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IMPACT OF AUTOMATION ON CHANGES IN THE DAIRY ECONOMY OF THE MIDWEST

(Remarks of Charles E. French, Purdue University
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Introduction

My remarks will be directed primarily upon the expected impact of automation on plant operations, especially upon processing rather than distribution. This I do because:

(1) Other aspects will be covered generally by other speakers.

(2) Cooperatives are daily buying more and more plant problems.

(3) Cooperatives can no longer afford a lackadaisical attitude toward plant efficiency. You will be in even more direct competition with dealers. In previous dealings with dealers, your position was based upon farm economics. As a seller of farm goods you were an expert. Delving into both buying and selling mandates that you prepare yourself on both sides. A bright picture for cooperatives has no place for mediocre cooperative processors and distributors. The old adage "diversify only so far as you can specialize" is prudent. Even the best possible operation may find divided loyalties within your organization as your interests fluctuate from buyer to seller.

(4) Cooperatives must gain through efficient operation, the economic cushion necessary for managerial elbow room to consider overriding problems of marketing management, structure analysis, institutional organization, and producer relations.

My remarks will be essentially in a philosophical vein because:

(1) I am not a skilled technician who can drive home this subject with threats of intricate cosmic plants of the future. Anyway, sputniks have made this unnecessary. However, I might say as another layman that these technicians no longer amaze me - I expect them to accomplish the impossible.

(2) I am an economist and hope to approach this thing primarily from a broad economic point of view. The economic issues of new technologies such as this are not subject to precise evaluation. The need which exists is for the broader, philosophical, and more qualitative approach.

My remarks are predicated upon what may be a unique and uninformed definition of automation. Apparently, a Ford Company Vice President, a Mr. Harder, coined the word in 1946 when describing some automatic work-feeding and material handling devices. Mr. Harder coined the term in a narrow sense, but it was soon broadened by the press. A Massachusetts Institute of Technology professor, Dr. Wiener, made headlines of the subject with his book on "cybernetics," a term he used to mean "control and communication in the animal and the machine."(16)a/

I view this development essentially as an extension of industrialization. Yet, I do agree with Mr. Ralph J. Cordiner, President, General Electric, who said that, "It is important to recognize that 'automation' is only one phase in the process of technological progress, a natural evolutionary step in man's continuing effort to use the discoveries of science in getting the world's work done."(18)

I view it as essentially evolutionary, not revolutionary. Thus, I like the definition of Professor James R. Bright, Harvard University, that "Automation simply means something significantly more automatic than previously existed in that plant, industry or location."(16)

Some argue that automation is not an improvement of man hour usage, but an elimination of the man hours themselves. This is the alleged difference between the Automation Revolution and the Industrial Revolution. However, for the most part, automation is a transfer of man hours from production processes per se to manufacturing processes such as those used for making devices to reduce such man hours. Of course, coupled with this is an improved

a/ Numbers in parenthesis refer to number of reference in bibliography.

standard of living which allows more time for the basic cultural pursuits and less for the production processes per se.(19, 20, 21, and 22)

My remarks will emphasize the future of this development. Yet, I admit they constitute more of a speculation than a prediction.

Technical Considerations

Five basic considerations have been outlined for appraising the technical feasibility of automation in a particular industry: (1) availability of automatic machinery, (2) the nature of raw materials, (3) the production processes, (4) the factory or plant layout, and (5) the product design.(16) These may assist our analysis.

Automatic machines are obviously not available for some food processes. However, an appraisal of available machines, especially in other industries, might be quite encouraging. There is no doubt that automation is going at a rather rapid pace. As early as October 1955, Business Week magazine stated, "At first it was just a word, a handy tag for a single engineering concept. But there was excitement in the air -- a sense that something new and revolutionary was being born in the laboratories and the factories. The word became a focus for the excitement. Now it's agitating businessmen, unions, politicians. And it means something different to each."(23) This reminds me of the old farmer's evaluation of the growth of integration. Said he, "I don't know what you call it but something is sure as hell happening."

Undoubtedly, official statistics are lagging the actual development. However, the census showed employment in the electrical machine industries to increase 113% between 1940 and 1950. Of course, the development since that time has been tremendous. A recent survey suggests that electrical machine industry sales in 1958 could be one-third more than in 1954. Development in other industries cannot be overlooked as a tremendous potential for adaptations in the food industry. Often we either have the automatic machinery or we can get it.(17, 25, and 26)

Growth in scale of food plants and development of multiple-plant firms suggest that it is now appropriate to consider this type of mechanization. We lagged in industrializing the food industries during the Industrial Revolution, primarily because of our small scale.(10)

Raw material considerations in food industries suggest opportunities for automation. Ralph J. Cordiner has said, "The 'flow' concept of automation is most easily applied in the processing of liquids, gases, and energies, such as electrical energy. Thus, in the chemical, petroleum, and electric utility industries you will find a high degree of automation already in existence."(18) Milk is a highly definable, chemical substance which is dependable within the flow concept of automation. The necessity for improved materials handling in the food industry might give us an extremely valuable by-product. Automation brings about more systematic materials handling. The need for this is acute in food processing.

Production processes in food handling should be subject to automation. Batch processes did not generally allow it, but almost complete continuous processes do.

Our factory layouts are extremely inefficient in many cases. Yet, potential may be here for automatic processes. Some developments in this area are showing up in new layouts as we put all control devices in one area. This is not a very long step toward automation but it indicates the direction. Professor Bright contends that mechanization in a given production system has three dimensions: "(1) A span or spread of mechanization across a given production system, i. e. the extent to which the required sequence of events is accomplished mechanically; (2) a level of mechanization, which is the degree of mechanical accomplishment of a required activity; and (3) a penetration or degree to which the secondary and tertiary supporting activities such as adjustments, inspection and maintenance are mechanized."(16) Modern dairy plant layouts can have a wide span of mechanization with the high level

of penetrating mechanization possible for automation.

Product design may give us some problems in automation. Recent years have seen an increase in number of products.(9) However, we have tended to specialize the processes on particular products within individual firms. Moreover, we may not need the extremely wide line of products developed more for competitive reasons than for efficiency reasons. Proper evaluation may not have warranted introduction of many new products merely to meet competition. Many products are the result of our hanging on to the traditional artistic concept in food. The public today is interested in scientific as well as artistic concepts.

The technical outlook for automation is not all bright. Actually, we have done very little to automatize fully the control procedures in food plants. Possibly, we have done more than we realize to mechanize certain processes. However, actual elimination of man hours has not come as we might hope.

Moreover, mechanization is not easy. It is not simply keeping in touch with the most recent developments in automatic equipment. It must consider the entire operation of our businesses, including not only factors such as design, materials and processes which go to make up the interior operation but also the marketing practices and the over-all environment in which the plant must operate. Such things all go into the complete picture of automation.

Economic Considerations

The above technical considerations suggest a fine vantage point for discussing the economic considerations in automation. This vantage point is illustrated by viewing the cost structure of a typical fluid operation.

The major expense item is milk (about one-half of the sales dollar). One reported advantage of automation is improvement in product control. The

leverage for savings in milk loss in a plant is almost unbelievable. The average milk loss in a good fluid operation is probably slightly under 2% with an almost unbelievable range among plants. Cutting fat loss from 4% to 2% in a plant with 40 million pounds annual volumes does as much for profits as increasing sales by more than 10%. The economic potential of automation here is certainly encouraging.(2)

Factors which adversely affect fat loss make an imposing list. A few of these include: (1) bad sampling; (2) inaccurate weights; (3) poor standardization; (4) general leakage and spillage; (5) bottle breakage and leaks; (6) overfilling; (7) poor salvage on returns; (8) theft and pilferage; (9) evaporation; (10) poor control of donations; and (11) product spoilage.

After milk, labor is the next most important outlay (about one-fourth of the sales dollar or about one-half of the gross margin). We think of automation as replacing labor. Probably it is a more drastic step than we have taken before. Yet, the potential is here. Eight hours saved each bottling day is worth as much to the typical Midwest plant as a million dollar increase in sales.(4)

Containers and packages are big items (about 70 cents per hundredweight). Automation should give the control necessary to save on in-plant loss of containers. However, trippage on glass containers will still be the major factor influencing costs here.(8)

Rent, repairs and depreciation are approximately as important in the fluid milk cost picture as containers. These are the items that constitute a big part of automation costs. In all probability this area can stand considerable increase in the automation process without serious concern. Capital item purchases in processing have often been based upon short payback periods, not entirely consistent with present tax laws and capital budgeting procedures. Most such outlays should be based upon an annual use cost of 15% of the initial investment. For example, 30 minutes saved each

day with a wage rate of $1.75 per hour will allow an investment of more than $2000. Industrialization would be fostered by such comparisons of these relative costs.(5 and 6)

The economic leverage in automation is powerful. The Edward B. McClain Company, a cost comparison and consulting service for a large group of fluid milk and ice cream plants in several states, estimates that their average client realized 41½ cents per hundredweight operating profit before income taxes last year. Potential for cost reduction by automation appears favorable relative to such a figure.

Another economic consideration of probably more significance to the future of automation is the potential of so-called modern management techniques, involving mathematical procedures and digital computers. Ralph J. Cordiner of G. E. has said, "When the history of our age is written, I think it will record three profoundly technological developments: nuclear energy, which tremendously increases the amount of energy available to do the world's work; automation, which greatly increases man's ability to use tools; and, computers, which multiply man's ability to do mental work. Some of our engineers believe that of these three, the computer will bring the greatest benefit to man." Mr. Cordiner may or may not be right.(24) But our work in this area is extremely encouraging.(3, 7, 11, 12, 13, 14, and 15)

This area involves two aspects - routine data processing and management problem solving. Automation of the routine planning and control procedures is getting well started. The problems here are akin to those on processing operations themselves. We are currently doing research in this area and are optimistic that automation can do much for this nearly forgotten area of dairying.

Let me speak more completely on problem solving and automation. Electric brain is a familiar word to most of us. You probably picture it as the mysterious machine seen on election nights. You remember the engineers

nursed it maternally as its many lights flashed. Viewing it with some amusement but with some respect, the news comentator promised that it would give you the winner by 8 o'clock. Over the years, your faith in its possibilities has grown.

The high cost of these machines may have led you to think that you would never use such a machine. Ownership is not necessary for use. Machine time for problem solving can be rented from almost any of the major computer manufacturers. For many problems the cost is at most a few hundred dollars.

The virtue of a computer lies in the fact that it can often handle complicated problems more accurately and much quicker than can man. But man must tell it how to do the problems. Large repetitive problems are it favorite diet. You can get either a large number of interpretations of a small amount of data or you can get an interpretation of a large amount of data. Now that we have derived more and better operating data, we can take advantage of such machines. Problems today are too complicated for the human mind to handle all the interrelationships simultaneously.

Computer development has gone hand in hand with development of high-powered mathematics. The machine was invented because the mathematicians worked themselves into a paradox. Mathematicians could generally solve these complicated problems with simple arithemetic but computing the arithemetic took so much work that nobody could afford it. Mathematicians then developed obtruse and intricate mathematics which could solve their problems with little work. But by then the mathematics had become so complicated that nobody but a handful of mathematicians could use it. So they built computers that do simple arithemetic with unbelievable dispatch.

Automation potential in management problem solving is beyond appraisal, but it is tremendous. Many traditional management problems today can be handled effectively. This area of economics will see profound effects of

automation.

Environmental Considerations

Automation potential is, in a sense, more dependent upon the environment created for it than upon technical or economic considerations.

Environmental conditions must be made attractive enough that automators will work the dairy industry rather than other industries. In the Industrial Revolution food industries lagged almost all other industries. We will lag in the Automation Revolution unless the men who make and sell automation equipment see a more lucrative market here than in the hard goods industry. Certain things could help create such an environment.

Think costs both absolutely and relatively. My economic analysis was sketchy and inconclusive in traditional evaluation of the cost of automatic equipment versus the savings from it. Generally, cost saving potential looks good. However, the absolute costs must be carefully planned on each individual problem. Shopping around is still good policy. The machines should be adapted to the job, not vice versa. Such absolute costs may be quite high. Then costs relative to alternatives must be derived. These will be difficult to calculate. Often the indirect returns may be much higher than the direct returns.

Allow modern management to function. Managers today can not be interested in the generalist concept -- they are too young. They tend to be specialists. Therefore, they must have large amounts of timely, precise, over-all information on which to make decisions. They want the type of information which you can get with automatic control - both in data processing and technical plant processes. Their problems are large and complicated. Solution of them takes system and high-speed mechanization.(1)

Break with tradition. Too much tradition exists in the dairy industry, especially in quality considerations, long working hours, reverence of fat,

artistic concept of products and processes, and sacred attitude toward the traditional institutions of the industry. Automation calls for considerable "eggheadedness". Acceptance of that is often a break with tradition. The trends of the times favor automation. To ignore them merits caution. Possibly automation may be only the gimmick for accomplishing a change. Whether it is the device or the end result is rather incidental.

Adjust resources as needed with this improved productivity. We will see continued technological unemployment as a development of automation. This is part of our changing times. Generaly, we will welcome less time on production and more on living. A British writer recently said, "All of the evidence suggests that very large increases in output will be necessary merely to maintain employment if productivity continues to increase rapidly." More plants will close. We will probably accentuate the price pressure from supply outstripping demand for milk. Increased productivity will allow the industry to pass on to consumers a reasonable amount of the savings and consumers may use some more dairy products. But in numbers, we must expect a declining industry in nearly all respects. The importance of this attitude toward adjustment reminds one of the story told of Walter Reuther. Supposedly he was visiting a large automobile plant and was asked rather facetiously by the manager, "Well, Mr. Reuther, how are you going to collect trade union dues from these machines?" Reuther replied, "How are you going to sell them motor-cars?"(19)

Instill dignity into the modern concept of work. Actually automation may warrant some crusade here. Mr. Magnus Pyke in his book, Automation, Its Purpose and Future, makes a forceful case that development of assembly lines was one of civilization's most degrading stunts. It reduced the tradesman from a man of respect for his trade to a man who was merely interested in getting his job over with so he could go out and live. Mr. Pyke says that as we develop machines to do the arduous and menial tasks of the day, man

will regain his dignity and respect for work. Trade union people have noted this. Mr. Charles Geddes, President of the Trades Union Congress said, "We can visualize the time when there will be an abundance of consumer goods which will meet the requirements of every man, woman and child on the face of the earth ... to fear 'automation' would be a cowardly approach. These developments must be controlled and not restricted."(19) Walter Reuther reportedly said, "Automation holds out the promise of vast improvements in living conditions, leisure and national strength. It likewise promises the elimination of routine, repetitive jobs. But the widespread introduction of automation within the coming decade or two will present us with serious economic and social problems, involving dislocations of the labor force, geographical shifts of industry, labor displacement, the upgrading of labor, and the need for substantial yearly increases in consumer purchasing power for rapidly growing markets."(23)

Summary

Automation is here to stay. It is not a revolution in the usual sense. It need not invade the food industry for some time in order to survive. When that invasion happens depends more upon the environment created within the industry than upon normal technical and economic considerations per se. Yet, technical and economic considerations suggest that this giant will continue to feed on the food industry. But, in fact, he has only now started to nibble. A welcome mat seems in order. Dairy cooperatives especially can risk extending such a mat because their increasing activity in processing and distribution mandates top-notch, modern methods. Anything else will deter cooperatives rather than advance them.

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