A COMMENTARY ON THE EFFICIENCY OF MACHINE DISHWASHING

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The presence of microorganisms on eating utensils are determined readily by swab tests which reveal the effectiveness of the cleansing given the equipment. Studies of temperatures and water treatment show that the only reliable indication of satisfactory dishwashing effectiveness is a performance test.

Perhaps a discussion on dishwashing, whether it be by hand or mechanical means, should be prefaced by the objectives of good procedure. These are, principally, the elimination of the public health hazard and the attainment of a dish clean as measured by sight and touch. Although the two objectives are distinct by definition, yet the two are complementary. The attainment of a dish clean to sight and touch, generally means a dish free from health hazards, though there are many exceptions; conversely, the attainment of a dish free of health hazard does not necessarily mean a clean dish.

What constitutes a health hazard on eating utensils? Such a condition may be defined as that which exists when dishes actually have microorganisms (including viruses) on their surfaces that are capable of causing disease in an individual when introduced into the mouth along with food or drink contained in such dishes.

Use of Swab Cultures

Inasmuch as there is no means of routinely determining the presence of pathogenic microorganisms on dishes it is necessary to resort to the quantitative determination of other microorganisms which either accompany disease-producing bacteria or simply represent contamination bacteria. Unfortunately there are usually no organisms on improperly washed and sanitized dishes that are even suggestive of the presence of harmful organisms.

When water is suspected of carrying disease organisms, an examination is made for coliform organisms that originate in the intestinal tract. If coliform organisms are present in water in significant numbers, they are direct indicators of sewage contamination. If sewage is present, then it is likely that pathogenic bacteria such as Salmonella typhosa and Shigella dysenteriae may be present.

The bacteria from foods, soil, and hand contamination are used in measuring the sanitary value of food utensils. In 1935, Mallmann and Devereux\(^2\) reported on a sanitary survey of beverage places and proposed a sanitary standard of convenience. This suggested standard of a maximum of 100 bacteria on 4 square inches of surface was based on the fact that it was easy to hold bacterial populations to less than 100 bacteria when dishes were washed and sanitized in clean water containing a good detergent and rinsed in clean water containing 200 ppm available chlorine. This standard has been generally accepted by public health authorities as a measurement of sanitary quality.

The organisms that originate in the mouth are highly susceptible to adverse conditions such as those which exist in dishwater. France et al.\(^3\), in attempting to evaluate the swab technique for checking drinking glasses, had students mouth clean drinking glasses. These glasses were swabbed and the swab samples were held in physiological salt solution for varying periods of time to determine how long the samples could be stored before plating for bacterial count. He found that most of the bacteria had died after 24 hours. He recommended that swabs must not be held more than 2 hours if the swab was to be representative of the bacterial population of the swabbed glass.

The senior writer found that swabs could be stored, at least, 24 hours at refrigeration temperature without any material diminution of numbers. The observations of the writers and France would appear to be diametrically opposed. Such is not the case, because the organisms actually cultured from the glasses were not the mouth-borne bacteria but the bacteria introduced from the wash water, the hands,

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the food, and other sources of contamination.

The value of the standard for swab tests of eating utensils lies not in the fact that the organisms present are, in any sense, representative of pathogenic bacteria and viruses, but their destruction by heat or chemical agents down to a population of 100 or less indicates that if pathogens were present they would have been destroyed. The standard is one of convenience and is not a direct measurement of public health hazard.

HEAT TREATMENT

In mechanical dishwashing procedures, hot water is used both for washing and sanitizing; hence, the following discussion on sanitization will be limited to the effectiveness of hot water as a means of rendering utensils free of health hazard.

In 1896, George Sternberg reported in his book on bacteriology, a method of measuring the minimum temperature for killing bacteria by heat. The minimum temperature is called the thermal death point. This is the minimum temperature necessary to kill bacteria in 10 minutes under a standard set of conditions. Sternberg demonstrated that all common pathogens were killed at temperatures of 60°C (140°F) for 30 minutes, and irrespective of the number of tubercle bacilli that might be present, no health hazard will exist in the milk at the completion of the pasteurization period.

Milk is also pasteurized at 161°F for 15 seconds. This method is equally as effective as the long-time pasteurization. Dahlberg demonstrated that the tubercle bacilli are destroyed at 160°F in 5 seconds.

These data are presented to show that the bacteriologist has known for the past five decades that the non-spore-forming pathogens that might occur on eating utensils are readily destroyed at a temperature of 160°F for 7-15 seconds.

In spite of the fact that these temperatures and time have been accepted for pasteurization, public health officials have worried about the effectiveness of heat in sanitizing dishes and silverware notably because of the difference in the means of application. As you all know, the requirement of immersion for 2 minutes in 170°F water is still commonly in force.

Through a grant from the National Sanitation Foundation, a study was made to determine if bacteria die on dishes at the same temperatures that have been established for destroying bacteria in milk and water. The results of these studies by Mallmann and associates are published.

Without entering into the minutia of these studies, suffice it to state that a temperature of 170°F was recommended for a minimum period of 10 seconds and with a flow of water of 0.375 gallon per 100 square inches of tray area (1.5 gallons per 20-inches tray) for sanitizing dishes in a dishwashing machine. These figures represent a safety factor of 10°F because actually 160°F would accomplish the results if the dishes were unsoiled.

The tests were made with test organisms embedded in a soil film so that the results at 170°F really represent not a properly washed dish but a soiled dish.

It will be remembered that the temperature is recorded at the dish surface. Because a marked fall in temperature results when water is sprayed into the air, the line temperature should be 180°F.

The time of 10 seconds is the minimum time because it takes at least 7 seconds for the heat to be transferred from the water to the bacteria and dish or silverware. Actual tests for shorter periods, even at temperatures above 170°F, were unsatisfactory as far as kill of test organisms was concerned.

SANITIZING PROCEDURES

The amount of water used is as important as the time and temperature. Enough water must be passed over the surface of the dish to yield sufficient heat to the organism and the dish to attain kill. A dosage of 0.375 gallon per 100 square inches of tray area is minimum.

If a dishwashing machine is to effect proper sanitization of dishes irrespective of the cleanliness of the dishes, it is necessary that the water be at the proper temperature, be applied for the proper time, and that it be spread evenly over the dishes in the tray. If this is accomplished, there is no public health hazard on finished dishes irrespective of their appearance, such as, the amount of stain from coffee and tea or even minute food particles or waterstone.

Do the present dishwashers accomplish sanitization of the dishes? The answer depends entirely upon the type of machine under discussion. The single-tank, door-type machine can effect proper sanitization if personnel is trained to maintain the rinse for 10 seconds and the machine is supplied with the proper amount of hot water. In our initial survey of these machines we found that it was necessary to maintain a flow pressure of 30 pounds in order to supply 9 gallons of water per minute with some machines. Two machines gave excessive flows at 30 pounds pressure. We understand that most of these manufacturers have redesigned their machines so that a flow of 9 gallons can be attained at 20 pounds pressure.

The main consideration, however, is that all these single-tank, door-type machines can do a satisfactory job in sanitization if they are properly operated.

The single-tank, push-through machines never were satisfactory because it was practically impossible to operate them in a manner wherein sanitization could be effected. The manufacturers have discontinued this type of machine.

The single-tank, conveyor-type machine with a curtain rinse is physically incapable of attaining sanitization because the interval of contact in the curtain rinse is too short. If the wash operation is done at a minimum temperature of 160°F, which is lethal in the presence of the proper amount of detergent,
dishes are properly sanitized irrespective of the temperature of the curtain rinse. Under this type of operation, the curtain rinse functions primarily as a flush for removing the wash water and detergent. As measured by public health hazard, these machines do a satisfactory job under the stipulated operation. Unfortunately, few of them are operated at a temperature of 180°F in the wash water.

The double-tank machines that have been checked do a satisfactory job of sanitization provided the power rinse and the final curtain rinse are operated at temperatures of 170°F at the dish surface. These machines, as presently designed, offer no health hazard as far as the final treatment of the dish is concerned.

The basket-type and conveyor-belt-type machines are both satisfactory just as long as 180°F water is supplied in the power and curtain rinses and a temperature of 170°F is attained at the dish surface.

In concluding the comments on the sanitizing action of dishwashing machines, it can be stated that there is no danger of turning out dishes carrying disease-producing bacteria or viruses in present-day dishwashing machines provided they are properly operated.

So much for the public hazards of machine-washed dishes; the second phase of this discussion has to do with the washing of dishes so that a dish is made clean as measured by sight and touch. A report on this phase of our studies appeared in both National Research Bull. Nos. 1* and 2*.

**Measurement of Washing Efficiency**

To clarify our discussion, it will be well to present our methods of measuring washing efficiency very briefly.

There are two ways of measuring washing efficiency, namely, field testing by actually washing dishes and observing the degree of cleanliness attained and testing with a standard soil either under laboratory or field conditions.

The first method of testing, that of field testing, is highly unreliable because there is little, if any, chance to control the variables of flow, temperature, detergent concentration, type of water and degree and kind of soil on the dishes. This method has been the one used by manufacturers for many years—a trial and error procedure, that has actually slowed improvements in design because the so-called acceptable results frequently, in fact, generally, obtained were very misleading and erroneous.

The second method, by laboratory testing, was one chosen by us for checking the action of the various machines.

In order to measure soil removal, a soil was prepared that was made up of various food products which included proteins, carbohydrates, and fats. Included was an indicator, India ink, to make possible the recording of the soil by photography and light meters. The soil was made of food ingredients, supposedly, to simulate foods found on dishes. The principal point, however, was that a standard soil, a reproducible soil, was difficult to remove. The soil was designed so it would not be removed entirely and the amounts removed could be measured easily. Irrespective of the type of soil or the amount removed, the soil would serve as a means of measuring the comparative efficiencies of various machines and to make possible a study of the various variables that enter into the design and operation of a dishwashing machine.

### Table 1. Effect of Wash Temperatures on Soil Removal

<table>
<thead>
<tr>
<th>Type of Soil</th>
<th>140° F</th>
<th>155° F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent Clean Dishes</td>
<td>Percent Clean Dishes</td>
</tr>
<tr>
<td>Deter. Conc.</td>
<td>No. of Dishes</td>
<td>140° F</td>
</tr>
<tr>
<td>Chili</td>
<td>0.28</td>
<td>260</td>
</tr>
<tr>
<td>Meat Pie</td>
<td>0.24</td>
<td>263</td>
</tr>
<tr>
<td>Chop Suey</td>
<td>0.24</td>
<td>250</td>
</tr>
<tr>
<td>Spaghetti</td>
<td>0.26</td>
<td>277</td>
</tr>
</tbody>
</table>

In the work reported, interest was not in the comparative efficiencies of the various machines tested because we were interested in learning the basic principles of design and operation. However, in obtaining this information, data on comparative efficiencies of the machines were obtained. These data will be discussed later. First we were interested in data on the factors responsible for proper cleaning action.

The factors concerned in soil removal in present spray-type machines are:

1. Amount of water
2. Time of contact
3. Force of application of water
4. Wetting of the soil
5. Presence of detergents to speed wetting of soil, to aid in removal and suspending the soil in the wash water
6. Temperature of the wash water

In the early phases of our studies we were particularly interested in the first three factors: (1) amount of water, (2) time of exposure, and (3) velocity of water. If water is moved over a surface for an extended period of time, eventually the most stubborn soil can be removed so that time and volume of water enter into varying relationship. These two factors alone could account for cleaning, but the time of exposure of contact and the volume of water would be excessive. If the water can be impinged against the soil, then a
cutting action would occur that would speed the action. In the spray-type machine all three factors, time, volume and velocity are involved.

Theoretically, if the water can strike all surfaces of dishware with the same velocity and the velocity is set at the maximum allowable, then all three factors would be constant or if one factor were either increased or decreased, then if the other two factors were adjusted accordingly the end-result would always be the same.

In the studies made on commercial machines, however, the design was different so that numerous variables were encountered, and it was impossible to evaluate any of three factors without experiencing interference for the other variables.

For example, the shape, placement, number and the orifice size of the jets varied from machine to machine.

The higher the velocity of the stream of water the more rapid the soil removal. In dishwashing operation the velocity must not be such that dishes are tossed about in the machine. A small stream of water can carry a greater velocity than a large stream. For example, the lower arm of a Hobart single-tank, door-type machine carries a velocity of 3 feet but the slot is large. If a pressure of 3 pounds were maintained at the slot opening, the dishes would be pushed from the trays. On the other hand, in machines with narrow slots, a pressure of 3 pounds at the slot opening and a velocity of 7 feet is permissible because of the smaller streams of water. Theoretically both types of machine could do an acceptable job of washing as far as these two factors are concerned.

In a recent publication, we have been using pressures of 100 pounds at the jet orifice. The most stubborn soils are removed nearly instantly, irrespective of whether they have been moistened previously. Such pressures could not be used in dishwashing practice, however, one of the greatest limitations to present machines is the fact that they are designed so that effective velocities cannot be used.

If the machines were redesigned so that high-velocity jets could be used, the washing operation time could be reduced and more effective washing could be done.

The amount of water used in washing is dependent upon the placement of the water on the dish surface and the velocity at which it is applied. The mere throwing of large volumes of water over dishes by cascading or showering is of little value as far as actual cleaning is concerned.

Recently a new machine has been brought to our attention that uses approximately a flow of 50 gallons per minute, but has a high velocity — 14 feet. Reports indicate good cleaning. We have not tested the machine but if the placement of water is properly done, we can see no reason why it should not do a job equal to much higher flow machines now on the market.

OTHER FACTORS

The other factors involved in the cleaning process, wetting action, temperature and presence of detergents, all play a part but are not particularly involved as far as machine design is concerned. They are essential factors in any cleaning process and without them currently designed machines do not operate very successfully.

The need of a wet soil on dishes prior to washing is a very valid criticism of the current dishwashing machines. In one of our studies, egg dishes were washed in a two-tank machine without previous soaking of the dishes prior to washing. Only 44 percent came through free of soil. When macaroni and cheese were served, only 65 percent were free of soil. This lack of capacity to clean forces operators to have soaking tanks or pre-washers in order to wet the soil sufficiently for quick removal in the machine.

Tea and coffee staining in cups perhaps can be charged in part, at least, to insufficient jet velocity properly placed. The amount of water used is definitely not involved.

The improvement in washing efficiency is demonstrated in table 1. In this case the dishes passed through a Salvaraj rinse and then through a power pre-wash and finally through the wash-and-rinse system of the machine. The machine was exactly the same as the one previously discussed but had the additional pre-wash tank. It is interesting to note that the percentage of clean dishes approached 100, but rejects were still obtained. Incidentally, coffee and tea stains still occurred, forcing a hand-washing operation for the rejected dishes.

Recently in a visit to a large college cafeteria the senior author was impressed by the fact that a large tank supplied with detergent was located ahead of a two-tank dishwashing machine. Each dish was hand scraped and then washed by brushing in this tank. The cleaned dishes were then racked and put through the machine. Although the wash tank contained detergent the machine was really operating as a sanitizing bath.

<table>
<thead>
<tr>
<th>Machine</th>
<th>Percent Soil Removal</th>
<th>Jet Pressure (Feet of Water)</th>
<th>Flow G.P.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>95.1</td>
<td>4.0</td>
<td>100.0</td>
</tr>
<tr>
<td>B</td>
<td>98.3</td>
<td>3.7</td>
<td>100.0</td>
</tr>
<tr>
<td>C</td>
<td>96.3</td>
<td>1.9</td>
<td>132.6</td>
</tr>
<tr>
<td>D</td>
<td>96.6</td>
<td>4.5</td>
<td>129.0</td>
</tr>
<tr>
<td>E</td>
<td>85.5</td>
<td>5.1</td>
<td>99.0</td>
</tr>
</tbody>
</table>
Efficiency of Machine Dishwashing

Why did they have a wash tank and hand washing ahead of the dishwashing machine? The answer is simple. The machine was not designed to wash dishes and silverware adequately, so hand washing was resorted to in order that clean dishes could be obtained at the end of the sanitizing procedure.

Machine Design

In our two publications on mechanical dishwashing, no mention was made of the comparative value of the machines in effecting good washing. This was intentional even though the data presented showed some comparative values. As previously stated, we were interested in obtaining data on the basic principles involved in the cleaning and sanitizing action.

At this time when we are seriously attempting an evaluation of dishwashing design and operation we should very carefully evaluate machines. We have no desire at this time to divulge names of machines because we do not want to go on record as approving any particular machine or design of machine nor do we desire to issue any statements that would hurt any manufacturer.

We are not interested in the construction of the machine itself, the types of motors, the ease of cleaning, and the cost. We are interested primarily in the end result, namely, the value of the machine when properly operated to remove soil from dishes. We shall go one step further in that we shall limit the cleaning action to one type of utensil, the plate. In these discussions we shall also eliminate all variables as much as possible. For example, we shall use a constant temperature, a dry soil, and no detergent. The only detergency possible is that of the water. In each instance, clean water will be used so that soil build-up in the wash water will not be involved. Other than design factors, the three factors involved are: (1) volume of water, (2) velocity of water, and (3) time. In most cases time was constant, so only two factors were sometimes involved — volume and velocity.

First, the single-tank door-type machine will be considered. The results of comparative tests are presented in Table 2. The machines were supplied on loan by the five leading manufacturers for test purposes.

You will note that the soil removal varied from 98.3 to 85.5 percent. Please remember in examining these data that the soil was designed so that it would not be removed in its entirety in a 30-second wash in the most efficient machine under test; however, this soil is more easily removed than is dried egg or cereal soil. Incidentally, the soil used in our studies was standardized with these machines. Our data show a variation of 12.5 percent, which is significant.

Why did these machines vary? Was it due to low jet velocities, too little water, design of the jets or the placement of the wash water?

Machine B did not have a high jet velocity nor a high-water volume, still it effected the best soil removal. Machine E, with a jet velocity of 5.1 feet gave the poorest results, although the water flow was equal to that of machine B that had the best soil removal. Machine A, with a water flow of 182 and a jet velocity of 4 feet, was less efficient than machine B with a flow of 100 gallons and a jet velocity of 3.7.

The variations in washing action are due to design. These data show that no specifications as to jet velocities and minimum flow rates are in any sense a measurement of dishwashing efficiency.

Incidentally, because these machines are manually operated, it is possible to obtain good results with all of them by washing for longer periods of time. In home dishwashing machines, where splash washing is involved, good results are always obtained provided the dishes are properly spaced and located because the wash period is, at least, 5 minutes or more in duration.

The results on the single-tank, conveyor-type, curtain rinse machines are presented in Table 3. Here the variation in washing efficiency is from 0 to 91.2 percent. It will be noted that the wash period now is only 12 seconds as contrasted to 30 seconds in the previously discussed machines. In the time interval involved most of the period is taken in wetting the soil so even though a large volume of water passes over the dishes and a moving target is presented little soil removal results. It is apparent that machine E with low flow and jet velocity cannot wash properly. Suppose the jets were redesigned without increasing the flow rate, could this machine wash equally as well as the competitive models?

In examining these data you may wonder how this machine can compete with Machine A when the price differential isn’t very great. These machines are in current use, and not too much criticism results from the users because, first, most restaurant dishes carry very little soil and most of it is easily removed and, second, the operator soon

<table>
<thead>
<tr>
<th>Machine</th>
<th>Percent Soil Removal</th>
<th>Jet Pressures (Feet of Water)</th>
<th>Flow G.P.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>91.2</td>
<td>7.1</td>
<td>216.0</td>
</tr>
<tr>
<td>B</td>
<td>55.6</td>
<td>4.1</td>
<td>178.5</td>
</tr>
<tr>
<td>C</td>
<td>42.0</td>
<td>7.3</td>
<td>137.9</td>
</tr>
<tr>
<td>D</td>
<td>62.0</td>
<td>2.5</td>
<td>218.4</td>
</tr>
<tr>
<td>E</td>
<td>0</td>
<td>3.2</td>
<td>62.3</td>
</tr>
</tbody>
</table>
learns that he must pre-soak or brush heavily soiled dishes before washing in the machine. Under these conditions the machines pass, but the cost of operation is high because of the amount of labor involved in the operation.

In table 4 are presented the data for two tank machines. These are unpublished data. Both the percentage of soil removal for the wash and the wash-rinse period are presented because in this type of machine the wash cycle is generally of 8 seconds duration so the test soil is hardly wetted and little is removed. Most of the test soil is removed in the rinse tank. Actually in two-tank machines both the wash and rinse tanks serve as wash compartments because with present jet velocities and flow rates the 8-second interval is too short for good wash action. These data, like those previously presented, show that the jet velocities and the flow rates are not, either separately or collectively, measurements of washing efficiency.

These data (tables 2, 3, and 4) show that the current dishwashing machines can be improved to a considerable extent in wash efficiency. Without the aid of prewashers and soakers coupled with a large amount of labor, the end result would be unsatisfactory.

SUMMARY

These studies have demonstrated both the good and bad features of dishwashing machine design and their relationship to efficiency of operation. Our observations and research data have proved that a specification of design as it pertains to rates of water flow and time of exposure is in no sense a measurement of efficiency in removing soil from dishes and silverware. The efficiency of a machine in soil removal and sanitizing action can only be measured by performance. If a machine washes and sanitizes dishes and silverware so that the utensils are clean to sight and touch and free of health hazard, the end result has been attained.

Performance can, of course, be measured roughly by actual operation. If a machine can deliver clean sanitized dishes routinely, the machine certainly is doing an acceptable job. This method is, of course, time consuming and unreliable because the soil is highly inconstant in restaurant operation.

For laboratory testing and field testing where a laboratory can prepare test plates, the standard soil used in our studies does a very satisfactory job. The accuracy of the test is well within the range of practical use. Our soil preparation and the method of preparing test plates are not difficult but do not fit into the routine program of an environmental health group.

We seriously question the need of such tests by the local sanitarian. An inspection of the dishes, a check of hot water supply, temperature of rinse and a mechanical examination of the machine probably is ample. There are so many other jobs, in producing safe food, that need inspection it seems that an attempt on the part of the local sanitarian to evaluate machine design is perhaps unwarranted knowing that if the dishes are properly sanitized there is no health problem involved.

The machine design checking must be done in the laboratory, and preferably in the experimental laboratory of the manufacturer aided by information from research laboratories. A performance test such as that presented by us in National Sanitation Foundation Bull. No. 1 can be used successfully by the manufacturer and the research or testing laboratory. We have new soils that are easier to prepare. We are engaged in research to design a very simple test soil that could be applied by the fieldman for checking machine maintenance in operation. This soil will be supplied in either stick form or in a paste pot with brush.

CONCLUSION

Present dishwashing machines are so designed that when properly operated, all utensils passing through the machine are sanitized.

A very marked variation in washing efficiency of present dishwashing machines exists. These variations are due to design.

Flow rates of water jet velocities and time of exposure are not measurements of efficiency per se but are responsible for washing efficiency when machines are properly designed.

The only reliable measurement of dishwashing efficiency is a performance test.

A reliable performance test suitable for laboratory use, or field use where properly equipped laboratories are available, exists. This test has made possible the studies reported in this work.

A quick field test for checking proper maintenance in the field is needed.

LITERATURE CITED


(continued on page 161)

<p>| TABLE 4. SOIL REMOVAL, JET PRESSURES AND FLOWS OF TWO TANK CONVEYOR TYPE MACHINES |
|-----------------------------------------------|-----------------------------------------------|-------------|-------------|</p>
<table>
<thead>
<tr>
<th>Machine</th>
<th>Percent Soil Removal</th>
<th>Jet Press (P. of Water)</th>
<th>Flow G. P. M.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wash</td>
<td>Wash-Rinse</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>18.4</td>
<td>43.9</td>
<td>2.2</td>
</tr>
<tr>
<td>B</td>
<td>9.4</td>
<td>36.0</td>
<td>6.6</td>
</tr>
<tr>
<td>C</td>
<td>9.4</td>
<td>36.0</td>
<td>5.1</td>
</tr>
<tr>
<td>D</td>
<td>75.4</td>
<td>—</td>
<td>3.5</td>
</tr>
<tr>
<td>E</td>
<td>61.8</td>
<td>97.5</td>
<td>6.7</td>
</tr>
</tbody>
</table>
than the plant production record or profit for the year.

In some plants, housing is provided for employees, and more and more plants are providing cafeterias where the employees can obtain nutritious, wholesome meals at reasonable cost. Most plants believe this is a valuable service to the workers and results in greater efficiency. However, group feeding brings the danger of transmission of communicable diseases if not operated in a sanitary manner. A poorly operated, insanitary cafeteria can result in many workers being incapacitated in a matter of hours due to food poisoning and food infections from improperly prepared or stored foods. This could be disastrous when tons of perishable raw products are waiting for processing.

Various laws and regulations apply to food industry sanitation, but laws and regulations, by their very nature, can establish only minimum requirements. While some of these requirements may be difficult to attain, most progressive industrialist desire to conform to the greatest possible extent, and in many ways go far beyond the minimum required. Frequent inspection by government agents and enforcement of regulations alone merely serve to maintain minimum standards. However, such inspection is necessary and of value in disclosing conditions that have been overlooked, and in keeping the recalcitrant individual, who refuses to recognize his responsibilities, from threatening the reputation of the rest of the industry. It is far better that plant managers recognize sanitation in its true relationship to their entire operations. Self inspection to find and correct insanitary conditions leading to possible trouble before it occurs is a sensible approach.

So, in practice there is an important place for the sanitarian both in private industry and in government enforcement. Fundamentally, the work is similar, but in practical application it may be quite different. Nevertheless, it is a professional obligation to standardize our thinking, concepts, interpretations and application of the sanitary sciences to as great a degree as possible. Men entering this and related fields from public health and food technology departments of our colleges and universities should have uniform training in food industry sanitation so their concepts will not vary greatly in different sections of the country. Reference books, such as the one I have mentioned, and the various published papers will all help us to progress together. And most important of all, meetings such as this, where private industry and government representatives can become acquainted and exchange views, will aid us in our mutual responsibility of assuring the public of the availability of good quality, nutritious foods.


(continued from page 154)

EFFICIENCY OF MACHINE DISHWASHING


THIRD NATIONAL CONFERENCE ON INTERSTATE MILK SHIPMENT

The Third National Conference on Interstate Milk Shipment was held at the Hotel Statler, St. Louis, Missouri, June 10-12th. Representatives of various milk control authorities and industry from twenty-seven states participated in the Conference.

General agreement was reached on a number of problems and several were assigned for further study.

Maintenance of an informal type of organization was decided upon by the general assembly. An executive committee was elected which in turn chose their chairman for 1953. J. L. Rowland, of Missouri was re-elected by the committee to serve as Chairman of the Executive committee.

Remarkable progress has been made through the three conferences toward solving the many problems connected with the interstate shipment of milk. The need for better education and participation of local control authorities with regard to the interstate program is becoming more apparent. The various states were urged to expend much greater efforts toward dissemination of information. The complete report of the conference will be published in this Journal in the near future.