

Troubleshooting Guide for Powder Coating



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WHY POWDER COATING?

INTRODUCTION

Thermo setting powder coatings are now generally recognized as having a significant role in the metal finishing industries world-wide. Powder coatings have been a commercial reality now for close to thirty years

Powder coatings are used for the same key reasons as any surface finishing process:

- To protect the substrate they have been applied to
- To enhance the appearance of the item they have been applied to.

- The key benefits of powder coatings are often summarized by the five E's of powder coating.
- Ease of application
- Environmentally friendly
- Economical
- Excellence of finish
- Excellence of performance

Other benefits include:

- The elimination to a large extent of solid waste disposal problems.
- Solvent emissions are virtually eliminated, resulting in much easier compliance with EPA regulations.
- Energy costs are greatly reduced and Volatile Organic Component easily controlled.
- No solvents are required in mixing, cleaning or maintenance.
- Up to 99% of powder overspray can be recovered and reused. The 1% residual can easily be disposed off as a solid.

For these reasons there has been a rapid growth in the coating industry.

Powder coatings are often used as alternatives to liquid paint finishing. In comparisons with traditional liquid finishing, powder coatings offer two significant application benefits:

- they are single coat finishes, with no primer required.
- High film thickness can be achieved with a single coat.

The powder coating application process is also readily automated, enabling high volume industrial application plants to operate economically with a minimum of rejects.

These benefits have enabled powder coatings to take a significant share of the industrial finishing market.

APPLICATIONS

HOME APPLIANCES

In the home appliance industry, powder coatings are well recognized as being a high quality finish for both major and minor applications. In the appliance finishing industry, the advantages of high corrosion resistance with single coat application has resulted in powder coatings being used on a wide variety of electrical appliances, including; air conditioners, clothes dryers, cookers, dishwashers, fans, freezers, microwave ovens, rice cookers, refrigerators, stereo components, television components, video components, washing machines, water coolers.

In addition to the major appliances noted powder coatings are also widely used for smaller appliances such as toasters, irons, can openers, juice extractors, food processors, vacuum cleaners and floor polishers.

AUTOMOTIVE COMPONENTS

Although powder coatings are not yet widely used on auto bodies, they are finding growing applications on components for both interior and exterior applications. In most automotive applications, powder coatings are used for auto performance characteristics as most auto producers still prefer the use of liquid coatings for those areas requiring optimum appearance. Current applications in the automotive industry include:

air filter housing, alloy road wheels, brake calipers & components, bright trim molding, bumper bars, door handles engine blocks-iron & alloy, mirror housings, motorcycle frames, oil filter housings, rocker covers, seat frames, steel wheels assemblies, stereo system, components suspension systems, underbody primer, windscreen wipers.

FURNITURE

The furniture industry is a major market for powder coatings. Powder coatings are used extensively on both commercial and domestic furniture for both their performance and for their appearance.

The performance characteristics of powder coatings which make them so suited to the furniture industry include :

- toughness
- hardness
- corrosion resistance

ARCHITECTURAL

Powder coatings have developed a strong position in the architectural industry as a coating for aluminum profile, cladding and other building components.

ELECTRICAL AND ELECTRONIC INDUSTRY

Computer casings, computer components, encapsulation, telecommunications equipments.

METAL PRE-TREATMENT

Metal Pre-treatment prior to powder coating is essential step to ensure proper coating performance. Metal Pre-treatment prior to powder coating is of two types.

a) Mechanical surface Preparation.

b) Chemical surface Preparation.

For powder coating most commonly used surface preparation method is chemical pre-treatment.

It is essential for an applicator to know the following:

1. Need for Pre-treatment
2. Surface Preparation
3. De-rusting Processors
4. Activation
5. Conversion coatings for
 - a) Mild steel
 - b) Galvanised steel
 - c) Aluminum
 - d) Mazak
6. Trouble Shooting

1. Need for Pre-treatment: The performance of powder coating on a metallic surface mainly depends on Proper Pre-treatment of the substrate.

Proper pre-treatment is an essential factor because of the following advantages

(1. Pre-treatment process provides a clear, uniform, oil-grease free surface.

(2. Provides good adhesion of film

(3. It forms an inert layer which inhibits the corrosion of the paint film

General Pre-treatment Process sequence:

- a) De-greasing Process
- b) Water-Rinse
- c) De-rusting
- d) Water rinse
- e) Activation
- f) Conversion Coating
- g) Water rinse

De-greasing Process: Chemical de-greasing methods used in any particular application is closely related to the nature of the surface being cleaned and the amount and type of contamination.

The various chemical degreasing processes applicable to Mild steel, Galvanised Steel & aluminum substrates, are as follows:

Solvent Cleaning:

a) Solvent Wipe: Solvent cleaning is the cheapest and best method to remove heavy or sticky oil/grease like substances from any surface. Since all solvents are almost neutral they do not attack the base metal. In this process, the parts to be cleaned are wiped with a rag of cotton soaked in a suitable solvent such as Kerosene, Benzene, Naptha etc. The following are the advantages and disadvantages of solvent wipe method.

Advantages

- a) Cheapest cleaning method available in the industry to remove heavy oils, greases or sticky press compounds.
- b) Skilled labours and costly plant installation is not required.
- c) Suitable for smallest job coater as well as for OEM industry.

Disadvantages

- a) The process is labour intensive.
- b) Since all the solvents are flammable, a great fire risk is associated with the solvent cleaning.
- c) Frequent change of cloth and solvent is essential or otherwise it can affect the quality of cleaning.
- d) Solvent going into the drainage can cause effluent disposal problem.

Vapour De-greasing:

Vapour de-greasing is quite a sophisticated method of cleaning.

In this method, special type of solvent is used which has following advantages.

- Mineral & veg. Oils removal is faster.
- Has lower boiling point than water
- Non-toxic to human being.

This process requires a closed system in which the item to be cleaned is exposed to the condensing vapours of solvent. This method effectively removes light oils, greases but cannot remove heavy oils, greases, and sticky press compounds.

Advantages

- a) Very good method for cleaning light oils, greases.
- b) Less risk of fire hazard, minimum pollution as it is a closed system.
- c) Since the solvent used is a not-toxic there is no danger for the operating worker.

Disadvantages

- a) Require costly plant installation and skilled labour.
- b) Frequent removal of oil & grease is required or otherwise they increase the boiling point of solvent.
- c) Thin sheets having heavy oil grease or sticky press compounds can not be removed by the process as there is no mechanical action on the parts.
- d) Costly process.

Emulsion Cleaning:

Emulsion cleaners are popular as they are based on mild Alkalis and hence suitable to all substrates (Iron, Galvanised steel Mazak etc.) and operate at room temperature. Emulsion cleaners are generally based on either kerosene-emulsifier or turpentine-emulsifier. These cleaners are generally milky in appearance. Emulsion cleaners have a limited cleaning tendency and they leave a very thin film of solvent/emulsifier over the substrate even after water rinsing. Hence, Emulsion Cleaning is always followed by Alkali cleaning. In case of spray process the parts to be cleaned are suspended in a funnel wherein they are constantly exposed to the spray solution for 2 to 5 minutes at a pressure of 2-3 kgs/cm² for better results. In dip process, the parts to be cleaned are simply immersed in a bath of the cleaning solution.

This process has following advantages and disadvantages

Advantages

- a) Operates at a lower temperature (45-50°C) hence consume less energy.
- b) Suitable for all the substrates such as Mild steel, Mazak, Aluminium, Galvanised etc.

Disadvantages

- a) Limited cleaning ability as it can not remove heavy grease, oil etc.
- b) Not suitable for higher temp. As the emulsions are based on solvents which gets separated above 70°C from the emulsion phase.

Alkali Cleaning:

Alkali cleaners enjoy superior position in the Pre-treatment industry due to following advantages.

- They operate at room temp.
- Bath stability is higher compared to all other degreasing processes, low foaming tendency.
- Simple bath control.
- Costly plant installation is not always required.
- High capacity to absorb oil.

These cleaners are based on strong alkalis such as Sodium hydroxide, Sodium silicates, other fillers and builders such as soda ash etc, surfactants and additives.

The parts to be cleaned are immersed in this bath at a recommended temperature and time.

Strong alkaline cleaners are avoided in case of Manganese phosphate process as they can cause inferior quality coating.

Strong alkaline cleaners are also not suitable for non-ferrous substrate such as Zinc, aluminum, Brass, Copper, Glass, Galvanised Steel, because all these metals readily get attacked by strong alkalis.

De-rusting: Corrosion is common phenomenon for metals. Iron or steel when exposed to humid atmosphere the corrosion process is initiated resulting in rust formation.

Rust is the oxide of iron which is loosely adhered to the substrate and hence it is very dangerous if overcoated by any surface coating. Rust is readily soluble in acids such as Hydrochloric acid, Sulphuric acid, Phosphoric acid and hence it can be removed by acid cleaning.

De-Rusting Process

Advantages

- a) Cheaper process than blast cleaning or flame cleaning.
- b) Can be done anywhere, no big plant or sophisticated equipments are required.
- c) Remove rust, Mill scale.
- d) Makes the surface reactive for the next phosphating stage.

Disadvantages

- a) If Hydrochloric acid or hot Sulphuric acid is used for derusting it can create a corrosive atmosphere in the plant.
- b) Not suitable in case of spray application.
- c) Carry over can create problem in next stage (i.e.) in phosphating bath.

De-rusting can be done with the following acids/acid combinations :

(1. **Hydrochloric acid Pickling:** Hydrochloric acid is fuming acid and mostly used for "Pickling", as it readily dissolves the mill scales formed during the hot rolling operations. Hydrochloric acid pickling is the cheapest de-rusting process. The use of Hydrochloric acid is very limited in the industry due to the corrosive nature of the Hydrochloric acid fumes which can create problem in the coating plant and secondly the carry over of Hydrochloric acid to the next pre-treatment stage (i.e.) either activation or phosphating can damage the bath permanently.

In case of Pure Hydrochloric acid de-rusting the tank should be of Stainless Steel.

(2. **Sulphuric Acid:** Sulphuric Acid is a strongest acid and it is most suitable for the heavily rusted components. Sulphuric Acid at an elevated temp.(50-60°C) gives outstanding results in a short time. The use of hot process is limited in the industry due to the corrosive nature of Sulphuric acid fumes. The use of inhibitor is must in hot process to avoid the excess attack of acid on the base metal. Carry over of Sulphuric Acid bath in phosphating bath can permanently damage the phosphating bath. For Sulphuric Acid based derusting the tank should be of either stainless steel or Mild steel with lead lining.

(3. **Phosphoric Acid:** Phosphoric acid based de-rusting process is more popular in the finishing industry due to its following advantages.

- a) It gives a uniform & fine de-rusting pattern which ultimately gives less coarser coating in phosphating.
- b) It has less pitting tendency than Hydrochloric acid & sulphuric acid based derusting.
- c) It does not emit any corrosive hazardous fumes.
- d) Carry over of bath solution does not create much problem.

Phosphoric acid based de-rusting is costly as compared with Hydrochloric acid or Sulphuric acid. For Phosphoric acid based de-rusting, the bath should be of Stainless steel.

Activation Process: This process provides fine active crystal centres on the surface of the metal which ultimately results into fine phosphate coating layer in phosphating stage. This process helps to attain a uniform phosphate coating. There are two types of activation processes:

- a) Acidic Activation
- b) Basic Activation

a) Acidic Activation: This is a cheaper process. Here bath testing and control is not required. Bath can be prepared in hard water. The process results into coarser bigger crystalline coating. Not suitable for non ferrous substrates such as Aluminium.

b) Basic Activation: This process is based on titanium based compounds which are most suitable for Ferrous & non Ferrous substrate. It gives more compact, uniform fine crystalline coating having better corrosion resistance. Disadvantages are 1) The bath is unstable (Titanium forms colloids in aqueous solutions) 2) Bath cannot be prepared in hard water.

Conversion Coatings: Phosphating is universal method of metal Pre-treatment. Phosphating consist of the deposition on the metal surface of insoluble metal phosphates which are actually chemically bonded to the substrate. Since this is a chemical reaction, it gives good adhesion for paint film. Phosphating can be either crystalline or amorphous.

This process provides the following:

- a) A clean, grease/oil free surface.
- b) A corrosion inhibitive base for powder coating.
- c) A non-conductive bond between base metal and powder coating.
- d) A chemically inert surface which prevent the reaction between the base metal and powder/paint ingredients.

Phosphating process is divided into 2 types,

- a) Zinc Phosphating (sub-divided into Mono, Di, Tri Cationic Process).
- b) Iron Phosphating

a) Zinc Phosphating: Zinc phosphating process is widely in the automobile, hardware, home appliance industry. Zinc Phosphating bath solution contain a saturated solution of phosphoric acid along with Zinc phosphate. On immersion of an article in such a bath the iron gets attacked by the acid component of the bath, by lowering its concentration at

the metal surface. After certain time (within 2min. Maximum) the phosphate crystallises on the metal surface. Since this is a chemical reaction between the metal and the phosphating solution, it stops after the formation of crystalline phosphate layer. It is not advisable to keep the parts/components in the phosphating bath for more than 10 minutes because the bath pH is acidic (between 4.8 to 5.5, depending on the bath concentration) and at this pH the coating formed gets dissolved slowly thereby leaving the bare metal, which is again attacked by the phosphating solution forming fresh crystalline layer of phosphating. This process may go on till the end of the metal and it unnecessarily increases the chemical consumption.

Zinc phosphating is sub-divided into 3 types:

Mono-cationic: Cations are positively charged ions. Zinc is the basic cation in all crystalline phosphating processes. Mono-cationic processes are comparatively cheaper than di & tri cationic processes. The bath solution contains only zinc as a cation. These processes find a very limited use in the industry as they have a limited corrosion resistance.

Di-cationic Process: In this type the bath solution consists of zinc and Nickel as cations. Zinc imparts adhesion and Nickel contributes to the corrosion resistance. Hence coating formed in this type is more durable and withstands drastic corrosive atmosphere than Mono-cationic.

Tri-cationic Process: In this type, the bath solution consists of zinc, nickel and manganese as cations. Manganese improves wear resistance of the phosphate coating. Hence coatings formed in this type are more superior [w.r.t](#) adhesion, corrosion resistance and wear resistance.

Today tri-cationic process is more popular in the metal pre-treatment industry because
(1.It gives superior quality coating along with better corrosion and wear resistance.

(2.Generates lesser amount of **Soft Sludge** as compared with mono or Di Processes.

This process is mostly acceptable by automobile industry (most used prior to Electro-deposition process) Home & consumer appliance industry etc. Suitable for Mazak and Aluminium.

b) Iron Phosphating: Iron phosphating is of limited use in the pre-treatment industry although this has got its own segment. Iron phosphating does not contain any zinc like cation. They are based on sodium or dihydrogen phosphate as a major ingredient along with accelerators such as molybdate. The coating formed is non-crystalline (amorphous) and having dark bluish colour. The major advantage of Iron phosphating is (due to its non-crystalline nature) iron phosphated parts can be welded prior to powder coating. Iron phosphated parts when powder coated give outstanding mechanical properties.

Conversion coating for Aluminium: Aluminium can be pre-treated by the following ways.

(1.Phosphating (Tri-cationic Zinc)

(2.Chromatising (Green, Yellow or colourless)

Phosphating : Aluminium parts can be phosphated like mild steel. For Aluminium mild degreasing chemicals should be used. Heavy, strong degreasing chemicals can cause excessive etching to the base metal. Derusting process should be avoided in phosphating sequence, which should be replaced by desmuting process (parts to be dipped in 10% Caustic Solution for 1 to 2 minutes).

Phosphating process is not popular in Aluminium pre-treatment because Aluminium ions beyond a limit can cause poisoning to the phosphating bath.

CHROMATISING:

a) Green Chromium Phosphate: This is general process for the pre-treatment of Aluminium. This bath contain Mixtures of phosphoric acids, chromic acids and additives. This process is more popular in the food industry as it is non toxic. This process forms excellent substrate for powder coatings. The coating formed is dark green in colour weighing 0.5-1.5 gm/m². It gives limited corrosion resistance.

b) Yellow chromium chromate : This process is more popular in the powder coating industry. The bath contain mixture of chromic acid along with accelerators. This process gives dark yellow coloured (process applicable to OEMs) coating which is having high corrosion resistance. Since this process is based on hexavalent chromium, it suffers from the disadvantages such as effluent problems etc.

c) Colourless coating : This process is a modified process originated from process b) and used for certain application (lacquer coat/- clear coat applications) where it is desired to retain the original metallic Aluminium appearance. The coating formed is having limited protected value. This process is not popular in the industry.

[A trouble shooting guide to iron phosphating](#)

PROBLEM	CAUSE	REMEDY
Poor Coating formation in phosphating stage.	pH not in range See "Poor Cleaning"	Adjust pH (down with acid, up with Caustic)
Poor Cleaning in De-greasing stage	De-greasing bath Temperature too low. De-greasing bath Concentration too low. Poor exposure to cleaner solution	Increase the bath temperature Increase concentration of bath. Check racking . Check nozzles Check pressure. Increase the pressure if necessary.
Spotty Coating / Streaking	Contamination rinses. Poor Cleaning	Check rinse tanks See "Poor Cleaning"
	Contamination rinses. Poor exposure	Check rinse tanks. Check racking. Check nozzles.
Rusting	Coating weight too low Dry-off too slow. Drying between stages.	Increase the bath temperatures Lengthen time in phosphating stage. Increase concentration of bath. Increase temperature in final rinse. Run at lower temperatures. Better placement of nozzles. Use fog nozzles.
Solutions foaming in degreasing	De-grease bath temperature too low	Increase the bath temperature.
	Pressure too high. Pump picking up air.	Check for plugged nozzles. Check pump packing. Check water level.
Poor Paint Adhesion	Phosphate Coating too heavy	Lower temperature. Lower concentration. See "Poor Cleaning"
	Poor cleaning in de-greasing stage. Contamination.	Look for source of silicone near washer. Check raw material for excessive oil.
	Bad Steel.	

A trouble shooting guide for Zinc phosphating

PROBLEM

Coating weight too low

CAUSE

Phosphate or Accelerator concentration too low.
Phosphate bath temperature too low.
Process time too low.

REMEDY

Increase Concentration.
Increase phosphate bath temperature.
Lengthen time phosphating stage.

Coating weight too high

Phosphate or Accelerator concentration too high.
Process time too long.

Decrease concentration

Shorten time.

Powder on Coating

Poor rinses.
Excessive sludge.
Accelerator concentration too high.
Higher bath temperature.

Keep rinse overflowing.
D-sludge tank.
Allow concentration to drop.
Lower the temperature of the bath.

Spotty Coating

Poor cleaning.
Low concentration of Phosphatizer or Accelerator.
Poor solution coverage
Resistant Metal.

Check cleaning tank.
Increase concentration.
Check racking and nozzles.
Add Jernstedt salts to rinse or clean tank.

Rusting

Coating weight too low.
Final dry-off too slow.
Dry-off between stages.
Higher free acid pointage in phosphating bath

See "Trouble-Coating Weight too Low"
Increase temperature in the final rinse use air blow-off.
Better placement of nozzles
Use fog nozzles
Run at lower temperatures.
Reduce the free acid pointage.

Streaking

Poor cleaning
Poor rinsing
Dry-off between stages.

Check cleaning stage.
Keep over-flowing.
Better arrangement of nozzles.
Use fog nozzle.
Run at lower temperatures.

A trouble shooting guide for chromate process

PROBLEM	CAUSE	REMEDY
Bath pickles Metal and creates Dusty Coating.	Accelerator level too high	Reduce accelerator level by processing the aluminium or auto-draining* and adjusting the bath.
Low Coating Weight	Aluminium concentration too high in bath. Accelerator too low. Concentration too low. Total acid too high in relation to chromium concentration.	Autodrain* and adjust. Add accelerator. Add make-up chemical Autodrain* bath and adjust.
No coating	Total absence of accelerator in bath	Add accelerator
Sludge Plugging in Nozzles	Aluminium concentration in bath too high. Alkaline salts dragged into bath	Autodrain* bath and adjust Increase overflow rate of rinse following cleaner.

Trouble Shooting Guide for Powder Coating

INTRODUCTION

There are a wide variety of powder coating materials available; each with its own characteristics. Fluidised bed or electrostatic application can be used. Application reclaim and auxiliary equipment vary from supplier to supplier. However, there are operation problems common to all. This chapter will provide a systematic check list to follow when a problem arises.

Many of these problems can be avoided with good procedure and supervision. Close attention to a few critical areas will eliminate potential operation problems with a powder finishing system. Careful attention should be given to having a clean, dry, compressed air supply, clean sieved reclaim powder, good ground to parts and equipment, humidity controlled spray booth air, and regular inspection and replacement of wear parts. The powder coating equipment should be installed and operated as recommended by the equipment supplier's manual. Follow the recommendations on your powder coating material data sheets. Have a good regular preventive maintenance program and good housekeeping practices.

Following are some trouble - shooting procedures that may be of value in correcting difficulties that may arise with powder coating operations.

POWDER SUPPLY PROBLEMS:

1) Fluidized Bed Operation

Trouble

1. Dusting-powder blowing
Out of hopper

2. No air-precolaitng through
powder surface

3. Rat holing-air blowing large jet
holes through power surface

Possible Causes

1. Air pressure to high

2. Powder too fine

1. Insufficient air pressure

2. Plugged Membrane

3. Obstructed membrane

Stratification-powder separating

4. Compacted powder

into layers of fine and coarse
particles.

1. Powder level too low

2. Packed or moist powder.

3. Obstructed membrane

4. Plugged or broken membrane

1. Powder level too high

2. Powder too fine.

Possible Solutions

1. Adjust air regulator to lower pressure to fluid bed.
- 2a. Too much reclaim added to virgin powder
- 2b. Virgin powder pulverised too fine by manufacturer.
- 1a. Check air supply, Increase air regulator pressure
- 1b. Check air line size to equipment.
2. Check membrane for plugged pores dirty air supply.
3. Check bottom of bed for plastic, cardboard or other large obstructions.
4. Manually loosen powder and fluidize well with clean, dry air.
1. Add powder until hopper is 2/3 full when fluidized
- 2a. Manually loosen powder and fluidize well with clean, dry air
- 2b. Check compressed air and booth air for high humidity.
3. Check bottom of bed for plastics, cardboard or other large obstructions.
4. Check membrane for plugged pores from dirty air supply, cracks or holes.
1. Remove powder until 2/3 full when fluidized
- 2a. Too much reclaim added to virgin

powder.
2b. Virgin powder pulverized too fine by manufacturer

POWDER SUPPLY PROBLEMS :

2) Hoses and pumps : Venturi operation

Trouble

1. Plugged from impact fusion hard build-up
2. Insufficient powder feed.

Possible Causes	Possible solutions	POWDER APPLICATION PROBLEMS : 3) Electrostatic coating operation
1. Normal build-up 2. Air pressure too high 3. Moisture in air supply 4. Composition of powder feed hoses 5. Worn ventureries and wear parts 6. Powder too fine	1. Clean or replace parts 2. Turn down air settings on pumps and guns 3. Check air supply for clean, dry air 4. Check hoses. 5. Replace worn parts 6. a. Too much reclaim added to virgin powder 6 b. Virgin powder type pulverized too fine by manufacturer 7. Some resin types tend to have more impact fusion. Check with your powder supplier	Trouble 1. Poor charging inadequate powder build or wrap on part.
7. Powder type of formula		
1. Powder not fluidizing 2. Obstruction from contamination powder supply	1. See fluidized bed section. 2. a. Clean out ventureries and hoses 2b. Check powder supply for contamination 2c. Sieve all reclaim before using	
3. Kinked or flattened hoses.	3a. Replace if permanently deformed. 3b. Avoid sharp bends. Use hose saddles for reciprocators. 3c. Run hoses in covered trenches across traffic aisles.	
4. Worn pump ventureries	4. Replace worn parts.	
5. Low air pressure	5. Check air supply. Adjust all setting to pumps and guns.	

POWDER APPLICATION PROBLEMS :

Possible Causes

Possible Solutions

Trouble

1. High -voltage source not providing enough KV at charging electrode or grid.

- 1a. Check high voltage source is on. Systematically check electrical continuity from voltage source to electrode (grid)including cable, resistors and fuses.
- 1b. Replace missing or broken electrode (grid) insulated by powder build or impact fusion.
- 1c. Clean electrode (grid) insulated by powder build or impact fusion.

2.Poor penetration powder will not coat Faraday Cage areas (holes, grooves, channels inside corners and recesses.)

2. Poor ground.

2.Check ground from conveyor rail (or rub bar when used) through hanger to part. All contact areas must be free from heavy grease and other insulating material

3. Powder delivery (feed) is too high

3.Turn down powder feed until all material passing through charging carona (field) is adequately charged.

4.Excessive moisture in powder booth air.

4.Moisture in humid air will tend to dissipate humidity in the powder spray area.

5. Powder too fine.

- 5a. Too much reclaim added to virgin powder.
- 5b. Virgin powder pulverized too fine by manufacturer.

3.Back charging powder layers are repelled from part in spots.

6. Powder type or formula

6.Some resin type charge better than others and some formulas are designed for thin firm applications. Check with your powder supplier.

7.Powder delivery air too high. Powder blowing by part.

7.Turn down air setting or move gun position further away from part.

4. Powder picks up charge through powder hoses. Reverse charging usually through reclaim system.

2. Poor delivery and/or reclaim equipment ground.

Possible Causes

1. Powder delivery too high

2. Poor ground.

3. Powder spray pattern too wide

4. Voltage too high.

5. Powder delivery velocity too high

6. Poor gun placement

7. Powder too fine

1. Voltage too high.

2. Gun positioned too close to part.

3. Poor ground

4. Powder too fine.

1. Powder booth air too dry

2. Provide ground for all equipment.

Possible Solutions

- 1a. Turn up powder delivery air setting.
- 1b. Use barrel extension.
2. Check ground.
See page 16
2. Poor ground.
- solution.
3. Select smaller deflector or use suitable slotted barrel and cover. (consult your equipment supplier).
4. Turn voltage setting down so powder builds on part edges and leading surfaces do not repel powder from corner.
5. Turn air setting down so powder/air stream does not blow powder out of corners.
6. Adjust gun position so powder cloud has direct path to recess area.
- 7a. Too much reclaim added to virgin powder.
- 7b. Virgin powder pulverised too fine by manufacturer.
1. Turn down voltage setting.
2. Change gun placement away from part.
3. Check ground
See page 16
2. Poor ground
- solution.
4. a. Too much reclaim added to virgin powder.
- 4b. Virgin powder pulverized too fine by manufacturer.
1. Adjust powder spray area humidity.

Continued

Trouble

5. Powder feed spurting or slugging interrupted powder feed.
6. Poor spray pattern – not a symmetrical powder cloud (not applicable when using special deflectors for desired effect.)

Possible Causes

1. Insufficient air pressure volume
2. Hoses kinked, flattened or too long.
3. Hoses, pump venturies or guns clogged with powder.
1. Worn E/S gun parts.
2. Impact fusion build.
3. Delivery (feed) air too low.
4. Hoses, venturies or gun blocked with powder

Possible Solutions

- 1 Check air supply. Air supply piping to equipment is large enough. Enough air volume must be provided so that when other equipment such as reverse air cleaning in reclaim housing pulses, air pressure to powder feed does not drop.
2. Check powder feed hoses.

- 3a. Clean hoses, venturies and guns.
- 3b. Check air supply for moisture that causes powder compaction.
- 3c. Check spray booth air humidity.
- 3d. Check powder supply for contamination. Check reclaim sieve.

- 1.Repalce worn feed tubes, orfices deflectors and covers.
- 2.Clean gun parts as needed.
- 3.Check air supply, Increase air for powder feed.
- 4.Clean hoses, venturies and guns.

POWDER SUPPLY PROBLEMS : 4) Collection and reclamation operation

Trouble

- 1.Contamination in reclaim powder.

- 2.Spray booth dusting inadequate air flow through spray booth

Possible Causes

- 1.Reclaim in-line sieve torn, missing or inoperable.
- 2.Powder or dirt falling in spray booth from conveyer or hangers.

- 3.Contamination from parts entering spray booth

- 4.Contamination from plant air circulated through spray booth.

1. Bag or cartridge filters blinding

2. Final filters clogged

- 3.Too large of open area in spray booth housing.

- 4.Powder delivery (feed) too high

CURED FINISH PROBLEMS
5) Coating finish-cured physical properties

Possible Solutions

- 1. Replace sieve or repair as necessary
- 2. Clean conveyor regularly (or continuously) before entering powder spray booth. Strip hangers as needed.
- 3. Check cleaning pre-treatment equipment and ensure proper part drainage before spray booth.
- 4. Isolate spray booth area. Preferably enclose in a room filtered, humidity controlled air.
- 1a. Clean or replace bags or cartridge filters
- 1b. Check spray booth air humidity.
- 1c. Check reverse air cleaning.
- 2. Check filter bags or cartridges for powder leakage, repair or replace as needed.
- 3. Reduce open area. Increased opening reduces booth air velocity.
- 4. Reduce the number of spraying or the amount of powder to each gun.

Trouble

- 1. Poor impact resistance/ poor flexibility.
- 2. Poor adhesion
- 3. Poor corrosion resistance
- 4. Poor chemical resistance
- 5. Poor pencil hardness/poor abrasion resistance.

Possible Causes

- 1. Under cured.
- 2. Poor cleaning or pre-treatment.
- 3. Film thickness too high
- 4. Change in substrate thickness or type.
- 5. Powder resin type or formula.
- 1. Poor cleaning or pre-treatment
- 2. Change in substrate
- 3. Under cured.
- 4. Powder resin type or formula
- 1. Poor cleaning or pre-treatment
- 2. Under-cured
- 1. Under cured.
- 2. Powder resin type or formula
- 1. Under cured.
- 2. Powder resin type or formula.

Possible Solutions

- 1a. Increase oven temperature
- 1b. Increase dwell time in oven.
2. Check pre-treatment equipment and chemicals
3. Reduce film thickness by adjusting application equipment.
4. Check substrate with supplier.
5. Check with powder manufacturer.

1. Check pre-treatment process
2. Check substrate with supplier.
- 3.a. Increase oven temperature
- b. Increase dwell time in oven.
4. Check with powder manufacturer

1. Check pre-treatment equipment and chemicals.
- 2.a. Increase oven temperature
- b. Increase dwell time in oven.

- 1a. Increase oven temperature
- 1b. Increase dwell time in oven.

2. Check with powder manufacturer.

- 1a. Increase oven dwell time.

2. Check with powder manufacturer.

CURED FINISH PHYSICAL PROBLEMS

Trouble

1. Poor surface flow too much orange peel.

2. Gloss too low for high gloss powder

3. Gloss too high – for a Matt type powder

4. Contamination in powder.

5. Inconsistent film thickness

Possible Causes

1. Film thickness too thin

2. Heat-up rate too slow

3. Powder resin type or formula.

1. Incompatible powder contamination
2. Micro-pinholding from gassing.

3. Over cured film.

4. Powder resin type or formula

1. Under cured

2. Powder formula

1. See reclaim system : contamination No. 1 through No.4

2. Virgin powder contaminated

1. Guns positioned wrong.

2. Reciprocators not matched to line speed.

3. Air flow in booth disturbing spray pattern.

4. Defective spray equipment

Possible Solutions

1. Increase film thickness by adjusting application equipment.
- 2a. Increase oven temperature.
- 2b. Modify oven baffling to increase heat rate.

3. Check with powder manufacturer.

1. Clean application equipment before changing powders.
- 2.a. Check substrate for porosity.
- b. Check substrate for moisture.
- c. Check powder for moisture from reclaim or compressed air.
- d. Check film thickness, coating too thick.

3. Check oven temperature

4. Check with powder manufacturer

- 1a. Increase temperature of oven.
- 1b. Increase dwell time in oven

2. Check with powder manufacturer.

2. Check with powder manufacturer

1. Check and reposition guns so that spray patterns overlap slightly
- 2.a. Adjust line speed : Adjust reciprocator stroke.

3. Consult your equipment supplier.

4. Go through application section check list.

CURED FINISH PHYSICAL PROBLEMS *Continued*

Trouble

6. Off. Color.

7. Pinholing and gassing through coating surface.

8. Pull-way or tearing coating film shrinks leaving bare substrate.

Possible Causes

1. Improper oven

2. Bake time too long.

3. Oven temperature too high

4. Variation in film thickness

5. Powder formula.

1. See coating appearance section, low gloss, No.2 and No.3.

1. Uncharged powder.

2. Poor cleaning, metal preparation or dry off..

POWDER APPLICATION PROBLEMS
6) Output of powder insufficient to coat parts.

Possible Solutions

1. Check exhaust vent fan (s)
2. Adjust line speed
3. Lower oven temperature.
4. See coating appearance page 21, point 5 inconsistent film thickness causes point 1 to 4
5. Check with powder manufacturer.

1. See application section, poor charging, Page 16, causes 1 to 7.
2. Check pre-treatment process, dry off oven and part drainage.

Possible Reasons

1. Poor fluidizing properties in the powder hopper.

2. Blockage in ventureries and hoses.

Possible Causes

1. Pressure of fluidizing air too low.
 2. Fluidizing membrane is blocked
 3. Humidity of compressed air too high
 4. Humidity of the powder too high
 5. Free-flowing properties of the powder are bad.
1. Fusing of the powder in the venturi
 2. Fusing of the powder in the hoses.
 3. Fusing of the powder in the hoses
 4. Bad free flowing properties of powder.

POWDER APPLICATION PROBLEMS
Continued

Possible Solutions

1. Adjust (increase) pressure of fluidizing air.
2. Clean or replace the fluidizing membrane : see instructions of equipment supplier
3. Install an air dryer with a corresponding oil micro filter or another suitable drying system.
4. Check storage facilities. Powder shall be stocked at room temperature (30°C) in closed packing (Maximum humidity 60%)
5. Contact your powder supplier.

1. Clean or replace the hoses (see instruction of the equipment supplier) if necessary reduce pressure of powder of transport air.
2. Clean the hose by bending and breaking up the fused powder if necessary replace it.
3. Install an air dryer with a corresponding oil micro filter or an air dryer with a corresponding oil micro filter or another.
4. Contact your powder supplier.

Possible Reasons

3. Blockage in the gun.

Possible Causes

1. Fusing in the gun or gun outlet.
2. Blockage caused by contamination of the powder with dust of other coarse materials.

POWDER APPLICATION PROBLEMS

Solutions

1. Clean the gun according to the instructions of your equipment supplier. When blocking occurs frequently check humidity of compressed air and the freeflowing properties of the powder.
2. Clean the gun according to the instructions of equipment supplier and determine the reason of this contamination. (check powder pumps for possible impact fusion. Impact fusion particles which break off in the pump could be transported to the spray gun and result in blockage)

7) Poor or insufficient coverage

Possible Reasons

1. Insufficient wraparound

2. Poor penetration into corners, flanges, slots, etc

Possible Causes

1. Poor electrostatic charging of the powder.
2. Insufficient ground contact.
3. Output of powder too low
4. Using an unsuitable powder supplier.
1. Output of powder too low.
2. Insufficient ground contact.
3. Powder cloud too wide

POWDER APPLICATION PROBLEMS
Continued

Solutions

Possible Reasons

Possible Causes

- 1a. Adjust level of electrostatic kilovoltage (Increase).if not possible, check equipment and guns according to instructions of the equipment supplier.
- 1b. Check for broken electrodes on the spray gun. If found, replace electrodes.
- 1c. Check for possible frictional transport through powder hose. If evident, consult powder supplier for hose material recommendation.
2. Check the ground contacts using a measuring device. Correct and insure sufficient earth to ground control.
3. Turn up powder delivery air setting.
4. Contact your powder type.

3. Poor adherence of powder to part, powder falls from part easily.

1. Poor electrostatic charging of the powder.
2. Powder output too high or the pressure for the transport air too high, which blows the powder from the object.
3. Unsuitable particle size distribution of the powder or unsuitable powder type for the objects.

1. Turn up powder delivery air setting.
2. Check the ground contact and if necessary use a suitable measuring instrument.
3. Narrow powder cloud. If necessary install a more suitable deflector or adjust air for cone adjustment.

Possible Solutions

- 1a. Adjust level of electrostatic kilo-voltage. (increase voltage if not possible, check equipment and guns according to instructions of equipment supplier.)
- 1b. See "Insufficient Wrap around" problem 1b, page 25.
- 2.Reduce powder output and/or reduce pressure of the transport air.
- 3.Contact your powder supplier.

CURED FINISH APPEARANCE PROBLEMS

8) Coating finish-cured films appearances.

Possible Reasons

- 1.Dust, precured or other coarse material.
- 2.Matting or powder surface.
- 3.Orange-peel.
- 4.Cratering

Possible Causes

- 1a. Dust or other coarse parts on the metal surface.
- 1b. Dust or other coarse parts in powder.
- 1.Contamination with other powder (based on other raw materials).
- 1.Warming-up of the coated material is too slow or too fast.
- 2.Powder type too fast or too coarse particle size distribution.
- 3.Moisture contamination.
- 1.Contamination with other powder (based on other raw materials.)
- 2.Bad pre-treatment.
- 3.Contamination with incompatible materials from the spraying areas e.g. silicones

**CURED FINISH APPEARANCE
PROBLEMS**
Continued

Possible Solutions

- 1a. Check pre-treatment. High sludge level in phosphate bath.
- 1b. Check powder and locate the cause of this contamination; if necessary clean up the installation and use fresh or sieved powder.

1. Clean up the installation, if necessary contact your powder supplier.

1. Check curing cycle and curing oven; if necessary contact your powder supplier.

2. Contact your powder supplier.

3. Replace the powder.

1. Clean up the installation; if necessary contact your powder supplier.

2. Check pre-treatment and if necessary contact pre-treatment supplier.

3. Check the presence of incompatible materials : if necessary clean up the installation and contact your powder supplier.

Possible Reasons

5. Pinholing

Possible Causes

1. Humidity of the powder too high

2. Air entrapment with casting.

3. Gas entrapment and escaping due to chemical reaction.

Possible Solutions

1. Check storage facilities. Powder shall be stocked at room temperature in closed packing (maximum humidity 75%)
2. Preheat objects over 320 F (160°C) and cool down before applications (only galvanized), or contact your powder supplier, who can advise you a special developed powder.
3. Keep coating thickness below 100 microns; if necessary contact your powder supplier.