Symposium on Milk Equipment

Present and Future Status of Milk Plant Equipment and Materials *

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The subject of this symposium, as you know, is "Present and Future Status of Milk Plant Equipment and Materials", which subject can be interpreted in several ways. It would be fitting to assume that this group would be interested in this from the standpoint of sanitary improvements and technical developments, and yet there is another angle which might be brought to your attention and which I will touch upon later.

Generally speaking, an observation of the displays at the exhibition hall reveals no radical changes in the principles of major equipment, although some companies have endeavored to give you a preview of what might be expected in time to come.

There are, however, certain things of interest which are new and which I shall endeavor to mention briefly. For instance, there is a device for can washers which maintains a given range of solution strength in the solution tank, electronically operated and equipped with a warning signal at the front end of the machine which lights red when the solution strength drops below the minimum strength desired.

Also, there is a volumetric rinse at the front of the can washer to minimize plant waste and reduce the contamination of streams running by country receiving plants.

There is shown a packaging machine for filling paper containers which handles the package through the complete operation without the necessity of touching the container whatsoever.

There is a new type of apparatus for sterilizing milk which has apparently been perfected to a point satisfactory for commercial operation. There is equipment which might radically change the method of handling butter, which has long been discussed and referred to as the "Continuous Butter-making Process".

There have been many improvements in the small accessory equipment in plants. These are small items which are necessary to the operation of plants but which have never before been given too much thought from a sanitary standpoint. The items to which I refer are sanitary pipe washing machines, sanitary pipe racks, sanitary fitting tables, etc.

There is a new capper made up of a very few parts and so constructed that it can be disassembled and reassembled very quickly. The milk bottle capper has always been rather an unsanitary item in a milk plant, but this new capper which is constructed of all stainless steel solves this problem. Another feature about this capper is the fact that when caps jam in the machine, the bottom cap slide can be removed quickly without disassembling the rest of the capper so as to take out jammed caps without the necessity of touching the caps with the hand or with an ice-pick a practice which is unsanitary.

Storage tanks have been greatly improved by incorporating spun heads with a large radius both on the inner shell as well as the outer shell. There

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has also been an improvement in the design of the front head accessories such as the inlet fitting, peep sights, manhole door frames, and in some cases the elimination of the thermometer fitting within the milk receptacle entirely. This is accomplished by welding a thermometer well on the outside of the inner shell into which the bulb of the dial thermometer is projected. According to the manufacturer who is incorporating this device in his tank, there is only a time lag of about 45 seconds to 1 minute before the thermometer reaches the milk temperature. As previously stated, this eliminates any thermometer fitting through the milk receptacle and also eliminates the necessity of the thermometer bulb being submerged in the milk itself.

These are just a few of the many things I might mention, but again referring to my earlier remarks, the other angle which might be brought to your attention is the physical ability of the manufacturer to accomplish what might be normally expected of him by your group.

Last night I attended the Service of Supply Dinner, better known as the S.O.S. Dinner, and for about two and one-half hours I heard the supplier expound to the industry the almost impossible task of trying with all their ingenuity and ability to come somewhere near to meeting the demands of the industry. Many obstacles with which you are all familiar were mentioned and the picture as a whole looked pessimistic to say the least. Deliveries of equipment were quoted at anywhere from 4 to 30 months, averaging approximately 18 months. These figures were the result of a personal canvass of executives of the displaying manufacturers.

I shall give you delivery dates as a result of this canvass as follows:

- Freezers .................. 12-20 months
- Coolers ................... 4-12 months
- Pumps ....................... 4-12 months
- Pasteurizers ............... 6-15 months
- Plate Equipment .......... 10-18 months
- Storage Tanks .............. 15-24 months
- Weighing and Receiving Equipment .................. 6-30 months
- Straight-line Can Washers .. 9-32 months
- Rotary Can Washers .......... 4-19 months
- Homogenizers .......... 12-24 months
- Separators and Clarifiers ... 4-13 months
- Refrigeration Compressors .. 18-20 months
- Can Conveyors ........ 10-16 months

At this point you might be interested in the following statistics as given by the Bureau of Census in Washington in regard to the shipment of dairy equipment. During the month of June, 1946 in round figures approximately $2,800,000 worth of dairy machinery and equipment was shipped. At the end of the month of June the backlog of orders for dairy machinery and equipment totalled $45,000,000.

Almost all of the audience at last night's dinner were customers there to have one question answered, "When can I expect my equipment?"

Your group, however, is looking for two questions to be answered. "When can we expect equipment to replace the old unsanitary existing equipment?" and "When are the manufacturers going to develop something new?"

Gentlemen, the first question was answered last night in an exceedingly pessimistic way and yet the second question presents to the manufacturer a more herculean task than the first.

I am sure every single manufacturer in this industry would rejoice in its ability to be able to accomplish both of these things under present day conditions. This, however, is impossible, we cannot do both at this time.

Therefore, in behalf of all the dairy machinery and equipment manufacturers I am going to request that you gentlemen bear with us during these hectic times and take these remarks into consideration when making demands both upon the processor and the equipment manufacturer.

I am sure your kind indulgence will not only be appreciated but will materially help us all toward better conditions.
Thermometers and Control

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Delivery

New Instruments—

Perhaps of first importance is the matter of delivery of instruments. The instrument industry, in common with most others, assumed a very heavy burden during the war for the production of indicating, recording, and controlling devices which were found to be real essentials in war-time industries. This responsibility was discharged in creditable fashion, many companies producing several times their pre-war volume. The backlog in the instrument industry is still appreciable but I am happy to report to you that the delivery situation is well on the way toward improvement. In some cases new instruments can be had in from four to eight weeks depending upon the manufacturer. In general, where complete new installations are concerned, instruments can be made available for installation by the time the equipment is to be started up.

Repairs:

You may be even more interested in the service which can be expected when instruments are sent back to the manufacturer for repair. The time required for effecting repairs varies anywhere from two to eight weeks under present conditions, depending upon the type of instrument and form of bulb connection. Instruments which have been in service for many years may utilize a form of connection no longer in regular production, in which case a few weeks should be added for the special work involved. There are some dairy machinery manufacturers who have set up a system of repair by replacement in the case of special instruments which have been developed for a specific piece of equipment.

New Developments

Under the heading of new developments which have made their appearance at the present show are a number of improvements and newly developed devices which are of interest to the sanitarian and milk enforcement officer. I shall attempt to briefly describe these, as follows:

Indicating Thermometers:

There is exhibited a complete line of mercury-in-glass indicating thermometers. Heretofore much thought has been given to the creation of fool-proof and sanitary methods of attaching thermometers to a given piece of apparatus but not much has been done towards improving the scale portion for dairy service. This new design represents an all-out effort towards obtaining maximum readability under all operating conditions and better sanitation. This is accomplished by hermetically sealing the scale and tube within a thick Pyrex glass tube. This makes it possible to submerge the entire thermometer in a washing solution so that it can be cleaned by the same methods used for fittings, pipe, etc.

Improved Controller Design:

Several companies are offering an improved model of temperature controller, such as used on continuous milk heaters. In these models a new attempt has been made still further to simplify construction and insure a more positive operation under tough field conditions. One manufacturer has introduced a new form of controller for high temperature short time pasteurizers which might be termed a packaged unit since it combines in a single case the temperature controller and safety thermal limit recorder. This construction makes possible the com-
complete replacement of a control system as a unit. It is a step in the direction of simplification and is of public health significance in that it makes the individual plant more self-contained should trouble develop.

**Holding Period Timer:**
At least two types of a holding period timer for the high temperature short time pasteurizer have made their appearance this year. Both operate on the thermometric principle and have the advantage of making it possible to make a determination of the holding period quickly while the pasteurizer is operating in a normal manner on milk.

The principle of operation is very simple. Two thermal responsive elements are used. One is located at the entrance of the holding tube and the other at the outlet. A surplus amount of steam is admitted through the circulating water system for a brief interval causing a small quantity of slightly overheated milk to move through the holder tube. The time required for this "temperature wave" to pass from one thermal element to the other is a measure of the average velocity of the milk passing through the holder tube. One manufacturer's apparatus consists of thermo-couples and an electronically amplified potentiometer type of recorder in which there is a fast revolving chart. Another manufacturer secures a similar result by the use of two mercury-in-glass thermometers in the bores of which are inserted electrical contacts. Tests made to date with this thermometric method indicate holding time readings which are quite consistent although approximately 3 seconds longer than intervals obtained by the conventional salt injection method.

**Plastic Covered Flexible Connecting Tubing for Recording Thermometers:**
In their effort to provide a more durable instrument, manufacturers have resorted to an extremely strong interlocking type of non-corrosive flexible armor to protect the smaller inner capillary from damage. This form of design has been eminently satisfactory and has reduced failure due to capillary breakage to the very minimum. Some sanitarians, however, objected to the corrugations of the flexible armor. This objection has now been overcome by covering it with a corrosion-resistant plastic which completely eliminates crevices and presents a smooth water-tight washable surface.

**Differential Sanitary Pressure Switch:**
A switch of this type has now been developed for use in connection with certain hookups of high temperature short time pasteurizers where means are desired to prevent automatically raw milk from entering a milk-to-milk regenerator unless the pressure of the pasteurized milk is at least 1 lb./sq. in. higher.

References to the use of such a switch are contained in the *U. S. Public Health Service Code*, Sec. 7: Item 17p. It is completely sanitary and water-proof in its construction and its operating point is capable of being sealed. It operates at static pressure levels from 3 to 20 lbs./sq. in. and will open or close an electrical circuit whenever the pressure of the pasteurized milk falls to within 1 pound per square inch of the pressure of the raw milk. At any given setting it will operate within plus or minus one-quarter pound per square inch.

**New Flow Diversion Valve:**
A new model flow diversion valve is being exhibited which has been designed to insure greater trouble-free operation than has been achieved in the past. It is also simpler and of more rugged construction than earlier models. It is constructed so that the entire valve body assembly can easily be removed and it contains 13 fewer parts. It is more fool-proof than older models in that the forward flow port is automatically kept closed until the operator manually connects the valve stem to the operating mechanism. In other words, its position can only
change to forward flow when the temperature reaches a plus legal value. Failure due to improper assembly or failure of the auxiliary circuits and contacts controlling the raw milk pump cannot cause a forward flow condition.

The entire valve assembly has been changed so that the forward flow port is at the highest point. In such a position it would be physically impossible to obtain a forward flow of sub-legal temperature milk were the hydraulics of the system such as would exist if the restriction now commonly used in the diverted flow line to assure equal holding periods in forward as well as diverted flow is eliminated. The valve, however, is designed so that it will perfectly seal the forward flow port in the event of a differential as high as 15 lbs./sq. in. between the milk in the body of the valve and that in the forward flow line. The entire valve body and all parts exposed to milk are constructed of 18-8 steel thereby insuring longer life by being resistant to various corrosive washing solutions. 

**Service:**

One other item of interest that deserves mention is the broad subject of instrument service. One company has what is termed a protective service plan. This has been in operation for the past three years and has met with favor judging from the rate at which the demand for it is growing. It consists of contracting with the user for periodic service of instruments at specified intervals. It is interesting to note that there has been only one single instance of instrument trouble between visits out of over 400 inspections divided among 90 companies who have contracted for this service.

These service contracts have been welcomed by the sanitarians in the territories where they have been given. It has been devised especially for high temperature short time pasteurizers with the realization that trouble-free operation of the control system is necessary in the interest of overall efficiency of operation.

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**Abstracts of Milk Literature**  
(Continued from page 91)

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The Milk Bottle Supply Situation*

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Your secretary has suggested that I talk to you on a subject vital at this time to the whole dairy industry—the milk suppliers, distributors and customers, as well as yourselves. The subject is the present supply situation with regard to milk bottles.

Normally, such a subject would not have sufficient news interest to be worth while as a topic. Even during the tremendous supply dislocations of the war, it might have been taken for granted that the milk bottle supply would be adequate. In view of the difficulties and the unprecedented demands on the glass container industry in the last six years, I feel that the milk bottle manufacturers have every reason to be proud of their record of service to the dairy industry. No other industry has been as fully and as steadily supplied with glass containers as the dairy industry.

At the present time, with milk bottle manufacturers operating at full capacity, the supply may be described as "tight", and even critical. Only in one area is there a serious shortage of containers and there, it is generally admitted, other factors are at work beyond the responsibility of the milk bottle suppliers.

Before analyzing the present supply outlook for milk bottles in detail, let me review briefly the record since 1940. Some of our experiences in this period serve as an instructive background for the current situation. Bear in mind that the milk bottle industry must be prepared to deliver a considerable normal annual volume of containers for replacement, and that when an increase in milk consumption develops, approximately eight bottles are required initially to service each unit delivered. In periods of increasing milk consumption, in other words, milk bottle manufacturers must supply the normal grossage for replacements and in addition approximately eight times the unit value of the increase.

For the five years preceding 1941 the milk bottle industry shipped an annual average of slightly under 2½ million gross a year. In 1941, with the boom in war industries and the beginning of concentrations of men in training camps, shipments suddenly jumped 30 percent to 3½ million gross. In the following year they increased further to 3¾ million gross. After that they steadily declined for two years. This slackening in the requirement occurred mainly for these reasons. The "float" of bottles—that is, the eight required to service each unit delivered—had temporarily caught up with the increases in milk consumption wherever those increases had taken place. Men were moving rapidly overseas and others were being taken from cities and villages into training camps already well supplied with bottles. Moreover, in the fall of 1942 limitation orders were issued by WPB—Order No. 10 requiring a deposit on all bottles—and Order No. 79 restricting the distribution of cream and limiting the amount of fluid milk that could be sold in areas of 50,000 population or more. The deposit order stimulated the return of bottles with the result that dairies generally were securing greater trippage from their bottles.

Late in 1944 the demand for maximum milk bottle production reappeared and has remained ever since. During 1944 the dairy industry could have had a half million more gross if it had asked for them. While the glass industry foresaw the later demand and made timely preparations, it
could not have laid by a stock of any considerable size because the clamor for other types of bottles was too great, if for no other reason. Since the late months of 1944, milk bottle manufacturers have operated their machines as fully as the supply of raw materials would let them.

As a result of their efforts, shipments of milk bottles for the first eight months of 1946 are 60.5 per cent greater than for the first eight months of 1940. They are nearly 9 percent ahead of even the similar period of 1945.

The continued rapid increase in milk consumption is one reason for the "tight" supply of milk bottles. The return of our military forces, the large number of new households, the shortages of other foods, and similar factors have combined to create a continuously rising demand for milk. The increase has been so rapid that the "float" of bottles has had no opportunity to quite catch up to milk distributors' requirements. Once the "float" is adequate, the situation is eased; the milk bottle, being a multiple-trip container, needs only to be replaced after its service life of thirty or forty trips or more.

But an increase in business volume is as much a goal of the dairy industry as of the glass industry. The dairyman wants to know why the glass bottle has trouble in keeping his pace.

If the supply of milk bottles is something less than could be desired, the causes lie beyond the power of the glass industry to correct. In the first place, there is a serious shortage of soda ash, one of the requisite raw materials for glass. Authorities estimate that soda ash production this year will be about 10 percent, or 500,000 tons, short of expected demand. There is no total, reasonable substitute for soda ash in making glass; and, unfortunately, there is no substitute for soda ash in making aluminum, soap, paper, cleansers, detergents, and hundreds of other products. We are all on a quota basis, so that each industry receives its share, but the supply is limited.

A further curtailment in soda ash supply has recently resulted from the opening of new aluminum manufacturing facilities, and it is probable that our industry will not be able to maintain its present rate of production. Since soda ash production requires elaborate and expensive processes, it is not likely that this situation will clear up for at least another year.

Further, the shortage of box cars has had the effect of holding down shipments. Earlier in the year, the coal and railroad strikes handicapped our performance. In view of these difficulties, our 60.5 percent increase in shipments as compared with 1940 is an achievement.

With these production problems making the supply of milk bottles critical throughout the country, in the New York City metropolitan area the situation is especially so, and there, as in other areas, the milk bottle manufacturers have been absolved. A recent survey of urban milk markets showed that elsewhere, while additional milk bottle supplies could be used to advantage, the continued rise in milk distribution was not being impaired to any great extent.

Another subject your Secretary expressed interest in is—future trends in the design of milk bottles. As to this matter, I can say emphatically that the square design, development of which started prior to the war, has proven to be the ideal dairy container. While improvement in glass manufacturing technic may result in still further improved designing, the square bottle is here to stay.

It should be pointed out here that the extent that this new bottle has been introduced into use, has been a factor in increasing the milk bottle supply. Since there is no individual blown lettering on these bottles, they can be turned out in long production runs; and the inventory problem, often a complex one with round, blown-
lettered bottles, is simplified. Still another advantage must thus be scored to the credit of the square type of bottle, which the glass industry, and that part of the dairy industry which has adopted it, are confident will be the milk bottle of the future.

Those dairies which have adopted the new bottle are obtaining the economies predicted for it. Indeed, wherever it has been possible to install the new design, the saving it has effected in greater utilization of equipment and storage and delivery space has been as important as the overall economy of approximately 1¢ per delivered unit resulting from its use. Since a case of round bottles takes up 47½ percent more area than a case of squares, a dairy can do almost half again as much business with the same storage and cooler space. Moreover, the space-saving feature is a tremendous advantage in the delivery operation, and becomes a very important factor in the loads carried on every-other-day deliveries. The carrying capacity of present-day trucks can be increased with very minor adjustments by as much as 50 percent. The storage advantage of square bottles is also of importance to the consumer, especially when she is served by every-other-day deliveries.

As milk sanitarians, you will be interested in a cleansing test on square bottles performed under average dairy conditions by Professors L. H. Burgwald and T. V. Armstrong of Ohio State University. Since the square design is new, some doubt arose in the minds of a few dairymen lest it would wash as easily and thoroughly as the old round bottle. Actually, the inner corners of the square design have curving radii, so that it approximates the interior of the round bottle; moreover, it was anticipated by the designers of the square bottle that the flattened panels would act as a baffle in the washing process, breaking up the swirl, increasing the splashing action and therefore the effectiveness of the cleansing.

To resolve all doubt, Professors Burgwald and Armstrong took batches of a dozen square and a dozen round bottles at intervals from seven types of washers in use in an average size city. Following standard testing procedures, bacteria counts were made for each of nearly a thousand bottles, half of them square and half of them round, brought to the laboratory over a period of three months. Their conclusion was that "there is no difference in the commercial practicability of cleansing and sterilizing the returnable square milk bottle and the conventional round bottle in the typical dairy soaker equipment".

I have attempted in this short talk to acquaint you with the facts of the current milk bottle supply situation. In spite of shortages of soda ash and other materials and services, the glass container industry is now producing at a rate 60 percent greater than it was in 1940, but it is doubtful if this rate can be maintained under present conditions. Where container shortages threaten to become more acute experience proves that dairymen have a means for helping themselves. In many such markets campaigns urging consumers to return their bottles promptly have been instituted with excellent results. To achieve the best results such campaigns should cover the entire market with all units cooperating. That real possibilities for greater utilization of the glass milk bottle exist in many markets is indicated by the contrast in trippage figures.

Glass milk bottle manufacturers have accepted as a responsibility the furnishing of these containers for the great mass of consumers, and will continue, as in the past, to give their best in design and production to this objective, but it should be realized that the present conditions, outlined above, are real handicaps and that every reasonable cooperation from the dairies and the public is needed.