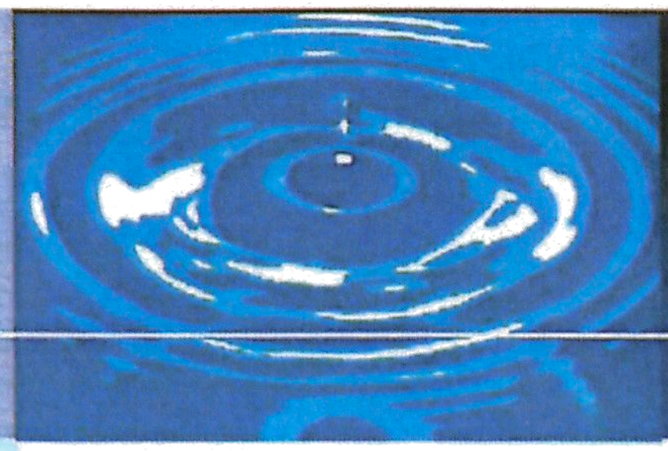


SECTION 2

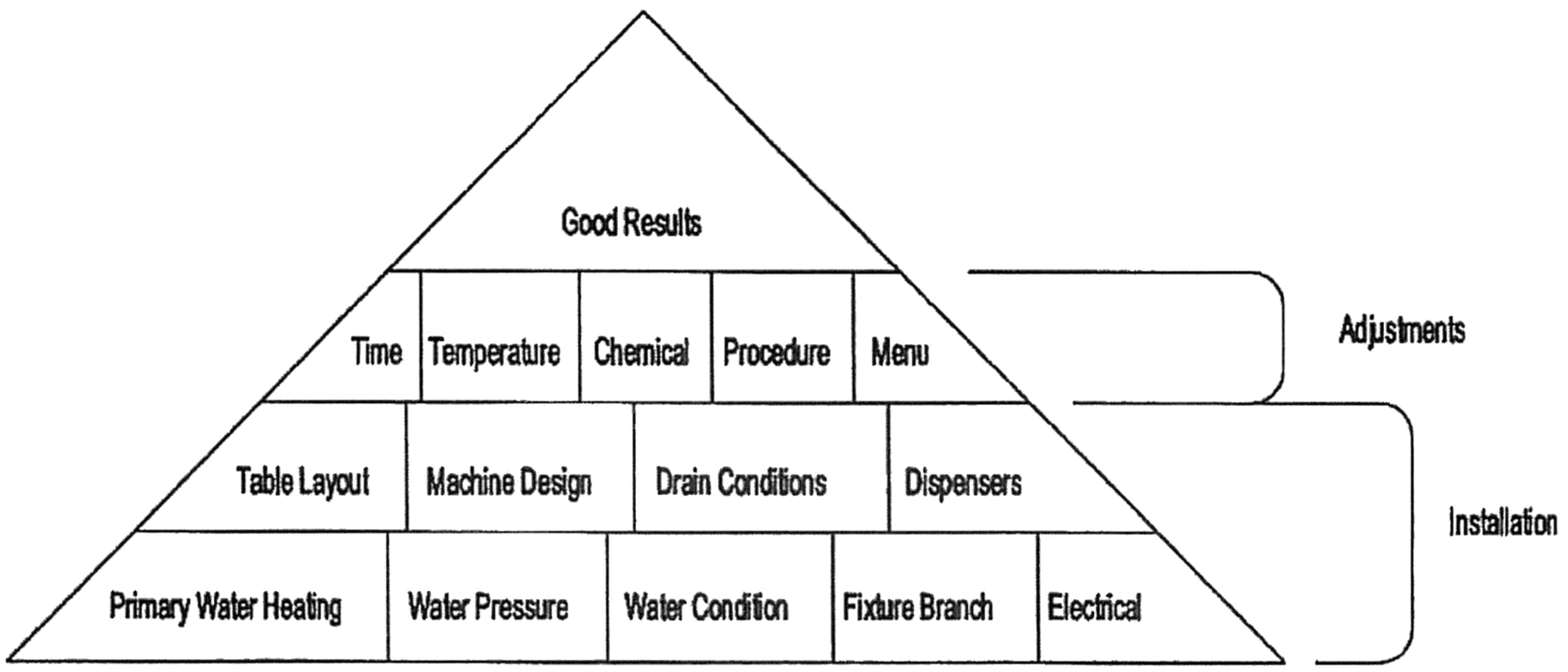
Principles of Cleaning

This Section Contains:

- Principles of Cleaning
- Mechanical Ware washing
- Ware Washing Procedures
- Dispensing Systems
- Solving Problems
- The Service Routine
- Dish Room Flow
- Procedures in Ware Washing

Section 2: Principles of Cleaning

Elements in Cleaning Process



NOTE: Adjustments can not correct Installation Errors

The Chemical Question

Chemicals used in commercial dishmachines
Detergents: Sodium Hydroxide or Potassium Hydroxide 1500 to 2000 PPM
Sanitizers: Sodium Hypochlorite 50-200 PPM
Rinse Agents: Assorted surfactants
Hard water deposit remover: Phosphoric Acid

Basic Questions:

1. Is there an appropriate volume (PPM) of detergent in the wash solution?
    a. This PPM level can only be determined by a titration process.
    b. Fixed ccs or milliliters per cycle cannot account for water volume differences.
2. Is there too much detergent in solution; can the rinse water successfully remove the detergent before rinse becomes saturated?
    a. You cannot continue to add detergent solution to a fixed volume of water without reaching an overload condition.
    b. 1900 to 2000 PPMS is usually considered sufficient in the cleaning process. 2500 PPM usually produces carryover.
    c. In the best cases, there is still only a fixed amount of water available for rinsing. After re-circulated rinse water has been saturated with the carry-over detergent, rinsing is no longer effective.
3. Are the solution transfer devices (peristaltic pumps) working effectively?
    a. The "squeeze tube" is a replaceable part that degrades over time.
    b. When the tube is worn or flattened, it will cease to pick up the solution at the "foot" and transfer it along the length of the tube. There are two limitations to the peristaltic pump design: lifting solutions over large distances and pumping against line pressure. Extreme suction or pressure will deform the "squeeze tube" wall; this deformation allows the solution to escape the squeeze or remain in its current position.
4. Is there an appropriate volume (PPM) of sanitizer in the rinse solution?
    a. 50-PPM chlorine is twice the killing strength of pasteurization.
    b. 200 PPM will rapidly degrade the welded seams of the tank and other metal parts.
5. Is the rinse additive creating foam in the solution because of low (120° F) water temperature?
    a. Increase the water temperature, foaming will defeat the rinsing and pump processes.
    b. Retard the entrance of rinse additive until the last seconds of the rinse cycle, it will still achieve sheeting action.

INDUSTRY TRUISMS

1. The hardest task of any dishmachine is in delivering good RINSE results.
2. Phosphate is nature's cleaner; non-phosphate formulas have yet to demonstrate equal strength and economies.

American Dish Service, 1998 Technical Support Material, RLP

CHAPTER ONE

PRINCIPLES OF CLEANING

Whether you are cleaning a floor, a wall, dishes, or anything else, there are four basic principles of cleaning that must be used in conjunction with each other. These four basics are time, temperature, mechanical action and chemical action. These four basics must be carefully balanced in order to accomplish the stated job most efficiently and most economically.

Should any of the four basics be decreased in strength, one of the others will have to be increased in order to accomplish the job. It is our responsibility as a sanitation specialist to maintain the proper balance of the basics for our customers.

TIME — This applies to how long the job is actually performed. Common sense tells you that with all the other things being equal, a floor will be cleaner if you mop it for ten minutes rather than five minutes.

TEMPERATURE — Different jobs require particular temperatures for the required function. For instance, grease is more easily cut with hot water than with cold water. Some other jobs are done better with the higher temperature that creates steam. The correct temperature has to be married to the particular cleaning problem.

MECHANICAL ACTION — Mechanical action is sometimes referred to as either the friction or the force required to do the job. It's the pressure that you exert on the mop while cleaning the floor or how hard you rub your hands together when washing them.

CHEMICAL ACTION — This is the power of the chemicals that are used in the cleaning operation. It is how much and how strong of a detergent you need to use to complete the assigned task.

If you visualize the correct balance of these four basics as a straight line, you can readily see that if any of the value amounts are varied an opposite action will be needed to maintain the proper balance.

We will apply these principles to the various cleaning procedures and operations discussed in this manual. You will find them to be extremely valuable in solving many sanitation problems during your career.

CHAPTER TWO

MECHANICAL WAREWASHING

Due to the high volume of business handled by most modern restaurants, it is necessary to have an efficient and economical way to manage their dishwashing problems. An automated dishmachine can provide an answer to this problem if it is operated and adjusted correctly. It is our responsibility to make sure this is done.

The basic setup of a warewashing operation consists of a dirty dish table (complete with prescrap hose and a disposal or scrap hole), a dishmachine, and a clean dish table. There are many variations of this setup; but, they will all contain these basic elements.

The dishmachine itself will be the center of our attention. These dishmachines are either classified as low temperature or high temperature dishwashers. The basic difference between these two classifications of machines refers to the final rinse water temperature used in each machine. The high temp uses a 180° rinse while the low temp uses a 140° rinse water with a chlorine sanitizer injected to aid in sanitation of the dishes.

The basic principles of cleaning as discussed in Chapter One apply as follows:

TIME	The proper length of the wash and rinse cycles in the dishwashers are necessary to insure clean dishes.
TEMPERATURE	Proper wash and rinse water temperatures are necessary.
MECHANICAL ACTION	The proper force of water needs to be run over the dishes. The pump of the machine determines this.
CHEMICAL ACTION	The correct selection of the detergent is necessary for the soil load and water conditions you are experiencing.

HIGH TEMPERATURE MACHINES

There are four types of high temperature dishmachines. They are as follows:

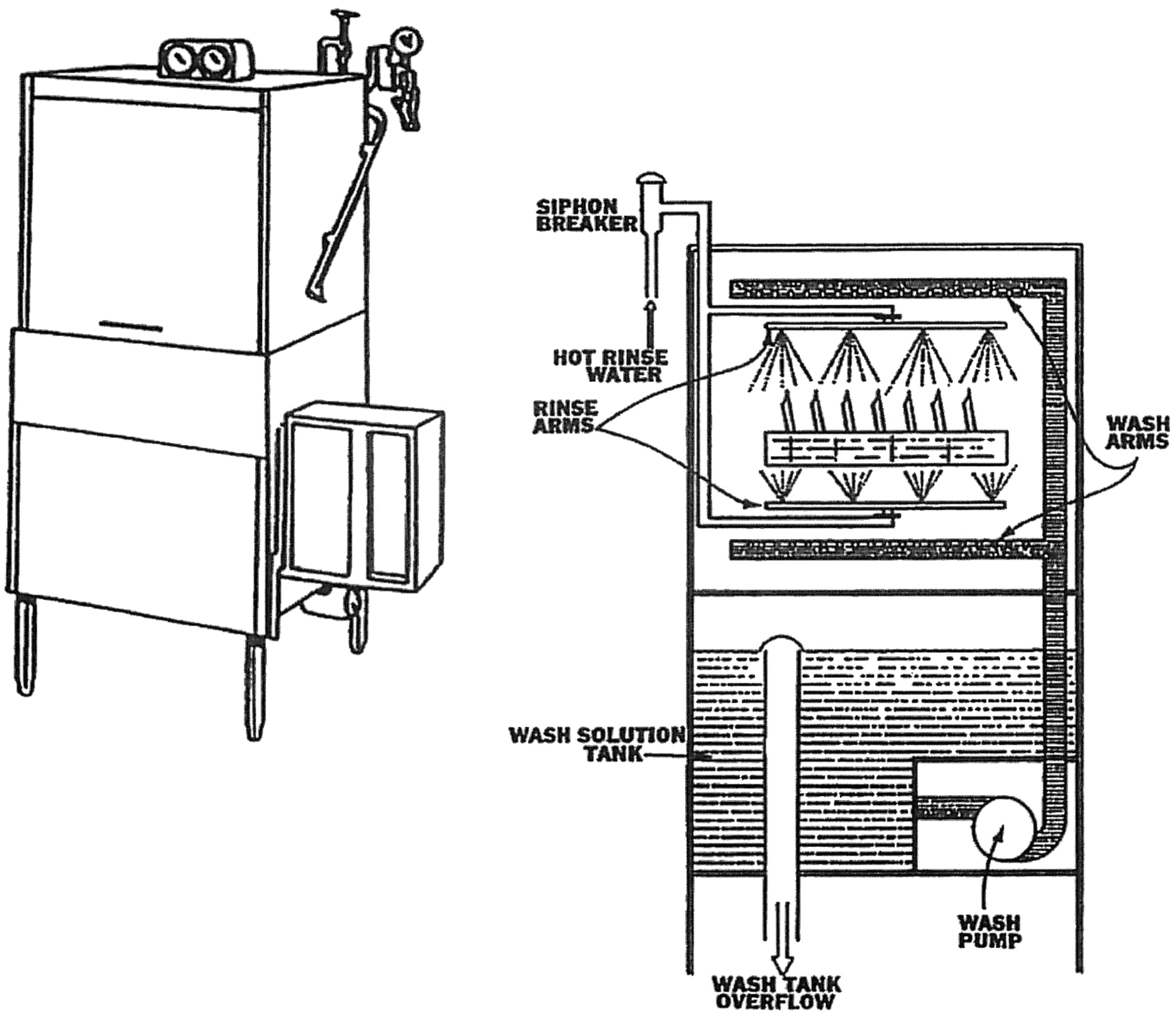
SINGLE TANK RACK MACHINE

This machine is also referred to as a door type machine. It operates with fixed time cycles for both the wash and rinse cycles. The wash runs for 45 seconds and the final rinse for 12-15 seconds. Both the wash and rinse cycles are performed in a single cavity on a stationary rack of dishes. The wash water is recirculted through a pump and is used for many cycles before being changed. The water is pumped from the wash tank through the pump motor and out the wash arms over the dishes. The water then falls back into the wash tank reservoir where it will begin the same trip over again.

The rinse water is brought in through the fresh water supply from a booster heater. It enters the machine through a siphon breaker and flows through the rinse arms and flows over the dishes. This rinses any residual detergent and food soils off of the dishes and leaves you with sparkling clean results. The water then falls into the wash tank and causes the level of the water in the tank to rise. Any food soils floating in the water will then go down the wash tank overflow. This is call “skimming action” and helps to keep the wash tank water clean.

Specifications for the door type machine are as follows:

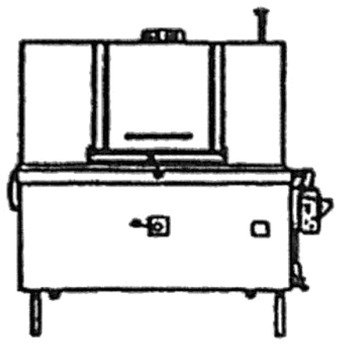
WASH TEMPERATURE:	140 - 160°
FINAL RINSE TEMPERATURE:	180 - 195°
FINAL RINSE PRESSURE:	18 - 22 psi
PREWASH TEMPERATURE:	90 - 120° and is accomplished outside the machine with the prescrap hose.



INSIDE VIEW OF DOOR-TYPE DISHMACHINE

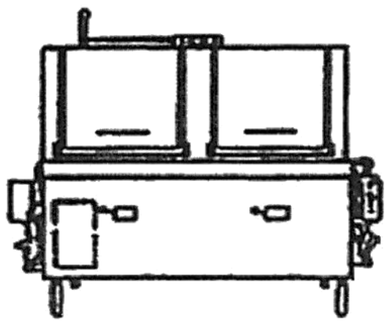
SINGLE TANK RACK CONVEYOR

This machine does not operate with a fixed time cycle. Instead, racks of soiled dishes are passed through the machine with the help of a conveyor. As they pass through the wash section they are cleaned and are sent on to the final rinse section. The racks then exit the other end of the machine. The skimming action is provided by splash over from the rinse section into the wash tank.



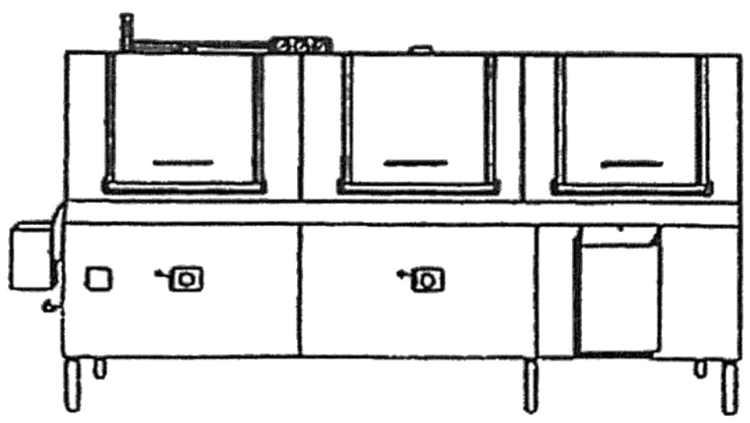
MULTIPLE TANK RACK CONVEYOR

This machine is an expanded version of the single rack conveyor. It will always have a recirculating power rinse cycle and may or may not have a recirculting prewash section. The skimming action is provided by a bypass that should provide 1 -1.5 gallons per minute of fresh water to the wash tank. The power rinse temperature should be 160 - 170°. All other specifications are the same as on the other machines.



MULTIPLE TANK FLIGHT MACHINE

This machine consists of a prewash, wash, power rinse and a final rinse section. Dishes may be placed on the belt individually or in racks. All specifications are the same as the multiple tank rack conveyor. It is used in extremely high volume accounts.



LOW TEMPERATURE MACHINES

There are three basic styles of low temperature dishmachines. They are the single rack, the double rack and the conveyor. There are also a few under the counter machines in the marketplace for either smaller accounts or for bar glass washers.

SINGLE TANK MACHINES

These machines are similar in appearance to the single tank high temperature machine. There are a few manufacturers that manufacture a recirculating wash water machine with a sanitizer injected in the final rinse. The more prevalent type of low temperature single rack machine is the batch type machine. This

Machine usually holds less than two gallons of water. Detergent is added during the wash cycle and the entire wash water is drained at the end of the wash cycle. Fresh water is then added along with the rinse agent and the chlorine sanitizer. After the rinse cycle is run, this becomes the wash water for the next cycle. The advantages of this type of machine are that you are always washing with a higher pressure. The rinse pressure is also always constant since it is a pumped rinse. The detergent pumps are normally built into this type of machine. The specifications for this type of machine are as follows:

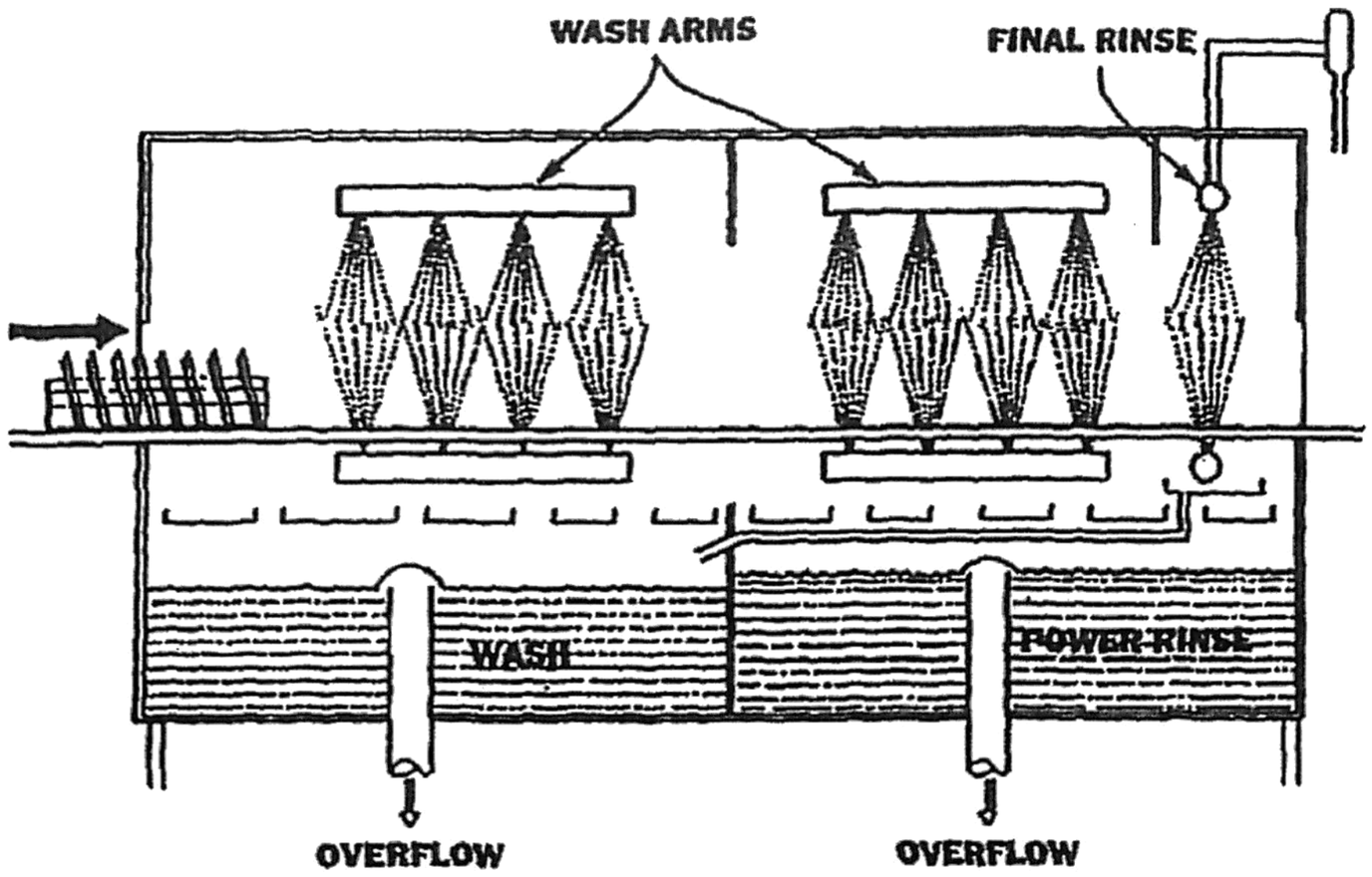
WASH TEMPERATURE	Even though the health departments will accept 120° water, you should always use 140° water to insure proper results.
FINAL RINSE TEMPERATURE	Again, even though the health departments will accept 120° you should use 140° water to get spot free dishes.
WASH PRESSURE	Normally around 17 psi.
RINSE PRESSURE	The same as the wash pressure since it is pumped by the same pump and does not come from the fresh water supply.
CYCLE TIME	Normally 90 seconds, but both 60 and 120 second cycles are available.
SANITIZER SETTING	Normally a chlorine sanitizer is used and is injected at a rate equal to 50 – 200 parts per million.

DOUBLE RACK MACHINES

These machines are basically the same as a single rack batch machine except that they hold two racks of dishes. The amount of water in the wash tank is about twice as much. The specifications are the same.

CONVEYOR MACHINE

This machine resembles the multiple tank rack conveyor in that it has multiple tanks; but, they are much smaller. The final rinse is a fresh water rinse with chlorine injected. The specifications are basically the same as the batch machine.



CONVEYOR DISHMACHINE INSIDE PICTORIAL VIEW

This general information on the different styles of dish machines will provide you with a basic knowledge of what is in the field. Following is an outline of some more of the features of the different machines. These will be important to you when servicing a customer.

FEATURES OF HOT TEMP DOOR TYPE DISHMACHINES:

1. Fixed time cycle
2. Internal wash tank heaters
3. Fresh water final rinse supplied through booster heater
4. Siphon breaker installed in final rinse line to avoid contamination of fresh water
5. Recirculating wash water
6. Separate wash and rinse arms
7. Wash tank overflow for skimming

FEATURES OF HOT TEMP CONVEYOR DISHMACHINES:

1. Dishes move through stages of washing
2. Cycle time is determined by the speed of the conveyor
3. Siphon breaker
4. Stationary wash and rinse arms
5. Separate motors for each stage of washing
6. Fresh water feedback for skimming action
7. Much larger wash tank water capacity

FEATURES OF LOW TEMP BATCH DISHMACHINES:

1. Fresh water each washing cycle
2. Uses chemical sanitizer instead of high temperature in final rinse sanitation
3. Very small wash tank water capacity
4. Pumped final rinse
5. Higher wash pressure with less water volume
6. Dispensers normally built in
7. Uses a single set of arms for wash and rinse
8. Cycle is slightly longer than hot temp machines

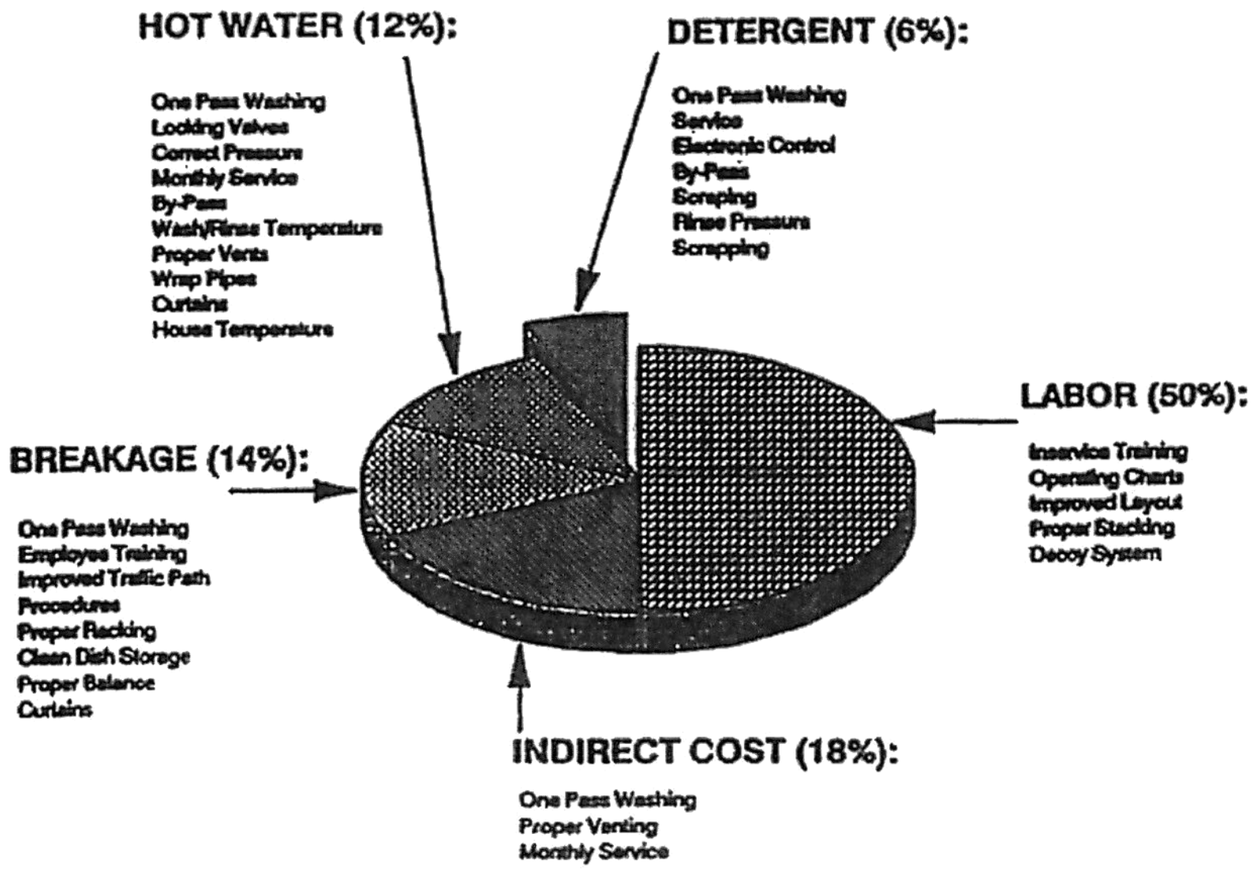
FEATURES OF LOW TEMP CONVEYOR DISHMACHINES:

1. Cycle time depends on speed of conveyor
2. Recirculating wash water
3. Sanitizer used in final rinse
4. Small internal tank heaters
5. Separate motors for separate stages of washing
6. Siphon breaker
7. Normally has internal detergent dispensers

CHAPTER THREE

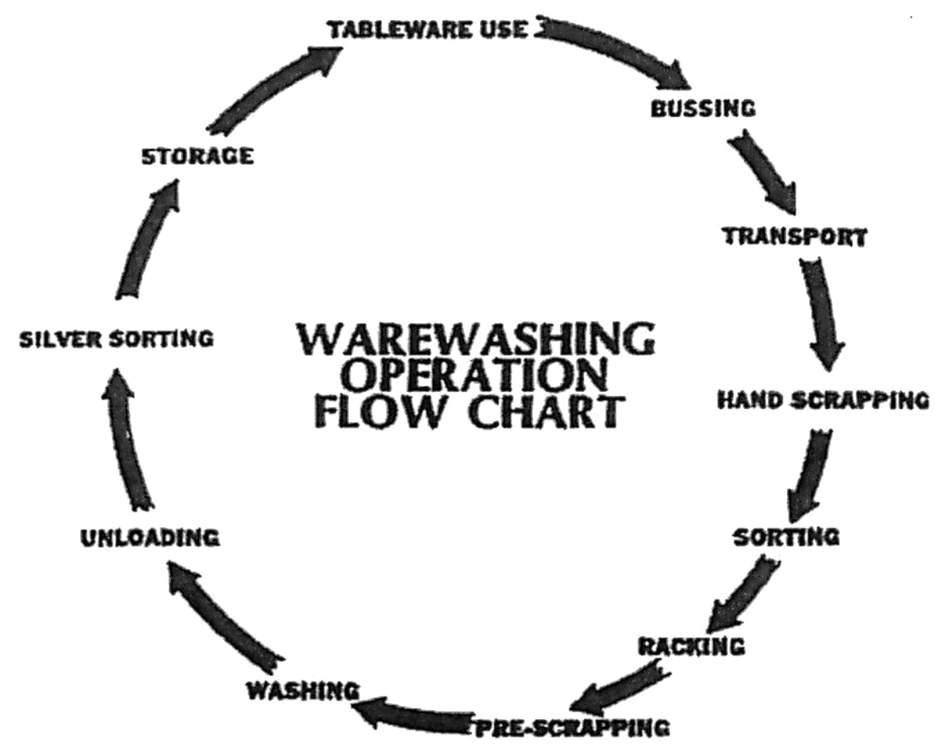
WAREWASHING PROCEDURES

Insuring the proper operation of the dishmachine is only part of our responsibility as a chemical specialist. We must be able to isolate any additional problems that emerge from the warewashing operation. The chart below provides a graphic example of how the dollar is spent in the dishwashing procedure.



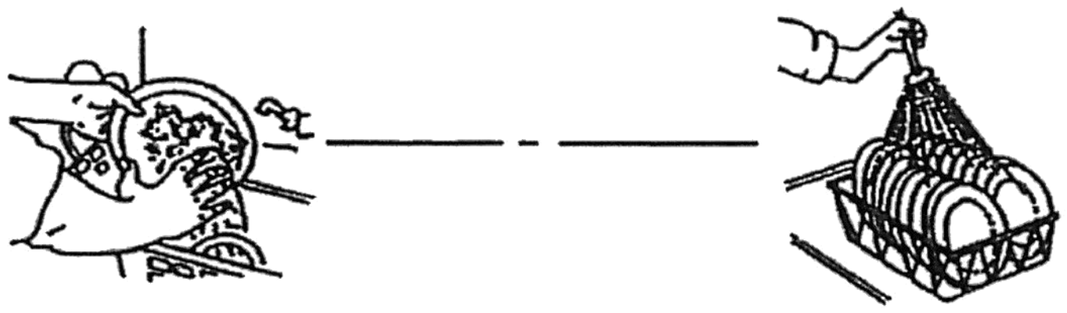
We have also outlined ways to decrease cost in each of the areas of concern. In this chapter we will concentrate on showing how proper procedures can decrease both breakage and labor.

You must have a complete understanding of the warewashing operation flow chart to conduct a complete survey of the dishwashing operation. There are eleven different steps in the handling of dishes. The proper method will maximize customer profits.



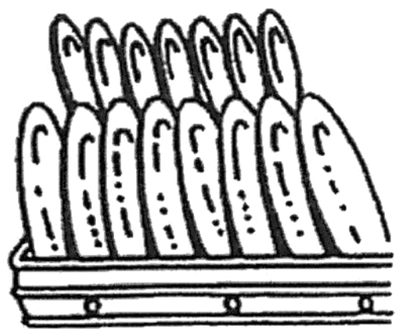
The removal of the dirty dishes from the restaurant table is the first step in the journey back to this same location. The bussing operation should be done in a manner to minimize breakage and to speed along the operation. Normally, a buss tub or cart is used to load the dishes in and to transport them to the dishmachine location. If possible each type of dish should be stacked separately to prevent breakage and as much trash as possible should be removed to eliminate the possibility of silverware being thrown out with it later.

Once the dishes have arrived at the dishmachine, they must be hand scrapped to remove any gross food soils and garbage.



Then the dishes should be sorted using the decoy system. In this system, the dishmachine operator will place one of each style of dish in the proper location. Then as the dishes are bussed in they are stacked with the decoys.

It is at this point that the dishmachine operator takes over. He will rack the dishes in the proper racks using a peg rack for plates and saucers, a cup rack for the cups, and a glass rack for the glasses. By using the compartmentalized racks for cups and glasses he will eliminate the scratching that is caused by the dishes rubbing together. All silverware will be stored in a presoak solution until the operator is ready to run them. Then they are racked in a flat rack and run through the machine. Once they have passed through the machine, they are re-racked in silverware cones with the eating ends up. The utensils should be mixed to prevent nesting and improper washing. Once the silverware has been re-run, it can then be stored in the proper place. When racking plates or saucers the smaller plates should be placed in front of the larger plates. This will prevent shielding of the smaller plates. Once the dishes are washed they are stored in a location that is convenient for the staff to use. Care should be taken to properly stack the dishes in storage to prevent breakage.



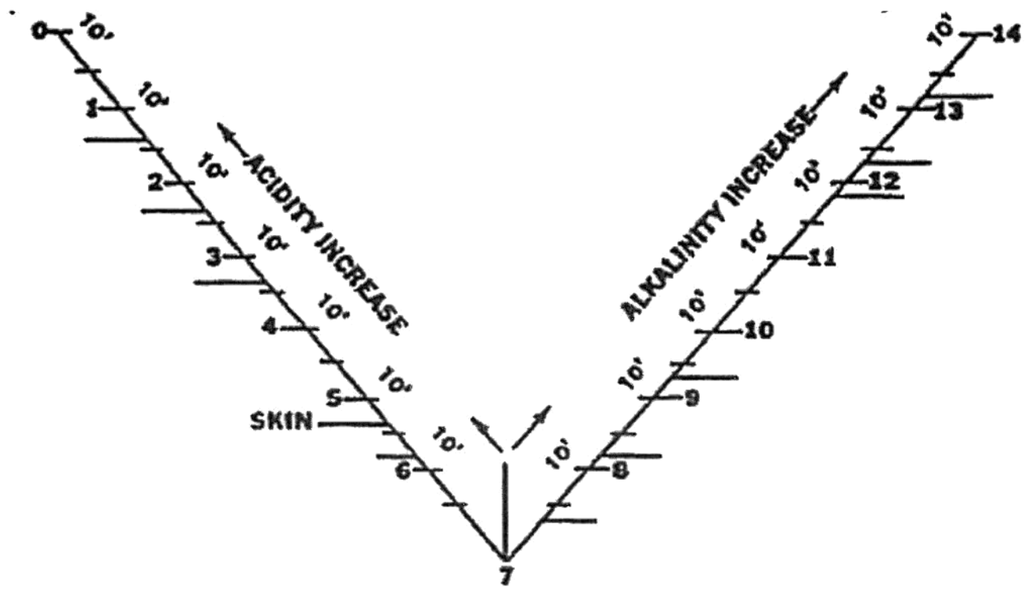
CHAPTER FOUR

WAREWASHING CHEMISTRY

To best understand the chemistry of warewashing, you must first be introduced to the pH scale. The pH scale is an outline of how acidic or how alkaline a particular item is. The scale is rated from 0 -14, with 0 being the highest acidic items and 14 being the most alkaline items. Seven is neutral. This is not a direct relationship reading of the strength of two items as the pH scale is a logarithmic function rather than a linear function. Each number on the scale indicates a tenfold change compared to the previous number. Because of this multiplying effect, the acidity of a product that is rated at zero would be drastically greater than that of a product rated at 3 on the scale.

If an item is rated as an acid you would need an alkaline reaction to neutralize it. If an item is alkaline you would need an acidic reaction to neutralize it. That is why we take the nature of the soil that we are trying to clean into account when selecting the product to use.

Food soils, for the most part, are acidic in nature. Dishmachine detergents are, therefore, alkaline in nature. Dishmachine detergents range from 11.8 – 12.4 on the pH scale.



OTHER CONSIDERATIONS

WATER HARDNESS

Water hardness is the term used to describe the amount of calcium and magnesium salts present in the water source. If the calcium and magnesium are not held in solution by the detergent they will deposit themselves on the dishes being washed in the form of limescale. The limescale will leave a white film or spots on the utensils being washed. Most detergents will contain water conditioning agents that will hold the limescale in solution and prevent it from depositing on the dishes. These agents are also referred to as sequestering agents. Because each detergent has a specified amount of water conditioning agents in them, the harder the water the more of that detergent it will take to work effectively. Most detergents will be rated as to what hardness they will be effective in.

There are two units of measurement used to determine the hardness of water. Hardness is measured in either parts per million or grains of hardness. If you had a million pounds of water and that water contained ten pounds of calcium and magnesium, you would have ten parts per million, There are 17.1 ppm (parts per million) in one grain of hard water. There are particular tests to determine the water hardness discussed in your test kit.

DESTAINING CAPABILITIES

Most detergents will contain an ingredient to help destain the dishes and coffee cups. Normally, this is

chlorine. The percentage of available chlorine in a dishmachine detergent is a good indication of how effective it will be in eliminating certain stains.

WETTING AGENTS
Wetting agents or surfactants are used to make water wetter. These chemical ingredients allow the water to penetrate food soil more easily by reducing surface tension. This will allow the detergent to get under the food soil and to lift it off the utensil. These ingredients will also allow the freer rinsing of the utensils because surface tension is reduced.

ALKALIES
Since food soils are acidic in nature we use alkalis to neutralize the food soils. The more food soil present, the more alkali needed. Alkalis are also important to help dissolve non water-soluble materials such as protein. The alkali saponifies (the reaction of an alkali with grease to form soap) many food items and allows them to be removed from the dishes.

EMULSIFICATION
The action of either an alkali or a nonionic detergent to break up globules of grease into small particles and then to keep them separated for easy rinsing.

DEFOAMERS
Ingredients used to eliminate excess sudsing in dishmachines. Especially necessary when protein soil is prevalent.

DEFLOCCULATION
Breaking up large chunks of soil is the most difficult task in the dishmachine. Alkalis are used as deflocculating agents to help break up the soil clusters.

ANTI-REDEPOSITION AGENTS
Once the food soils have been removed from the utensils they will redeposit on the dishes if the detergent doesn't have anti-redeposition agents to hold them in solution.

DISHMACHINE PRODUCTS

The entire dishmachine area should be considered as an entity when you are selecting products. You should both select for and sell to your customer the best possible products for his needs. The following list of products are all used in the dishmachine operation.

SILVERWARE PRESOAK
The silverware should always be soaked in a presoak solution to loosen any dried-on soil. This is particularly important where heavy protein or starch soils are present. If real silver is used instead of stainless steel for tableware, you should use a presoak that will detarnish as well. When using it to detarnish, a piece of tin foil should be placed in the bottom of the presoak tub. The presoak will act as an electrolytic and transfer the tarnish to the foil from the silver.

LIMESCALE REMOVER
This product is used as a maintenance product in the machine. When limescale from hard water builds up in the machine, deliming the machine will remove it. Since lime is alkaline in nature, the delime is an acid detergent. The proper procedure for deliming is as follows:

1. Drain the dishmachine and refill it with fresh water.
2. Turn off the detergent dispenser as the detergent alkali would neutralize some of the effectiveness of the delimer.
3. Add the appropriate amount of the delimer according to the label directions.
4. Run the dishmachine long enough to remove the limescale. This is normally about ten minutes.
5. Drain the machine.

6. Refill the machine with fresh water and run for about five minutes to flush any residual acid out.
7. Drain the machine and refill with fresh water. Check the water temperature.
8. Turn on the detergent dispenser and you are ready to run dishes.

DETERGENTS

The real workhorse of the dishmachine chemicals is the detergent. It can be a liquid, a powder, or a solid. Normally, an automatic dispensing system is utilized to add and maintain the proper amount of detergent. A detailed explanation of the operation of the dispensing systems will be presented later in this manual.

It is extremely important that the correct product be selected for the soil load, water conditions and type of utensil being washed. When aluminum, pewter or any other soft metal is being washed, a metal-safe detergent must be used. These detergents contain metasilicates that will protect the utensils. If a normal detergent is used the soft metals can be pitted and blackened by the chemicals.

RINSE AGENTS

Rinse agents are used to aid in the drying of the dishes. Since they contain surfactants, they reduce the surface tension of the water on the dishes and allow the water to disperse evenly over the entire glass. When water is spread in a thinner layer it will evaporate more quickly. The rinse agent is injected into the final rinse at a rate of approximately 100 ppm. It is extremely important to remember that different rinse agents need to be used in high temperature dishmachines (180° final rinse) and in low temperature dishmachines (140° final rinse). Surfactants react differently at various temperatures, creating the need to match the correct surfactant to the temperature you are using.

Most rinses are neutral in nature. However if hard or alkaline water is found in the fresh water supply, it will be advantageous to use an acidic rinse. This will help to keep limescale from building up in the rinse jets and will prevent an alkaline film from building up on the glassware.

There are specific rinses that are designed to be used in areas with high solid content in their water. Solids are the residual particles that are left when water evaporates. These particles will be deposited on the dishes in the final rinse and cause a film.

FINAL RINSE SANITIZER

When using a low temperature machine a sanitizer will be used to kill the bacteria that the 180° temperature kills in the high temperature machine. Most regulatory agencies require 50 - 200 ppm of the chlorine in order to insure proper sanitation. If real silverware is being washed a quaternary sanitizer will be needed, as chlorine will attack the silver.

OXYGEN DESTAINER

The last product that is used with the dishmachine is the oxygen destainer. It is used to remove stains from coffee cups, trays and tea glasses. If a chlorine bleach was used, it would attack the glaze on the china. Once the glaze has been damaged in this way, staining occurs more rapidly. The oxygen destainer is used as a soak solution and will not damage the dishes in any way.

MANUAL DISHWASHING DETERGENTS

An associated product to the dishwasher is the pot and pan detergent. The products are in the neutral range on the pH scale. This will prevent irritation to employee's skin. They may either be solid, liquid or powder in form. Many times, a proportioner is used to dispense these products at their proper dilution ratio.

The detergent solution is used in the first compartment of a three compartment sink. The water should be hot.

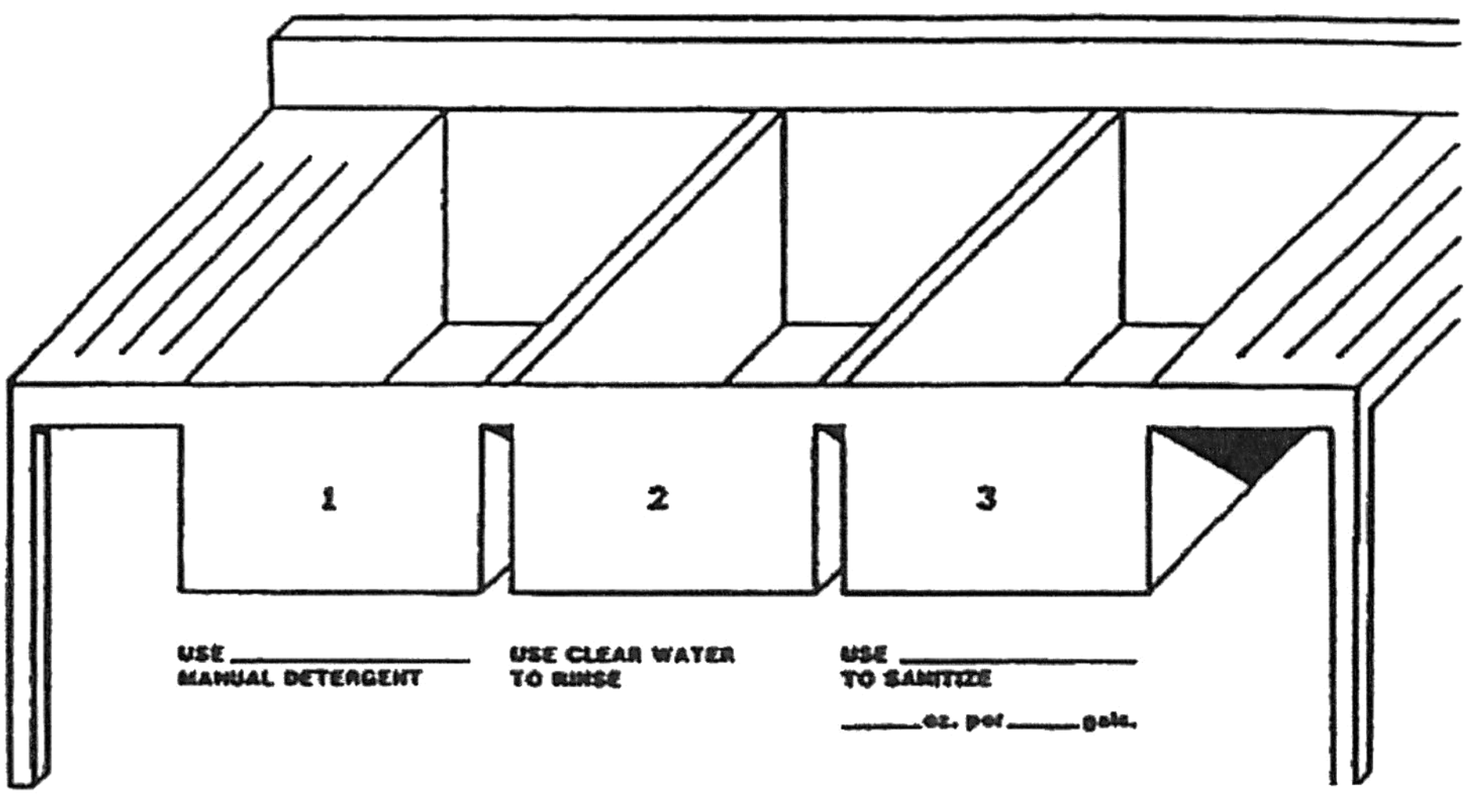
The second compartment of the sink should be clear, warm water. After the dishes are washed they should be rinsed in this clear solution.

Then they are immersed in a sanitizing solution in the third sink. The sanitizer can be a chlorine, a quaternary or iodophor sanitizer. Most regulatory agencies require a 1 – 2 minute immersion. Then the utensil is placed in a rack to air dry. Towel drying is prohibited.

MANUAL

dish + pot & pan

WASHING INSTRUCTIONS



1. **PRE-FLUSH – To keep gross soil out of wash tank.**

2. **WASH – In tank No. 1, using _____**
   at _____oz. per _____ gallons of water.

3. **RINSE – In tank No. 2, using clear water.**

4. **SANITIZE – In tank No. 3, using _____**
   at _____oz. per _____gallons of water.

5. **AIR-DRY – Do not towel dry. Put all utensils where they will stay clean.**

AMERICAN DISH SERVICE

EQUIVALENCY CHART

CC Chart

30 CC	equal	1 oz
3,840 CC	equal	1 Gal
19,200 CC	equal	5 Gal

CC guide line for 5 gallon pail

3 CC	equal	6,400 racks
4 CC	equal	4,800 racks
5 CC	equal	3,840 racks
6 CC	equal	3,200 racks
7 CC	equal	2,742 racks
8 CC	equal	2,400 racks
9 CC	equal	2,133 racks
10 CC	equal	1,920 racks
11 CC	equal	1,745 racks
12 CC	equal	1,600 racks
13 CC	equal	1,477 racks
14 CC	equal	1,371 racks
15 CC	equal	1,280 racks

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CHAPTER FIVE

DISPENSING SYSTEMS

The two basic dispensing forms are hydraulic and electronic. The hydraulic is completely activated by water while the electronic dispenser is activated by electrical energy.

HYDRAULIC SYSTEMS

The hydraulic system is used in smaller accounts where the volume of chemicals used would not support the expense of an electronic system. Dispensing detergent in this manner is an approximate value with small amounts of detergents being added every cycle during the final rinse. A water line is tapped off of the final rinse line of the dishmachine and run to the detergent hopper. Each time the final rinse turns on, water will flow through the water line into the detergent hopper causing the level of water in the hopper to rise. The detergent in the water of the detergent hopper will flow out the detergent feed tube into the dishmachine. A petcock can be installed in the water line to determine how much water will be sent into the hopper.

The main disadvantage of this system is that there is no way of compensating for different soil loads as the same amount of detergent will be added each cycle. This system is sometimes desirable to use in very hard water because there is no sensor to be affected by limescale.

A hydraulic rinse injector is mounted in the final rinse line and provides fairly accurate dispensing capabilities since rinse fluid needs to be added during every rinse cycle. A Dema 260 is one of the most common hydraulic rinse pumps. A screwdriver adjustment will determine the flow of the rinse agent.

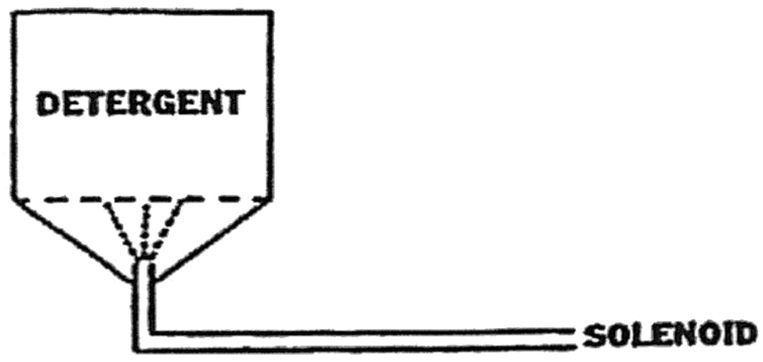
ELECTRONIC SYSTEMS

An electronic detergent dispenser is much more sophisticated than the hydraulic system. It relies on a sensor located in the wash tank of the dishmachine to measure the conductivity of the water in the machine. The more detergent in the machine, the more conductive the water. A circuit in the control head will determine from this conductivity reading whether the proper amount of detergent is being maintained.

If more detergent is needed, the control head will send an electrical message to a detergent solenoid valve which will open and allow more water into the detergent hopper. The level of the water rises until the detergent overflows into the dishmachine.

Once enough detergent has been delivered to the dishmachine wash tank, the dispenser system will turn off until needed again. An outline of this type of dispensing system is pictured on the next page.

The detergent hopper pictured is one of many types of hoppers used today. This is called a water bath reservoir. A dry reservoir would hold the detergent in a dry condition until the detergent solenoid is opened. Once the valve is opened, water is sprayed up at the detergent, dissolves the detergent and carries it down the feed tube into the dishmachine. A similar dispenser is used with solid detergents.

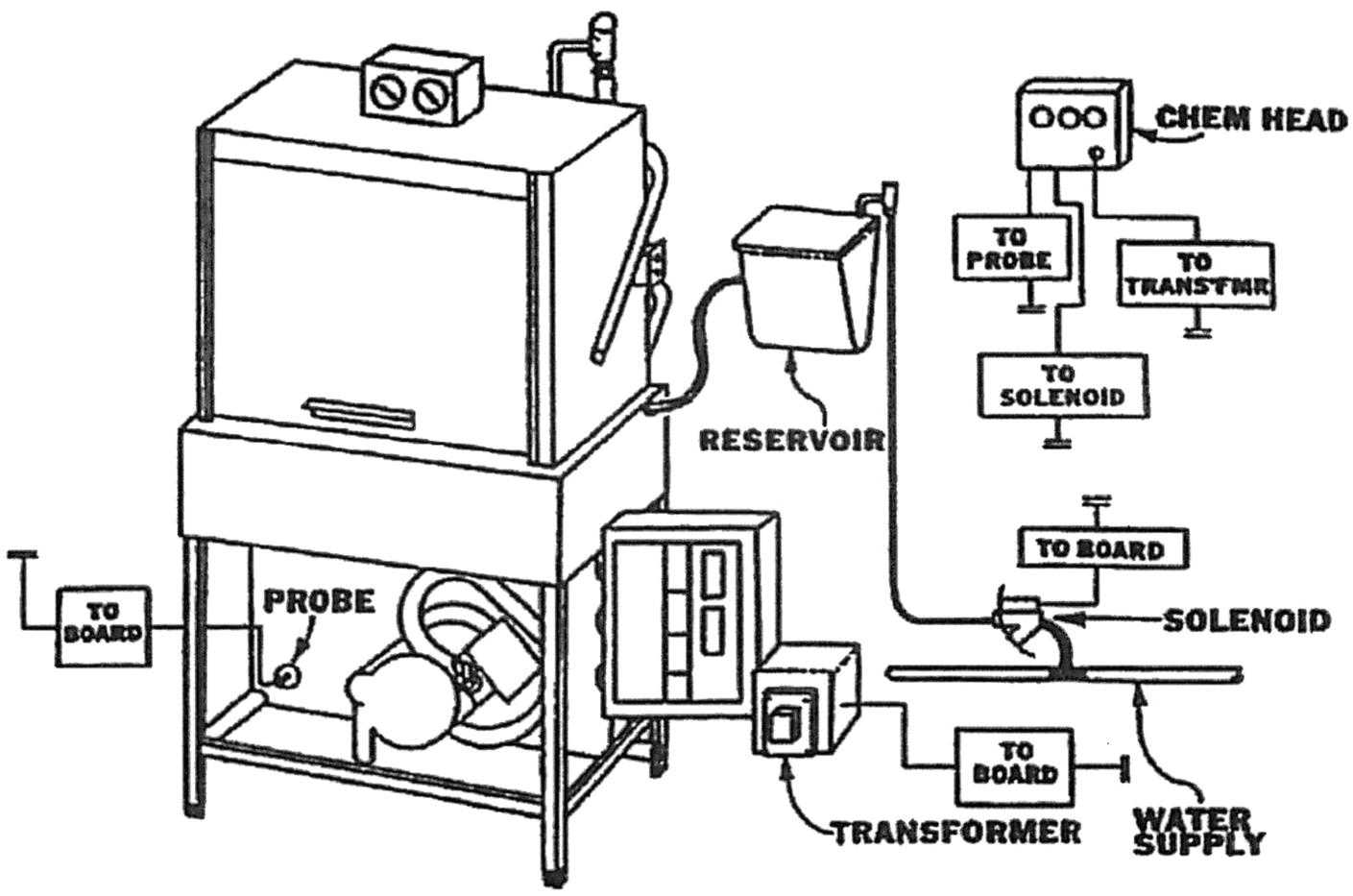


If a liquid detergent is used, a peristaltic pump replaces the solenoid valve and the detergent hopper. Once the dispenser control head determines the need for more detergent, it activates the peristaltic pump which delivers the needed amount.

An electronic rinse pump is normally of the peristaltic type. It is either wired to the dishmachine so that every time the final rinse solenoid valve is opened, a voltage will be applied to the peristaltic pump to activate it. A potentiometer adjustment will determine the speed at which the rinse pump will turn. The pump will run during the entire rinse cycle.

The other type of electric rinse pump still uses the peristaltic pump to deliver the rinse agent. However, a pressure switch that is connected to the final rinse line of the dishmachine will determine when the pump will run. As the water flows through the final rinse line and into the pressure switch, two reeds are compressed together to complete the electrical circuit needed to apply voltage to run the rinse pump. The disadvantage to this type of rinse pump is the adverse affect hard water sometimes has on the pressure switch.

Sometimes, the rinse pump and detergent controls are combined in a single box; but, the basic circuitry is the same. This central pump system eliminates some wiring and allows for an easier and quicker installation. Installation instructions will be provided with each dispensing system you purchase.



SCHEMATIC REPRESENTATION OF DISPENSING SYSTEM

CHAPTER SIX

SOLVING PROBLEMS

The old adage that selling is nothing more than solving problems is especially true in dealing with ware washing chemicals. It is the sales-service person who can best solve a customer's dishwashing dilemma and keep any problems from reappearing that will be most successful.

CUSTOMER CONCERNS

Most customers' concerns are fairly simple. They want clean dishes at the lowest possible cost to them. They also want the peace of mind that if their machine breaks down, they will get relief quickly.

If we can deal with these three simple demands, we will be very prosperous. In order to provide this type of service to our customers, we have to have a thorough understanding of what to do when a problem appears. The following outline will serve as a general guideline to troubleshoot many ware washing problems.

USING TOO MUCH DETERGENT

1. Hard water liming up detergent probe.
2. Detergent head operating incorrectly.
3. Wire to probe loose, off, or broken
4. Temperature of wash water too low.
5. Wash water not being changed often enough.
6. Rinse pressure too high causing excess dilution of detergent in the wash water.
7. Using the incorrect detergent for the account.
8. Location of the detergent probe incorrect.
9. Dishwashing personnel not prescrapping correctly.
10. On conveyor machines, a curtain could be missing causing excess splash over of rinse water.
11. Fresh water feed (make up water) could be set too high on a conveyor.
12. End caps missing on wash arms.

DISHES NOT CLEAN

1. Detergent set incorrectly.
2. Wash temperature too low.
3. Incorrect wash pressure.
4. Prescrapping incorrectly.
5. Dishes left sitting too long prior to washing.
6. Dishes not being racked correctly.
7. Water not being changed often enough.
8. End cap missing from wash arm.
9. Cycle time not long enough.
10. Overflow plugged not allowing skimming action.
11. Wash arm bearing frozen, not allowing arm to spin for proper spray pattern.

WASH PRESSURE TOO LOW

1. Wash pump not working correctly.
2. Intake screen on wash pump clogged.
3. Wash arm bearing worn.
4. Wash arm clogged with debris.
5. Water level too low in the machine.
6. Sudsing in the machine causing pump to pump suds rather than water.
7. End cap missing from wash arm.

EXCESS SUDSING IN DISHMACHINE

1. Operator not prescrapping well enough, allowing food soil protein to cause sudsing.
2. Overflow clogged causing improper skimming action.
3. Too low of wash temperature.
4. Using excess rinse agent which will foam.
5. Not using a detergent with enough defoamers.
6. Water level too low causing the pump to cavitate while trying to pump air rather than water.

WATER LEVEL OF MACHINE TOO LOW

1. Drain seat not sealing properly.
2. On a conveyor, a cap missing will shoot the water into another tank.
3. Curtains missing in a conveyor
4. Makeup water set too low in a conveyor
5. In a door type, if the rinse pressure is too low, not enough water will be added in the rinse each cycle.
6. Wash tank leaking.

WASH TEMPERATURE TOO LOW

1. Wash tank heating element thermostat set incorrectly.
2. Wash tank heating element burned out.
3. Main facility water heater not functioning properly.
4. Reset for heating element popped.

SPOTTING ON GLASSES AND SILVER

1. Not clean causing improper rinsing.
2. Hard water.
3. Silverware not being presoaked.
4. Improper rinsing.
5. Not racking dishes correctly.
6. Rinse water not hot enough.
7. Rinse jets clogged.
8. Carry-over detergent not being rinsed off.
9. Final rinse pressure too low.
10. Final rinse pressure too high causing misting and improper rinsing.
11. Glasses etched. Only remedy is to throw away glasses.
12. Fresh water supply is alkaline.
13. Rinse jets worn giving improper pattern.
14. High solids count in the water supply. Switch to high solids rinse agent.

FINAL RINSE TEMPERATURE TOO LOW

1. Adjust thermostat on the booster heater.
2. Heating elements burned out in the booster heater.
3. Main water supply heater not functioning properly.
4. Circuit breaker popped on the booster heater.

FINAL RINSE PRESSURE TOO LOW

1. The final rinse line strainer is clogged.
2. Main water supply pressure is too low. Can be compensated for by using a Well-X-Trol.
3. Final rinse pressure regulator needs to be adjusted.
4. Final rinse pressure regulator screen needs to be cleaned.
5. Rinse jet missing.
6. Clogged line.
7. Too small of line coming from main water source to the dishmachine.

HAZE OR FILM LEFT ON GLASSES

1. Final rinse temperature above 195° causing baked-on rinse agent.
2. Hard water film.
3. Chlorides present in the water. Can only be removed by deionizer if coming from water supply. Can't possibly be coming from improper back flushing of a water softener.
4. Residual detergent left on glasses.
5. Alkaline water supply.
6. Too hot of rinse causing misting.

USING TOO MUCH RINSE AGENT

1. Rinse injector malfunctioning.
2. Rinse injector hooked to dishmachine incorrectly.
3. Dishmachine solenoid valve staying open causing pressure sensitive injectors to run continuously.
4. Select a more concentrated rinse agent for the water conditions.

DETERGENT BUZZER GOING OFF CONTINUOUSLY

1. Faulty detergent probe.
2. Detergent probe limed up.
3. Faulty control head.
4. Buzzer adjustment set incorrectly.

SMALL CLEAR SPECKS LEFT ON GLASSWARE

1. Detergent set too low causing metasilicate fallout.
2. Instant potatoes being mixed incorrectly in the food preparation area and are adhering to the glass.
3. Detergent reacting with silicate in glass.

CHAPTER SEVEN

THE SERVICE ROUTINE

One of the most important functions you are going to perform as a chemical specialist is the servicing of a customer's dishmachine. The impression of professionalism that he is left with after your service call will make you an invaluable asset to him.

Service calls will fall into the two categories of routine and emergency service. Routine or preventive maintenance is performed at prescheduled intervals to insure proper dispensing and results. Emergency service is provided when the customer has an immediate need. The chemical specialist who provides a 24 hour a day, 7 days a week service program will instill extreme customer loyalty.

A written service report should be filled out on every service call. Every blank on the report should be filled in and the customer should sign the report. An example of such a report is located at the back of this manual.

The first step of the service call is to check your own appearance prior to entering the account. You should be neatly dressed and groomed. You should check your tool box to make sure that you have all necessary tools and test kits to accomplish the service call. Your tools should be organized for easy access and clean and free from dirt and rust.

Once you enter the account, you should let the manager know that you are there so he is aware of how quickly you responded to his call. You should then don a laboratory coat to protect your clothing and to maintain your appearance for your next call.

On your way to the dishmachine, you should stop at the clean dish storage area and check the appearance of the dishes. If there are any noticeable problems, you can look for particular causes during your service call.

When you arrive at the dishmachine, the first thing you should check is the titration setting of the detergent. This should always be checked prior to any adjustments or changes. You should then check the hardness of the water. Both of these readings should coincide with what you had the last time you visited the account. If there is any significant change, this could alert you to possible problems.

All of the other points highlighted on your service report should be checked with great care. Any blanks that can be filled with an actual number reading should be noted this way. All other blanks should be marked O.K. or with a check mark to designate any problem areas.

In the comments section of the service report, you should note the problem areas, what the result of this problem was to the customer, what you did to correct it, and how your action will benefit your customer.

When checking the detergent probe during your call, it should become standard procedure to drain the dishmachine and clean the probe. This will help to eliminate future trouble calls.

When checking the motor of the dishmachine, be sure to clean the motor vent and to periodically lubricate the motor. Taking a little extra time to thoroughly check all functions of the machine will be a time saver in the long run. Once you have completed the entire check-out procedure, you should totally complete your service report prior to presenting it to the manager. Any problem areas that you repaired or that need to be repaired by an outside service agency should be brought to the manager's attention. The ware washing service report is used to help you complete an extensive analysis of the operation and as a marketing tool to present to the manager. You have performed a valuable service for him and he should know about it. After you have explained the entire service report, make sure the manager signs it. This provides you with written documentation for later reference.

One copy of the report should be left with the manager and the other copies should be routed through your company's normal filing procedure. A copy of a suggested service report is located at the back of this manual. Other forms may be designed to incorporate information specific to your program. Whichever style of report that fits your company's particular needs may be used; however, it must contain the appropriate check list.

In addition to the service report, a route book is an essential tool to the serviceman. The route book will include all pertinent data about the account. This gives the serviceman extremely useful information at his fingertips. Any changes at the account should be noted carefully. There is also room in the route book for the serviceman to keep a running account of the services he has performed. This will help him to note any repeat problems that occur.

If the serviceman is not on a beeper system, he should always call his office when having completed the service he is to perform in any given geographic location. That way, if any emergency calls have been received from that area, he can handle them while he is there. The elimination of additional travel time and man hours that this can prevent will make the serviceman happier and the program more profitable.

Following the service reports and route book sheets is a list of suggested tools that the serviceman will need to perform his duties. This is a stating list and should be elaborated on as the need arises.

SUGGESTED TOOLS FOR SERVICE and INSTALLATION WORK

No workman can be expected to produce quality work without the proper tools to do the job. We are listing below our recommendations on the tools each serviceperson should have…for ware washing laundry and beverage calls. By maintaining a well-stocked tool kit, recalls can be eliminated, and more importantly, you can put your customer back in business with minimum down time.

1 Set End Wrenches (Boxed one end – other end open)
Sized 3/8", 5/.16", 7/16", 9/16", and 5/8"
Crescent Wrench – 6" Length
Crescent Wrench – 10" Length
Vice Grips
Channelock Pliers (Medium)
Standard Pliers
Screwdriver – Phillips Head (Medium)
Screwdriver – Flat Blade (Medium)
Screwdriver – Flat Blade (16" Length)
Needle Nose Pliers (Small)
Side Cutters (Small)
Wire Stripper/Cutter Tool
¼" Wood Chisel (Sharp)
Adjustable Pipe Wrench (Monkey Wrench)
1/8" Pipe Tap
¼" Pipe Tap
Voltage Meter (Volt/Amp Meter w/dial)
¼" or 3/8" Electric Drill (Variable Speed, Double Insulated and Reversible if possible)
Drill Chuck
2 Each (Sharp) Drill Bits of the following sizes:
¼", 3/8" and 11/32"
2 Each 7/8" Case Hardened Hole Saw (for stainless steel) **OR**
7/8" Greenlee Knock-Out-Punch (Available at Electrical Suppliers)
3 Each 50' Electrical Extension Cord w/grounded plug
Copper Tubing Cutter (for up to ½" Copper Tubing)
Bastard File (Small 6 – 8" Length)
Small Pocket Screwdriver
Titration Kit
Water Hardness Test Kit
Thermometer
Small Parts Kit (Compression Fittings, Tie-Wraps, Wall Anchors, Electrical Connectors, Electrical Tape, Teflon Tape, Bathtub Sealant Compound)

WAREWASHING SERVICE REPORT

Date_____

Account _____ Contact/Title _____ Time _____

Address _____ Phone # _____

Street City/State Zip

Acct. # _____

Machine make & model	Detergent dispenser	Rinse injector	Sanitizer

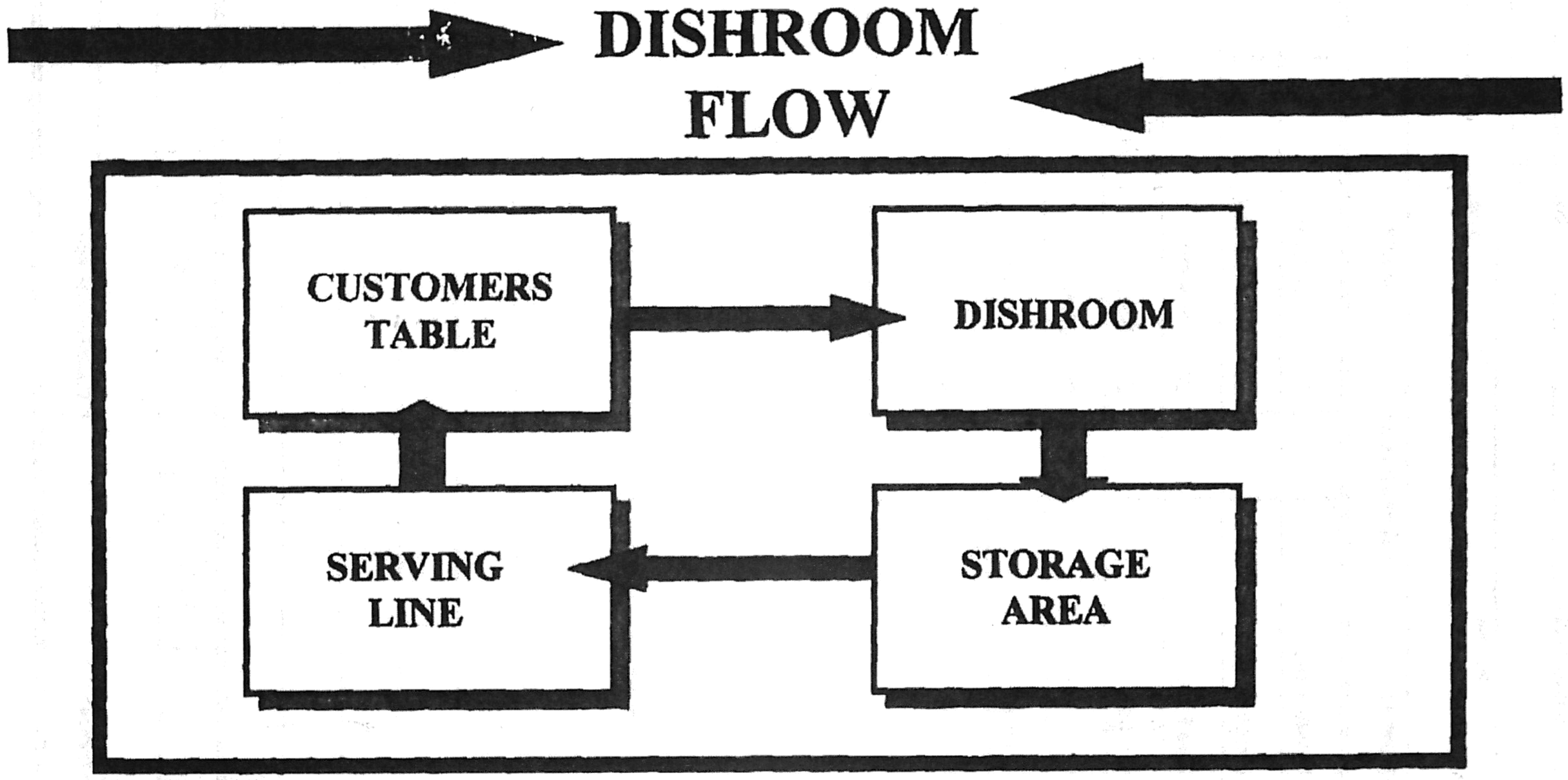
1. Water hardness gpg		11. Wash arms		21. Procedures	
2. Detergent concentration		12. Rinse arms		22. Sanitizer ppm.	
3. Prewash temp.		13. Bearings		23. Flatware	
4. Wash temp.		14. Bypass		24. Glasses	
5. Final rinse temp.		15. Overflow		25. Dishes	
6 Final rinse pressure lb/in		16. Drains		Model Type Serial	
7. Wash pressure		17. Motors		Equip. Out	
8. Gauges		18. Pump intake			
9. Curtains		19. Conveyor speed		Equip. In	
10. Leaks		20. Detergent probe		Rack Count	

Comments:

Mileage		Labor		Parts		Total	

Parts Used

Service Representative	Service number	Customer signature



OBJECTIVE:

To move the soiled ware from the table,through the dishroom, into the storage area, and ready for the serving line.

This movement should take into consideration the following key items:

- ELIMINATION OF BOTTLENECKS
- VOLUME IN TERMS OF PIECES PER HOUR
- HANDLING EACH PIECE A MINIMUM OF TIME (WHICH CONTROLS BREAKAGE)
- EFFECTIVE USE OF LABOR
- WATER, SEWAGE, AND WATER HEATING COSTS

WHICH IN TURN WILL LEAD TO .....**RESULTS**

THE PROPER PROCEDURES OF WAREWASHING
A MATERIALS HANDLING APPROACH

When one sets out to design a "state of the art" warewashing system, two underlying concepts should be kept in mind. These concepts are (1) warewashing starts at the table and (2) warewashing is a materials handling job. The objectives of a well designed warewashing system are to move soiled ware from the customer's table through the warewashing area, performing all the tasks that ensure sanitary results, then storing or transporting the clean ware back to the serving line as efficiently and cost effectively as possible. This movement should take into account, the total number of pieces to be washed, the elimination of bottlenecks in the system, keeping breakage to a minimum, effective use of labor, and minimizing the cost of water, sewage, and energy. In order to explore these concepts further, let's break the total warewashing job down into the individual procedures required to reach our objectives.

BUSSING

Bussing is a term that is used to describe the removal of soiled ware from the table and transporting it to the warewashing area. The manner in which bussing takes place significantly impacts and effort required in the warewashing area.

For example, soiled ware should be picked up from the table in an orderly fashion so that the flatware is together with all the handles pointing in the same direction. Plates and bowls are stacked in the buss box or on the tray according to size, and glassware should be free of paper goods. A glass that has paper waste can take up to 5 seconds extra to prepare for the washing procedures that follow. If you multiply this by the number of glasses that a busy operation can go through in a day, week, or year, the savings can be significant. The design of a warewashing system should also consider **"who"** will be responsible for performing the bussing function. Generally speaking, there are four options in this regard. Each option has advantages and disadvantages that suggest compatibility with certain types of operations. The four options are:

Patrons **Serving Staff** **Bussing Personnel** **Dishroom Personnel**

For example, operations that have patrons buss their own dishware are usually found in the institutional sector. Patrons can do some separation tasks such as flatware, glasses, dishes, and disposal of paper waste. Some cafeterias such as schools, employee feeders, and correctional institutions utilize self bussing. The self bussing systems commonly use pass-thru windows and/or conveyor belts for moving soiled ware to the dishwashing area. When a conveyor is used, consideration should be given to the method of accumulating large volumes of soiled ware in short periods of time, since the ware can reach the warewashing area at a rate faster than can be efficiently handled.

METHODS OF TRANSPORTING WARE FROM THE TABLE TO THE DISHROOM

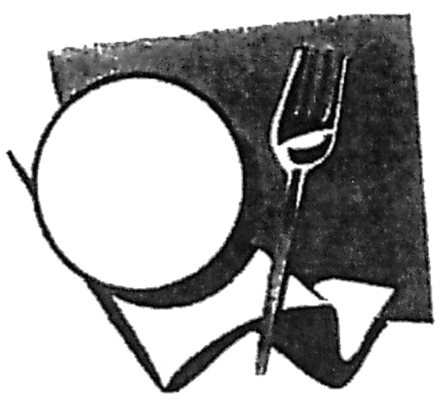
METHOD	COMMON SIZE	APPROXIMATE CAPACITY	COMMON USES
Buss Box	20" x 15" x 5" 20" x 15" x 7"	35 Pieces 40 Pieces	Full Service Restaurant
Bussing Cart	Varies	3, 6, or 9 Buss Boxes	High Volume full service restaurants and banquets
Waitress Tray	12" Round 14" Round 16" Round	8 – 10 Pieces 10 – 12 Pieces 12 – 14 Pieces	Upscale full service, fine dining, and white tablecloth restaurants
Banquet Tray	19" x 24" Oval	25 – 35 Pieces 35 – 45 Pieces	Banquets and hotel room service

LANDING

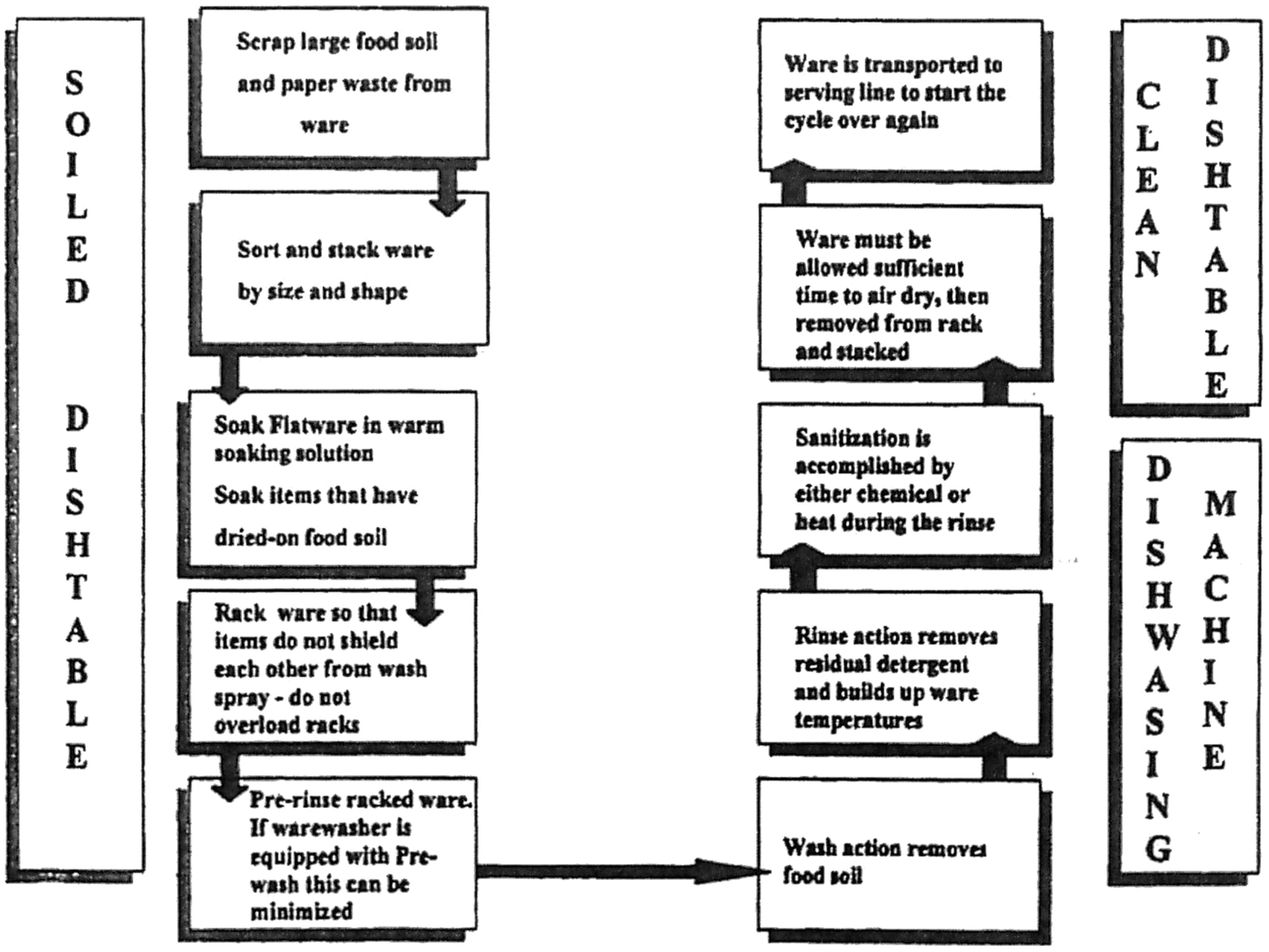
When the soiled ware enters the dishroom it should be placed on the soiled dishtable. Many soiled dishtables are designed with a landing area that facilitates placement of trays or buss boxes in preparation for the steps that follow. A landing area of sufficient size and proper location can significantly help reduce breakage.

SCRAPPING

The first step in getting good results from the warewashing operation is called scrapping. Scrapping is the physical removal of food scraps, garnishes, and paper waste such as napkins. The scrapping function is extremely important for several reasons. If paper and waste are allowed into the warewasher, it is possible that the strainer, wash arm nozzles, and pump impeller may get clogged, thereby reducing the warewashers ability to clean properly. Next, proper scrapping procedures will reduce overall detergent consumption. Large amounts of food soil in the warewashing machine will break down the effectiveness of the detergent at an accelerated rate. This simply causes the automatic detergent dispenser that is typically installed on the warewasher to compensate by adding excessive detergent.



PROCEDURES IN WAREWASHING



TYPICAL PLACE SETTING IN VARIOUS OPERATIONS

FULL SERVICE RESTAURANT

Water Glass	1
Beverage Glass	1
Salad Bowl	1
Flatware (4pieces)	1
Dinner Plate or Platter	1
Dessert Plate or Bowl	1
TOTAL PIECES	6

FINE DINING, WHITE TABLECLOTH, RESTAURANT and/or BANQUETS

Water glass	1
Wine or Cocktail glass	1
Appetizer Plate	1
Soup Bowl and Saucer	2
Salad Bowl and Saucer	2
Bread Plate	1
Entrée Plate or Platter	1
Coffee Cup and Saucer	2
Flatware (8 pieces)	2
Dessert Plate or Bowl	1
TOTAL PIECES	14

CAFETERIAS

Tray	1
Beverage Glass	1
Salad Plate or Bowl	1
Entrée Plate	1
Plate Cover	1
Dessert Plate or Bowl	1
Flatware (3 pieces)	1
TOTAL PIECES	8

TYPICAL PLACE SETTING IN VARIOUS OPERATIONS

HOSPITALS

Tray	1
Beverage Glass	1
Salad Plate or Bowl	1
Entrée Plate	1
Plate Cover	1
Dessert Plate or Bowl	1
Flatware (3 pieces)	1
TOTAL PIECES	7 - 10

GRADE SCHOOLS

Compartment Tray	1
Flatware (3 pieces)	1
TOTAL PIECES	2

DISHWASHER
SIZING

By using this dishwasher sizing chart, you will be able to determine the appropriate dishwasher needed to better accommodate your specific needs.

INSTRUCTIONS

•STEP 1 Determine the total number of pieces to be washed using "SECTION A"

•STEP 2 Using "SECTION B" find the model that will produce enough TOTAL REAL PIECES to handle the volume determined in STEP 1

SECTION A

TOTAL NUMBER OF SEATS		_____
MULTIPILED BY NUMBER OF TURNS PER PEAK HOUR	X	_____
MULITIPILED BY NUMBER OF PIECES USED FOR EACH MEAL	X	_____
(silverware = 1 pieces)		
EQUALS TOTAL PIECES TO BE WASHED	=	

SECTION B

Using an operating efficiency of 70%, the total real pieces over one hour would be:

ET-AF	**504**	**HT-25**	**1210**
L3DW	**621**	**ADC-44**	**4100**
AF3D	**621**	**ADC-66**	**4100**
	5AG	**1243**	