ABSTRACTS OF PAPERS PRESENTED AT THE SECOND ANNUAL DAIRY ENGINEERING CONFERENCE MICHIGAN STATE COLLEGE, EAST LANSING, MICHIGAN, MARCH 3 AND 4, 1954.

F. W. Fabian
Associate Editor

Engineering Design and Operation of Bulk Milk Coolers on Farms.
C. N. Turner and Leon F. Charity
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There has been a rapid increase of bulk milk coolers in New York State. They increased from 40 in 1952 to more than 300 at the present time. Many other states are experiencing a similar increase. There is a wide range of physical and mechanical differences in the tanks. These are differences in agitator size, shape, and location, and these will affect the rate of cooling and blending of the milk. Just how important the combination of these factors is has not been determined. The greatest factor in the rate of cooling milk is the condensing unit, and even in this common element, there are wide differences. The engineering problems are discussed, and four diagrams of different types of controls are given. (Cornell Ext. Bull. No. 899, entitled "Bulk Milk Cooling and Handling on the Farm" will soon be available.)

Which Farm-Pick-Up Tank and Truck is Best Suited for Your Operation.
Tom Burruss
Sales Mgr., Tank Div., Heil Co., Milwaukee, Wis.

Thirteen important considerations are given for selecting the proper unit to do a particular job. Each of the considerations is then discussed such as tank size, how the tank should be mounted, outer jacket materials, insulation, pump type and size, how pump should be mounted, size and kind of hose, tray facilities and cooling methods, when is a two compartment tank needed, agitation, baffles and sanitary regulations.

Effect of Bulk Handling of Milk on Plant Operation.
Max L. Jacoey
Sani-Seal Dairies, Inc.
Bay City, Mich.

The effect of bulk handling of milk in a plant (Midland, Mich.) handling about 17,000 lbs of milk daily is discussed. Briefly the favorable results were: made additional floor space available, eliminated expensive receiving room equipment and its maintenance, effected a saving of approximately 50%, reduced temperature of milk to 40°F or lower as compared to an average of 52°F with cans, thereby saving on refrigeration necessary for holding vats, and greatly improved quality. The savings in handling and the improved quality of the milk has been so satisfactory that they are now converting their Bay City plant into 100% bulk pick-up.

Remarks
C. W. Broughton

"Many dairymen believe that the bulk method of handling milk on the farm has done more for the dairy industry than any one single development since pasteurization." Discussing the first subject of bulk tank coolers he said it was particularly interesting because we were still very definitely in the early and promotional stages of farm tank cooling. We are in the same stage today with farm tanks as we were 25 years ago with ice cream cabinets. Continuing, he said "Here is a method, which with proper sanitary procedure, produces milk quality beyond our fondest dreams and hopes. Let's not drown our progeny before it learns to swim. This is both a challenge and a warning to manufacturers and sanitarians alike." Speaking of section 3A in the Sanitary Code he said that it was not for the sanitarians any more than it was for the manufacturers or the dairymen; it was for the dairy farmer, the man who buys the farm tank. He believed the best way to develop the farm tank program in the manner originally intended is to work together. Continuing, he said, "Considerable work was done by the sanitarians, milk people, and the manufacturers this past year to develop the present tentative code. Notwithstanding, there are many sanitarians who have their own ideas. You sanitarians own the 3A copyright, but you must all be together before it will ever attain its rightful stature. In the same breath, tank manufacturers will wish to give the 3A standards complete cooperation. It is only with this oneness of purpose that the dairy farmer will receive the most for his money."

Everyday Problems of a Dairy Plant Engineer.
A. L. Ruppen
Plant Manager, Kegle Dairy, Lansing, Mich.

It is the duty of the dairy plant engineer to have all the machinery in condition to maintain high quality production on an efficient basis. New techniques and automatic devices such as found in controlling temperature in heating and refrigeration equipment have been of great assistance. Some of the engineer's problems that were discussed were preventive maintenance, operation of equipment by plant personnel, operating costs, personnel safety, and finally trouble shooting and handling a breakdown. The dairy plant engineer plays a very significant position on the production team of the plant with consumer satisfaction the ultimate goal.

Water Treatment for Dairies.
Joseph O'Dell

Water treatment for dairies was discussed from an operating standpoint. The four objectives in any boiler feedwater treatment are: to
prevent chemical scale deposition, corrosion, boiler water carryover, and caustic embrittlement of the boiler metal. Usually the addition of sodium nitrate to the boiler water in a concentration equivalent to 30-40% of the boiler water NaOH alkalinity eliminates it. The effects of boiler scale on a heat exchange surface was discussed especially heat flow and overheating. Removal of scale is accomplished by acid cleaning or turbining or a combination of both. The most practical solution of the corroding of iron piping in the boiler feed water and return condensate system is to install brass or copper pipe. Corrosion was discussed in detail.

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**Engineering a Modern Receiving Room.**

V. Schwartzkopf

President, Lathrop-Paulson Co.,
Chicago, Ill.

A receiving room is important to the profitable operation of a dairy because the milk is inspected, weighed, and sampled for butterfat testing here. The accuracy of this work affects producer relationship, makes production control practical, and simplifies accounting practices—all of which have a direct bearing on profits. The more important factors which should be given consideration in a receiving room are: the number of grades, the number of cans and pounds of milk to be received per hour, the number of producers and their average daily delivery in the period of highest production, the elevation of receiving platform in relation to the driveway, and finally the traffic lanes to and from the receiving room.

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**Proper Installation and Use of Conveyors.**

W. S. Campbell

President, M & C Conveyors Inc.,
Chicago, Ill.

Conveyors should be installed not only to eliminate labor but also to keep men contented on their jobs by making the work easier and more enjoyable. In many cases there should be two automatic can stops. One should be located at the dumping position and the other placed ahead of it so that cans can be stopped for inspection, sediment tests, fat tests and the like. Many are installing conveyors which permits the weighing to be done right on the conveyor. It is possible now to install conveyors to carry the milk as it is unloaded from the cans on the truck throughout the entire plant to the filled milk bottles which end up in the refrigerator.

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**Engineering the Dairy Plant of the Future.**

John H. Fossliew

Engineer, Carnation
Los Angeles, California.

In the future, city bottling and ice cream plants will undergo many improvements in design and building construction. The nature of these improvements will be determined by the improvements in machinery and the nature of the raw and finished products. The future milk plant may be a less complicated engineered plant. For example, in the future a city bottling plant may simply be a plant where whole powdered milk is reconstituted since it will be possible and more economical to produce and condense or powder the milk in a less populous area. Again the ice cream plant will be a reconstituting plant where all the ingredients are received in concentrated form, placed in a mixing vat, reconstituted, and then made into ice cream. Milk and ice cream plants will be consolidated for economic reasons. They will also need considerably more space for parking. Therefore, we shall be speaking in terms of acres rather than square feet.

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**Scheduled Maintenance of Refrigerating Systems.**

W. R. Laub

Western & Campbell Co.,
Detroit, Michigan.

Preventive maintenance is a planned program that is faithfully administered. If maintenance is scheduled on a systematic basis it will go a long way towards reducing costs with a minimum of down time. Such a program will accomplish three principal things: first, get the longest practical life of the equipment, second, it will keep operating costs to a minimum, and finally, there will be a minimum of down time. This last item is far reaching and can be so costly that the eventual result cannot be calculated. Two methods of administering preventive maintenance to a refrigerating system are discussed. The first method is to contract with a commercial company to furnish periodic inspection by a competent refrigeration specialist. The contract should call for a certain number of inspections and cover the renewal of parts—both material and labor. The contract price is determined from actuary tables that takes into account many items such as size of plant, age of equipment, complexity of system, compressor sizes, and other such items. The second method is to build a service group within the dairy operating engineers. This method is feasible but has many contingencies such as an experienced, well-trained engineer, adequate help, and the amount of other work he is required to supervise. These and many other things can mitigate against a good refrigerating program. Consequently, the refrigerating system is neglected. A typical contract service form was shown on slide No. 1. Refrigeration plant inspection forms were shown on slide No.s. 2 & 3.

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**Applying Time-motion Study to Dairy Plant Operations.**

Albert E. Geiss

Bowman Dairy Co.,
Chicago, Illinois.

Since about 1881 when Taylor pioneered the science of time and motion study, it has been widely practiced throughout the world. Its value has been recognized by management and labor alike and they have gradually accepted it as an accurate technique for establishing standards of performance for men and machines. The dairy industry has been tardy in using this valuable tool. Recently some dairy companies have used the time study technique in an analysis of processing, cleanup and delivery operations. To date about 100 dairies in the East and many more on the west coast have used the method to determine product costs and to improve methods. Many questions arise in the mind of a dairy plant operator as to what the time study will accomplish. Such questions arise in the mind of a dairy plant operator as to what the time study will accomplish. Such question as: What is time study supposed to accomplish? Will such a study help in determining accurate costs? What is the reaction of the plant worker to them? Will I be able to do a better job of
running my business? Is time study for the large or small plant? The answer to these and other questions were discussed. Also specific examples of time studies in a dairy were given. What is a time study? A time study is the process of recording the detailed elements of an operation and, with the aid of a stop watch, the time required to perform each element of that operation.

Solutions to Dairy Plant Paint Problems?

IVAN NICODEMUS
Chemist, Valduna Division, American-Marietta Co.

Completely satisfactory paint performances have not been easy to obtain in many fields of industry because of the nature of the unit processes or unit operations. Each paint application should be given careful consideration such as type of surface, proper preparation of surface, color desired, application procedure, and the conditions to which the surface will be exposed. Each of these points was discussed. High moisture causes paint failure such as peeling and flaking from moisture coming through the wall until sufficient pressure is built up, due to a differential in moisture vapor pressures, so that the paint is literally pushed off the wall. Such a condition exists for example when a high moisture content room is adjacent to one of low moisture content or when a colder room with a low moisture content is adjacent to a warm room with a high moisture content. Any cracks or joints should be fixed. Preventive measures include better ventilation and the use of impervious paints. Growth of mold on walls and ceilings need not occur since fungicides can be added to paints to control them effectively. Damp surfaces may be painted with paints containing certain resins and oils. For areas subject to normal conditions there are high gloss enamels with a base of oil-modified alkyl resins. Vinyl coatings should be used on machinery subjected to water, cleaning solutions, abrasions, and the like. A class of paints that are extremely resistant to moisture and various chemicals are chlorinated rubber finishes.

Cleaning in Place Specialized Equipment.

GORDON HORBS

Cleaning in Place (C.I.P.) first was applied to plate type heating and cooling equipment. Later it was demonstrated that with correct cleaning materials, proper control of time and temperature, and control of the rate of flow through the passages between the plates, a plate heat exchanger could be completely cleaned by the circulating method. Sanitary piping was next cleaned successfully. Later a few plant men tried cleaning pumps, homogenizers, internal tube heat exchangers, and even ice cream freezers. There are differences of opinion about the effectiveness of the C.I.P. method of cleaning some of this equipment. However, experience shows that freezers and sanitary pipe lines in an ice cream plant can be effectively cleaned by the C.I.P. method. It has also been proven that bacteria in an ice cream plant can be controlled more effectively by C.I.P. than by hand methods of cleaning the lines and freezers. Causes of failure to use the C.I.P. effectively has been due to: incorrect cleaning materials, improper control of time and temperature, and finally insufficient velocity and flow of the cleaning solutions for the respective circuits. Examples of failure due to one or more of these causes are given. The conditions necessary for successful use of C.I.P. are: sanitary pipe secured firmly in position; all sanitary pipe connections sealed with C.I.P. gaskets, stainless steel circulating pumps of sanitary construction with sufficient velocity to completely fill lines and freezers; remove core of all in-line sanitary valves and all parts of the valve brushed clean after rinsing and before circulating the cleaning solution; completely dismantle, thoroughly check and hand clean all sanitary lines at least once every 90 days; dismantle and check freezers once each week; replace old gaskets with new gaskets every 30 days—clean and sterilize old gaskets for re-use in next period. If molded gaskets and grooved fittings are used, it is not necessary to replace the gaskets except where a leak has developed; remove pump impellers from pumps on freezers and replace the plate before the first rinsing operation; hand-wash the impellers and do not replace until the next morning before the sanitizing agent is circulated; install a recording thermometer near the end of the circuit so that supervisory personnel can constantly check the time and temperature while the circuit is being circulated; and finally leaking joints that appear during the freezing operation should be taken apart, cleaned, and the gasket replaced between the first rinse and the circulating of the cleaning compounds. One of the advantages of the C.I.P. method is that it eliminates much of the trouble caused by careless assembly of equipment.

Keeping a Floor in Your Plant.

RAYMOND B. SKYMOUR AND JOHN R. SWIFT

The requirements for modern dairy floors are: a high degree of sanitation; complete resistance to milk, milk acids, grease, detergents, and other liquids characteristic of the dairy industry; ability to withstand steam, sterilization, and damage from impact by cans, cases, and bottles; attractive appearance and freedom from odors; and finally long service life. These requirements are met by modern quarry tile floors in which both the bed and vertical joints consist of a chemically resistant resin cement. The advantages and disadvantages of the various type of floors were discussed. These types were wood, monolithic Portland cement, protective coating floors, monolithic resin cement, industrial acid-proof, Portland cement tile, tile floors pointed with furan cements, and modern furan dairy floors.

Hardening Room Longevity.

EDWIN C. WARD
District Manager, United Cork Companies, Chicago, Ill.

The question was asked, what is the life span of a hardening room? The Internal Revenue Department allows 20 years for the depreciation of a freezer or hardening room. It is one thing to have a hardening room to last just 20 years but quite another thing to have it effective (Continued on Page 163)
sterilization of heat-labile drugs and biologicals, in the sterilization of blood, and in the sterilization of human organs for subsequent transplant. The Department of Food Technology at the Massachusetts Institute of Technology has been cooperating with surgeons at the Harvard Medical School with respect to this latter application. Aortae sterilized in this manner have now been successfully transplanted into human beings. Today approximately twenty persons have had sections of their aortae replaced with tissues that were removed from fresh cadavers and sterilized with ionizing radiations.

If the present-day knowledge of radiation sterilization of foods is compared with what was known five years ago, it is apparent that considerable progress has been made. Much research is yet to be done, however, before food processing with ionizing radiations becomes an industrial reality. Studies on the fundamental mechanism of the action of ionizing radiations on foods and food components are being continued, in an effort to determine the cause of undesirable side effects and the means of preventing them.

"This expression "rep" is the density of energy, equivalent to 93 ergs absorbed by 1 gram of ordinary tissue.

REFERENCES

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and efficient for the 20-year period. To get this type of service from a hardening room it must be constructed correctly from the very beginning. Detail description of the building of a hardening room to last not only 20 years but longer was given. First described was the construction of the outer walls—the thickness, type of materials to use, and how to build them. Similar details followed for the floor and other parts of the hardening room. The heating of floors in hardening rooms was discussed and also the three different types of construction that may be used to avoid heaving. After the details of constructing the shell were given, the best type of insulation for the floors, walls, and ceiling were given and finally a discussion of the different types of doors available and the ones that give the most satisfactory service.

A bound book containing mimeographed copies of the original papers reproduced in these abstracts may be obtained by sending a check, money order, or draft for $1.50 to Dr. Carl W. Hall, Dept. of Agricultural Engineering, Michigan State College, East Lansing, Michigan.

MARKET MILK CONFERENCE
PURDUE UNIVERSITY

Lafayette, Ind., April 13. About 95 percent of all fluid milk sold in Indiana today is Grade A pasteurized milk, John Taylor, dairy division director of the Indiana State Board of Health, said Tuesday at Purdue University.

He told more than 85 dairy plant operators and dairy products manufacturers at a Market Milk Conference that this top quality milk is being inspected and supervised by cities operating under Grade A milk ordinances.

Taylor went on to say that current proposals in Indiana call for dairy farm and dairy plant sanitarians to be licensed so they can offer relief to dairies outside the jurisdiction of cities having Grade A milk ordinances. They would help dairies to qualify their supplies and label their products Grade A. He also thought the time was drawing near when other products such as ice cream may be made from inspected products and qualified for labeling as Grade A.

G. P. Gundlach, president of G. P. Gundlach and Company, Cincinnati, Ohio, said that dairy products offer one of the greatest food bargains today for the 41 million housewives who are trying to buy food for their families at the lowest possible price.

Speaking on the preparation of cultured buttermilk, Dr. C. E. Parmeele, of Purdue’s dairy department, told dairy plant operators that the incubation temperature for this product should be maintained at 70 to 72 degrees F. to keep the culture organisms in balance and to produce a fine flavor.

Other speakers on the Tuesday program were Dewey Shaw, of Kraft Foods Company, Chicago; C. E. French, Purdue agricultural economist; and members of the Purdue dairy department staff.

The milk conference was held in cooperation with the Indiana Dairy Products Association.