TALL OIL PRODUCTION TO REACH BILLION POUND MARK IN 1964

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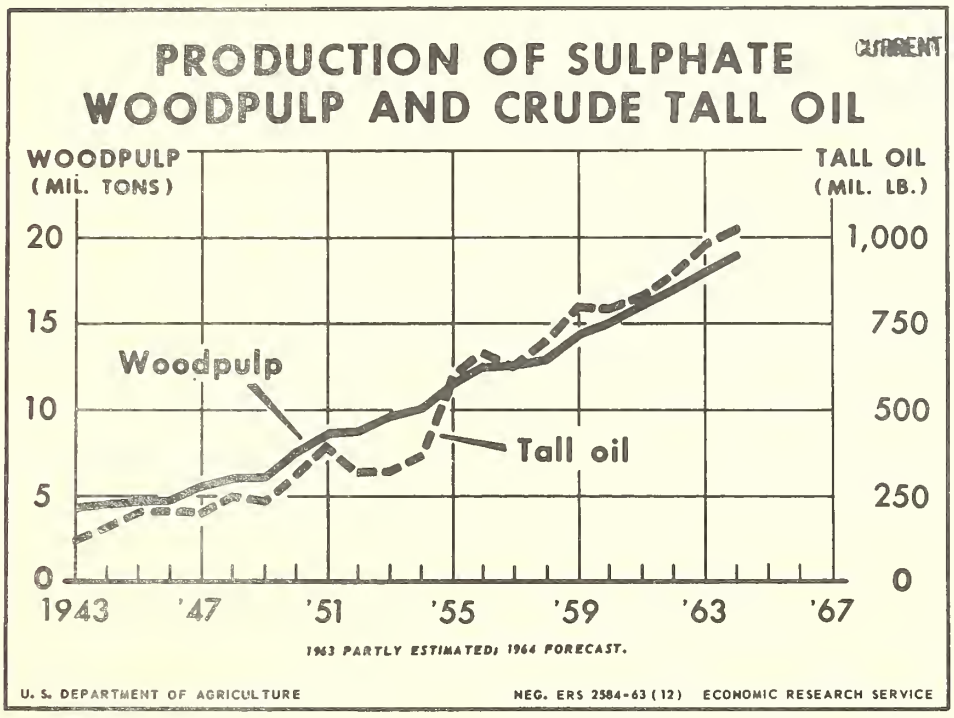

Tall oil production is closely related to the production of pine sulphate pulp since it is a byproduct of the Kraft paper manufacturing process. Tall oil output in the United States increased sharply from 125 million pounds in 1943 to a record 990 million in 1963. Based on current prospects, output in 1964 probably will exceed a billion pounds for the first time.

A major factor in the growth of tall oil consumption, other than improvement in quality and development of new uses, has been its relatively low, steady price compared with the wide price fluctuations of higher-priced linseed and soybean oils.

(See page 31).

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Tall oil, a byproduct of the sulphate wood pulp industry, continues to be a growing source of fatty acid and rosin. Its production and uses have increased steadily since its commercial introduction in the United States in 1930. Output in the postwar era has increased nearly fivefold, from 200 million pounds in 1947 to 990 million pounds in 1963 1/ Total crude tall oil output for 1964 is forecast at a record 1,050 million pounds, 6 percent more than last year (table 22). This level of crude oil production at the works would be valued at about $38 million.

The consumption of tall oil by industry has kept pace with its rapid rise in production in recent years, mainly because it is a principal source of vegetable fatty acids for industrial purposes. Domestic disappearance of tall oil, after increasing gradually from about 200 million pounds at the end of World War II to 331 million in 1954, increased sharply to over 500 million pounds in 1955. In 1963, disappearance totaled a record 924 million pounds (table 22).

The sharp increase in the utilization of tall oil largely reflects (1) its low price compared to the drying oils (linseed and soybean); (2) its upgrading by continuing research; (3) its availability during periods of vegetable oil scarcity; (4) its adaptability to new applications; and (5) its price stability.

Tall oil is used in a wide range of products for which little data are available. In general, however, the main uses include: a raw material in surfactants such as soaps, asphalt additives, lubricants, flotation chemical, fat chemicals, etc., and as a drying oil in the manufacture of paints, varnishes, printing inks, core oils, linoleum, oil cloth, floor tile, driers, etc.

Exports of tall oil in recent years have generally declined, dropping from 61 million pounds in 1954 to 30 million in 1963. The United States is the world's leading producer by a wide margin followed by Sweden and Finland.

Sulphate Paper Mills Produce Tall Oil

Production of paper by the sulphate process results in 2 byproducts that are classified as naval stores--sulphate turpentine and tall oil. The name Tall Oil was derived from the Swedish "Tallolja" which means oil of pine.

In the pulping process, the pulpwood is debarked, chipped, and cooked in a weak sulphuric acid solution. Turpentine vaporizes and is condensed while the resins from which tall oil is made are skimmed off after the cooking is completed. For many years the naval stores byproducts of the sulphate

1/ The U. S. Bureau of the Census is the primary source of the data analyzed in this paper.

Table 22.--Tall oil: Supply and disposition, 1947-64

Year	Supply			Disposition		Price per pound	
	Production (crude oil)	Stocks Jan. 1	Total	Exports	Domestic disappearance	Crude, tanks, works	Refined tanks, works
	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Cents	Cents
1947	200	---	200	23	177	3.63	6.92
1948	249	41	290	28	214	2.09	5.75
1949	230	48	278	33	186	2.00	5.36
1950	310	59	369	36	287	2.10	5.10
1951	398	46	444	44	323	3.12	5.75
1952	313	77	389	35	270	2.82	5.19
1953	318	85	403	42	280	2.25	5.00
1954	357	81	438	61	331	2.03	5.00
1955	584	46	630	48	508	2.44	5.19
1956	665	74	739	44	599	2.50	5.25
1957	625	95	720	52	560	2.60	5.47
1958	701	108	810	37	651	2.75	5.50
1959	794	122	916	21	749	2.75	5.50
1960	789	146	935	53	1/807	2.80	5.34
1961	826	88	914	33	1/814	3.19	7.08
1962	880	107	987	27	1/859	3.50	7.50
1963 2/	990	120	1,120	30	1/924	3.57	7.50
1964	3/1,050	189	3/1,239				

1/ Factory consumption used for years in which Census reported factory consumption exceeds calculated domestic disappearance.
2/ Preliminary and partly estimated.
3/ Forecast.
Totals computed from unrounded numbers.

Table 23.--Tall oil: Utilization, 1947-63

Year	Nonfood products									
	Soap	Paint and varnish	Linoleum and oilcloth	Resins and plastics	Other drying oils	Lubricants and similar oils	Fatty acids	Other 1/	Foots and loss	Total
	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.
1947	16	13	19	---	---	---	113		16	177
1948	18	22	14	---	---	---	127		33	214
1949	14	18	16	6	12	---	92		27	186
1950	13	20	16	8	26	---	172		32	287
1951	22	34	15	11	24	---	191		26	323
1952	15	32	13	15	27	---	160		8	270
1953	14	34	17	11	31	---	165		7	280
1954	12	40	29	20	27	---	189		13	331
1955	14	40	31	13	38	---	344		27	508
1956	17	48	31	28	39	---	356		80	599
1957	12	44	31	23	31	---	353		66	560
1958	12	37	27	24	23	---	443		86	651
1959	23	29	22	18	16	26	2/557	59	---	749
1960	15	35	17	12	22	24	674	9	---	3/807
1961	12	38	20	12	25	20	676	11	---	3/814
1962	10	42	22	10	30	15	720	10	---	3/859
1963 4/	9	47	18	10	35	14	779	12	---	3/924

1/ Includes unreported domestic disappearance. 2/ Beginning in 1959 Census data indicates that the use of whole or crude tall oil in the distillation or fractionation process is reported as consumed in fatty acids, the use in the acid refining process is reported as consumed in "Refining". The production of refined tall oil includes the output of acid refined tall oil and distilled tall oil (containing less than 90 percent free fatty acids not including rosin acids). 3/ Factory consumption used for years in which reported factory consumption exceeds domestic disappearance. 4/ Preliminary and partly estimated.
Totals computed from unrounded numbers.

industry were used at plants as fuel or were dumped. Refining processes were developed and the sulphate wood industry is now regarded as a major source of naval stores.

Tall oil is a natural mixture containing about equal amounts (45 percent each) of rosin acids (abietic acids) and of fatty acids (principally oleic acids). The remaining 10 percent is unsaponifiable matter. The rosin acids in tall oil are related to the acidic components of rosin. The fatty acids, present as such in the growing pine tree, are closely related to the components of both vegetable and animal fats, especially soybean oil.

Trend Toward Fractional Distillation Of Tall Oil

While tall oil was finding numerous uses, it was early recognized that its individual components, if separated, would have much broader utility.

Early refining processes usually consisted of purification of the oil by simple distillation or treatment with sulphuric acid to remove color bodies. However, the original ratio of rosin to fatty acids in such oils remains practically unchanged by these methods. Modern refineries now separate the rosin from the fatty acid by fractional distillation, thus producing a variety of rosin-fatty acid mixtures. Distilled tall oils containing 20-50 percent rosin acids are often utilized as is by industry. Fatty acid fractions from tall oil that contain less than 1 percent of rosin acids and, conversely, tall oil rosin with less than 1 percent fatty acid contents, are being produced.

According to trade estimates, tall oil fractionation plants at the end of 1963 had capacities of nearly 1.2 billion pounds and further plant additions were planned at that time. Fractionation plants have grown rapidly in capacity since 1954. This growth closely follows the sharp increase in tall oil output and use beginning in 1955. In 1963 the trade also indicates 9 companies in the United States operated 13 tall oil fractionating plants.

Census Data Show Sharp Increase in Tall Oil Consumed in Fatty Acids Since 1959

The consumption of tall oil in the manufacture of fatty acids increased from 557 million pounds in 1959, the first year Census data became available, to 779 million pounds in 1963, an increase of about 40 percent (table 23). Census reports indicate that the use of whole or crude tall oil in the distillation or fractionation process is reported as consumed in "fatty acids"; the use in the acid-refining process is reported as consumed in "refining". Census data on the production of refined tall oil include the output of acid-refined tall oil and distilled tall oil (containing less than 90 percent free fatty acids not including rosin acids).

Inasmuch as fatty acids are categorized as a separate end-use, by Census definition, fatty acids from the primary oils used in drying oil and other products are not included.

Table 24.--Tall oil: Supply, disposition and price, by months, calendar years, 1954-63

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total or average
	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.
						Production							
1954	25	25	29	30	31	33	28	27	28	33	36	33	357
1955	42	43	49	48	53	49	43	49	48	54	55	51	584
1956	58	56	65	58	61	59	50	55	47	57	48	49	665
1957	58	54	59	54	55	48	45	51	45	51	56	48	625
1958	60	57	64	62	59	52	52	60	56	66	60	52	701
1959	63	64	69	73	71	66	58	65	62	70	70	63	794
1960	66	71	80	74	70	70	53	68	60	64	62	52	789
1961	62	66	76	72	77	72	58	68	65	74	70	66	826
1962	72	79	85	78	84	74	60	72	67	76	72	60	880
1963 1/	83	78	95	84	90	82	71	83	73	87	86	78	990
						Stocks, first of month							
1954	81	83	82	81	81	77	68	69	64	59	56	54	
1955	46	50	52	56	57	58	58	62	64	59	63	70	
1956	74	87	89	97	92	89	99	100	97	96	93	91	
1957	95	100	106	113	109	119	116	113	112	106	104	109	
1958	108	111	117	119	120	128	124	123	123	116	120	130	
1959	122	133	142	142	150	143	150	147	142	141	138	144	
1960	146	145	147	149	156	152	142	136	126	113	102	96	
1961	88	86	94	102	100	102	99	105	100	97	100	104	
1962	107	113	121	124	134	136	137	128	120	127	123	116	
1963 1/	120	128	142	148	160	162	168	167	172	168	171	168	
						Exports							
1954	1	1	5	5	8	14	4	6	1	5	5	5	61
1955	8	2	5	10	3	4	1	1	7	1	1	4	48
1956	1	5	3	4	8	2	4	4	1	8	1	2	44
1957	2	6	2	6	5	8	4	2	3	1	3	9	52
1958	4	4	5	2	1	3	1	1	3	4	1	6	37
1959	1	1	2	2	2	1	2	2	2	1	3	1	21
1960	5	6	4	5	6	5	3	3	4	4	4	4	53
1961	6	3	3	5	3	3	1	2	2	2	2	1	33
1962	2	2	2	3	2	3	2	2	2	2	2	2	27
1963 1/	2	2	4	2	3	3	3	4	1	1	2		
						Domestic disappearance							
1954	21	25	25	26	27	28	23	27	31	31	32	36	331
1955	29	39	39	37	49	45	39	45	46	50	47	43	508
1956	44	49	53	60	56	47	46	54	46	52	48	43	599
1957	52	42	50	52	40	44	44	49	48	52	47	40	560
1958	53	47	58	59	50	53	51	60	59	57	49	53	651
1959	51	54	67	64	76	59	58	68	61	72	61	59	749
1960	62	63	74	62	67	75	56	74	70	72	63	56	794
1961	59	55	65	68	71	73	51	72	66	70	64	62	774
1962	64	69	81	65	79	70	67	77	58	78	77	54	839
1963 1/	73	62	85	70	85	73	69	73	76	83	87		
						Price per pound, crude, tanks, works							
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
1954	2.25	2.12	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.03
1955	2.25	2.25	2.25	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.44
1956	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
1957	3.00	2.88	2.70	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.56	2.60
1958	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
1959	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
1960	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.78	2.88	2.88	2.88	2.90	2.80
1961	3.00	3.00	3.00	3.19	3.25	3.30	3.25	3.25	3.25	3.25	3.25	3.30	3.19
1962	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1963 1/	3.50	3.50	3.50	3.50	3.50	3.62	3.62	3.62	3.62	3.62	3.62	3.62	3.57

1/ Preliminary.

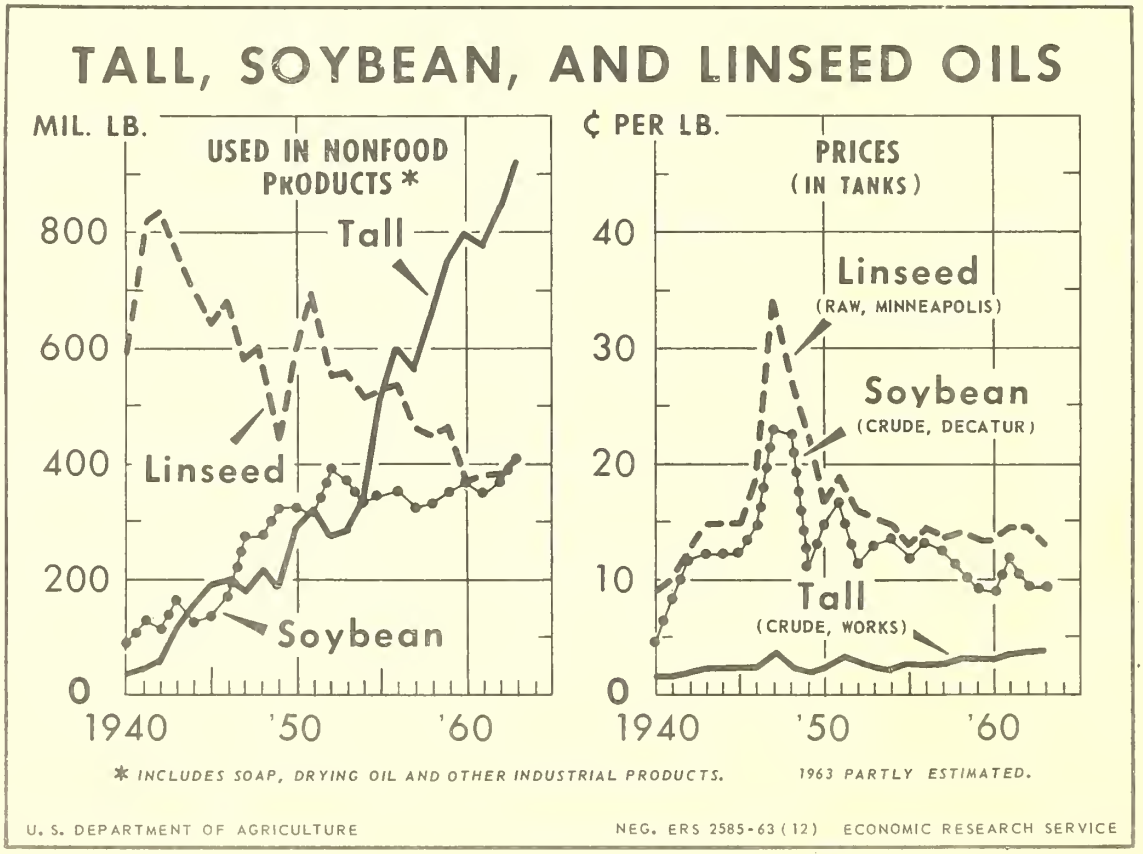
Totals computed from unrounded numbers.

For this reason, the tall oil utilization data, presented in table 23, for soap, protective coatings, chemicals, and other industrial uses, show only the trends in direct use of tall oil in these various end-product categories. The more important trends revealing the significant increases in the use of tall oil fatty acids in protective coatings, soaps, detergents, and chemical intermediates cannot be determined and analyzed from Census statistics.

According to estimates developed by the Oil Paint and Drug Reporter (December 23, 1963 issue), tall oil fatty acid production in 1963 totaled 120,000 tons distributed as follows: Coatings, 27,400 tons; detergents, soaps, and disinfectants, 13,500; intermediate chemicals, 31,900; flotation, 6,900; tallate driers, 2,100; hard floor coverings, 3,500; other, inventory, 14,600; and exports, 20,100.

Low Price Unique Advantage of Tall Oil

Tall oil prices have been relatively stable in the postwar years contrasted with the wide fluctuations in prices of linseed and soybean oils. (See chart below). Manufacturers of chemicals from fatty raw materials require low steady prices if they are to compete effectively with chemicals from petroleum and natural gas.



Annual average prices of tall oil during the past decade (1954-63) varied 1.6 cents per pound, from 2.0 to 3.6 cents. Linseed oil prices varied 1.9 cents per pound, from 12.7 cents to 14.6 cents whereas soybean oil fluctuated 4.5 cents per pound, between 8.8 cents and 13.3 cents. It is interesting to note, however, that the price of tall oil has moved up steadily each year from 2.0 cents per pound in 1954 to 3.6 cents in 1963 while the price of linseed oil during the same period generally declined from 14.6 cents per pound to 12.7 cents and soybean oil dropped from 13.3 cents per pound to 9.0 cents.

While the use of tall oil has been expanding sharply, consumption of competitive vegetable oils has been slipping. The combined use of linseed and soybean oils in nonfood products has declined from 850 million pounds in 1954 to about 800 million in 1963. The decline in consumption of vegetable oils (mainly linseed oil) is largely due to reduced utilization by the drying oils industries. While the output of paints and varnishes has been maintained at high levels during the past decade, the use of fats and oils in their manufacture has lost ground because of the continuing shift to low fat and nonfat content materials.

Shift to Tall Oil Rosin Continues

The 3 sources of rosin are: (1) wood rosin from first growth pine stumps; (2) gum rosin from live pine trees; and (3) tall oil rosin from the sulphate paper manufacturing process. While the rosins differ some chemically due to source, they are often used interchangeably by industry. The largest use for rosin is in the manufacture of paper size.

Tall oil rosin production has an economic advantage over the wood and gum rosins: as a byproduct of the Kraft paper process, it would present a disposal problem for the mills if not utilized. This contrasts sharply with the high costs involved in collecting pine gum by hand labor and the rising costs involved in bulldozing and transporting pine stumps.

During the past decade, tall oil rosin output increased from 50,000 drums (less than 3 percent of the total rosin output of 1.9 million drums) in 1954 to 510,000 drums (about 24 percent of the total rosin output of 2.1 million drums) in 1963. A drum of rosin weighs 520 pounds. Steam distilled wood rosin production dropped 230,000 drums or 17 percent during this same 10-year period while gum rosin declined 63,000 drums or 12 percent. Tall oil rosin prices are comparatively stable compared with the fluctuating prices of gum rosin and the higher prices for wood rosin.

Among the 3 types of rosins, tall oil is in the most favorable position economically to command a larger share of the rosin market. Research has developed tall oil rosin into a product of generally satisfactory uniformity and quality, and it comes from a dependable source of supply.

Tall oil rosin is unlikely to fill the supply vacum resulting from the expected decline in the production of steam distilled wood rosin during the

next several years. The supplies of softwood sulphate pulp are a limiting factor and an increasing amount of hardwood is being mixed with the pinewood in the Kraft process. Hardwood produces no tall oil and therefore no rosin. Another limiting factor is the tendancy of increased tall oil rosin supplies and expanded paper size requirements to go hand in hand.

Outlook

Future prospects of the tall oil industry are quite obviously tied to the sulphate paper industry. As the demand for paper increases, the sulphate industry will continue to expand, making possible increased production of tall oil from the increased amounts of byproducts liquors. Improvement in the recovery of the crude black liquor soap from the Kraft cooking liquors may also boost tall oil output since it is estimated that about 15-20 percent of the soap is not now recovered. On the other hand, the above mentioned increasing utilization of hardwoods is a partially offsetting factor.

The average annual rate of increase in the output of sulphate woodpulp during 1954-63 was about 6 percent. This rate probably will continue over the next several years. Thus, it appears that the outlook for tall oil is bright as it likely will become an increasingly important source for rosin, mainly, but also for fatty acid. Supplies of tall oil will continue to rise along with increased utilization, as research efforts likely will continue to find new uses and new tall oil products. While tall oil prices probably will continue to edge up as they did during 1960-1963, this versatile material likely will continue to maintain its unique price advantage over competitive vegetable oils.

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