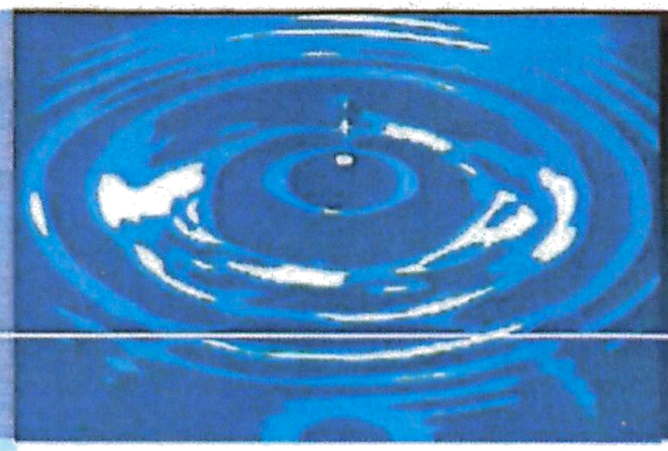


SECTION 4

Adjustment Techniques

This Section Contains:

- Finite Capabilities of the Machine
- The Chemical Question?
- Tuning of a Batch Machine
- Centrifugal Pump and Hydrodynamics
- Delime Switch Instructions

Section 4
Adjustment Techniques

FINITE CAPABILITIES OF THE MACHINE
(Batch-type or Dump & Fill)

The commercial dishmachine can only perform these tasks:

1. Pump and spray water over the dishrack area
2. Drain and refill the water volume
3. Add detergent and sanitizer solutions according to time
4. Recover pump prime and spray water over the dishrack area again
5. Shut down at the cycle's end

If these five tasks are performed, then your investigation of the machine is finished. (Don't invent avenues to non-issues)

Water temperatures, foaming, specs on glasses, remaining soil, black spots, streaks on silver and glasses, and grease build-up will all be a result of foundation elements or procedure elements.

Trouble Shooting Guide for Conveyor Dishmachines
FINITE CAPABILITIES OF THE MACHINE
(Chemical or Hi Temp Conveyors)

A commercial conveyor dishmachine can only perform these tasks:

1. Pump or spray water over the dishrack area at prescribed pressures
2. Refill the water volume
3. Add detergent and sanitizer solutions according to dispenser operations
4. Recover heat loss from spraying water
5. Pull racks along a straight line
6. Shut down at the cycle's end

If these six tasks are performed, then your investigation of the machine is finished. (Don't invent avenues to non-issues)

Water temperatures, foaming, specs on glasses, remaining soil, black spots, streaks on silver and glasses, and grease build-up will all be a result of missing foundation elements or procedure elements.

ANSWER

Technical Advice: The inclination to say *"I've checked everything and everything is okay"* is typical of faulty troubleshooting technique. Otherwise, you would not have any further problems if, in fact, "everything was okay". This line of thinking also loads your outcome and prevents the next logical step. Recommend that you begin with: "When did the machine last work and what has happened since that time? What is missing now that was present when the machine did function correctly?" Machines will always tell the truth, listen to what they say.

The Chemical Question

Basic Questions:

1. Is there an appropriate volume (PPM) of detergent solids in the wash solution?
    a. This PPM level can only be determined by a titration process.
    b. 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 it, too, become saturated?
    a. You cannot continue to add detergent solution to a fixed volume of water without reaching an overload condition.
    b. 1900 to 2000 PPM's is usually considered sufficient in the cleaning process. 2500 PPM usually produces carryover.
    c. In the most extreme 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 can no longer be 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 across the length of travel. 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 and 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.

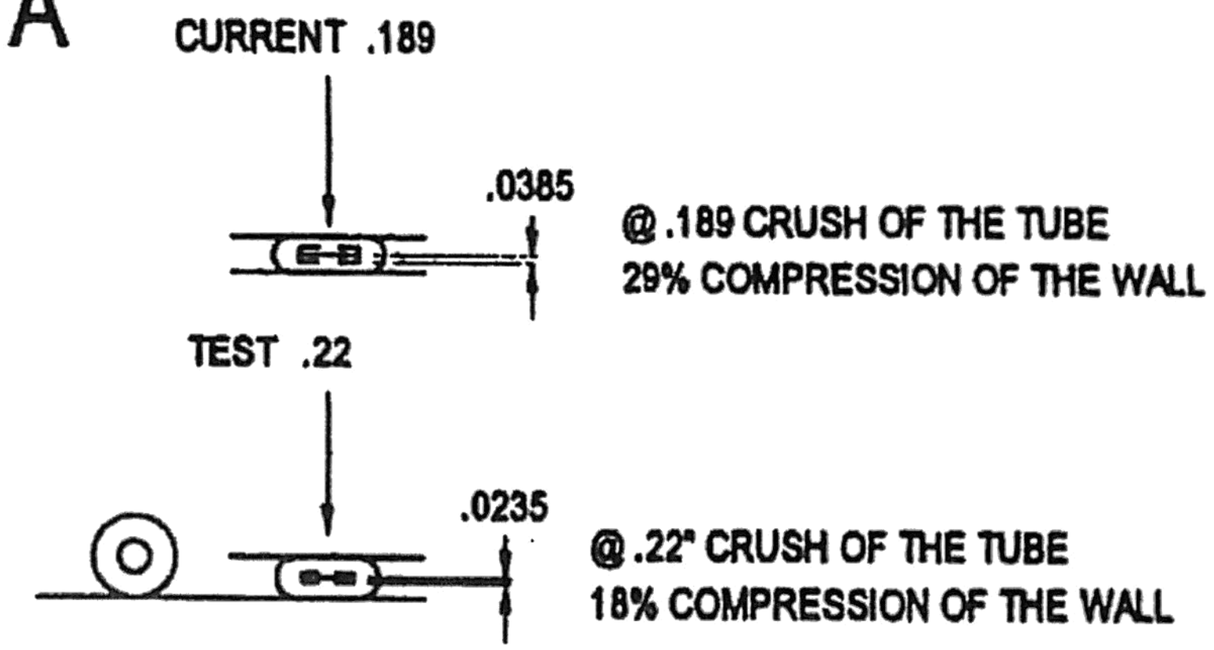
INDUSTRY TRUISMS

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

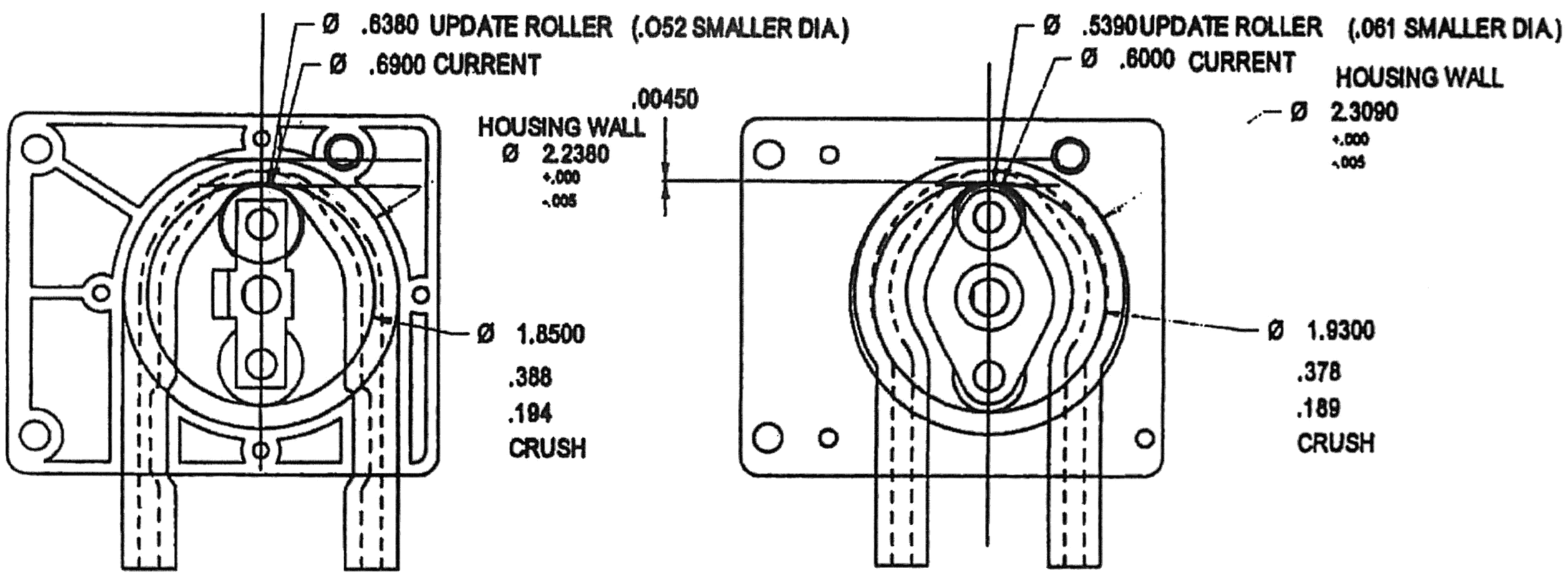
PERISTALTIC PUMP DATA

CHEMICAL TUBE SPECIFICATIONS

PART NUMBER: 64-0001 OR 64-0010
DIMENSIONS: .429 OD, .165 ID, .1335 WALL
PLUS OR MINUS .005 FOR ANY TWO OF THE THREE DIM.



GREATER CRUSH IN 3D PUMP



TECHNICAL SUPPORT MATERIAL

SUBJECT: TUNING OF BATCH TYPE, DUMP & FILL DISHMACHINES

The machine type known as low-energy, dump & fill, batch type, low-temp or LED are all equivalent terms for the NSF classification for chemical sanitizing dishmachines. The category's principle elements are: chlorine sanitizing, circulated pumped rinse, draining of entire batch during wash cycle, and high pressure/low flow sprays. Low temps are different from hot water machines in that they have no holding tank, no heaters, and no final rinse.

Ordinarily, the batch type dishmachine is said to have "result" problems. These are interpreted as spots on glassware, streaks on flatware, soil on dishware, wet dishes and trays. All of these problems are associated with poor tuning of the machine and untreated water conditions.

The water coming to dishmachines will vary in both temperature and pressure – this is inevitable. There is no realistic way to standardize the water supply. It must be dealt with individually at each site. Generally, the heating source will be undersized. This means the hot water (**recovery rate**) will run out before the heater can restore the correct temperature during continued use of the dishmachine. In addition, the water heater may be operating below its normal efficiency or set at lower temperatures. Distance to the machine is also a factor; forty feet or more of uninsulated pipe will present consistency problems. For a machine capable of 37 racks per hour, the required water heater recovery rate should be 80 gph. This is for the dishmachine alone; any additional requirements would increase the rate of recovery (Tankless water heaters are not recommended for commercial dishmachines). The ideal temperature for a batch type machine is 130° - 140° F. Temperatures below 120° or above 150° create result problems, problems you cannot correct with more soap or more water.

The force of city water can be measured by two numbers: Flow (GPM) and Pressure (head). Flow is the amount of water delivered over time and is determined mostly by pipe diameter. Pressure is the force applied to that delivery. But they do not mean the same. An open ½" water pipe with low pressure (10 psi) might deliver 10 GPM. Conversely, a severely clogged ¾" pipe even with *high* pressure (40 psi) might only deliver 5 GPM. High pressures (70 – 90 psi) can cause valve and joint problems, low pressures (20 psi) will take longer times to properly fill and operate the equipment. Pressure regulators can assist with the reduction of high pressures and pressure bladders or reserve tanks can increase some low pressure problems.

The information above is background, now we will cover the tuning of the machines.
The first step is to set the correct water usage. There are only two elements in this procedure. One is the fixed (drain cam), meaning you cannot adjust or modify and the other is the adjustable (fill cam). **The fixed part** is called the drain cam. The drain cam establishes the wash and rinse sequence of the cycle and is required by NSF to be fixed or non-adjustable. When the cycle begins, the pump motor turns on and immediately the detergent cam operates but do not adjust this cam yet. After some seconds of wash (45 seconds) the drain cam rotates into position and the switch finger drops down on the low cam. This energizes the drain solenoid and causes all the water to exit into the drain.

IMPORTANT: During this time, all the water must exit the machine. About 10 seconds into this sequence you should hear the typical hollow running sound of the wash pump. If you do not hear this sound the machine still has soiled water in the pan, there is too much water coming into the machine. Reduce the incoming water by time (the fill cam is the **Adjustable part** of the procedure). Decrease the space on the fill cam so the water solenoid is closed sooner. Now, run the machine again and see if all water is dumped from the machine – you'll hear the pump running dry half way through the drain. As soon as you hear that sound (>) meaning "**Empty**", now you can move the water cam so that the "fill" begins immediately. This will help purge the machine and start recharging the pump.

The next part is the adjustable tuning of the machine or setup. Connect a pressure gauge (kit #88-1048) to the lower spray arm. Run the machine again and watch the pressure build up after the drain closes. You should see the needle make three distinct surges up to 17 – 19 psi and then hold steady at that

pressure. This point (*) is called ***Full-Spray-Arm-Pressure***. This is the point when you can close off the water fill cam. Now the machine will operate within the best conditions for that account. Run the machine through another complete cycle, you should see steady pressure during the wash, a drop to zero during the drain, three surges back to *full-spray-arm-pressure* (after the fill sequence), and full pressure during the remainder of the rinse. This is the normal profile for performance.

DRAIN CAM: ----------\ drain >(Empty) /----------|
WATER CAM: ----------\fill until *(FSAP)/---------|

TROUBLESHOOTING

If you see cavitation or wide swings of the pressure gauge during the wash or rinse cycle it is caused by too little water. Increase the water. If you see a lack of any significant pressure during the rinse cycle but good pressure during the wash cycle then the temperature is too high or the incoming water pressure is too low to recharge the pump (you can use the "burp-wire" procedure to correct these problems). If you see the normal profile but the pressures runs 15, 12, 10, or 8 psi then some or all of the impeller vanes are blocked. We will assume the drain screen is clean and the inlet manifold is clear.

There are two problems that are difficult to solve and there are few alternatives. One is fluctuating water pressures. When there are wide swings in pressure (10 – 40 psi) there will be starvation or overfilling no matter how you set up the machine. Batch type machines are more sensitive than final rinse machines. This condition is caused by inconsistent layout of the building's water feeder pipes and the number of demand fixtures. The other problem is water condition itself. Some elements found in the make up potable water supplies are complex and difficult to compensate within the dishwasher alone, these should be treated in the water before reaching the machine.

Payzant 2/24/97

TECHNICAL SUPPORT MATERIAL

SUBJECT: CAM TIMER, TUNING OF BATCH TYPE

The Cam Timer: an electric motor (1 RPM) gear turns a gear on a hex shaft that passes through the center of several plastic "cams" (cam barrel). The barrel would look like it rotates toward you as you are standing in front of the control box, looking at the cam timer. It will appear the cams are rolling towards you as a ball would rotate rolling towards you. The brass gears attached to both the motor and camshaft determine (by teeth numbers) the speed of the rotating cam barrel – not the motor rpm, which is the same RPM for 60, 72, 90, and 120 seconds.

Switch #1 – Master (fixed cam): The "master" cam is the first one on the left (like reading a book) and is a solid part; you cannot adjust it. The "finger" or simulated-roller coming from the snap-action switch will lift out of the small notch of the master cam and run along the "high" side of this cam until it completes one full rotation. Then the finger will drop down in the notch and shut the cycle off.
(Service Note: If the timer finger continues to run over the notch, that condition is usually a sign that the master switch points fused together and must be replaced.)

Switch #2 – Detergent (adjustable cam): This is the detergent cam and operates when the finger drops onto the lower cam or notch. This is an adjustable cam, meaning there are two wheels each having half-low and half-high cams. When they are moved back and forth (rotated), a notch opens to the lower cam. The finger will follow the high cam until it drops down to the lower cam. When this finger drops, it sends a signal to operate the detergent chemical pump. You can lengthen or reduce the amount of time the pump delivers chemical by opening or reducing the size of the notch. This notch should be located close to the beginning of the wash cycle to maximize the use of chemical in washing. This is done by moving the opening cam toward the beginning of the wash cycle, then bring the closing cam to an appropriate position. The pump should remain on long enough to deliver 1500 – 2000 ppm of detergent.

Switch #3 – Drain (fixed cam): This switch operates the same as the detergent, only its cam is fixed and cannot be adjusted. It regulates the time between wash and rinse cycles.

Switch #4 – Fill or H_2O (adjustable cam): This switch operates the same as the detergent, and is an adjustable cam the same as the detergent. It is important in adjusting this cam to note when water is finally drained out. That is the point water should enter and flush the machine before the drain ball closes the drain. When the spray arms return to full and steady spray arm pressure that is the point when this fill signal should cease. Water pressure will cause this length of fill time to vary widely. Poor water pressure can require such a long fill sequence, that the machine's operation is compromised. Consult service instructions in this case.

Switch #5 – Sanitizer Pump (adjustable cam): This switch also operates the same as the detergent cam. It should begin to operate about the time the machine is re-filled. The length of the notch opening depends on how much water is needed. The sanitizer level should be tested to 50 ppm chlorine; it is increased according to time. This cam can be adjusted by closing or opening the notch length.

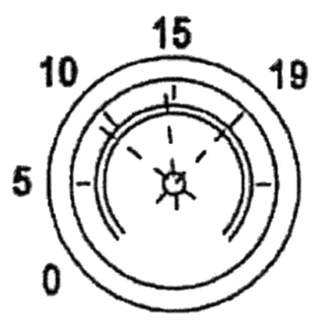
Switch #6 – Rinse-aid Pump (adjustable cam): This switch also operates the same as the detergent cam. It should operate about the time the machine is re-filled. The length of the notch opening depends on how much rinse-aid is needed to start the sheeting action on the dishware. This cam can be adjusted by closing or opening the notch.

SPRAY ARM PRESSURE TESTER
For Batch-type, Dump/fill Dishmachines

(ADS tester, kit # 88-1048)

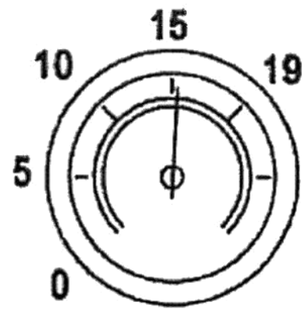
Reading of "0" when pump is stopped

When the pump starts with water in the tank, normal pressure should read approx. 19 psi.



Recovery has three typical surge patterns before normal pressure returns

The pattern of the needle movement tells the story of what is taking place in the pump dynamic.



The needle pattern wil tell:
1. Is the impeller clogged
2. Is there enough water
3. Is the water too hot
4. Are the wash arms wore
5. Is there foam in the system
6. The point of pump recovery

A blocked or clogged impellar will show the same recovery patterns but overall pressure will drop in 2 psi increments

L603DW
CYCLE TIMES