

PRETREATMENT INFORMATION & TROUBLESHOOTING GUIDES

Pretreatment is just one aspect of a total finishing system. Problems with the finished product do not necessarily mean a problem with pretreatment. There may be problems with paint quality, paint application, curing ovens, etc. Sometimes the problem is a result of two or more aspects of the finishing system as a whole. Therefore, it is very important that our operators are skilled and knowledgeable enough to recognize and solve problems with the entire system as soon as possible.

This guide will deal with the problems commonly found in pretreatment parts of a finishing system. We will begin with the mechanical cleaning of the metal and end with the parts about to enter the paint booth.

1. Mechanical Pre-cleaning

The cleaning process starts at the abrasive blast machine. The abrasive blaster removes rust, mill scale, and other contaminants (such as residues left on and around welds by the welding process). It accomplishes this by propelling tiny beads of metal at the part. Other systems use sand, metal grit, glass beads and even walnut shells!

The abrasive machine has a “window of operation”, which is the area inside the machine where the cleaning is the most thorough and efficient. Parts which are hung outside this window (very tall parts, for example) will not be cleaned as well as parts within the window of operation. This must be kept in mind when hanging parts on the line. The abrasive blast machine is tested regularly and Preventative Maintenance performed to ensure everything is working up to its’ capability. Observing parts coming out of the blast machine before entering the wash is the best way to tell if the machine is doing its job. They should be free of any rust or mill scale and uniformly silver in appearance.

5 STAGE WASH SYSTEM

1. Stage One – Cleaning – Inpro-Clean 1300 (Oakite)

Stage one of our five stage wash is the cleaning stage. Inpro-Clean 1300 is an alkaline cleaner (pH is above 7.00) which means it cleans inorganic soils the best. These soils include grease and any oils that may be on the substrate (part). The purpose of this stage is to get the metal as clean as possible in preparation for the phosphate conversion coating (Stage 3). Parameters for concentration, pH and temperature must be closely adhered to or the bath simply will not perform its job as well. If concentration is slightly high, there will be no adverse effect. However, if concentration is extremely high, the parts may not rinse properly and there may be an alkaline residue left on the parts. If concentration is extremely low, the stage may fail to completely remove all of

the oil or shop oils from the metal surface, thereby leaving the metal not clean enough to perform a proper phosphate conversion of the metal in stage 3.

TDS is not measured in either this stage or the phosphate stage (Stage 3). TDS stands for 'Total Dissolved Solids' and is a measurement in parts per million of the contamination of the solution. In a cleaning or phosphate stage, the TDS reading is too high to be measured. This is because, if a cleaning stage is doing its' job properly; there will be lots of contamination in the solution. In a phosphate solution, measuring TDS will give you a reading of the phosphate in the solution and therefore will not be an accurate indicator of contamination.

Maximum conveyor speed allowed for Inpro-Clean 1300 to perform properly is six feet per minute.

2. Stage 2 – Fresh Water Rinse

The cleaning stage is followed by a fresh water rinse to rinse off any alkaline cleaner from the parts and neutralize the pH of the metal, to prepare it for the phosphate conversion coating. The temperature is ambient; there is no heater on this stage. An effect of this rinse being at a low temperature is that it may not remove the Inpro-Clean 1300 residue on the parts as effectively. If the temperature is very high, there are no adverse effects. In fact, the high temperature should help remove any residues on the metal surface more thoroughly. It is very important to keep the TDS of this rinse down to well below 530 PPM. If not, you do not have clean parts going into the phosphate stage which would result in a poor phosphate coating and therefore, poor paint adhesion and durability.

Overflow from stage four (another fresh water rinse) flows to a riser directly after this stage to keep the parts from drying down between stages, that also flows into the tank of this stage. The TDS (total dissolved solids) of the tank must be monitored very closely to ensure your rinse water is pure and clean enough to perform effectively. There is also an automatic TDS sensor on this stage that will start overflowing the tank when the TDS reaches approx. 450 ppm, to help keep the water clean. A contaminated rinse will leave a residue on the metal surface that will affect the iron phosphate conversion coating in stage 3.

3. Stage 3 – Phosphate – Cryscoat 347 or 547 (Oakite)

The purpose of this stage is to place on top of the substrate, a phosphate coating, which serves to protect the metal from premature corrosion. The conversion (or phosphate) coating enhances paint adhesion and improves the corrosion resistance of the metal surface under the paint. Keeping this solution well within parameters is critical, as slightly too high or low pH, concentration, or temperature measurements can greatly affect the quality of the coating.

Essentially what happens is the acidic (below 7.00 pH - usually around 4.75 pH) solution 'attacks' the top layer of the substrate and actually removes some of it. These metal particles attach themselves to free phosphate acid molecules in the bath and then reattach back onto the part, as an insoluble metallic phosphate crystal. The surface is being changed to another form rather than depositing a separate and distinct layer on it. The result is a smooth, invisible, phosphate conversion coating on the surface of the part. This process is virtually an instantaneous reaction, which explains why it can occur in only 1 1/2 minutes (the dwell time of this stage). It simply converts the metal

into a 'passive' state that now resists corrosion or rusting. This is an extremely delicate balance, as too great a concentration of acid will result in too much metal attack and insufficient acid will result in too little phosphate coating.

Controlling the concentration of this bath is extremely important. A concentration slightly too high will not affect the coating. A very high concentration will leave a white phosphate residue on the metal surface. This residue will lessen paint adhesion. A very low concentration will not produce an adequate phosphate conversion coat, which will result in flash rusting on the metal surface. Therefore, it is very important to closely monitor the concentration of your phosphate bath.

A 'good' coating weight is around 45 mg/ft², with an acceptable range of 25 - 60 mg/ft². We send test panels away to be tested for coating weights every 3 months. They simply weigh the unpainted and washed panel, soak it in an acid bath to remove the phosphate coating, and then reweigh the panel to obtain the weight of the coating in milligrams.

The pH measurement is also extremely important. Correct pH is essential for the phosphate action to occur, so it must be monitored constantly. Too low a pH (very acidic) will result in too much metal attack, resulting in a very high coating weight. This will be evident by a white, powdery film on the part coming out of the wash. This results in poor corrosion resistance. A very high pH will result in an insufficient coating weight, which will result in premature rusting problems. If you stay within parameters you should not have any of these problems.

Finally, temperature is yet another factor in an iron phosphate bath that is critical to the performance of the solution. An extremely high temperature will result in dry down on metal surfaces of the parts before they get to the rinse stage. This residue would affect paint adhesion. A very low temperature will reduce the reactivity of the phosphate solution resulting in less coating and lower coating weights.

4. Stage 4 – Fresh Water Rinse

Following the phosphate stage is another fresh water rinse. As with the first rinse, TDS for this stage should be well below 530. This rinse washes off any residue of phosphate solution left on the parts and stops any further reaction. As with the stage two rinse, this rinse's temperature is ambient and unheated - although they do rise in temperature as the wash is running because of the warm parts passing through from previous stage. If the temperature is quite high, there is no adverse effect. In fact, the higher temperature will help remove the phosphate salt residue on the metal surface. A low temperature rinse may not remove the phosphate salts effectively. There is a fresh water riser (that uses city tap water to rinse the parts) directly after this stage, to keep the parts from drying down, that flows into the tank. This also helps keep the TDS from getting too high.

5. Stage 5 – Sealant – Gardolene (Oakite)

Stage Five is a final, 'sealing' rinse which essentially removes any phosphate or water salts from the metal surface and fills in the cracks of the phosphate coating. This prepares (smoothes) the surface for painting. Once again, staying within specified parameters will assure you of the best results.

Maximum TDS allowed is 530 PPM. It is very important to ensure that your TDS stays below 530 or the solution may be too dirty to adequately do the job. This stage is also

prone to developing 'flock', which is essentially a smelly, alga-like bacterial growth in the bath.

The concentration of this solution must be monitored very closely. If the concentration is higher than the set parameter, you may get a residue on the parts coming out of the wash. This residue would greatly lessen the quality of the paint adhesion and durability. If concentration is too low, you may see flash rust on the parts because the solution is too weak to completely 'seal' the phosphate coating, leaving it exposed and susceptible to flash rusting. This flash rust affects paint adhesion, durability and naturally speeds up corrosion.

A very high temperature (above 60° C) may evaporate one of the ingredients in Gardolene, making the solution less effective. Also, the high temperature could produce alga-like growths in the solution. If the bath temperature is very low (below 21° C), the desired reaction of the bath may not occur. The temperature range recommended is 43° - 52° C.

The above was a brief description of the purpose and function of each stage of the five stage wash. If you wish to acquire more information on any one or all of the pretreatment stages, contact your Production Supervisor.

Troubleshooting

When troubleshooting your pretreatment system, it is important to remember your troubles may lie with other factors (ie: the paint itself, the metal condition before the blast machine, the painters' application, the shot blast machine, cure oven, etc). As this guide deals solely with pretreatment, the following assumptions will be made:

- a) The powder paint is fine.
- b) The paint booth/painters are good.
- c) The cure oven is operating properly.
- d) There are no airborne contaminants in the plant, which could cause paint failures (e.g. silicones).

When a problem arises, it should be looked at in a systematic and logical manner by:

- a) Identifying the problem.
- b) Gather all related (and seemingly unrelated) data. (ie. check all equipment, concentrations, pH, etc.)
- c) List all possible causes and solutions.
- d) Weigh the options. What is the most likely cause/solution to the problem?
- e) Select the most likely solution.
- f) Act.
- g) Did this solve the problem? If not, go back to your list of solutions and try the next best choice. Act again.
- h) If you have exhausted all possibilities - call your Production Supervisor.

Whenever there is a problem with too high/low concentration or pH for stages 1, 3, 5; check to ensure the chemical feed pumps are actually pumping chemical. To check, pull the feed hose from the pump out of the wash tank and see if chemical is coming out of the hose.

Safety: Do not stand in front of the hose when you pull the hose out of the 5 Stage Wash Tank. Wear proper Safety Equipment (ie. face shield, gloves (latex), chem. apron).

A. Rusty parts exiting the wash:

If the metal is oxidized or rusted, corrosion resistance and paint adhesion may be affected. The rust severity will vary depending on the cause. As soon as you note any large amount of flash rusting, corrective action is required.

Possible Causes/Remedies

- 1) **Line stoppages** - Will result in part 'dry-down' between stages, which results in flash rust. Also if the 'fog' or 'misting' nozzles are not working, dry down may occur.
- 2) **Sealer concentration too low** – If the concentration is too low (under the minimum allowable concentration), the solution may not be 'sealing' properly and flash rust will form. Check your titrations, get the concentration within parameters.
- 3) **Line speed** - If line speed is much slower or faster than normal, flash rust may occur as a result of either dry down, poor phosphate coatings, or poor sealer rinse.
- 4) **Phosphate pH/concentration** - If either of these factors are too high or too low, flash rust may be the result. Check your pH and titrations, get everything within parameters.
- 5) **Nozzles** - If nozzles are out of alignment, plugged, or pressures are too low in any of the five stages (especially phosphate), flash rust may occur. This is a result of a discontinuous or thin phosphate coating on the affected parts. Do a wash check as soon as possible.
- 6) **Rust on parts prior to wash** - Shot blast machine not doing an adequate job. Rust will not be removed in the cleaner stage. Therefore, it will remain on the parts throughout the wash. Check parts coming out of the blast machine for rust. Call Maintenance if rust is evident.

B. Dusty/White Coating on Parts

Loose, powdery and non-adherent phosphate will not provide adequate adhesion to metal and will reduce corrosion resistance (phosphate coating can be easily wiped off).

Possible Causes/Remedies

- 1) **Poor cleaning** - Check to ensure that the cleaner concentration, pressure, and nozzle alignment are adequate. Also, check for plugged nozzles in stage one. Tank cleanliness (both bottom of tank and bath itself) is also an issue. If there is excessive sludge and bath is dirty, it will not be cleaning adequately. Do a 'water break free' test at the end of the wash and also a white rag test to check if cleaner is performing well.
- 2) **Excessive phosphate coating weight** - Check the concentration of your phosphate bath (it may be high). Also, check the temperature. It may be high

as well. Usually, if your concentration is high in a phosphate solution, your pH will be low, which would also cause increased coating weight (the more acidic the solution, the more aggressive it is). Lowering the concentration (by turning down the feed and/or adding fresh water) should take care of the problem. This will also lower the temperature, which may also be a factor. The hotter the solution the stronger and faster the reaction, therefore, greater coating weight.

- 3) **Dirty or old phosphate bath** - If there is excessive sludge on the bottom of the tank, the result may be a loose, powdery phosphate coating. Check the bath for sludge build up. It may need to be dumped, cleaned and recharged. Call Maintenance.
- 4) **Stage four rinse may be dirty** - If there is too much chemical 'carry over' from the phosphate stage into stage 4, you could get this problem. Check your acid contamination and your TDS. Slow drain (or dump and clean tank) if contamination greater than 0.6% or if the TDS is higher than 530 ppm.
- 5) **Line stoppage** – Sometimes, if there is a long line stoppage, the parts caught in the phosphate stage will get an excessive coating, resulting in a loose, powdery film. Check parts carefully after any line stoppages and check your line speed, to see if it is much slower than usual. Always try to avoid stopping the line (unless it is absolutely necessary)!

C. Increased Chemical Consumption/Low Chemical Concentrations Possible Causes/Remedies

- 1) **Nozzle alignment** - One nozzle out of alignment can waste a lot of chemical and increase your contamination in other stages. Check all of your nozzles to ensure they are properly aligned in all stages.
- 2) **Increased production** - Has there been a notable increase in the amount of parts going through the wash? If so, you may have solved the problem! Increased parts = increased chemical consumption. Continue to check all other possibilities to rule out a problem.
- 3) **Carry-over/Drag-out** - If parts are hung on the line in such a way that they hold a lot of wash solution, there will be excess carry-over into the next stage. This will result in increased chemical consumption, low concentration, and cross contamination of your baths. Check to see that your parts are hung in the best possible position for drainage. Also, if there is an increase in line speed, there will be more carry-over than usual as the parts have less time to drain before passing into the next stage. In this case, the only thing you can do is keep your baths as clean as possible.
- 4) **Dirty bath** - Especially evident in the cleaning and phosphate stages. If your bath is old and/or dirty, you may consume more and more chemical in trying to keep it performing well. Check your sludge levels, solution appearance and do a 'water break free' test to see if your cleaning stage is working properly. Also, check the records to see if a dump, clean and recharge is due.

*** NOTE:** If you notice a definite shift (up or down) from your concentration 'target' on stages 1, 3, or 5; act as soon as you notice the trend! Do not wait until the concentration is 0.4 below target to change the feed meter setting. At that point, adjusting the feed meter by two or three seconds will not do much of anything. It is similar to letting a car slow down to 60 km/hr and then having to 'punch it' to get it back up to 100 km/hr! It is much easier to get it back up from 90 km/hr. Similarly, you should make adjustments when it is 0.1 to 0.2 below or above target. If you do let the concentration get very low, you will have to 'punch it' by manually adding enough chemical to raise the concentration back up to target. Refer to your parameter chart for the proper amount. ie: concentration target = 3.5% and tank capacity = 21,104 litres if your concentration = 3.1%; then you need to make up 0.4% add approximately 84 litres. (21,104 x .004)

D. Other

1) Foaming - stage 2 rinse

Possible Cause(s)

- a) High concentration contamination.
- b) Cold solution left sitting for long time without movement.
- c) Carry over from stage 1.
- d) Misdirected nozzles from stage 1.

Possible Solutions

- a) Add water/slow drain the tank.
- b) Check concentration and TDS. Slow drain if out of parameters.
- c) At earliest convenience, check alignment of nozzles in stage one. Also check how parts are hung on line (check for parts holding a lot of water).

2) Air bubble in feed pump line

Possible Causes

- e) Low feed pump setting.
- f) Tote may be low.

Possible Solutions

- a) Run pump at full speed for a few seconds and work air bubble out of line. If the above does not work, call Maintenance to have a look at the meter.
- b) Change out the tote if it is empty or very low.

3) Stage 3 pH too low

Possible Causes

- a) Concentration of phosphate may be high.
- b) Bath could be new.

Possible Solutions

- a) Add some water to raise the pH. Keep an eye on your temperature!
- b) Add small amounts of 714 (60 - 120 mls) until pH is above the bottom end of parameter. Monitor frequently to make sure it does not fall again. Also keep an eye on the concentration to ensure it stays within parameters.
- c) Be patient! The pH will rise in operation and once the bath ages a bit (if it is new).

4) Stage 3 pH too high

Possible Cause

- g) Concentration of phosphate may be low.
- h) Bath could be 'used up' and need changing.

Possible Solutions

- a) If concentration is low, add chemical (increase feed 2 - 3 seconds or if it is very low, add manually) to get concentration up to target.
- b) Check the records to see if the bath is overdue for a clean out. Also check the sludge level in the tank and the solution cleanliness. Do a phosphate test on the metal exiting the wash to ensure the bath is performing well.
- c) If the pH is above the high parameter set, plug in the OX/M to reduce the pH. Run the pump and time for 20 seconds, then check the pH. Give it enough time to adjust if it is still too high, add another 20 seconds worth.

Quality: When adding 714 and OX/M so only if you're other 'solutions' do not work. Additions of these chemicals to the bath should only be used as last resort, as they will affect the bath's effectiveness and age if too much is added.

5) Stages 2 and/or 4 TDS too high

Possible Cause

- a) Baths could be stagnating. Not getting enough fresh water.
- b) There could be carry-over from the previous stage (stages 1 or 3).
- c) Incorrect nozzle alignment. (i.e.: stage 1 nozzles spraying solution into stage 2).
- d) Parts could be extremely dirty (cleaning stage and/or blast machine not working properly).
- e) Tank/nozzles could be excessively dirty.

Possible Solutions

- a) Increase overflow of fresh water or turn on intake valve and slow drain tank.
- b) Check the way the parts are hung to ensure there is not carry-over of solutions from tank to tank.
- c) Do a wash check ASAP. Check the nozzle alignment in all stages and correct any misdirected nozzles.
- i) Inspect the parts going into the wash for mill scale, rust, oil or grease. Do a water break free test at the end of the wash to check how your cleaning stage is doing.
- e) Check the sludge levels on tanks 1, 2 and 4 to see if they need dumping and cleaning. Also, check your nozzles to see if they are plugged or dirty.

6) pH Meter will not stay calibrated

Possible Cause

- a) Buffers could be contaminated.
- b) Meter will easily lose calibration when being used in several different solutions with a variety of pH readings.
- c) Improper calibration.
- d) Batteries may be weak.
- e) Probe may be cracked or worn out.

Possible Solutions

- a) Make fresh buffers. (Avoid contamination by rinsing probe well with distilled water between different solutions.)
- b) Verify calibration and recalibrate if necessary before each set of titrations.
- c) Ensure you are calibrating the meter properly. Using clean, correct buffers.
- j) Try changing the batteries (even if 'lo batt' message does not appear). They may be weak.
- e) Check the probe for cracks (if nothing else works, you may have to call (Company) Maintenance to replace the probe).

7) Overspray out of wash entrance or exit

Possible Causes

- a) Pressure too high on stages 1 or 5.
- b) Misdirected nozzles in stages 1 or 5.
- c) Exhaust fans not operating

Possible Solutions

- a) Check the PSI on the pumps for stages 1 or 5. Turn down if they are above the designated number.
- b) Check your nozzle alignment in stages 1 or 5. Ensure that all nozzles on the 3 risers nearest to the entrance/exit of the wash are angled toward the center of the wash and none are pointing out of the wash.
- c) Ensure fan switch is on; if it is call electrical maintenance immediately.

Note: In general, when troubleshooting a pretreatment problem, check out your most likely cause first and end with your least likely cause. Document everything you do so you do not miss any steps.

Sample Problem

Problem - poor white rag test results (reject).

Check:

1. Parts coming out of the blast machine - is there excessive grease, oil, rust, mill scale, etc.? If so, problem (may be) solved. Parts are too dirty to be cleaned adequately by the wash. The blast machine is not performing properly. Call Maintenance.
2. The sludge level in all wash tanks and solution cleanliness in all tanks (especially stage 1). One or more tanks may be very dirty and not cleaning/rinsing the parts well enough. (Your parts will only be as clean as the dirtiest part of your pretreatment system!)
3. Nozzle alignment and cleanliness. If the nozzles are out of alignment and parts are getting poor impingement, they may be dirty. Also, if the nozzles and risers are dirty or plugged, the solution will be weak or contaminated. A good indication of plugged nozzles will be higher than normal pressure. Low pressure indicates missing or worn out nozzles, or leaking risers or spray pipes.

One of the above solutions should solve your problem with poor white rag test results. If you cannot solve the problem quickly on your own, call your Supervisor and (Company) Maintenance.

NOTE: If you ever experience a more serious problem that may potentially result in injury, equipment damage or rejected parts, do not hesitate to call your Production Supervisor and Maintenance immediately!

3 STAGE WASH SYSTEM

1. Stage 1 – Cleaning/Phosphate – Crycoat 347 (Oakite)

The three stage wash is a combination cleaning/phosphate stage. The cleaner and the bath itself is acidic (pH is below 7.00) and it cleans organic soils the best. Organic soils include dirt and dust, but not grease or oil. Therefore, it is important that the parts going into the wash are free of grease and oil. These are inorganic soils and will remain on the parts and if they are painted, may cause the coating to fail to adhere or cause other paint problems.

The other function of this bath is to place on the part surface a phosphate coating, which serves to protect the metal from premature corrosion. Essentially how this works is the acidic solution “attacks” the top layer of the substrate and actually removes some of it. These metal particles attach themselves to free phosphate acid molecules in the bath and then reattach back onto the part. The result is a smooth, invisible phosphate conversion coating on the surface of the part. This process is almost an instantaneous reaction, which explains why it can occur in such a short time and in combination with the cleaning function of the stage. It simply converts the metal into a ‘passive’ state that resists corrosion or rusting.

This is an extremely delicate balance, as too great a concentration of acid will result in too much metal attack and insufficient acid will result in too thin a phosphate coating. The pH and temperature are also crucial factors. Too low a pH reading (very acidic) will result in too much metal attack, resulting in a very high coating weight. This will be evident by a white, powdery film on parts coming out of the wash. This would result in poor corrosion resistance. A very high pH will result in an insufficient phosphate coating and also giving you poor corrosion resistance. A very hot bath will cause the reaction to occur at a greater rate and more aggressively, giving you heavy coating weights. If temperature is too low, your reaction will be weak and slow, which will result in low coating weights. For these reasons, you must be extremely careful to monitor your bath closely and keep everything within parameters.

2. Stage 2 & 3 – Fresh Water Rinses

The following stages are fresh water rinses. The purpose of these rinses is to wash off any residue of phosphate solution left on the parts and stop any further reaction.

The rinse water is ambient temperature (unheated). Two things are very important to watch. First, the TDS must remain well below 530 PPM to be clean enough to adequately rinse your parts. Second, you must ensure that your acid contamination stays below 0.6 mls. At the beginning of each week, a fresh water titration from the tap should be performed so that when you do a wash test you can subtract this number from your answer to get a true contamination reading.

If you find you are continually getting high TDS and contamination readings, there are three things you should check:

- a) Risers and nozzles - Check your nozzle alignment and cleanliness in all three stages. Misdirected nozzles from stages one or three will cause the bath to become contaminated very quickly, as well as plugged or dirty nozzles or risers.
- b) Overflow - The last row of risers in stage two is incoming fresh water and causes continuous overflow in the tank. This riser should always be on.
- c) Parts on line - Check the way your parts are hung on the line. If they are holding a lot of solution from stage one and are carrying it into stage two, the result will be a high acid contamination in your rinse. Always hang your parts to allow excess solution to drain out immediately.

Troubleshooting

When troubleshooting any pretreatment system it is important to remember that problems may also exist with the paint, application equipment, curing ovens, sloppy application by painters, etc. Because this guide is directed toward pretreatment the following assumptions will be made:

1. The paint quality is fine.

2. The application equipment and applicators are working properly and applying the coatings adequately.
3. The cure oven is operating properly.
4. There are no airborne contaminants in the plant, which can cause paint failures (ie. silicone).

Whenever a problem arises it should be addressed in a systematic and logical way by:

1. Identifying the problem.
2. Gather all related (and sometimes seemingly unrelated) data. (ie.: check all equipment)
3. List all possible solutions.
4. Weigh the options.
5. Select the best alternatives. (ie: Most likely cause of solution.)
6. Act now!

Continue this cycle until your problem is solved.

Keeping the above process in mind, here are some common problems that may occur and some possible solutions.

1. Poor Adhesion/Corrosion Failures

- a) Is there a cleaning problem? Perform a “water break” test on parts exiting the wash. The water should not “bead” on the part.
- b) Check stage 3 operating parameters (time, temperature, concentration, pH) and adjust where needed.
- c) Any mechanical or equipment failures? (Faulty gauges or probes, clogged nozzles, pumps not working properly etc.)
- d) Age of the bath. (Is it time to dump and recharge?) Check the sludge levels in tanks and also the solution appearance.
- e) Steel supply. Has suppliers or material changed? Is it rusty? Check the parts exiting the wheelabrator.
- f) Has there been any change in the process prior to pretreatment? (ie: lubricant on the steel.)
- g) Conversion coating problem? Perform phosphate test on the metal, check with testing solution #47. Failure indicates an inadequate bath or clogged nozzles.
- h) Is the coating uniform? If not check the nozzles. If the nozzles are out of alignment you may get a poor or streaky coating.
- i) Check operating parameters of stage 1. Correct if anything is out of parameters.
- j) Run some tests using Q panels and B100 panels (pretreated panels). Poor results on Q panels indicate that the bath needs either adjusting, dumping, or both.
- k) Rinse quality? Check operating parameters and adjust if needed. Check sludge levels in rinse tank. Check nozzle alignment and cleanliness.

2. Rusty Parts

- a) pH of stage 1 phosphate may be too high or too low. Get it within parameters.
- b) Incomplete cleaning. Refer to ‘poor adhesion/corrosion failures’ section.
- c) Line stoppage. Parts trapped in or between stages.

d) Check pump pressures, nozzle alignment and cleanliness in all stages.

3. Dusty or Powdery Phosphate Coating

- a) Excessive coating weights. pH too low, concentration too high in stage 1.
 - i) Check operating parameters.
 - ii) Lower the concentration, temperature or both.
 - iii) Check the pH. Get it within parameters.
- b) Bath needs changing. Excessive sludge. Check with Maintenance.
- c) Too much carryover into stage 2 rinse. Check your nozzle alignment and cleanliness in all three stages.
- d) Line stoppage or line moving too slow. Parts caught in phosphate stage.
- e) Incomplete cleaning.
- f) Phosphate adhering to dirt particles. Check parameters on stage one, do a white rag test on parts exiting the wash.

4. Increase in Chemical Consumption/Low Concentration

- a) Check operating parameters over the past number of weeks. If concentration goes very low, it requires a large amount of chemical to bring it up to parameters. Even fluctuating from lower to upper limits, will increase consumption.
- b) Chemical is exiting the bath by carryout or increased production.
 - i) Check nozzle alignment. One nozzle out of alignment can waste a lot of chemical. This should also be evident by a lowering of pH in stage 2 and a higher acid contamination titration.
 - ii) Are parts hung properly? ie: sloped backwards so water drains back into its stage?
 - iii) Has a new part or product been introduced to the paint line causing increased consumption?
 - iv) Has production increased recently? If so, this would explain an increase in chemical consumption.

Note: When adjusting chemical feed, use the timers on the pumps. Do not bypass these timers by unplugging them.