depends on the twist of the yarn and the desired patterns—and price cannot be disregarded in evaluating fabrics. It is a prime factor. Furthermore, the ideal fabric varies widely according to the particular purpose and car under consideration."

There were some preferred fabrics used in all price lines of the 1955 passenger automobiles. The specific types of materials executives preferred were utilized most often in higher priced models, to a secondary extent in medium-priced cars and occasionally in low-priced cars.

Out of 19 officials explaining the use of fabrics other than those preferred, 15 mentioned price as the determining factor and 10 officials pointed up the need for variation among models.

Preferences in Upholstery Materials When Cost Considerations Are Eliminated, 1955 Compared with 1950

In 1950, more of the interviewed executives (61 percent weighted) preferred 100 percent wool than any other fabric. In 1955, 100 percent wool accounted for only 2 percent of the weighted replies. The radical decline in wool's position as a preferred material may be attributed to its continued high cost and to the creative styling achieved with synthetics, especially nylon, and blends of synthetic and natural fibers. In 1955, 78 percent (weighted) favored materials containing some nylon in contrast with 27 percent (weighted) in 1950. The most popular fabric in 1955 was a blend of nylon and rayon backed with cotton while in 1950, the most popular nylon fabric mentioned in only 21 percent (weighted) of the replies was a nylon face, cotton back (table 19).

Good wearing qualities, appearance, and prestige with the customers were the general reasons advanced for preferences in 1950 and the first 2

TABLE 19.—*Preference for upholstery materials regardless of cost, 1955 compared with 1950*

Material	Weighted percentage of total replies	
	1950	1955
	Percent	*Percent*
Nylon, rayon blend with cotton back	---	59
Nylon, rayon blend	---	7
Nylon face with cotton back	21	5
Nylon, rayon, wool blend	---	3
Nylon, wool blend	5	2
Cotton rayon blend	---	2
100 percent wool	61	2
Nylon with Lurex	---	2
Leather	1	2
Cotton, wool, rayon blend	---	1
100 percent nylon	1	(1)
Other blends of natural and synthetic fibers	5	---
Don't know	6	15
Total	100	100
Number answering question	28	39

[1] Less than 1 percent.

were again important in 1955. However, an analysis of the qualities specifically attributed to nylon and wool in 1950 shows that whereas both were liked for their good wearing qualities, *best appearance* was attributed only to wool, not to nylon. In contrast, nylon and nylon blends were considered to have the best appearance as well as good wearing qualities by almost 90 percent of the executives preferring these fabrics in 1955.

As will be noted in the discussions of other parts of the car, preferred upholstery fabrics were more often used in 1955 than in 1950. In the earlier study, it was reported, "preferred upholstery fabrics were most often used in high-priced models of the company, occasionally in medium-priced, and never in low-priced models." In 1955 preferred fabrics were used to a varying degree in all price lines, probably because in that year the preferred materials, essentially nylon blends, were comparatively cheaper and consequently more practical than the wool of 1950.

Types of Upholstery Materials Used and Variations in Use According to Price Class of Cars, 1950 and 1955

The 33 basic fiber combinations used for upholstery trim fabrics in the 1955 model cars and the number of manufacturers reporting their use are listed below. If an accounting were made of the different weights and proportions which were reported for each fiber combination, number of fabrics physically different one from the other, would easily be in the hundreds. For example, the cotton-vinyl combination, found in use by all 5 companies was described in almost 40 different weights and fiber proportions.

Combinations of fibers in upholstery materials reported by 5 companies, 1955:

Fiber combination	Number of companies using
Vinyl and cotton	5
Nylon and cotton	5
Nylon, cotton, rayon	5
Nylon and rayon	4
Nylon, cotton and metallic yarn	3
Nylon, cotton, rayon and metallic yarn	3
Vinyl and jute	2
Vinyl, cotton, rayon	3
Vinyl and rayon	2
Nylon, rayon and metallic yarn	2
Wool, cotton and rayon	2
All wool	2
Cotton and rayon	2
All rayon	2
All nylon	2
Leather	2
Nylon, rayon and wool	1
Nylon and wool	1
Nylon, rayon and Orlon	1
Nylon, cotton and Lurex	1
Nylon, cotton, rayon and Orlon	1
Nylon, rayon and mohair	1
Nylon, cotton, rayon and Lurex	1
Nylon, mohair and cotton	1
Nylon, cotton, Lurex and vinyl	1
Nylon, Lurex and vinyl	1
Cotton, rayon and metallic	1
Dacron, rayon and metallic	1
Cotton and pyroxylin	1
Paper and jute	1
All cotton	1
All linen	1
All Saran	1

Nylon, cotton, and rayon were the fibers found as basic components in the largest number of fabrics. Half of the 33 fabrics used for upholstery in 1955 contained at least some nylon blended in the cotton or rayon fibers. Metallic yarns were also used in a wide number of fabrics, whereas wool fibers were used alone in 1 upholstery fabric and in 3 blends.

Only 3 fabrics with the same basic components were reportedly used by all 5 of the companies. These were: cotton-backed vinyl, nylon and cotton, and nylon, cotton and rayon fabrics. Four of the 5 companies reported use of a nylon and rayon blend.

It is evident that the manufacturers in the industry are currently using a considerably broader range of fabrics for upholstery trim than in 1950. At that time, only 11 different fiber combinations were used, totaling 66 different fabrics when variations in weight and fiber proportions are considered. Thus, the findings bear out the statements made by executives that as many as 4 or 5 different fabrics may be used for the same trim application on any given model.

Use of wool fibers as a component in upholstery fabrics was considerably less marked in 1955 than it was 5 years ago. As stated earlier, wool was used in only 4 of the 33 basic fiber combinations reported in 1955, whereas it was a component in 8 of the 11 combinations described in 1950. Cotton and nylon were relatively as important as components in 1950, while vinyl and rayon enjoyed considerably more use as components in 1955. Snythetics such as Orlon, Dacron, Saran, Lurex and other metallics, not in use in 1950, were liberally employed as component fibers in upholstery fabrics in 1955.

Whenever feasible, information as to which specific fabrics were used in the various makes, lines, and models produced by each company was obtained.[7]

The same basic variations noted in 1950 in the use of fabrics according to price class of car applied in 1955. As makes proceed upward in price class, the amount of expensive material used reportedly increased and the use of less costly fillers diminished. Generally, the same basic fiber components, e. g., vinyl, nylon, cotton, and rayon are in universal use regardless of price class. However, the proportionate use of more costly fibers increases greatly as the makes and lines progress upward in price.

Makes of cars considered in the high-price class generally contained the richest blends of nylon. For example, blends containing up to 75 percent of nylon were reported in this class. And use of luxury materials such as leather, all wool, and 100-percent linen were also essentially restricted to the high-priced makes. Although cotton-backed vinyl was used for trim in the top-priced makes, bolsters accounted for the principal yardage.

Medium and lower priced makes consumed the largest portion of the cotton-backed vinyl reported. Nylon also enjoyed relatively wide usage in the medium and low-priced makes but generally cheaper fillers predominated in the blends and mixtures used.

Thus, just as there is considerable overlapping in the selling price among lines within makes of various classes, there is also considerable overlapping in the types of upholstery fabrics used with no firm demarcation as to fabric used by price class. Rather, it is a matter of degree, with more luxury fabrics and greater proportions of luxury fibers within blends being used in the higher priced cars and more extensive use of utility fibers and fabrics and more cheap fillers in lower priced cars.

[7] To clarify the references made in the text: *Make* of car applies to a specific car brand name. If a corporation has 5 makes, 1 may be considered low-priced, 2 medium-priced, 2 high-priced. *Lines* of cars are a further delineation in that each make may be produced in various lines. As in the case of make, the basic distinction among lines is usually price, increasing as mechanical, styling, and trim embellishments are added. The models within each line are known as 2-door, 4-door, hard top convertibles, station wagons, etc. Since, for example, the price of a high-priced line within a low-priced make may exceed the price of a low-price line within a medium-priced make, the selling price alone was not considered suitable for classification purposes. Rather, the manufacturer's concept of the price class of the make was accepted since executives discussed variations in price class from this general point of view.

To determine the reasons behind use of particular fabrics, executives were asked:

Why did you decide to use a fabric of this particular content rather than something else in the same price range?

In 1955 as in 1950, performance and appearance were of paramount importance in the selection process. The fabrics used in 1955 were selected because their appearance and performance characteristics were suitable and did not deviate too far from the price established for specific models (table 20).

TABLE 20.—*Reasons upholstery fabrics used for production were selected rather than others in the same price range 1955 compared with 1950*

Reason given	Weighted percentage of total replies	
	1950	1955
	Percent	*Percent*
Best appearance for price	19	24
Suitable appearance and performance for particular models	45	22
Best wearing qualities for price	16	18
Acceptance by public, sales appeal	3	18
Permanency of color	--	17
Easily cleaned	--	1
Dye consistency	6	--
Experience with material	3	--
Recommendation of supplier	2	--
Limited availability of synthetics	1	--
Other reasons	1	--
Don't know	4	--
Total	100	100
Number answering question	22	17

The suitability of a fabric means not only its appearance and performance but its cost, although price restrictions for desirable fabrics appear to be more relaxed than they were 5 years ago.

When executives were asked:

Is there anything cheaper you could use in place of your most used fabric that would serve the same purpose?

No, was the unqualified response received from all but one of the 18 executives answering this question. The executives stated that any attempt to compromise style and quality for cheaper materials would be a serious error in today's competitive market.

When a fabric is finally selected, there is no doubt, apparently, that the final choice represents the best available in terms of style and performance for a minimum cost. One executive summarized his viewpoint in this manner:

Because of our volume of production, 1 cent is important in the price we pay for materials. We do everything possible to obtain the lowest price on a fabric which we feel is commensurate with the appearance and performance we are trying to achieve. Rest assured that we tried everything, and without compromising on quality and style, there is nothing cheaper on the market that will fill our needs.

Price Limitations on Upholstery Fabrics for Low-priced, Medium-priced, and High-priced Cars, 1950 and 1955

The obvious importance to potential suppliers of the prices paid for fabrics by the automotive industry necessitated this question:

In developing new fabrics the laboratory needs some idea of cost limitations. Suppose you could get an upholstery fabric which would meet all of your performance and appearance requirements. What is the most it could cost for you to use it in your *low-priced, medium-priced* and *high-priced* cars?

The prices shown in table 21 represent the maximum range of fabric prices reported by the 4 companies answering this question. The low figure in the range represents the cost of the cheapest material used in each class, the high figure was the top price paid for fabrics in each class. For example, in the low-price field, $1.70 per lineal yard was the lowest price paid by any manufacturer and $3.60 per lineal yard was the highest price paid.

TABLE 21.—*Price ranges of upholstery fabrics for the various price classes of cars produced*

Classes of cars	Price ranges per lineal yard	
	Low	High
Low-priced makes	$1.70	$3.60
Medium-priced makes	2.00	4.50
High-priced makes	2.00	6.20

Considerable overlapping was found in the prices paid for upholstery fabrics for cars thought of as being in different price fields. The top lines in the low-price field may be trimmed with fabrics which cost the same, or a little more, than those used in the bottom line cars of medium-priced makes. There is some indication that the range of prices reported in 1955 is much broader than it was in 1950.

Generally, in 1955 the lowest prices reported in each range were paid for backed vinyls, blends utilizing little nylon and other low-cost natural and synthetic fiber combinations. The highest prices represent purchases of the richer nylon blends, along with wool, linen, and the other luxury fabrics. To avoid distortion, leather prices are not included.

Trends in Fiber Content of Upholstery Materials Envisioned by Automobile Executives

The automobile executives interviewed were asked: "What changes do you expect in the fiber content of upholstery fabrics used in future (name

of company) cars? What are your main reasons for expecting this to take place?"

Five of the executives questioned visualized no change in the fiber content of upholstery materials and three others stated that they were unable to predict a trend. The overwhelming majority, however, indicated widespread satisfaction with synthetic upholstery fabrics and the expectation of continued growth of these materials in future years; 30 of the 31 executives stated that an increasing amount of synthetic materials would be used for upholstery trims in the future.

TABLE 22.—*Trends expected by executives in the fiber content of upholstery materials*

Expectation of use	Executives mentioning	Weighted percentage of total replies
	Percent	*Percent*
More synthetics	**77**	**69**
More nylon	44	26
More Orlon	5	18
More synthetics, general	44	10
More Saran	8	3
More vinyls	8	2
More metallics, general	8	2
More Lurex	8	2
More rayon	5	2
More Mylar	5	1
More Dacron	5	1
Use of extruded polyethylene thread	5	1
More woven plastics	3	1
More cotton, remain as backing and filler and may grow with synthetics	**18**	**21**
More wool	**8**	**2**
Visualize possible use of molded seats in the future	**10**	**3**
No change expected	**13**	**3**
Don't know, can't predict	**8**	**2**
Total	(1)	100
Number executives answering	39	

[1] Column adds to more than 100 percent because some executives mentioned more than one possible development.

In all, 11 types of synthetic materials were singled out for specific mention. More than half of the executives (26 percent of the total weighted replies) predicted greater use of nylon. In some cases, however, predictions of greater nylon consumption were qualified by price considerations. Since nylon is already being used extensively, its principal growth will be in more concentrated blends. The blends reportedly used for cars in the medium- and low-priced fields contained relatively small amounts of nylon, whereas cars in the high-priced field were trimmed with blends which were rich in nylon. The obvious barrier to the use of richer nylon blends in the lower priced makes has been the cost of nylon. Nylon is still thought of as an expensive trim material and its predicted growth in the auto upholstery field hinges, to some extent, on a reduction of price. One executive expressed this point of view briefly: "I can visualize a greater use of nylon in blends for our low-priced makes if it comes down a little in price. Other synthetics may be developed which will eventually replace nylon because of its cost. At any rate, synthetics seem to be in for a period of greater usage."

Orlon also stands out among the synthetics mentioned. Five percent of the executives (18 percent of the production-weighted replies) visualized an increased use of Orlon for upholstery trim. Like nylon, the growth of Orlon as well as many of the other synthetics mentioned depends to some extent on their relative cost, public acceptance, and the degree to which they harmonize with the style trends that develop.

Another interesting aspect regarding the trend to synthetics is that vinyl, the most heavily used material in 1955, received very little specific attention. In many instances, no doubt, executives included vinyl when they indicated a trend to synthetics generally. Some comments by executives indicate, however, that the use of vinyl for upholstery will decline in relation to the growth of other synthetics, principally nylon. The principal objection to vinyl for seating is its lack of porosity.

> The vinyl people are worried because the material doesn't breathe and is hot to sit on. The use of vinyl islands to form breathable vinyls has not been successful because the material loses its leather look. However, vinyl will probably remain in use for bolsters where the breathable characteristic is not too important.

In discussing the trend to synthetics, 18 percent of the executives (21 percent weighted) stated that cotton would remain as the principal filler and backing material used. In some cases, growth of cotton relative to the increased use of synthetics was specifically predicted.

As a long-term development, 10 percent of the executives visualized a trend toward molded seats. Described generally as rubber supported, molded synthetics, the idea was advanced as a possibility for the distant future. The replies of 8 percent of the executives (2 percent weighted) indicated a possible trend to blends of wool.

Basically, the detailed reasons supporting the trend predictions made by executives (table 23) reflect the desirable appearance and performance characteristics of the synthetic materials envisioned as increasing.

Cotton was expected to remain the principal filler and backing material for synthetics largely because executives felt it adds dimensional stability, flexibility in tailoring, and is cheap enough to reduce the cost of most blends. Executives stated that wool adds a quality look to a blend and eliminates wrinkling and tailoring problems. A few comments by executives follow:

> Nylon and other synthetics such as dacron may be used to a greater extent in blends. Cotton, as a backing and filler will remain stable. Rayon has been tried as a

TABLE 23.—*Reasons given for expected trends in the fiber content of upholstery fabrics*

Reason given	Executives mentioning	Weighted percentage of total replies
	Percent	*Percent*
Synthetics:	**97**	**80**
Strength and wearing qualities	74	21
More eye appeal—better appearance	55	18
Cleanability, resistance to soil	23	3
Variety of colors and patterns available	19	13
Coolness, fabric breathes	16	3
Public desire for something new, modern	16	2
Luster, sheen, rich look	13	2
Flexibility of design available	13	2
Comparative cost of synthetics is favorable	13	2
Workability, tailoring characteristics	10	2
Development and emphasis by suppliers	10	11
Sales appeal of nylon	6	1
Color fastness	3	(1)
Cotton as backing: allows flexibility for tailoring, dimensional stability and is low in cost	**23**	**14**
Wool: has a quality look, rich hand and is wrinkle free, easy to work with	**10**	**3**
Molded seats: desire for lower cost and simplicity in upholstering interiors—wearing qualities and appearance	**13**	**3**
Total	(2)	100
Number executives answering	31	

[1] Less than 1 percent.

[2] Column adds to more than 100 percent because some executives gave more than one answer.

backing but is not very popular due to its excessive stretch. Besides, cotton is cheaper and more flexible.

Synthetics may take over the complete market. Cotton backing and fillers will stay and may increase. Saran and nylon will increase but vinyl will go down, remaining principally as a bolster material. Nylon and Saran offer an attractive appearance, ease of handling, opportunity for vivid colors and fairly reasonable costs. In addition, they have good porosity, cool to sit on and hold dyes well, do not fade. Cotton is suitable for backing and cheap.

Saran and nylon will be able to give a breathable effect, not presently obtainable with vinyls. The vinyl people are making a fuss about breathable vinyls which are not really fully effective.

More nylon content in blends—between 30 and 50 percent of total weight. This will give us longer life, strong wearing qualities, appearance, luster, and a name we can merchandise. Nylon will grow in use in blends and be used in all models. Thus far Saran is only in a few models, but its use will increase. Saran is a tough fabric that rides cool. Vinyl will stay for bolsters in most cars. Cotton backing and fillers will stay popular.

We will use a lot more nylon in the future if the price is reasonable. The appearance and performance of nylon are superior to other synthetics. Price is the big question mark bearing on its use in all of our models.

Trends in Yardage for Upholstery

Executives were asked: "Do you expect to use less yardage, more yardage, or about the same yardage in future cars?"

Three executives of the 29 questioned expected smaller yardage requirements while 4 others, all with the same company, anticipated an increase in the amount of upholstery fabric needed. The remaining group did not expect a change in yardage requirements.

Some illustrative statements were:

We will be using the same amount of yardage for upholstery trim in the future but the distribution of materials may change. There will be smaller bolsters in future cars—therefore, we'll use more body cloth, but the size of seats won't change.

The future may hold a trend to individual seats but I can't see how that will effect the amount of material needed. The change will be in styling, not in size.

Individual seats will be used in future cars, particularly in the top style lines. This will definitely cut down on seat area and material usage.

The 4 company officials who envisioned larger car interiors did not advance any details on the matter. It was stated, however, that one of the company's lines would, in all probability, have larger seats due to a general enlargement of the car's interior.

The major reason offered for expecting smaller yardage requirements stemmed from a belief that seats would be smaller, thinner, and generally less bulky in the future. It is interesting to note that 3 executives expect a trend to individual seats something like those found currently in sports models. While 2 of these executives stated that this development would reduce yardage requirements, the third expected no change in the quantity of material needed.

Seat Covers

During the study conducted in 1950 the following comment was received from one of the interviewed executives:

Customer behavior to my way of thinking is pretty irrational. I don't know the real figures but I'll bet 7 out of 10 cars bought this last year had seat covers installed later. We knock ourselves out trying to style beautiful interiors and John Doe covers up a lovely wool cord material with a gaudy, shiny seat cover. But do you think we could put seat cover cloth in (name of make) or a (name of make)? Of course not. The public would scream. We've considered selling cars without upholstery but a car in a showroom without trim has no sales appeal whatsoever. So we trim them and the public spends $50 to save the trim for the next buyer. I guess it's the American instinct to save.

A recent consumer study [8] indicates that the public's interest in seat covers for cars less than 2 years old has waned. In recent times, with the introduction of highly attractive and long wearing original upholstery, the car owners are apparently reluctant to buy seat covers for new cars.

[8] "The Market for Automobile Seat Covers," Stewart, Dougall & Associates, Inc., March, 1955.

The usual practice among today's car buyers is to keep seats uncovered until the trim fabrics are soiled beyond cleaning. Hence, cleanability is reported as a highly desirable characteristic in upholstery materials. The industry is aware of the strong public desire to keep their upholstery clean and attractive throughout the life of the car.

At the time of the last study, the accessory departments of the automotive manufacturers were a primary factor in seat cover production and distribution. New car dealers did a flourishing business in seat cover sales. In today's seat cover market, both types of activity are practically nonexistent. The principal sales of seat covers are made through chains and smaller independents dealing almost exclusively with owners of older model cars.[9]

Throughout the automotive industry, reports indicate that there has been some interest in developing a changeable seat cover type of upholstery trim. The following comments dealing with seat cover type upholstery trims were typical.

> The seat cover concept of upholstery is not practical and will probably not be adopted. If there was poor workmanship on a job and it was a poor fit in the dealer's hands—we would be blamed. This whole concept puts us too much at the mercy of the dealer. A version of this has been tried using muslin to retain shape—but it did not work out well at all.
>
> There has been discussion of developing a seat cover type of trim that could be removed and cleaned. Upholstery cannot really be cleaned by washing just one side. There is some possibility of merchandising a package in this case—one set of covers for summer and one for winter. The trouble with this idea is it will limit our styling a great deal and we won't like it. If the car doesn't look good in the showroom, it won't sell.

Sidewall Materials

Definition

Sidewall material is the external covering for the sides of the automobile interior, including covering on door panels and posts.

Consumption

An estimated 36,173,064 pounds of sidewall material were bought for use in the 1955 passenger cars. Of this, 50 percent was cotton and 42 percent was vinyl. Two-thirds of the cotton poundage was used as backing for vinyl. A substantial proportion of the remaining cotton was consumed as padding and wadding in pleated sidewalling. Rayon accounted for 6 percent of the poundage while nylon and wool each accounted for 1 percent. The poundage consumed for sidewalls in the 1955 model year applies to 6,858,177 passenger cars.

In 1950, the automobile industry purchased 25,547,817 pounds of sidewall materials for use in 6,648,238 passenger cars. At that time, wool was the leading fiber used in sidewalls, accounting for 42 percent of the poundage. Cotton was second in importance with 38 percent while vinyl represented only 12 percent.

The position of cotton for use in sidewalls increased substantially between 1950 and 1955, both relatively and in actual pounds consumed. Apparently the decline of wool, which has primarily been supplanted by vinyl with cotton-backing, has resulted in a more favorable situation for cotton. The relative increase in cotton poundage consumed for sidewalls is 32 percent; the absolute increase in cotton poundage—taking into consideration increased car production as well as more extensive cotton usage—is 85 percent.

Characteristics the Automobile Industry Wanted in Sidewall Materials, 1955

Forty-one executives were asked to describe as fully as possible the characteristics a sidewall material should have to make it ideal.

Factors related to performance of the sidewall material over a period of normal use by the car owner were the most important concern of executives in describing desirable characteristics; 85 percent of the executives mentioned such factors. Weighted by company production, 50 percent of them did so.

Executives viewed as next in importance the characteristics having to do with general attractiveness of the sidewall material to the customer. Eighty-five percent of the executives (28 percent weighted) mentioned "appearance" considerations.

Production considerations were least important to automobile executives discussing desirable characteristics of sidewall materials; 44 percent of the executives mentioned this consideration or 22 percent of the replies when weighted by company production.

In discussing specific performance characteristics, soil resistance, moisture resistance, and permanency of color were the factors stressed most frequently.

Attractiveness to the customer was discussed primarily in general terms, the most important specific factor being that the sidewall material must be integrated with the material used in the body of the car.

General ease of handling and installation and tensile strength were primarily emphasized in executives' discussion of desirable production characteristics. The increased use of vinyl seems to have focused attention on desirable production characteristics peculiar to this material, namely, the ability to take vulcanizing when making pleats and "good dielectric sealing and embossing" properties (table 24).

Although the executives named specific desirable characteristics for sidewall materials, virtually everyone interviewed made the general statement that "sidewall materials must have the same external characteristics as upholstery."

In summary, the most important specific prop-

[9] See footnote 8.

TABLE 24.—*Characteristics the automobile industry said it wanted in sidewall materials*

Characteristics mentioned	Executives mentioning	Weighted percentage of total replies
	Percent	*Percent*
Ease of handling and tailoring in production	44	22
Ease of handling, installation (general)	24	9
Tensile strength; resistance to tear	22	3
Punctureproof; good backing strength	10	1
Good dielectric sealing and embossing qualities (vinyl)	5	1
Shrinkability; to eliminate sag and wrinkles	5	1
Dimensional stability	5	7
Dye consistency for matching	5	(1)
Soil resistance	2	(1)
Take vulcanizing, i. e., when making pleats (vinyl)	2	(1)
Performance over a period of normal use by the car owner	85	50
Soil resistance; good cleanability	63	13
Moisture resistance; resist water spotting	51	12
Permanency of color	51	12
No scuffing or roughing up	37	4
Wear resistance (general)	32	9
Fireproof	2	(1)
Attractiveness to the customer	85	28
Good appearance (general)	71	14
Must be integrated with body cloth, bolsters	49	12
Smooth; no wrinkles, sag	5	1
Luxurious, rich hand	5	1
Good color effects	2	(1)
Good texture for plush look	2	(1)
Total	(2)	100
Number of cases	41	

[1] Less than 1 percent.
[2] Column adds to more than 100 percent because most executives mentioned more than one characteristic.

erties named in connection with sidewalls—in their order of importance—are as follows:

Appearance (general)
Soil resistance (performance)
Moisture resistance (performance)
Permanency of color (performance)
Integration with body cloth (appearance)
Wear resistance (performance)
General ease of handling (production)

Executives were also asked to name the characteristics considered desirable for sidewall materials, which, in their judgment, were in greatest need of improvement. Of the 21 executives asked, 20 discussed the need for improvement in the general area of performance in normal use by the car owner. One executive discussed problems related to handling and production. No one stated that the current appearance of sidewalls needed improvement.

The specific performance characteristics which were reportedly in greatest need of improvement were cleanability and resistance to soil, named by 19 of the 21 respondents and resistance to water spotting, mentioned by 13 of the 21.

In addition to asking executives to express their ideas and opinions as to ideal sidewall characteristics, a card was shown which listed 5 major considerations and the respondents were asked to rank these in their order of importance in making decisions on sidewalls. Appearance was ranked highest in this regard, with cost and performance considerations second and third respectively.

Average rank order of factors reported as entering into decisions on fabrics to be used in sidewalls:

Factor	*Average rank order*
Appearance	1. 24
Cost	2. 07
Performance	2. 34
Prestige with customer	3. 83
Availability of supply	4. 55
Number of executives making ratings	29

Characteristics the Automobile Industry Wanted in Sidewall Materials, 1955 Compared with 1950

Several shifts in the basic thinking of automobile executives with respect to sidewall materials apparently occurred between 1950 and 1955. These shifts are to a major degree attributable to the increased emphasis on styling, particularly on interior design.

In 1950, the principal concern of the executives—when weights were applied—lay in the area of production problems. In 1955, concern with production in relation to sidewalls was of secondary importance.

Attractiveness to the customer was considered a far more important criterion in 1955 than it was in 1950, the emphasis being on integrated car interiors.

Performance under normal conditions of use, the most important basic concern of executives in 1955, was of secondary importance in 1950 (table 25).

TABLE 25.—*Relative importance of major factors pertaining to sidewall materials, 1955 compared with 1950*

Factor	Weighted percentage of total replies	
	1950	1955
Production	50	22
Performance	40	50
Appearance	10	28

Cleanability and soil resistance, shown to be primary performance concern of executives in 1955, were relatively unimportant problems in 1950. In 1955 many executives, while stressing cleanability and soil resistance as desirable characteristics and even while stating that these prop-

erties were in the greatest need for improvement, pointed out that vinyl had achieved the position it now holds to a significant degree on the basis of its cleanability. The ability of a material to resist water spotting was more important to executives in 1955 than in 1950. Again, executives pointed out that water-spotting problems had to a large degree been overcome by vinyl.

In addition to the shifts in emphasis on desirable characteristics of sidewall materials between 1950 and 1955, the degree to which cost operates as a restrictive factor had somewhat diminished. In 1950, when asked to rank the importance of 5 basic considerations in making decisions on sidewalls, cost was ranked first, with appearance a close second. In 1955, on the other hand, appearance was clearly in first place in the identical ranking technique, with cost in second place (table 26). This is not to say that cost considerations were not important in 1955 but rather that 2 changes had taken place which diminished the restrictive power of cost:

1. The increased attention to style as a primary factor in merchandising cars has resulted in more leeway in the selection of the materials for car interiors, in situations where a somewhat higher priced material can be demonstrated to have considerably greater consumer appeal, and
2. More importantly, the cost of cotton-backed vinyl is substantially below the cost of wool so that the overall cost of the car interior has decreased with the more extensive use of vinyl.

Another interesting difference between 1955 and 1950 in the rank order given by automobile executives to 5 basic considerations in connection with sidewall decisions is that availability of supply is currently of relatively lesser importance—for reasons discussed earlier in this report—while prestige with the customer is of greater importance in 1955 than it was in 1950, again a reflection of the change in the basic merchandising approach of the automobile industry.

TABLE 26.—*Average rank order of factors mentioned as entering into decisions on fabrics to be used for sidewalls, 1955 compared with 1950*

Factor	Average rank order	
	1950	1955
Appearance	2. 00	1. 24
Cost	1. 92	2. 07
Performance	2. 39	2. 34
Prestige with customer	4. 39	3. 83
Availability of supply	4. 31	4. 55

Preferences In Sidewall Materials When Cost Considerations Are Eliminated, 1955

Thirty-one executives were asked to name the sidewall material they preferred—regardless of price—taking into consideration materials now on the market (table 27).

TABLE 27.—*Preference given for sidewall materials regardless of cost*

Material preferred	Executives mentioning	Weighted percentage of total replies
	Percent	*Percent*
Vinyl	81	92
Cotton backed	66	57
Vinyl, unsupported (molded)	6	28
Vinyl and fabric combination	6	5
Vinyl and Mylar—cotton backed	3	2
Cotton blend	15	3
Combed cotton and rayon	3	2
Cotton and nylon	3	(1)
Cotton back with a nylon face	3	(1)
Cotton, nylon, and rayon	3	(1)
Cotton, mohair, rayon, and wool	3	(1)
Leather	6	3
Nylon and wool	3	2
Total	(2)	100
Number answering question	31	

[1] Less than 1 percent.
[2] Column adds to more than 100 percent because 2 executives mentioned two preferred materials.

Vinyl was named as the preferred material by 4 out of 5 of the executives interviewed. When replies are weighted by company production, preference for vinyl stands at 92 percent. The preferred form of vinyl varied somewhat among the executives. Cotton-backed vinyl was specified by two-thirds of the executives. In other words, of those who prefer vinyl for sidewalls, 82 percent specified cotton-backed vinyl. On the other hand, 7 percent of those preferring vinyl stated that they liked unsupported or molded vinyl. This preference for unsupported vinyl, when weighted by company production, amounts to 28 percent as compared with 57-percent preference for cotton-backed vinyl on the same weighted basis. Thus, in 1955, the ratio of preference for cotton-backed vinyl over unsupported vinyl was approximately two to one.

Two other forms of vinyl were described as preferred materials for sidewalls. A cotton-backed vinyl with Mylar was mentioned by 3 percent of the executives, and vinyl and fabric combinations were preferred by 6 percent. More specifically, these vinyl and fabric combinations were either vinyl (supported or unsupported) with a fabric inset or a "sandwich" of clear vinyl with a fabric in between.

Cotton blended with other fibers or synthetics (primarily nylon) was preferred by 15 percent of the executives reporting—this preference amounting to 3 percent of the replies when weighted by company production. It is apparent from the preferences of executives at this time that the principal opportunity for cotton consumption in sidewalls lies in usage as backing for vinyl.

The principal reasons given for the predonderant preference for vinyl were cleanability, wear-

ability, and attractiveness to the customer. There were no significant variations in the reasons for preference as between cotton-backed and unsupported vinyl.

Cotton-backed vinyl provides the most practical answer to sidewalls. Vinyls don't fade. They are cheap. Most importantly, they are easy to clean. Vinyls are resistant to water spotting. And, you can duplicate all designs and patterns in vinyl.

The only disadvantage noted in connection with vinyl was the fact that it had a "cold" rather than a warm, friendly appearance.

Discussions with executives revealed that rayon has been under serious consideration as a backing material for vinyl although no preference was expressed for rayon-backed vinyl.

Rayon is becoming more important as a possible backing material for vinyl due to its great strength (greater than cotton) but we've had trouble with its being unstable with regard to stretch. We like rayon best for flexibility but have to consider stretch as more important.

Some insight into the reasons underlying preference for unsupported vinyl as opposed to back vinyl may be gained from the following statement:

We could have used unsupported vinyl for sidewalling in the 1955 models. The principal advantage would have been that it is cheaper than backed vinyl—but unsupported vinyl is not as satisfactory for our method of upholstering. For example, we do a lot of cementing and vinyl is hard to cement. It has to be stapled. Also, if the quality is not just right it will crack in the cold. Cotton backing prevents this.

The reasons behind preference for the nylon and cotton blends were primarily the rich, lustrous appearance and general attractiveness of these farbrics. There is another factor which results in expressions of preference for materials other than vinyl, particularly when executives operating in divisions producing higher priced cars are questioned. The widespread use of vinyl in lower and medium priced cars is considered somewhat of a handicap to use of this material in higher priced cars.

Preferences in Sidewall Materials When Cost Considerations Are Eliminated, 1955 Compared with 1950

The preferences of executives for sidewall materials have changed substantially since 1950.

Wool and cotton blends and 100-percent wool were the heavily preferred materials in 1950, while there is only insignificant mention of wool in 1955. Supported vinyl was mentioned as the preferred sidewall material by only 6 percent of the executives in 1950 in contrast with vinyl's virtually unchallenged leadership in 1955.

Blends including nylon are preferred to a greater degree in 1955 than they were in 1950, although at a considerably lower level than vinyl.

Extent to Which Sidewall Fabrics Considered Satisfactory as to Performance and Appearance Are Used, 1950 and 1955

In 1950 the survey findings indicated that there was a tendency in the direction of use of the preferred materials—wool and cotton and 100-percent wool—primarily in the higher priced models because of the higher cost of these fabrics.

In 1955 there was a slight tendency in the opposite direction. Use of vinyl, the material preferred by a predominant number of executives, was more widespread in the low- and medium-priced lines, makes and models, than in the higher priced cars.

The desire to make the higher priced models look different and also the more luxurious appearance of the fiber and synthetic blends resulted in this somewhat more limited use of vinyl in the higher priced cars.

The lowest in our high-priced line had cloth sidewalls in 1955 and we received a number of complaints regarding soiling, particularly from rain, dust and insulation coming through. As a result, vinyl is going into these cars in 1956.

In general, there was a close correlation in 1955 between the basic material preferred and its actual usage in all cars, regardless of price class.

Variations in Types of Sidewall Materials Used According to Price Class of Car, 1955

Table 31 presents the composition of materials used for sidewalls on a company basis according to price class of car.

TABLE 28.—*Types of sidewall materials used in different priced cars in 1955*

Material	Low-priced	Medium-priced	High-priced
	Number	*Number*	*Number*
Cotton-backed vinyl	5	5	4
Saran, cotton, Lurex	------	1	------
Cotton blends:			
Cotton and rayon	1	2	1
Cotton, wool and nylon	------	--------	1
Cotton, wool and rayon	1	1	1
Cotton and nylon	------	--------	1
Wool	------	--------	2
Rayon	2	--------	------
Rayon and nylon	2	1	2
Mylar	------	1	------
Number of companies reporting	5	5	5
Average number of materials per company	2. 2	2. 2	2. 4

Cotton-backed vinyl was the principal material used in all 5 companies for their low- and medium-priced cars. Cotton-backed vinyl was used in at least some of the higher priced cars in 4 out of the 5 companies.

Use of all wool and blends containing wool or nylon was restricted in general, to the higer priced cars, while cotton and rayon supplemented cotton-backed vinyl in the low- and medium-priced classes.

The reasons behind use of materials other than vinyl in the higher priced cars have already been discussed. In the case of the low- and medium-

priced cars, several reasons were given for using blends rather than vinyl. First, there was the desire to have something different from what had been used the year before. Second, there was the feeling in connection with rayon and nylon blends, that the public reacted favorably to the "glamour of the synthetics." The extent to which fabrics other than vinyl were used in the lower priced cars, however, was very limited.

Costs of Sidewall Materials in 1955

Information was collected on the costs per lineal yard of materials used in 1955 according to price class of car. Table 32 presents the price ranges of materials used according to price class of the make of car and within that framework, of higher priced and lower priced lines and models.

TABLE 29.—*Price per lineal yard of sidewall materials used in 1955 according to price class of car*

Class of car	Price per lineal yard for—		
	Low-priced makes	Medium-priced makes	High-priced makes
	Dollars	*Dollars*	*Dollars*
Lower priced lines and models	1. 00–1. 85	1. 00–4. 00	1. 50–4. 00
Higher priced lines and models	1. 12–2. 25	1. 35–5. 00	3. 50–5. 00

In discussing the variations in sidewall costs according to price class of car, many executives indicated that the trend was toward use of the same type of material in all price classes, the only variation being in the design.

And commenting on the price differential between vinyl and fabrics, one executive said:

> About the cheapest fabric that can be bought for sidewalls is $2.60 per yard—a rayon-faced fabric with a cotton back, which soils easily. In contrast, we can go to $1.05 per yard for vinyl-coated material in acceptable grades.

Trends in Fiber Content of Sidewall Materials Envisioned by Automobile Executives, 1955

Thirty-four executives representing all 5 companies were asked about any future changes they expect in the materials used for sidewalls.

All but 3 among the 34 reported that they expected some changes in the future.

Almost half of the executives predicted increased use of cotton-backed vinyl. The majority among this group believed that the next few years will bring almost complete use of this material—100-percent usage in lower priced cars with more limited use in higher priced models.

An additional 12 percent predicted increased use of supported vinyl—but with backing materials other than cotton, e. g., rayon, nylon, and polyethylene. Lower cost and greater flexibility appeared to be the principal factors behind consideration of these other backing materials. These rayon- and nylon-backed vinyls are currently in an experimental state.

Perhaps the most interesting trend envisioned by automobile executives is future use of molded materials for sidewalls. Unsupported vinyl and rubber resins were specified for this. Molded materials were being discussed primarily in connection with door panels; 44 percent of the executives mentioned this developement.

> There is a trend toward molded door panels. We'd probably use unsupported vinyl for the interior. If this comes into effect, however, the back of the front seat would probably go back to fabric since it would be too expensive to use supported vinyl for only that limited application.
>
> Future is toward harder, more rigid materials. Sidewall cloth is on the way out. It hasn't done a satisfactory enough job. In the future, we may have a solid door panel.

However, many of the executives indicated that the development of molded materials for sidewalls was a long-range one.

> I don't see molded doors in the near future. Therefore cotton backing ought to continue for a while.
>
> Molded doors—which would probably use unsupported films—are about 5 years in the future.
>
> There are too many things necessary to put into a door panel, e. g., window lifts, regulator handles, etc. Molded doors present problems which will have to be licked.

About 12 percent predicted increased use of Mylar, particularly in high-priced cars and another 18 percent discussed increased use of synthetics in general.

> We expect to see greater use of synthetic yarns—anything that permits greater latitude in styling features.

It would appear that usage of cotton-backed vinyl will continue and, in fact, expand in the immediate future, but that trends toward other backing materials and toward molded sidewalls, using unsupported materials, may threaten cotton consumption for sidewalls in the long range (table 30).

Trends Envisioned With Respect to Yardage for Sidewalls, 1955

Twenty-three executives were asked about any trends they foresaw with respect to the *amount* of material used in sidewalls.

Sixteen of the 23 reported that they expected no change in sidewall yardage in the immediate future. No changes in basic body design were expected before 1960.

On the other hand, 4 executives reported that they expect *less* fabric area in the sidewalls, while 3 reported a trend toward *more* fabric area.

Less fabric area was explained primarily in terms of larger windows. These comments were based on the assumption that the size of the cars would not vary.

More fabric area was envisioned by executives who were thinking of increases in the absolute size of their models.

TABLE 30.—*Trends executives expected in the materials used for sidewalls*

Expected trend	Executives mentioning	Weighted percentage of total replies
	Percent	*Percent*
Increased use of supported vinyls	**59**	**47**
Cotton backed	47	41
Rayon backed	6	3
Polyethylene backed	3	1
Nonwoven nylon backed	3	2
Use of molded materials (door panels)	**44**	**42**
Unsupported vinyls	23	33
Rubber resins	3	(1)
Molded plastics (general)	18	9
Use of synthetic (general)	**18**	**5**
Use of Mylar (supported)	**12**	**5**
No change expected	**9**	**1**
Total	(2)	100
Number answering question	34	

[1] Less than 1 percent.
[2] Percentages add to more than 100 percent since some executives envisioned increased use of more than one material.

Headlining Materials

Definition

Headlining is the external cloth covering on the ceiling of the interior of the car.

Consumption

An estimated 14,995,196 pounds of headlining material was purchased by the automobile industry for use in the 1955 closed passenger cars. Of this poundage, 76 percent was cotton, 14 percent was vinyl, and 9 percent was paper. The quantities used of wool, rayon, and nylon were negligible. About 10 percent of the cotton poundage reported was used as backing for vinyl. The poundage consumed for headlining in the 1955 model year applies to an estimated 6,660,886 closed passenger cars, excluding convertibles.

In 1950, the automobile industry purchased an estimated 13,046,624 pounds of headlining material for 6,414,117 cars, exclusive of convertibles. At that time, cotton accounted for 96 percent of the poundage. Thus, cotton shows a relative decline of 21 percent between 1950 and 1955 in poundage consumed but, because of the greater quantity of headlining material used in 1955 due to greater automobile production, the absolute decrease of cotton poundage is only about 9 percent.

Characteristics the Automobile Industry Wanted in Headlining Materials, 1955

Thirty-seven executives, representing all 5 automobile companies, were asked to describe as fully as possible the characteristics a headlining cloth should have to make it ideal.

The responses to these questions fell into 3 major categories:

1. Performance over period of normal use by the car owner—mentioned by 92 percent of the executives and representing 44 percent of the weighted responses.
2. Ease of handling and tailoring in production—mentioned by 81 percent of the executives and accounting for 40 percent of the answers when weighted by production.
3. Attractiveness to customer—named by 92 percent of the executives but amounting to only 16 percent of the weighted responses (table 31).

TABLE 31.—*Characteristics of headlining materials the automobile industry said it wanted*

Characteristics mentioned	Executives mentioning	Weighted percentage of total replies
	Percent	*Percent*
Ease of handling and tailoring in production	**81**	**40**
Elasticity, ease of handling	57	10
Shrinkability	41	10
Prefabricated hard or molded headlining, instead of cloth	30	8
Snap-on, one operation installation	24	7
Uniform color	3	(1)
Flexibility	3	5
Sew well	3	(1)
Tensile strength—resistance to tear	3	(1)
Performance over a period of normal use by the car owner	**92**	**44**
Soil resistance; good cleanability	78	12
Permanency of color	49	10
Sound-deadening qualities	46	5
Wear well; won't sag or stretch	32	8
Moisture resistant; resists water spotting	32	9
Air permeability (to prevent bulge)	3	(1)
Attractiveness to the customer	**92**	**16**
Good appearance on showroom floor	54	9
Integration of design and color with rest of car	38	4
More patterns, textures, prints, designs	24	2
More colors	16	1
Odorless	5	(1)
Total	(2)	100
Number of cases	37	

[1] Less than 1 percent.
[2] Column adds to more than 100 percent because most executives mentioned more than one characteristic.

Thus, performance in use by the customer appears to be the major consideration in the requirements for headlining cloth followed closely by production factors.

A number of specific properties were named within the framework of the 3 basic characteristics described above.

For example, soil resistance; good cleanability, a performance factor, is reported as particularly important by 78 percent of the executives, as illustrated by the following quotations:

Cleanability is more important now—due to the greater use of light pastel shades.

We used to use napped cotton headlining which became shaggy and hard to clean. Now we use mercerized, bleached, water-repellent cotton which permits brilliant and pastel shades and is easy to clean.

Permanency of color, the second most important performance factor, was reported by 49 percent of the executives. Sound-deadening properties of the headlining material were indicated as important by 46 percent of the executives. They want a material that does not reflect sound.

Vinyl headlinings have been tried. But they reflect sound and make useless the sound insulations in the roof.

Vinyl has given us trouble because of the lack of sound absorption due to its hard surface.

Apparently, the experimentation with vinyl for headlining has focused the attention of executives on the desirability of a material that has sound-deadening properties.

The most frequently mentioned characteristics with respect to production was general elasticity and ease of handling—named by 57 percent of the executives.

The largest of all trim operations in the assembly line is the installation of headlinings, . . . so that ease of handling is a critical consideration.

Shrinkability to eliminate wrinkles was an important specific characteristic desired.

The roof of the car is curved and despite all efforts to make them all exactly alike, there are variations. As a result, the headlining has to be installed while in a somewhat extended state and then has to be steam shrunk to tighten up and remove all wrinkles.

Bearing in mind the production problems inherent in the headlining operation, 30 percent of the executives expressed a desire for a prefabricated hard or molded headlining instead of cloth, and 24 percent discussed the possibility of a snap-on, one-operation installation.

Would like a plastic headliner that could be placed into position and snapped in place.

Some type of one-piece unit that can snap into place and not require expensive labor to install it.

Ranking the principal specific characteristics desired in the order of their importance the following pattern emerges:

Appearance
Soil resistance (performance)
Permanency of color (performance)
Elasticity, ease of handling (production)
Shrinkability (production)
Moisture resistance (performance)

One executive summed it up as follows:

We want something that's easy to work with—pliable and free from wrinkles. The cleaning ability of the material is also very important since headlinings can get dirty just as well as other parts of the car. Wear is unimportant, however.

Executives were also questioned about which characteristics need the most improvement at the current stage of headlining developments. Of the 20 executives asked, 13 said "it should be easier to clean" and 8 said "it should be more resistant to soiling." This bears out the concern of the industry over the cleanability of headlining material, indicating that here lies the greatest area for improvement. Ten of the 20 indicated that improvement was needed in the entire concept of production, that installation should be simplified.

The need to improve the appearance of the headlining materials, however, was named by only 3 of the 20 executives.

A card listing 5 major considerations in choosing headlining was shown to executives, and they were asked to rank these in their order of importance. Appearance ranked highest. Cost—including cost of installation plus cost of material—was second in importance. Performance was third.

Average rank order of factors reported as entering into decisions on fabrics to be used in headlining:

Factor	*Average rank order*
Appearance	1.28
Cost	2.04
Performance	2.36
Prestige with customer	4.12
Availability of supply	4.60
Number of executives making ratings	25

Characteristics the Automobile Industry Wanted in Headlining Materials, 1955 Compared with 1950

In both 1950 and 1955, appearance considerations were named as desirable characteristics of a headlining material by 16 percent of the executives on a weighted basis. However, in 1950, the replies were general, or referred to a neutral appearance. In 1955, on the other hand, reflecting the styling changes that took place in the intervening years, executives discussed appearance in connection with "integration of design and color of the headlining with the rest of the car;" they specified "more patterns, textures, prints, designs, and colors" as desirable. And, while appearance was ranked as the third most important factor in headlining decisions in 1950, it was ranked first in 1955.

Another noteworthy change in automobile executives' thinking since 1950, was the increased attention to performance and the relatively lesser attention to production.

In the category of performance, sound-deadening considerations, permanency of color, and moisture resistance were of relatively greater importance to executives in 1955 than in 1950.

TABLE 32.—*Relative importance of major factors pertaining to headlining material, 1955 compared with 1950*

Factor	Weighted percentage of total replies	
	1950	1955
Production	49	40
Performance	35	44
Appearance	16	16

On the other hand, the characteristic of dimensional stability—a production factor—was not of concern in 1955, while it was very important in 1950. And tensile strength was a minor concern in 1955 (named by 3 percent of executives, whereas this feature was reported by 37 percent in 1950). Shrinkability—one of the most important production concerns in 1955—was not named in 1950. Thus, the changes in materials for headlining since 1950—e. g., use of cotton-backed vinyl, use of cotton in a different form (no longer napped), use of paper—have apparently changed the nature of the production problems with which the automobile industry is concerned. Perhaps the most important development in 1955 in connection with production is the reported interest of executives in snap-on, one-operation headlinings.

Preferences in Headlining Materials When Cost Considerations Are Eliminated, 1955

Thirty executives were asked to name the headlining material they preferred—regardless of price—taking into consideration materials now on the market (table 33).

TABLE 33.—*Preference given for headlining materials regardless of cost*

Material preferred	Executives mentioning	Weighted percentage of total replies
	Percent	*Percent*
100 percent cotton (woven and mercerized)	40	23
Cotton-backed vinyl (perforated)	40	15
Rubber resins; hardboard	13	58
100 percent wool	3	1
Nylon, rayon combination	3	[1]
Rayon, cotton, wool blend	3	3
Total	[2]	100
Number answering question	30	

[1] Less than 1 percent.
[2] Column adds to more than 100 percent because one executive named two preferred materials.

Cotton and perforated cotton-backed vinyl were the preferred materials. While hardboard (and rubber resins were) specified by only 13 percent of the executives, they accounted for 58 percent when production weights were applied.

When asked their reasons for preferring particular headlining materials, executives placed primary emphasis on appearance, ease of installation, and cleanability. Sound-deadening properties and soil resistance were next in importance (table 34).

One hundred percent cotton was preferred primarily for its appearance and its value in installation. It apparently is the easiest material to shrink into place. Cotton also was credited with being soil resistant and with having good sound

TABLE 34.—*Reasons given for preferring particular headlining materials when cost is eliminated from consideration*

Reasons given	Number of mentions among executives who preferred—						
	Total mentioning	100 percent cotton	Cotton-backed vinyl (perforated)	Preassemled rubber resins and hardboard	100 percent wool	Nylon, rayon combination	Rayon, cotton, wool blend
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Best appearance	21	6	10	2	1	1	1
Easy to install (snaps-in, molded in shape, shrinkage, and stretch)	16	6	5	4	----	----	1
Easily cleaned	15	3	9	2	----	1	----
Best deadening of sound (perforated, absorbent, etc.)	7	4	3	----	----	----	----
Soil-dust resistant	6	5	1	----	----	----	----
Better long-term performance (serviceable)	5	2	3	----	----	----	----
Permanency of color	2	----	1	----	----	1	----
Flexible styling—use combinations of textures	1	----	1	----	----	----	----
Best performance for rough use	1	----	1	----	----	----	----
Total materials mentioned	[1] 31	12	12	4	1	1	1

[1] Thirty executives discussed 31 preferred materials—many giving multiple reasons.

absorption properties. Woven cotton was specified in many instances.

Woven cotton looks good. Doesn't have nap which collects dirt and dust. Has good sound-insulating properties.

On the other hand, considerable resistance to napped cotton was voiced.

Napped cotton is hard to clean; it collects dust and dirt and is not very attractive.

Cotton-backed vinyl is preferred primarily for appearance and cleanability.

The preassembled rubber resins and hardboard were associated mainly with ease in installation.

It is in one piece which makes installation simple and it is very easily cleaned. However, its appearance should be improved and it should be made less sound resistant so that the insulator in the roof can be applicable.

Preferences in Headlining Materials When Cost Considerations Are Eliminated, 1955 Compared with 1950

The preferences of executives for headlining materials have changed substantially since 1950. A blend of wool and cotton was the leading fabric in 1950 with 18 percent of the executives interviewed preferring 100-percent wool, and 100-percent cotton nap.

The position of wool has declined substantially since 1950 and there was considerable resistance to napped cotton reported in 1955. Although "coated fabrics" were preferred to some degree in 1950, cotton-backed vinyl was not specifically named, nor were one-piece hardboards or rubber resins mentioned.

Relationship Between Preferred Headlining Fabrics and Headlining Fabrics in Use, 1950 and 1955

In 1950 the study findings indicated that materials preferred for headlining were actually used to only a limited extent.

The material preferred by the largest number of executives was a blend of wool and cotton for headlining. However, this material was used only in some high-priced and medium-priced cars made by their companies; 100-percent wool was reported to be used even less often by executives who said they preferred it. The sparing use of wool or wool and cotton blends for headlining reflects the effect of economy in the selection of headlining even for the majority of the high-priced models put out by most companies. Few of the headlining fabrics used in 1950 models represented the first choice of the executives who expressed opinions on this matter. To an even greater extent than for other parts of the visible interior trim, considerations of cost resulted in marked compromises with respect to appearance and performance of fabrics selected for headlining.[10]

In 1955, on the other hand, 100-percent cotton and perforated cotton-backed vinyl were extensively used in the high-, medium-, and low-priced models.

Of the 12 executives who reported a preference for 100-percent cotton in 1955:

. . . 10 reported that this material was used in all or some of the high-priced models of their companies.

. . . 9 reported that this material was used in all or some of the medium-priced models.

. . . 8 reported that 100 percent cotton was used in all or some of the low-priced models.

The executives who preferred perforated cotton-backed vinyl indicated wide usage of this material in all price ranges, although somewhat more limited than use of 100-percent cotton owing to price considerations.

Of the 12 who preferred cotton-backed vinyl (perforated)—

. . . 7 reported that this material was used in all or some of the high-priced models of their companies.

. . . 6 reported that this material was used in all or some of the medium-priced models.

. . . 5 reported that this material was used in all or some of the low-priced models.

Use of hardboard and rubber resins was reportedly in an experimental stage and use was restricted to some of the low-priced cars in one company.

Neither 100-percent cotton nor cotton-backed vinyl is as costly as wool and cotton blends or 100-percent wool. Thus, the greater coincidence between preference and usage in 1955 is probably traceable in part to the fact that the preferred materials do not adversely affect costs. In addition, there is evidence of greater merchandising effort in connection with automobile interiors in 1955 so that cost saving in these areas is not as critical a factor as the acceptability of the material.

Costs of Headlining Materials in 1955

Information was collected on the costs per lineal yard of the headlining materials used in 1955 according to price class of car (table 35).

TABLE 35.—*Price per lineal yard of headlining materials used in 1955 according to price class of car*

Class of car	Low-priced makes	Medium-priced makes	High-priced makes
	Dollars	*Dollars*	*Dollars*
Lower priced lines and models	0. 65–0. 92	0. 70–1. 40	0. 75–1. 60
Higher priced lines and models	. 80–1. 50	. 78–1. 50	1. 15–1. 83

[10] Agriculture Information Bulletin No. 45, p. 56.

Confirming the widespread use of the same headlining materials throughout all price classes is the fact that there is considerable overlapping in the costs reported. One executive explained:

> The price paid for headlining is not too dependent on the price of the model. Dressing up the interior is the best way to push the lower priced, higher volume makes and models.

Variations in Types of Headlining Materials Used According to Price Class of Cars, 1955

All 5 companies use 100-percent cotton in at least some of their low- and medium-priced cars; 3 out of the 5 used 100-percent cotton in some of the high-priced cars. (Table 36.)

TABLE 36.—*Types of headlining materials used in different priced cars in 1955*

Material	Low-priced	Medium-priced	High-priced
	No.	*No.*	*No.*
100-percent cotton	5	5	3
Cotton-backed vinyl	4	3	4
Cotton, wool, and rayon	------	------	2
Cotton and wool	1	1	1
Wool and rayon	------	------	1
Nylon and rayon	------	1	------
Paper	1	------	------
Rubber resin	1	------	------
Number of companies reporting	5	5	5
Average number of materials per company	2.4	2.0	2.2

Vinyl-backed cotton was used by 4 out of the 5 companies in at least some of the low- and high-priced cars, and by 3 companies in the medium-priced cars.

Mixtures of cotton, wool, and rayon and of wool and rayon were restricted to high-priced cars. Paper and the experimental rubber resins were used in the lower priced cars only.

There is little evidence of compromise in 1955 between the preferences of executives for headlining materials and actual usage, in contrast to the situation in 1950.

Trends in Fiber Content of Headlining Materials Envisioned by Automobile Executives, 1955

Thirty-eight executives representing all 5 companies were asked about any future changes they expect in the fiber content of headlining materials and to cite the reasons behind any changes anticipated.

About three-fourths of those questioned expected trends in the direction of one-piece snap-in headlinings. It will be recalled that only one company actually used such a headlining in some of their lower priced cars. There is evidence, however, that all of the companies are experimenting with this new concept in headlinings. Snap-in headlinings of hardboard, rubber resins, and plastics were mentioned, as well as the possibility of a molded headlining with a fabric center of, possibly, embossed cotton (table 37).

TABLE 37.—*Executives' expected trends in the materials used for headlining*

Expected trend	Executives mentioning	Weighted percentage of total replies
	Percent	*Percent*
Use of molded headlinings of the one-piece, snap-in type: hardboard, rubber, etc	73	46
Use of cotton-backed, perforated vinyls	45	40
Use of unnapped 100 percent cottons; waxed, glazed, waterproofed, with Lurex, printed, embossed, etc	21	8
Use of nylon, other synthetics	8	2
Use of woven papers	5	2
Use of sprayed adhesive and flock	5	2
No change expected	5	(1)
Total	(2)	100
Number answering question	38	

[1] Less than 1 percent.

[2] Percentages add to more than 100 percent since some executives envisioned increased use of more than one material.

Certain problems are envisioned in connection with molded headlinings which may somewhat delay their adoption, as indicated by the following quotations:

> A molded top is desirable for cutting down costs. However, neither we nor anyone else in the industry builds a body completely accurately. If we build an inner lining to snap into place, we'd also have to provide something to take up the variation in clearances. Thus, what is most likely is a semimolded lining with a center strip to be filled in with a fabric. The only trouble is that cotton costs so little that anything else is more expensive and the economics of molded tops can be severely questioned.
>
> Molded tops don't fold the way cotton does. Stacking problems will have to be overcome.
>
> Molded tops will be acceptable if appearance can be improved.
>
> Molded tops of the hardboard type are rigid and snap into place instead of having to be suspended by a series of hooks and fittings. This can reduce assembly time to 20 man-minutes whereas normal headlinings take as much as 80 man-minutes. The big trouble right now is that they don't look very attractive and they require improvement in sound absorption.

Increased use of vinyls, cotton backed for the most part and perforated to overcome the sound absorption problems were envisioned by almost half of the executives. The primary reason for expecting this trend was the cleanability of the vinyls.

About one fifth of the executives foresaw continued or more extensive use of 100-percent cotton. Smooth or napless cotton was specified in this regard in virtually all cases. Woven cotton has in its favor the possibilities of style variety and its relative cheapness. Use of glazed cottons and Lurex was anticipated by some executives. However, these executives indicated that use of cotton

for headlinings was essentially a short-range prediction, that the installation costs attendant upon cotton linings were excessive, and that the long-range trend lay in the direction of molded linings.

Increased use of nylon and other synthetics and of woven papers were predicted by a few executives. And use of sprayed adhesive and flock was mentioned. The sprays were under consideration because of ease of installation and because with them, insulation in the roof could be discontinued.

Convertible Tops

Description

Convertible tops are generally made in sandwich form by bonding a surface fabric to an interior lining with latex or butyl. The exterior fabric may, itself, have a plastic (vinyl) coating. Another variation is to use a single plastic-coated fabric instead of the usual sandwich construction.

Consumption

The automobile industry purchased 2,829,559 pounds of convertible top materials for use on an estimated 197,291 convertible cars produced in the 1955 model year as against 4,039,836 pounds purchased for 234,121 cars in 1950, a decrease of 30 percent in absolute poundage. A large part of this change is due to the 22 percent decrease in convertible automobile production, in itself a direct reflection of the widening popularity of hard topped convertibles. However, there was also a 21 percent drop in the actual amount of convertible top material used per car, from 17.3 pounds in 1950 to 14.3 pounds in 1955.

In 1955, 43 percent of the material in convertible tops was cotton, 12 percent vinyl, 8 percent jute, 1 percent rayon, 1 percent orlon, and 35 percent latex or butyl. Seventeen percent of the cotton was used as backing for vinyl.

In 1950, 45 percent of all top material was cotton, 3 percent was rayon, and 52 percent was latex or butyl. A negligible amount of nylon was consumed.

Although cotton retained its relative position between 1950 and 1955, in 1955 17 percent, as previously noted, was used to back vinyl. Vinyl's growth from none in 1950 to 12 percent in 1955 represents a radical change, apparently made possible by the practicality of cotton as a backing. Because one company used a nonsandwich top extensively in 1955, and also because the amount of butyl or latex per top is smaller in vinyl-coated sandwich tops, butyl and latex showed a relative decrease of 33 percent between 1950 and 1955.

Characteristics the Automobile Industry Wanted in Convertible Top Materials, 1955

The required characteristics for convertible tops were discussed with 32 executives in 1955. Performance during use by the car owner was considered the most important general criterion for a good top. Ninety-seven percent of the replies, 69 percent when weighted by company production, stressed this point. Second in importance, mentioned by 84 percent of the executives, 22 percent weighted, was attractiveness to the customer and, third, specified by 31 percent, 9 percent weighted, was ease of handling and tailoring in production. These broad general headings were broken down into more detailed subheadings and a complete summary of the desired characteristics is shown in table 38. The most important subcategories

TABLE 38.—*Characteristics of convertible top materials the automobile industry said it wanted, 1955*

Characteristics mentioned	Executives mentioning	Weighted percentage of total replies
	Percent	*Percent*
Performance over a period of normal use by the car owner	**97**	**69**
Color permanency	84	13
Proper dimensional stability (shrink and stretch resistance, freedom from wrinkling)	81	12
Durability—should have long life, resist weather, sun, mildew	63	11
Wear well—folding without getting ragged or cracking—should resist abrasion	47	11
Easy to clean	56	10
Waterproof—should resist cracking and leaks	63	5
Soil resistant	28	2
Should not stiffen or crack in cold weather	22	2
Resistant to water spotting	19	1
Should not become tacky in warm weather	6	1
Resistant to rot	9	(1)
Resistant to tear and scuffing	6	(1)
Should not be too soft or pliable	6	(1)
Attractiveness to the customer	**84**	**22**
Can be made in a wide variety of colors—to match the rest of the car—interior to match interior trim	63	12
Esthetic appeal; look satisfactory after a period of use	47	10
Should have the appearance of a woven fabric	3	(1)
Ease of handling and tailoring in production	**31**	**9**
Flexibility for production tailoring—workability	19	8
Easy to dye (especially Orlon)	6	(1)
Sew well	3	(1)
Cut well—no fusing—easy to trim	3	(1)
Total	(2)	100
Number of cases	32	

[1] Less than 1 percent.

[2] Adds to more than 100 percent because some users named more than one preferred characteristic.

under performance during use were color permanency, good dimensional stability, durability, good folding qualities, and cleanability. With regard to attractiveness to the customer, the corporation officials stressed the ability to offer a wide color variety and general esthetic appeal.

One executive, after summarizing his requirements for tops went on to say that "all the top materials used are compromises with each of the above listed points. Orlon tops, for example, had excellent appearance but were very difficult to keep clean and hard to work with." The inherent difficulties met with in this part of the car were further stressed by another company representative who said, "No one is happy with present convertible tops. The requirements for the fabrics are just too much for the materials. They have to be stretched out over an uneven surface and give contour molding—yet they're not supposed to shrink. They have to withstand the hot sun, but never fade. They may be folded at 30 degrees below zero and, if so, they shouldn't crack after weeks and months of folding and unfolding. They shouldn't show any creases. If there's a plastic coating, it should never get stuck to itself in the hot sun."

These problems were emphasized when the characteristics needing improvement most were discussed with 21 of the executives. All of them stated that performance over the period of normal use by car owners needs to be improved. Among the performance characteristics dimensional stability (shrink resistance) was mentioned by 12 of the 21, color permanency by 9, resistance to aging and weathering by 6, and cleaning ease, especially of the inside surface, by 5.

In addition to asking executives to express their ideas and opinions as to ideal sidewall characteristics, a card was shown which listed 5 major considerations and the respondents were asked to rank those in the order of importance in making decisions on convertible tops.

The average rank order of factors reported as entering into decisions on fabrics to be used in convertible tops was as follows:

Factor	*Average rank order*
Performance	1.43
Appearance	1.67
Cost	2.67
Prestige with customer	3.81
Availability of supply	4.67
Number of executives making ratings	21

With respect to the cost factor, cost is of less relative importance in convertible top material than it is elsewhere—due to the high cost of the car.

Characteristics the Automobile Industry Wanted in Convertible Top Materials, 1955 Compared with 1950

More dissatisfaction was expressed in 1950 concerning the convertible top materials now available than about any other item included in this study. In 1955, executives continued to be dissatisfied with these materials, although perhaps to a lesser degree. Broadly, the same problems were cited in both years and a comparison of the major characteristic requirements reveals the continued importance of performance. Under this heading, in both years, great stress was placed on color permanence, dimensional stability, leak resistance, and wearability. In 1955 a few more executives pointed up the need in top fabrics of resistance to the effects of weather. Furthermore, with the introduction of vinyl, several performance characteristics, stemming from problems with this plastic, were mentioned; namely, the need to resist cold weather cracking and warm weather tackiness, excessive softness and pliability (table 39).

TABLE 39.—*Characteristics of convertible top materials the automobile industry wants, 1955 compared with 1950*

Characteristics	Executives mentioning		Weighted percentage of total replies	
	1950	1955	1950	1955
	Percent	*Percent*	*Percent*	*Percent*
Performance over period of normal use by the car owner	100	97	75	69
Attractiveness to the customer	40	84	8	22
Ease of handling and tailoring in production	44	10	17	9
Total	(1)	(1)	100	100
Number of cases	25	32	25	32

[1] Adds to more than 100 percent because some users named more than one category of preferred characteristics.

The positions of the 2 less emphasized major categories, attractiveness to the customer and ease of handling, were reversed between 1950 and 1955.

In keeping with the greater emphasis in 1955 on styling throughout the car, attractiveness became the more important of the 2 and had grown from 8 percent (weighted) in 1950 to 22 percent (weighted) in 1955. As further emphasis, 12 percent of the total replies (weighted) made specific reference under this heading to the importance of a fabric's ability to take a wide variety of colors, a factor not mentioned in the 1950 report.

With respect to ease of handling, the same subcharacteristics—tailoring and sewing—were mentioned in both years but each with slightly greater emphasis in 1950.

In both years the characteristics of tops most in need of improvement were discussed with company officials and in 1950 the majority mentioned color permanency with a smaller group answering

dimensional stability. In 1955 the same 2 characteristics were said to need improvement most, although their relative positions were reversed. In addition, in 1955 the officials suggested improving the cleanability of tops, particularly of the inside surfaces.

When asked to rank the importance of 5 basic considerations in making decisions on top fabrics, the order of the first 3—performance, appearance, and cost, in that order—remained relatively the same from 1950 to 1955 (table 40).

TABLE 40.—*Average rank order of factors reported as entering into decisions on fabrics to be used in convertible tops, 1955 compared with 1950*

Factor	Average rank order	
	1950	1955
Performance	1. 50	1. 43
Appearance	2. 22	1. 67
Cost	3. 19	2. 67
Prestige with the customer	4. 22	3. 81
Availability of supply	3. 86	4. 67

Because the fabric market evidently was more stable in 1955, the positions of availability and prestige to the customer were reversed between the 2 years so that in 1955 prestige to the customer was rated fourth in importance instead of last.

Convertible Top Materials Used, 1950 and 1955

Types.—In 1950 all of the tops reported were of the sandwich type; in 1955 all but one were, the exception being a vinyl-coated cotton with no lining. In both years all sandwich type tops had a cotton lining.

Materials.—Table 41 shows the 7 convertible top material combinations used in 1955. Corportations reporting more than one top did not give the proportion of convertible production devoted to each.

Of the 6 top combinations reported in 1950, only 2 were used in 1955. One of these, the 100-percent cotton surface bonded to a 100-percent cotton lining, was used by 4 companies (55 percent weighted) in 1950 and only one company (14 percent weighted) in 1955. The other combination common to both years was a 40-percent cotton, 60-percent rayon bonded to a 100-percent-cotton lining. It was used by 2 companies in each year; 7 percent (weighted) in 1950 and 21 percent (weighted) in 1955.

Four combinations were reported in 1950 that did not appear in 1955. Three of these were some mixture of cotton and rayon and the fourth was a nylon surface, all bonded to cotton linings.

Three of the five combinations reported only in 1955 contained entirely new materials; vinyl in 2 cases and Orlon in the third. The remaining 2 combinations reported only in 1955 contained rayon and cotton in different proportions.

TABLE 41.—*Convertible top materials reported to have been used in 1955 cars*

Materials	Companies reporting	Weighted percentage of total replies
Sandwich:	*Number*	*Percent*
Vinyl surface backed with 100 percent cotton and bonded to 100 percent cotton lining	3	24
100 percent Orlon surface bonded to 100 percent cotton lining	3	22
40 percent cotton, 60 percent rayon surface bonded to 100 percent cotton lining	2	21
100 percent cotton surface bonded to 100-percent cotton lining	1	14
100 percent rayon surface bonded to 100-percent cotton lining	2	10
60 percent cotton, 40 percent rayon surface bonded to 100 percent cotton lining	1	7
Nonsandwich:		
Vinyl surface, cotton backed	1	2
Total	(1)	100
Number of companies	4	

[1] Column adds to more than number of companies because some companies used more than one type of material.

Application.—In general Orlon tops were restricted to use in medium and higher priced convertibles, as were rayon and rayon and cotton mixtures. Vinyl-coated cotton tops were used predominantly in low- and medium-priced convertibles, but also in some high-priced models.

Although Orlon was not used in 1950, 11 percent of the executives (weighted) in that year predicted great future use of this material and of new synthetics in general. These predictions have not been borne out to any great degree. Orlon was used in 1955 by 3 firms, but this usage was limited, generally, to more expensive models. Orlon tops "were difficult to clean and hard to work with." Several executives reported that they had discontinued or were preparing to discontinue its use.

> We fooled around with Orlon for 5 years and found it very difficult to dye.
>
> It's too costly and hard to work with. It didn't sell well.
>
> Orlon tops are out—they had no advantage over vinyl functionally or in appearance and were limited in color range while being high in price.

The few executives supporting continued use of Orlon confined their remarks to its advantages as a white top or as a nonwrinkling fabric.

Prices.—The costs of top materials including, in sandwich types, both surface and lining, ranged

from $2.40 to $5.50 a lineal yard in 1955. Vinyl-coated topping, sandwich and nonsandwich, cost $2.40 to $2.85 a lineal yard. Rayon and rayon and cotton mixtures bonded to cotton linings ranged from $3 to $4 a yard and Orlon bonded to cotton was reportedly $5 to $5.50 a lineal yard.

Trends in Fiber Content of Convertible Top Materials Envisioned by Automobile Executives, 1955

Trends in the fiber content of convertible top materials were discussed with 28 executives; their opinions are shown in table 42.

TABLE 42.—*Trends in the fiber content of convertible top materials expected by executives*

Expected trend	Executives mentioning	Weighted percentage of total replies
	Percent	*Percent*
More vinyl backed with cotton (Co-Tan, Vicodek, etc.)	46	70
New interior fabric or coating (Lurex and vinyl, nylon and vinyl, silicone, etc.)	18	5
Solid tops (metal) to replace fabrics	14	4
More synthetics, general	11	4
More rayon	7	2
More Orlon	11	1
Other (cotton-backed Saran, translucent vinyl-coated Mylar)	4	1
Expect some changes, but don't know what	4	2
Expect no changes	29	11
Total	[1]	100
Number answering question	28	

[1] Column adds to more than 100 percent because some executives mentioned more than one possible development.

The top material most often singled out for immediate growth is cotton-backed vinyl. Thirteen respondents, 70 percent (weighted), predicted an immediate increase in the use of this combination. In discussing the magnitude of and reasons for this change more than half of them stated that they would go very far, perhaps 100 percent, toward using vinyl-coated tops because of their good cleanability (12 percent), durability and resistance to aging (11 percent), adaptability to a wide color range (10 percent), and resistance to fading (5 percent).

The increased use of vinyl at the expense of woven synthetics will, in all likelihood, bring with it an increased use of cotton, the primary backing for vinyl. This increase, however, will be somewhat offset should vinyl-coated cotton-backed nonsandwich tops, which have no cotton lining, become more popular with manufacturers.

Five officials also envisioned using an undercoating of vinyl, vinyl and yarn, or silicone to aid cleanability and enhance interior styling.

One prediction was in regard to use of metal in tops.

This prediction represents a radical departure from traditional methods and materials, and foreshadows a decline in the use of all fabrics for tops. The executives indicated that, although still in the experimental stage, metal tops definitely will be employed for some cars, perhaps within 5 to 10 years. As a matter of fact, short-range increased use of vinyl and long-range adoption of metal tops were mentioned almost in the same breath. "Vinyl impregnated cotton duck gives a large variety of colors, excellent cleanability and weathering characteristics, and will probably be used in all our tops. Metal tops—like a rolltop desk arrangement—would be ideal, except that they would interfere with trunk space. There are still some bugs to be worked out. They are off in the future—perhaps in the next 10 years—and we can't tell the degree of usage yet—maybe only in high-priced cars." An executive from another firm, after indicating current acceptance of vinyl, points out that there have been some complaints about this material and goes on to say, "Solid top convertibles are definitely in the future—to displace fabric tops. Europe already has lots of convertibles with covered roofs—only a small center section is made of fabric. Present tops are far from satisfactory and we may well adopt foreign ideas to solve this problem. Our future convertible tops may be all metal or part metal and part fabric, with the fabric portion just a straight strip instead of the present intricate contour."

The predicted use of metal tops parallels statements in other sections envisioning a long-range trend to simpler one-piece units, e. g., molded headlinings, sidewalls, and seat cushions.

Foundation Sheeting

Definition

Foundation sheeting is the cloth between the upholstery and the seat padding. It is used when necessary to hold the padding in place. In addition to this general purpose, sheeting is also used to back pleats, to stiffen foam rubber, and to attach upholstery to the frame. Preformed padding comes already contained in tobacco cloth sheeting.

Consumption

The automobile industry purchased 4,516,720 pounds of foundation sheeting, including the tobacco cloth already on preformed pads, for use in 6,858,177 closed passenger cars produced in the 1955-model year. Ninety-nine percent of this poundage was cotton; the remainder was burlap. In 1950, 3,549,170 pounds of cotton were used in 6,648,238 cars. This represents an absolute increase of 27 percent in the amount of sheeting used although a decrease in future sheeting use was predicted in 1950.

A small part of the increase is undoubtedly due to increased car production. However, the greater part arose from increases in the amounts of sheeting used per car by 2 large companies. One of these firms, as a matter of fact, reported having discontinued most sheeting applications in 1950 but had reinstated its use by 1955. In addition, considerably more pleated upholstery, which must be backed, was employed in 1955 models. Furthermore, it was found necessary to use foundation sheeting with foam rubber pads in some applications although this had previously been considered unnecessary. There is no indication that the increase in poundage can be attributed to use of heavier sheeting.

Characteristics the Automobile Industry Said It Wanted in Sheeting, 1950 and 1955

Decisions on foundation sheeting are primarily in the hands of the trim engineers with management, of course, exercising veto power with regard to price. The materials used for sheeting have remained substantially the same between 1950 and 1955; there were no significant changes in the sheeting characteristics considered important between the 2 studies. In both studies, all of the executives with whom foundation sheeting was discussed placed paramount stress on tensile strength. The second most important characteristic was ease of handling in production (table 43).

TABLE 43.—*Characteristics the automobile industry wanted in sheeting, 1955*

Characteristics mentioned	Executives mentioning	Weighted percentage of total replies
Tensile strength:	*Number*	*Percent*
Strong enough to withstand stresses involved—to hold padding without breaking from the constant flexing of the seat cushion	10	49
Ease of handling:		
Easy to sew and handle, nonraveling, easy to clean in production	4	30
Resistance to stretch:		
Should not stretch and allow the padding to separate and become bumpy. Should be firm	5	12
Porosity:		
Fabric should "breathe"	1	7
Clean:		
Should be free from materials that might soil fabrics	1	2
Total	(1)	100
Number answering question	11	

[1] Column adds to more than total answering because several executives named more than one characteristic.

In general, sheeting is looked upon as a fine woven fabric which has a warp and a fill and can be sewn. It needs tensile strength to maintain a pad shape and to provide a tailored appearance to the seat. There are, however, some variations in the required characteristics depending upon the function. These are discussed in the following section.

Variations in the Use of Foundation Sheeting Among Automobile Companies, 1950 and 1955

Quantity.—The amount of sheeting used in 1955 varied from company to company and, industry-wide, averaged 0.66 pound per car as compared with 0.53 in 1950. In 1950, 2 companies reported that they did not purchase sheeting separately, but that they relied entirely on the tobacco cloth containers of preformed pads. In 1955, the larger of these 2 firms had discontinued this practice; the other continued to buy no separate sheeting.

Differences in the amount of sheeting used per car stem from variations in the types of padding employed and also from variations in the production methods from company to company or even within companies. One firm, for example, said that "Sheeting is not used where seats are made up in the horizontal position, when everything is just laid upside down on the table and the upholstery cloth is folded back into place and tied to the spring assembly. However, if the assembly is made in a semihorizontal position, the tobacco cloth is used to hold the pad to the spring and the upholstery is then pulled over."

Weight.—The average weight of sheeting used decreased from the 1.25 to 3.75 yards per pound reported in 1950 to 2.00 to 6.45 yards per pound in 1955. In 1950 no corporation reported using tobacco cloth in addition to the tobacco cloth already on preformed pads whereas 2 companies reported such usage in 1955. It ranged in weight from 11.03 yards to 24 yards a pound.

Prices.—The cost of regular sheeting varied in price from 14.5 to 18.24 cents per lineal yard. Tobacco cloth ranged from 5 to 10 cents a lineal yard.

Application.—As might be expected, the exact weight and characteristics of foundation sheeting vary with application.

> If used for a cotton pad, we need little strength, and light weight is preferred. If used as a backing for pleats or as a stiffener on rubber, strength is needed.
>
> We use different kinds, each for a specific place. In some places, the seat for example, strength is important. In other places price is the main consideration plus the ability to handle and sew well.

The heavier sheeting was generally used as a foundation for the fronts of seat backs, to back pleated upholstery, and to reinforce foam rubber in certain specific areas. In this last connection one padding expert remarked, "We have found it necessary to use sheeting on the center strip of foam rubber material used as backing for the

front seat—because—the pressure on each seat puts excess strain on the center and without support the rubber has torn." In general, however, foundation sheeting is not used over foam rubber seat cushions. Two companies reported using coarse sheeting "to hold the edges of the upholstery to the frame. This is only where it is invisible to the car owner."

The lighter tobacco cloth was used to hold cotton pads in place on the backs of seat backs and on the front and rear seat cushions.

Merits of Cotton for Sheeting

All companies using foundation sheeting were satisfied with cotton because it is cheap, sufficiently strong, and in general, well suited for this application. One firm, however, reported occasional use of 8-ounce burlap because it can be cut on the bias better, although this quality is usually not needed in sheeting. On the other hand, another company which discontinued use of burlap stated that cotton is preferable to burlap because burlap has tar in it and "stained some of our pastel shades of upholstery."

Trends in the Use of Foundation Sheeting, 1955

In discussing sheeting, trim engineers indicated that no other fiber will compete with cotton in this application in the foreseeable future. The increased use of foam rubber seat pads, however, may somewhat decrease the amount of foundation fabric used. One executive commented that greater use of molded di-iso-cyanate seat cushions may ultimately cut down the use of sheeting considerably.

Seat Cushion and Back Padding

Description of Seat Construction

The padding used in seat cushions and backs is composed of a number of individual parts. The parts are usually made of different types of materials. In the seat cushion, 2 or more pads are placed over the coil springs. The "spring" or "base" pad, immediately above the springs, is usually made of low grade cotton or of a mixture of cotton and jute or sisal or of 100-percent jute or sisal. A topper pad is placed over the spring pad. This is generally made from good quality cotton linters, pickers and fly, or of 1¾ inch to 2-inch thick foam rubber. One company varied this construction as follows:

A sponge rubber base pad was placed under the foam rubber topper and, in its most expensive models, all foam rubber cushions were used. Another company furnished some low-price models with unusually small rubber pads over the cotton padding. Still another company used topper pads of cotton over foam rubber in some of its medium-priced cars, and of reclaimed wool over foam rubber in some of its more expensive lines.

Like the seat cushions, the seat backs are constructed of cotton, cotton and sisal, and cotton and jute. One company reported using foam rubber in backs in 1955.

Natural fiber pads were usually preformed in standard sizes and put into tobacco cloth so that no additional foundation sheeting was necessary. The cotton and cotton mixtures used in padding varied in weight from 2½ to 10 ounces per square foot.

Consumption

An estimated 257,988,504 pounds of padding material was purchased for use in 1955 closed passenger cars. Of this, 61 percent was cotton; 22 percent foam rubber; 9 percent jute; and negligible amounts were of sisal, vinyl, burlap, nylon, rayon and hair.[11] The poundage reported for padding in the 1955-model year applies to 6,858,177 closed passenger cars.

In 1950 the automobile industry purchased 235,858,450 pounds of padding for use in 6,648,238 closed passenger cars. At that time, 71 percent of the padding material used was cotton; 17 percent was foam rubber; 9 percent sisal; 3 percent jute; and negligible amounts were of hair and wool.

In 1950, cotton padding constituted 85 percent of all the cotton used for all the sections of the car included in this study (excluding convertible tops and insulation). In 1955, cotton padding constituted only 75 percent of total cotton used. This change is due to an increase in use of cotton in other parts of the car, notably upholstery and sidewalling, and also to a relative loss to other padding materials. It should be borne in mind that the cotton used for padding is predominantly picker waste, linters, and fly, while the cotton used in upholstery and sidewalls, for example, is processed cotton.

The amount of cotton used for padding diminished between 1950 and 1955, both relative to other padding materials and in actual pounds consumed. Most of the change is attributed to the increased use of foam rubber. In addition, more jute and more synthetic fibers were employed in 1955 for padding. Sisal use decreased.

The relative decrease of cotton consumed for padding is 14 percent; the absolute decrease in cotton poundage, taking into consideration the increased car production, is 6 percent. Foam rubber increased 29 percent relative to its 1950 position and, in absolute pounds, increased 45 percent. Sisal, which represented 9 percent of the total poundage in 1950 fell to 3 percent in 1955 and jute, used for similar purposes, rose to 9 percent.

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[11] Vinyl is used in the cushion, but the amount appears to be minor.

Characteristics the Automobile Industry Wanted in Padding Materials, 1955

Decisions on padding were predominantly in the hands of trim engineers. Of the 19 executives who were involved in decisions regarding padding, 11 were engineers. The others represented styling, purchasing, sales and top management. They were asked to describe as fully as possible the characteristics padding materials need to be ideal.

Resiliency, mentioned by all the executives (23 percent of the weighted replies), was the most important single factor for good padding. The ability of padding to provide a comfortable, soft, springy seat was next in importance, specified by 16 executives or 19 percent when weighted (table 44).

TABLE 44.—*Characteristics of seat padding the automobile industry said it wanted*

Characteristics mentioned	Executives mentioning	Weighted percentage of total replies
	Number	*Percent*
Resiliency: returns to original shape so that upholstery fabrics do not sag or wrinkle. Does not pack down. Doesn't push through springs	19	23
Comfort: smooth, completely free from lumps and wrinkles, soft but firm with good dampening qualities. Not too bouncy	16	19
Minimum of moisture absorption: able to absorb small quantities of moisture without deteriorating or becoming soggy. Should absorb as little as possible	4	12
Easy to handle: should not tear in handling, easy to trim and shape	3	11
Good appearance: should look comfortable, have a firm, billowy, or plushy appearance	5	9
Odorless: should not have or pick up objectionable odors	4	9
Coolness: should dissipate body heat, not get warm, should breathe well, be porous	3	8
Single-unit construction: molded, one-piece seats	2	3
Should not shred in use: should be able to withstand spring forces	2	3
Should be new, not reclaimed material	1	1
Size range: pads should come in many sizes, or rolls should come in varied widths	1	1
Designs: should be able to put designs (pleats, pipes, etc.) in topper pads	1	1
Fireproof	1	(1)
Total	(2)	100
Number of cases	19	

[1] Less than 1 percent.

[2] Column adds to more than total number of executives because most executives mentioned more than one characteristic.

One executive, describing the ideal padding, stated:

> Padding should have a minimum of "set"—after the load is removed the padding should regain at least 80 percent—if not more—of its original height. It should have a lack of moisture absorption (cotton sometimes gets soggy) and good tensile strength, at least enough to withstand spring forces. It should have coolness—material should not retain body heat—it should "breathe." Padding should be comfortable to sit on—should have yield to it and conform to body contours. It should be odorless. Insofar as cotton is concerned, we also want a uniform consistency of material and a way of determining that the pads are made of proper grade cotton that has been garnetted properly.

Characteristics the Automobile Industry Wanted in Padding Material, 1955 Compared with 1950

In 1955, as in 1950, the single most important padding characteristic was resiliency, the ability of padding to retain its shape during use. In 1950, 14 of 16 executives, 37 percent when weighted, mentioned resiliency. In 1955, this factor was mentioned by all of the executives discussing padding, a weighted percentage of 23.

Comfort to the passenger was second in importance in both years. In 1950, the importance of comfort amounted to 26 percent of the weighted replies as compared with 19 percent in 1955.

A comparison of the broad general characteristics—performance, appearance, and production—indicates a heightened concern with production problems and somewhat of a decrease in the relative importance of performance and appearance (table 45).

TABLE 45.—*Major preferred padding characteristics, 1955 compared with 1950*

Characteristics	Weighted percentage of total replies	
	1950	1955
	Percent	*Percent*
Performance (includes comfort, coolness, fireproofing, odor and moisture resistance, nonshredding, new material only)	62	52
Appearance (includes resiliency, generally comfortable looks, designability of topper pads)	37	33
Production (includes easier handling, single-unit construction, range of padding, sizes)	1	15

Note that the increased use of foam rubber in 1955 has increased the cost of the total padding package. In addition, the companies show an overall preference for this material and indicate that price alone keeps them from using at least some foam rubber in all models. The desirability of foam rubber from the standpoint of resiliency and general comfort is reflected in several changes

in the preferred characteristics mentioned in 1955 compared with 1950.

In 1955, 15 percent of the executives on a weighted basis referred to easier or cheaper production as a desired characteristic as compared with 1 percent in 1950. The additional costs attending greater foam rubber use apparently led executives to place greater stress on methods for lowering production expenses.

The overall importance of performance characteristics decreased from 62 percent, weighted, in 1950 to 52 percent, weighted, in 1955. Whereas this is still the prime general consideration, greater use of foam rubber with its reported comfort superiority seems to have lowered the stress on this point. Furthermore, the 1955 group placed less emphasis on specific comfort factors such as firmness, danger of feeling spring contours, lumpiness, etc., and mentioned instead general comfort as a desirable characteristic. Also, coolness mentioned by 19 percent, weighted, in 1950 was specified by only 8 percent of the 1955 group. With heightened use of the more comfortable foam rubber there is an apparent willingness to sacrifice cotton's superior coolness. Finally, in 1955, there was greater stress on low moisture absorption as a desired characteristic. Comments indicated that cotton's tendency to become soggy elicited this response.

Although the relative importance of appearance as a desired characteristic appears to have decreased slightly between 1950 and 1955, 9 percent of the executives' statements (weighted) in 1955 made specific mention of good appearance as such. In 1950 the "appearance" consideration was associated solely with resiliency—ability to retain shape with no wrinkling or sagging. This shift in emphasis is in keeping with the generally increased stress, in 1955, on overall styling. Resiliency, however, remained the most important single factor in both years.

Fireproofing, mentioned by 15 percent (weighted) of the executives in 1950, was mentioned by less than 1 percent in 1955. Comments indicate that companies will not grapple with this problem until state requirements regarding fireproofing have become more standardized.

Variation in Types of Padding Used According to Price Class of Cars, 1950 and 1955

In 1955 as in 1950, foam rubber pads were standard equipment in front and rear seat cushions of all companies' high-priced models.

The upper two-thirds of the medium-priced lines also used foam rubber pads in front and rear seats. The lower third of the medium-priced lines generally used foam rubber only in the front seat cushions. None of the companies reported offering foam rubber in seat cushions as standard equipment in low-priced models. One company, however, reported that: "in some low-priced models, a series of cars may be furnished with small foam rubber pads instead of the usual cotton pads." In 1955, foam rubber seat cushions, when not standard, were offered as optional equipment and purchased to a very high degree. One company reported that 50 percent, and another that 75 percent of their cars included some foam rubber padding. One large company's executives stated that 5 to 10 percent of the rear seat cushions and 80 to 95 percent of the front seat cushions in their total 1955 automobile sales included foam rubber pads.

Pads of reclaimed wool over foam rubber were used by one company in some of its more expensive models and cotton over foam rubber in its lower priced cars.

Cotton padding is standard equipment in all low-priced cars because, as one company executive indicated, "foam rubber is the most comfortable type of pad and cotton comes next—but a long way behind." Although price is the major consideration, one executive stated that his company could,but does not, use foam rubber in all cars because they want to "make a distinction between the car models." This would indicate that cotton may be in further jeopardy if opinions about maintaining this distinction changed.

According to one padding expert "hair pads for use in low-priced cars have been found to be very unsatisfactory; aren't too comfortable."

Preferences for Different Types of Seat Padding

Preference for seat padding materials was discussed with 16 executives. Thirteen, representing all of the 5 companies, preferred foam rubber if cost were not a factor. One of these, however, indicated strong preference for a pad of reclaimed wool on top of the rubber. Two of the 16 executives preferred 100-percent cotton and one, goose feathers.

Foam rubber was favored because of its resiliency and its superior comfort, because of its ease of handling, its high prestige, and its uniform quality. Cotton was preferred by the two executives because it has always given good service. The company preferring wool or, in less expensive models, cotton atop the foam rubber pad, explained that wool "provides better resiliency and the most comfort. Rubber is somewhat harsh to sit on; feels warmer sooner. There is more of the luxury feel if wool is next to the skin." Foam rubber is not widely used for seat backs because less physical pressure is involved here and because cotton absorbs perspiration well.

One executive stated that his firm does not provide foam rubber in all cars because "rubber pads are more expensive. We make them available if the buyer is willing to pay a premium. We are governed by competition too, as to where we make rubber available." However, the same executive discussing the relative merits of rubber and cotton indicated that there is more than price to consider:

I feel foam rubber is the best on the market right now

because there is an airtight specification on rubber and we know what we are getting—besides the fact that it has excellent set characteristics, is easily molded, feels comfortable, and is very uniform. With cotton we're always at a loss to figure out what we've got. Cotton from different parts of the country is different. We never know what to expect. After the cotton is garnetted we can't tell if we're getting 50 percent grade I and 50 percent grade II, 70–30 or what. . . . The only way we might approximate what we're getting is to receive master samples from the converter and to test them. . . . (However) our inspectors aren't able to make thorough tests on each shipment. . . .

Variations in Padding Prices

When asked to discuss the prices they would pay for padding for low-, medium- and high-priced models, executives answered that, generally, they would pay $1.50 to $2.00 per seat for low- and medium-low-priced cars and $3.50 to $5.00 a seat for medium-high- and high-priced cars. It was found, however, that padding experts tended to think in terms of costs for seat backs, both front and rear combined, and of costs for seat cushions, again considering front and rear seat cushions in combination. The cost ranges reported in these terms were as follows:

	Cost range
Front and rear seat backs	$2.70–5.70
Front and rear seat cushions	
Natural fiber	$2.30–3.50
Foam rubber	$8.50–10.00

Trends in Types of Seat Padding Envisioned by Automobile Executives

The executives with whom trends in padding materials were discussed indicated that cotton use will be still further depressed as foam rubber use increases and new padding materials are adopted. Twenty-eight percent of the replies (weighted by company production) indicated greater use of synthetic spun fibers; 15 percent (weighted) predicted more foam rubber (table 46).

A major change in the concept of seat fabrication is envisioned for the distant future. Forty percent of the replies (weighted) anticipated the future use of a molded one-piece seat of di-iso-cyanate or of foam rubber. This development is motivated by the need for easier and cheaper production and will be facilitated by the movement in design to lower automobiles.

We'd like to have a simpler arrangement in making seats—perhaps mold them completely and thus not be concerned about padding.

There is a trend to lower and lower cars * * *. Every year cushions are getting lower. They are as low as possible now with regard to springs. The next step may be to remove the springs and make a large (molded one-piece) pad of rubber or di-iso-cyanates.

Additional reasons for changing to di-iso-cyanates as well as to synthetic spun fibers duplicate the reasons advanced for preferring foam rubber, e. g., comfort, resiliency, standardized product, etc.

We may (in the future) go to the use of di-iso-cyanates for molded seats—which might cut out padding altogether.

TABLE 46.—*Executives' expected trends in padding materials*

Expected trend	Executives mentioning	Weighted percentage of total replies
Expect to use:	*Number*	*Percent*
Molded seats of di-iso-cyanates (or of foam rubber) to replace all other padding	5	40
Synthetic spun fiber pads (nylon), dacron, rayon, frothed vinyl, DuPont fiber fill)	2	28
More foam rubber	10	15
Waste cotton-latexed (buck-air process)	1	2
More cotton and sisal	1	2
Some change, but don't know exactly what	2	7
No change	3	6
Total	(1)	100
Number answering question	18	

[1] Column adds to more than number answering because some executives named more than one possible trend.

We believe it can cut expenses and still permit a seat of good resiliency and life.

I want to deal with fibers I can control. We can specify Dacron, for example, by denier, length of staple, etc.

Opinion varied regarding the magnitude of the trend away from cotton. While some executives felt that change would be limited in the immediate future, others could not say exactly how much change there might be. But in general, there are definite expectations of shift in this area.

Rubber is so far over cotton in comfort and set characteristics that there'd be no competition—if the price on rubber was down. * * * di-iso-cyanates may replace rubber.

Several executives state that cotton will always be used in some padding.

Cotton won't ever go out of the picture—the low price will save it.

We'll have to keep some cotton pads because of the opportunity to advertise lower price.

While agreeing in this respect with the tenor of the 1950 report, the executives in 1955 did not go nearly so far in support of cotton. In 1950, for example, it was reported that many executives believed cotton to be indispensable because "it is cooler and absorbs moisture better than rubber."

Thermal and Sound Insulation

Description of Thermal and Sound Insulation

The insulation used in automobiles is designed to protect passengers from heat and cold, and from excessive noise produced by vibration of the engine or by movement of the car over the highway. Insulating materials are used principally under

the roof, on the floor, on the underbody, on the door panels, behind the cowling, and sometimes under the hood.

Consumption

As in 1950, it was impossible to obtain accurate data on the exact quantities of specific fibers used for insulation. Apparently, the fiber ratio in the various materials used is not a constant from shipment to shipment, nor is the precise fiber composition of particular interest to the industry. Unlike the selection process in the case of, for example, upholstery, sidewalls, and headlining, selection of insulation is left more in the hands of the technologists who work closely with the suppliers to provide materials at a specified cost.

While details on consumption of specific fibers are not available the reports indicate that approximately 180,000,000 pounds of insulating materials were used in the 1955 models. Between 2 and 3 percent of this quantity was estimated to be cotton in some form.

The sound insulating properties of a material are reportedly of far greater importance than its thermal insulating quality.

Thermal insulation is not really considered. We insulate against sound and that usually takes care of thermal insulation. In reality, we're only kidding ourselves when we talk about thermal insulation. The glass area of cars has been increasing steadily which tends to make any efforts to insulate the car thermally of no effect.

Our requirements are designed along our needs for sound insulation material. We have no test setup to cover thermal coefficients specifically. There is, however, plenty of published technical data on sound insulating materials, which include the termal coefficients of each material.

Only 6 to 7 percent of the 180,000,000 pounds of insulation used in the 1955 models was used primarily for thermal insulation. The remaining proportion (93 to 94 percent) was used for sound or for sound plus thermal insulating purposes.

Desired Characteristics in Thermal and Sound Insulation

Fourteen officials in the 5 companies were asked regarding insulation:

Would you tell me as fully as possible what characteristics a thermal and sound insulation material would have to have to be ideal from the standpoint of your company?

Responses to this question in 1950 had been limited to 4 desirable characteristics; in 1955, more characteristics were named as desirable for insulating materials (tables 47 and 48).

The relative importance of moisture resistance, fire resistance, and lightness is apparently unchanged since 1950. Ease of handling does not appear to be as much in the forefront of executives' minds today as in 1950, possibly because this problem has been minimized. On the other hand, concern over the possible injurious effects of certain insulation materials has apparently increased, perhaps because of the growing use of fiberglass which reportedly must be handled with care.

TABLE 47.—*Characteristics of thermal and sound insulating materials the automobile industry said it wanted, 1955*

Characteristics mentioned	Executives mentioning	Weighted percentage of total replies
	Number	*Percent*
Moisture resistant. Should not absorb and hold moisture from rain or condensation; color should not be subject to bleeding due to dampness	6	16
Fire resistant. Particularly important between the floor board and the engine	6	14
Light in weight. Yet should have sufficient weight and density to maintain the good sound insulation qualities of heavier materials	4	13
Not deteriorate after installation. Should hold its form; should be resilient; should not sag after spraying; layers should not separate; should resist mold, rot and insects	4	13
Porous. Porosity enhances sound and thermal absorption; material should return to original thickness after compression	3	13
No bad effects on installation workers. Should be free of injurious and irritating material; free of noxious matter; not oily	3	13
Easy to handle. Should not crumble or break apart; should be firm; should have least possible thickness to simplify handling and installation	7	10
Odorless	2	6
Good spraying qualities. Sprayed deadeners should have good adhesive qualities; should not fog or settle and dry quickly; should have a high flash point	1	2
Total	(1)	100
Number of executives answering question	14	

[1] Column adds to more than the number answering because executives gave more than one answer

Current Use of Insulating Materials

The overall situation with respect to insulating materials used by the various companies varied considerably in 1955 from 1950. While in 1950, each company reported one basic material as being used company-wide for insulating a particular part of the car, e. g., roof, floor, etc., the 1955 reports indicate variation in materials according to make, line and model of car. Thus, a company may use 4 different materials for, let us say, roof insulation, depending basically on car make and line and sometimes even on models within the line.

TABLE 48.—*Characteristics of thermal and sound insulating materials the automobile industry said it wanted, 1955 compared with 1950*

Characteristics	Weighted percentage of total replies	
	1950	1955
	Percent	*Percent*
Moisture resistant	19	16
Fire resistant	19	14
Light in weight	20	13
Not deteriorate after installation	8	13
Porous	5	13
No bad effect on installation workers	2	13
Easy to handle	19	10
Odorless	3	6
Good spraying qualities	--	2
One material for both purposes	5	--
Total	100	100

In addition, it was reported that the material used to insulate a particular part of a specific make, line, and model may have varied in the course of 1955 production.

The following statement was typical:

For roof insulation in the (*make, line, model*) we use fiberglass or wool and fiber. Optionally, a combination of fiberglass and wool and fiber could be used.

The degree to which each material or the combination of materials was actually used in the particular make, line, and model could not be determined since developing accurate consumption data in this area was not possible.

The tables presenting the different insulating materials used reflect only known usage and do not take into account optional combinations.

Roof insulation.—Roof insulation is primarily used to deaden sound caused by vibrations of the metal roof. Secondarily, roof insulation serves to give protection from heat and cold.

Discussion with executives indicated that there were 2 aspects to the sound insulation used in roofs. Apparently, both a sound deadener and a sound insulator are frequently used in combination.

Information on the specific deadeners used was limited. In general, these are asphalt-impregnated felt, usually paper but sometimes rag.

Much more detailed information was available on the sound absorbers used in the roof. Fiberglass, Amberlite, and Satinaire (Amberlite and Satinaire waste cotton products) are the principal sound absorbers reported. In general, fiberglass is used in the higher priced lines and models while Amberlite and Satinaire are used in lower priced cars. Interestingly, Amberlite and Tufflex, used in 1955 but not in 1950, were reported as preferred materials in 1950.

There apparently has not been a marked change in the basic roof insulation practices between 1950 and 1955. Felted asphalt paper combined with fiberglass was the leading material in 1950. If we assume that asphalt paper felt was still being used as a deadener in 1955, then the principal change is the increased use of Amberlite and Satinaire (absorbers) in combination with asphalt-impregnated felts. (See tables 49 and 50).

TABLE 49.—*Materials reported used for roof insulation, 1955*

Material [1]	Companies using	Weighted percentage of total replies
	Number	*Percent*
Fiberglass	5	26
Amberlite	3	22
Satinaire	2	21
Felt (Flint Kote impregnated or single-ply)	3	10
Tufflex	2	10
Wool and fiber (unspecified)	1	5
Jute	1	5
Embossed K–B board (processed paper)	1	1
Total	[2]	100
Number of companies answering question	5	--

[1] The specific materials reported are primarily sound absorbers. These are frequently used in combination with a sound deadener, usually asphalt-impregnated felt.

[2] The total is more than 5 since companies reported use of more than one material.

TABLE 50.—*Materials reported used for roof insulation, 1955 compared with 1950*

Material [1]	Weighted percentage of total replies	
	1950	1955
	Percent	*Percent*
Fiberglass	--	26
Amberlite	--	22
Satinaire	--	21
Felt (Flint Kote impregnated or single-ply)	--	10
Tufflex	--	10
Wool and fiber (unspecified)	--	5
Jute	--	5
Embossed K–B board (processed paper)	--	1
Asphalt paper felt in combination with fiberglass	82	--
Asphalt paper felt, only	11	--
Wool conversion felt impregnated with resin	4	--
Natural fiber felt impregnated with resin	3	--
Total	100	100
Number of companies answering question	7	5

[1] The specific materials reported in 1955 are primarily sound absorbers. These are frequently used in combination with a sound deadener, usually asphalt-impregnated felt. Thus, the variation noted in the above table is, in part, a factor of reporting rather than actual change in materials used.

Floor insulation.—Floor insulation is required primarily to keep heat from the exhaust pipe out of the car interior and to muffle road noise. The 2 basic materials reported for floor insulation in 1950—asphalt-treated paper felt and jute—remain the principal materials used in 1955. However, a third material, a fluid deadener essentially an asphalt mixture was also in substantial use in 1955 (tables 51 and 52). The use of this liquid substance explains the statements of executives that an insulating material should have good spraying qualities.

TABLE 51.—*Materials reported used for floor insulation, 1955*

Material reported	Companies using	Weighted percentage of total replies
	Number	*Percent*
Asphalt-impregnated paper felt	3	33
Jute	4	26
Fluid deadener (asphalt)	2	24
Triplex felt	1	15
Fiberglass	1	2
Total	(1)	100
Number of companies answering question	5	

[1] The total is more than 5 since companies reported use of more than one material.

TABLE 52.—*Materials reported used for floor insulation, 1955 compared with 1950*

Material reported	Weighted percentage of total replies	
	1950	1955
	Percent	*Percent*
Asphalt-impregnated paper felt	55	33
Jute	11	26
Fluid deadener (asphalt)	--------	24
Triplex felt	--------	15
Fiberglass	--------	2
Jute, in combination with asphalt paper felt	31	--------
No insulating material under the floor mat	3	--------
Total	100	100
Number of companies answering question	7	5

Dash panel and cowl insulation.—The primary purpose of this insulation is to protect the riders from engine heat. A secondary purpose is to deaden the sound of the engine. In 1955, fiberglass was reportedly the material used in most cars, with jute felt ranking second. In 1950, on the other hand, asphalt paper and fiberglass in combination was the leading material for dash panel and cowl insulation. Materials comprised of several layers of different insulators are reportedly in more widespread use now than in 1950, e. g., as in the case of roof insulation, Tufflex, fiberglass, and embossed K–B board. The use of asphalt paper felt for dash panel and cowl insulation has decreased sharply since 1950 (tables 53 and 54).

TABLE 53.—*Materials reported used for dash panel and cowl insulation, 1955*

Material reported	Companies using	Weighted percentage of total replies
	Number	*Percent*
Fiberglass	3	35
Jute felt	1	25
Felt mastic	1	7
Asphalt board	1	7
Asphalt-impregnated paper felt	1	7
Amberlite, single-ply felt, covered with asphalt felt	1	5
Embossed K-B board	1	4
Jute, Tufflex, Amberlite, mastic and K-B board	1	4
Amberlite	1	2
Triplex felt	1	2
Tufflex, fiberglass, and embossed K-B board	1	2
Total	(1)	100
Number of companies answering question	5	

[1] The total is more than 5 since companies reported use of more than one material.

TABLE 54.—*Materials reported used for dash panel and cowl insulation, 1955 compared with 1950*

Material reported	Weighted percentage of total replies	
	1950	1955
	Percent	*Percent*
Fiberglass	1	35
Jute felt	--------	25
Felt mastic	--------	7
Asphalt board	--------	7
Asphalt-impregnated paper felt	--------	7
Amberlite, single-ply felt covered with asphalt felt	--------	5
Embossed K-B board	--------	4
Jute, Tufflex, Amberlite, mastic and K-B board	--------	4
Amberlite	--------	2
Triplex felt	--------	2
Tufflex, fiberglass, and embossed K-B board	--------	2
Asphalt paper and fiberglass	86	--------
Jute felt and fiberglass	10	--------
Corrugated and flat paper cemented to jute felt	3	--------
Total	100	100
Number of companies answering question	7	5

Door panel insulation.—Door panels are insulated against sound to eliminate the drumming effects from vibrating metal. Asphalt paper has declined in importance also in this application since 1950. Fluid deadener (asphalt mixture) is the principal insulator named as used in 1955 (tables 55 and 56).

TABLE 55.—*Materials reported used for door panel insulation, 1955*

Material reported	Companies using	Weighted percentage of total replies
	Number	*Percent*
Fluid deadener (asphalt)	4	59
Asphalt-impregnated paper felt	2	27
Jute	1	14
Total	(1)	100
Number of companies answering question	4	

[1] The total is more than 4 since companies reported use of more than one material.

TABLE 56.—*Materials reported used for door panel insulation, 1955 compared with 1950*

Material reported	Weighted percentage of total replies	
	1950	1955
	Percent	*Percent*
Fluid deadener (asphalt)		59
Asphalt-impregnated paper felt	63	27
Jute		14
Sand and asbestos mixed with liquid rubber binder	37	
Total	100	100
Number of companies answering question	7	4

Hood insulation.—Insulation is used under the hood primarily to deaden engine noise. Fiberglass is the principal material used with jute ranking second (table 57). This information was not available in 1950.

TABLE 57.—*Materials reported used for hood insulation, 1955*

Material reported	Companies using	Weighted percentage of total replies
	Number	*Percent*
Fiberglass	4	44
Jute	1	25
Asphalt-impregnated paper felt	1	14
Duplex felt	1	13
Fluid deadener (asphalt)	1	4
Total	(1)	100
Number of companies answering question	5	

[1] The total is more than 5 since companies reported use of more than one material.

Costs of Insulation

Some information was collected on the costs considered acceptable for insulating materials as a package, that is, encompassing all parts of the car where insulation is required. Indications are that costs per car range on the average between $1.90 to $2.75, depending upon the make, line, and model. One line was reported to be spending as much as $8 per car for insulation.

Preferences in Insulation Materials When Cost Considerations Are Eliminated

Ten executives were asked to name the materials they preferred for insulation regardless of cost. The question was worded so that choice was limited to materials already on the market.

Fiberglass is strongly preferred for both sound and thermal insulation. However, its properties as a sound insulator are somewhat less widely accepted than as a thermal insulating material. In 1950, while fiberglass's desirability as a thermal insulator was notable, executives, at that time, ranked it second, naming asphalt-impregnated paper as the preferred material. Use of fiberglass as an insulator was only beginning in 1950. Wider experience with this material for automobile insulation indicated the desirability of using the "ultra-fine" type which reportedly has better properties as a sound absorber than the coarser type used earlier. Thus, the shift in executives' opinions reflects a change in the type of fiberglass used between 1950 and 1955 (tables 58 and 59).

The declining preference for asphalt-impregnated paper felts is reflected in the diminished use of this material.

Executives were asked why they preferred a particular material for insulation. With respect to fiberglass, the majority merely stated that it was the best insulator against sound and heat on the market. A few specifically commented on the fact that fiberglass does not absorb water, that it is odorless, that it cuts well and is easy to install, and that it is not susceptible to mold and rot.

Mastic was preferred for sound insulation because of its ability to stop vibration quickly.

Tufflex and Amberlite were reported as preferred because they "don't bleed through and discolor headlinings."

Petroleum products were preferred because of the ease by which they could be sprayed on.

TABLE 58.—*Preference given for insulation materials, regardless of cost, 1955*

Insulating material	Thermal insulation		Sound insulation	
	Executives mentioning	Weighted percentage of total replies	Executives mentioning	Weighted percentage of total replies
	Number	*Percent*	*Number*	*Percent*
Fiberglass	9	91	7	71
Mastic (asphalt with a sand filler)			2	18
Asphalt-impregnated paper felt			1	3
Tufflex			1	3
Amberlite	1	9	1	3
Petroleum products (oil tars)			1	1
Jute			1	1
Total		100		100
Number of executives mentioning	10		[1] 9	

[1] The total is more than 9 since some executives preferred more than one material, depending on the part of the car.

TABLE 59.—*Preference given for insulating materials regardless of cost, 1955 compared with 1950*

Insulating material	Weighted percentage of total replies			
	Thermal insulation		Sound insulation	
	1950	1955	1950	1955
	Percent	*Percent*	*Percent*	*Percent*
Fiberglass	90	91	31	71
Mastic (asphalt with a sand filler)				18
Asphalt impregnated paper felt			65	3
Tufflex			2	3
Amberlite	7	9	1	3
Petroleum products (oil tars)				1
Jute			1	1
Thermocraft	2			
Asbestos	1			
Total	100	100	100	100
Number of executives mentioning	8	10	8	9

Executives qualified their preferences for insulating materials by pointing out that an excellent material could have serious limitations for certain applications.

Fiberglass is best but not for floor insulation because it is impractical underfoot.

In cases where the material preferred was not used in 1955 the major limiting factor was cost. Fiberglass, which was considered too expensive for wide use in 1950, in 1955 was regarded as not too expensive.

Trends in Insulation

Seven executives commented on expected changes in *thermal* insulating materials to be used in the future by the automobile industry. Four stated that they did not envision any changes from current practices. The remaining 3 reported that they expected more widespread use of fiberglass, extending to lower priced makes, lines, and models, particularly if the cost of this material could be reduced.

On the other hand, 6 of the 10 executives questioned in regard to expected changes in sound insulation envisioned some new developments. Selection of insulation materials reportedly is based more on sound than on thermal characteristics. A number of executives expected more widespread use of fiberglass while others anticipated use of di-iso-cyanates. Use of asphalt mastic, if die cutting problems could be overcome, was also anticipated. Diaphragm type vibration dampeners may be increasingly used because they are effective at temperatures where asphalt melts. In addition, it was expected that use of jute will decline because "it is pricing itself out of the insulation market."

Use of cotton for insulation was restricted in 1955 to products such as Amberlite and Satinaire which contain cotton waste. None of the executives interviewed volunteered that they envisioned any increased or expanded usage of cotton or cotton waste for insulation.

Suggestions on Ways To Improve Cotton and Wool for Use in Automobiles

In accordance with the procedure followed in 1950, the concluding question was:

Is there anything you can think of that the laboratory might work on which would increase the use of cotton in (upholstery, sidewall, headlining, seat padding, insulation and convertible tops)?

The question was repeated for wool in the upholstery, sidewall, and headlining sections only.

Upholstery

Cotton.—The most important suggestions received from executives for improving the position of cotton for upholstery dealt with soil resistance, wearing qualities, and appearance. When cotton is used in blends, more luster is achieved.

The principal suggestions made in 1950 indicated the need for cheapening cotton's cost and increasing its soil resistant characteristics. While soil resistance is still most important as a desirable property in 1955, the cost of cotton was mentioned by only 4 of the 31 executives participating in this study. Those executives who expressed concern with the cost of cotton did so in terms of its being used as a facing material. On the other hand, the majority of executives stressed the point that cotton's future in upholstery would be primarily as a filling or backing fiber along with synthetics, cotton serving to reduce costs and add desirable characteristics to a weave or blend. Executives' views were as follows:

Improve resistance to soil and wear. In many cases, we use cotton as a backing material to bring down the price of a cloth. It is cheap and thoroughly adequate. Depending on the fabric trends, probably the use of cotton will stay within 5 percent of its present level. We've tried to get better appearance from cotton, better luster by mercerizing it but if one drop of oil gets on it, the stains cannot be removed. Thus we do not use cotton as a face material.

Cotton should be able to be worked into modern patterns and should cost less. To make cotton by itself suitable for today's market, we would have to go to such expense we would go out on a limb. Today coarse yarns are being used to give bulk to the fabric but they're usually out of sight. We are probably using more cotton now as bulk than we did 3 or 4 years ago. Generally the cleanability of cotton is good.

Improve its luster, wear characteristics, resistance to soil and recovery from elastic stretch. Cotton is still one of our basic construction fibers—it stabilizes a fabric and gives it irreversible shrink. . . Rayon is bad this way. Nylon isn't too bad. Orlon has no shrink but some is necessary—cotton is best of all—it has nearly all of the shrink taken out of it but maintains enough to give it good workability. Cotton filled fabrics cost less in trimming. In the future, cotton will probably hold its own—long range, however, it may not be required.

Wool.—The use of wool fabrics for automotive upholstery trim declined radically between 1950 and 1955. Apparently, the principal reasons for this decline were changes in styling and the high cost of wool.

At the time of the 1950 report, only 5 of the interviewed executives made comments pointing out the need for refinements in wool fabrics, while 9 said that wool was satisfactory. They thought the price of wool was too high.

In contrast, the 1955 study revealed that almost half of the 34 executives interviewed felt that "there was nothing that could be done to wool which would increase its use because of its high cost and out-of-date appearance."

Of the group who made suggestions for improvements in wool, the majority stressed the point that wool would have to be developed to the point where it could compete in appearance with the modern styles and designs achieved by synthetics.

Another group (11 of the 34 executives) stated that means would have to be found for reducing the cost of wool before it would gain acceptance as an automotive upholstery material.

Others indicated that a luster or sheen has to be achieved with wool and that it needs improved dyeing and wear qualities and greater soil resistance. The following comments illustrate executives' opinions:

Improve the ability of wool to take color and get decorative patterns. Unfortunately, we don't use wool as much as we used to although we tried it and the patterns aren't anywhere as sharp as synthetics. We can't get a change of pace with wool because it has no luster. Synthetics give much better wear for a lower price.

Wool will stay put for the quality look in very expensive cars but will go no further in other lines. Wool is out for lower priced cars except as a novelty or change of pace but by no means in quantity. Laboratories should work on moisture resistance, increased coolness, cleanability, luster, and strength, along with reducing its cost.

Wool people should meet the specifications of the synthetics manufacturers. For example, in vinyl we get very fine contemporary designs. The wool people should be in with synthetic manufacturers and work closely with them to develop wool as a backing or blending material. They can't fight the synthetics alone; they are too popular and cheaper.

Wool doesn't lend itself to piece dyed fabrics or synthetics. The wool people will not invest in looms that produce the patterns presently in vogue. Wool broadcloth is a terrific fabric but it's too expensive.

Sidewalls

Cotton.—Greater resistance to soil and cleanability was the principal suggestion for improving cotton mentioned by executives both in 1950 and in the recent study. Cotton's wearing qualities and appearance were also singled out by a number of executives as needing improvement. A few of the other recommendations for improving cotton for sidewall purposes stressed the need for better blending ability with synthetics, improved moisture resistance, less color fading, increased strength and resistance to water spotting. The following comments reflect the attitude of executives on the need for improving cotton for sidewall purposes:

More cotton will be used for sidewall only if more of the qualities of synthetic fabrics can be incorporated into cotton such as appearance, durability, and cleanability.

Work on cleanability and water spotting characteristics and also on the ability to use highly decorative patterns at a low price. Stylists would prefer to use fabric but switched to vinyls because of the ease of cleaning they offer. The improvement of cotton in this respect is very important.

A lot of soiling and water spotting with cotton may be due to the dyeing and finishing process rather than the fabric itself. What we want is a material that can be piece-dyed in one batch after it has been woven in the natural colored yarns and then scoured. On very decorative fabrics it is necessary to use yarn dyed or stock dyed fabrics which are very expensive.

Wool.—Of 32 executives 23 stated that further laboratory work would not help to increase use of wool as a sidewall fabric. The prevailing opinion among these executives was that, regardless of laboratory work, wool is too costly and not as attractive or as popular as the synthetics.

The executives who did suggest specific improvements for wool mentioned the need for longer wear, lower cost, greater soil resistance and modern textures, and designs similar to those now popular with synthetics.

Wool's cost must be brought down before it can be considered for sidewalling. Wool also should take on more of the synthetics' qualities such as cleanability, durability and better, more contemporary appearance.

A considerable reduction in price.

Develop a new nylon-wool combination which will wear well and look stylish.

Headlining

Cotton.—As in 1950 a substantial majority of the suggestions offered with respect to headlining stressed the need for improving cotton's soil resistance and cleanability. About one-fourth of the executives asked for greater flexibility and working qualities.

One executive summarized the situation as follows:

If the laboratories can develop a cotton headlining to the point where we get good soil resistance and cleanability plus a more stylish appearance at no increase in cost, cotton will sustain itself. Without these features it seems likely that cotton will soon be replaced as a headlining fabric.

Wool.—Twenty-three of the 29 executives questioned about suggestions to enhance wool's position for headlining stated that, in their opinion, there was nothing the laboratory could do in this regard.

Of those who made specific suggestions, half felt that the development of a *cheaper* wool fabric might prove helpful, and half mentioned that improvements could be made in wool's stain resistance and cleanability.

However, it was also pointed out that many attempts had been made to use a cheaper grade of wool with no success because of its undesirable appearance.

Convertible Tops

Cotton.—Eighteen of the 24 executives interviewed had suggestions for improvements which might increase the use of cotton for convertible tops. Most of their attention appeared to be directed toward problems dealing with the colors. Six executives wanted more color permanency, 5 asked for a broader range of colors, and 3 thought that smarter designs and colors on the interior side of cotton tops were desirable.

The need for increased cleanability, longer wear, and greater strength were also mentioned. Other suggestions were as follows:

The laboratory should try to reproduce the color effects that we get from dope-dyed rayon and Orlon. They should also concentrate on producing a cotton top which will last the life of the car.

Cotton tops have a tendency to fade badly. Along with this, shrinking is a problem. These are reasons why cotton is used as an inside top material only.

The laboratories should work on better designs and colors for cotton interior top material or else something new will replace it.

Seat Padding

Cotton.—Of the 15 executives answering this question, 7 stated that the laboratories could not develop cotton to a point where it would be as desirable as foam rubber for padding purposes. Typically, the comments expressed this attitude:

Foam rubber is inherently a much better padding material than cotton. It is soft, resilient, and has sales appeal. The development work on cotton has * * * not produced the desired resiliency * * *

Five of the eight executives offering recommendations for laboratory work wanted a cotton padding with greater resiliency and resistance to set. The other recommendations that were made are:

Improve specifications and standards.
Increase comfort.
Make it comparable in quality to Indian cotton.
Rubberize cotton to make it like curled hair.

Increase the resiliency of cotton padding to a point where the padding returns to at least 80 percent, if not more, of its original height after the load is removed.

Thermal and Sound Insulation

Cotton.—Of the 10 executives interviewed in this respect, 6 recommend further development of cotton for insulation purposes to meet the need for increased heat screening and sound deadening properties. It was pointed out that materials presently on the market are much more effective insulators and are favorably priced.

A few comments received from insulating engineers point out their attitude to this question:

The laboratories would have to produce a cotton material with sound and heat screening properties equal to fiberglass without increasing its cost. Ease of installation is another factor which must be considered. Cotton would have to be in a form similar to our present materials which allow simplified installation.

Pads of cotton blended with other materials might be used such as Tufflex and Amberlite. Cotton bats for roofs would be used if they were made with the same qualities as fiberglass and priced within reason.

Four other executives answering this question indicated their satisfaction with the materials they are presently using and could see little hope for cotton as a successful competitor.

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