COST-EFFECTIVE PAINT AND POWDER COATING: SURFACE PREPARATION

GOOD PRACTICE: Proven technology and techniques for profitable environmental improvement
COST-EFFECTIVE PAINT
AND POWDER COATING:
SURFACE PREPARATION

This Good Practice Guide was produced by the
Environmental Technology Best Practice Programme

Prepared with assistance from:
March Consulting Group

With particular acknowledgement for contributions from:
Croftshaw Solvents Ltd
This Good Practice Guide is one of four complementary Guides providing advice on cost-effective paint and powder coating. It is aimed at paintshop and production managers whose operations include preparing metallic surfaces prior to coating.

Good surface preparation is an essential element in the efficient production of high quality products. However, costs are often higher than expected due to the inefficient use of materials and utilities, coupled with the cost of waste disposal.

This Guide explains how companies can improve their efficiency and reduce their costs by adopting good practice in surface preparation. Avoiding or reducing the need for surface preparation is one of the best ways of saving money, time and materials. This can be achieved by looking closely at the reasons for surface preparation and assessing each in turn.

This Guide covers:

- abrasive cleaning methods;
- degreasing;
- alternative cleaning methods;
- alternative cleaning agents;
- conversion coatings;
- combined cleaning and conversion;
- design, operational and management aspects of good practice in surface cleaning.

Typical waste arising during surface preparation processes, measures to reduce solvent consumption, the use of less organic solvents, particularly volatile organic compounds, and other ways of reducing waste are also described. Industry Examples illustrate the savings that can be made through optimising surface preparation systems.

There is an Action Plan at the end of this Guide to help you focus on the ideas that are most relevant to your company.

The other Guides in the series cover materials management, coating materials and application technology. All are available free of charge through the Environmental Helpline on 0800 585794.
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Introduction</td>
<td>1</td>
</tr>
<tr>
<td>2 Minimising waste</td>
<td>2</td>
</tr>
<tr>
<td>2.1 Sources of waste</td>
<td>2</td>
</tr>
<tr>
<td>2.2 Solvent use</td>
<td>2</td>
</tr>
<tr>
<td>2.3 Improving efficiency</td>
<td>3</td>
</tr>
<tr>
<td>3 Mechanical treatment</td>
<td>4</td>
</tr>
<tr>
<td>3.1 Brushing</td>
<td>4</td>
</tr>
<tr>
<td>3.2 Shot blasting</td>
<td>4</td>
</tr>
<tr>
<td>4 Chemical cleaning</td>
<td>5</td>
</tr>
<tr>
<td>4.1 Cleaning methods</td>
<td>5</td>
</tr>
<tr>
<td>4.2 Alternative cleaning agents</td>
<td>7</td>
</tr>
<tr>
<td>5 Conversion coatings</td>
<td>10</td>
</tr>
<tr>
<td>5.1 Plant design</td>
<td>10</td>
</tr>
<tr>
<td>5.2 Plant operation</td>
<td>11</td>
</tr>
<tr>
<td>5.3 Plant management</td>
<td>12</td>
</tr>
<tr>
<td>6 Combined cleaning and conversion</td>
<td>13</td>
</tr>
<tr>
<td>7 Action plan</td>
<td>16</td>
</tr>
</tbody>
</table>
The four complementary Guides to cost-effective paint and powder coating in this series are:

<table>
<thead>
<tr>
<th>Guide Number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GG50</td>
<td>Cost-effective Paint and Powder Coating: Materials Management</td>
</tr>
<tr>
<td>GG51</td>
<td>Cost-effective Paint and Powder Coating: Surface Preparation</td>
</tr>
<tr>
<td>GG52</td>
<td>Cost-effective Paint and Powder Coating: Coating Materials</td>
</tr>
<tr>
<td>GG53</td>
<td>Cost-effective Paint and Powder Coating: Application Technology</td>
</tr>
</tbody>
</table>

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These Guides are intended to help a range of companies, including:

- metal finishers;
- fabricators;
- component and assembly manufacturers for original equipment manufacturers;
- original equipment manufacturers.

These Guides are applicable to companies using paints and powders to coat in:

- predominantly manual operations, eg degreasing baths and hand-spraybooths;
- partially automated operations;
- fully automated operations.

Symbols printed at the top of relevant pages or Sections of the Guide are intended to help you find useful ideas for saving money, time and raw materials.

- save money
- save time
- use less paint and solvent

The mention of an organisation in this Guide should not be regarded as an endorsement of its services or products by the Environmental Technology Best Practice Programme.

The best way of reducing costs is to eliminate or minimise the need for surface preparation.
Good surface preparation is essential for obtaining a quality finish with a long service life. However, surface preparation is often overlooked when upgrading processes. Traditional methods may work well, but often at a higher cost than anticipated. This is especially true if waste disposal costs and utility (gas, electricity and water) costs are taken into account.

2.1 SOURCES OF WASTE

Wastes arise from a variety of sources including:

- spent surface preparation agents, eg worn-out brushes, contaminated solvents, spent acid solutions and spent blasting media;
- loss of surface preparation agents directly from the process, eg solvent losses from degreasers and the loss to drain of metallic compounds from conversion baths;
- inefficient or excessive use of water in rinse baths and in cooling process tanks;
- poor quality work giving rise to the need for rework;
- energy losses during the heating of process tanks;
- overuse and leaks of compressed air used for agitating baths and with air-knives.

2.2 SOLVENT USE

Organic solvents are widely used in UK industry for a range of processes. Typically, the metal coating industry uses trichloroethylene, xylene, methyl ethyl ketone (MEK) and white spirit, mainly in paints and for cleaning and thinning processes.

These, and other organic solvents, give rise to volatile organic compound (VOC) vapours and, currently, levels of these VOCs in the atmosphere are a subject of widespread concern and regulation. This is primarily because of their role in the formation of low-level air pollution affecting human health, crops and natural vegetation, but also because they contribute to global warming.

Recent legislation, eg the Environmental Protection Act (EPA) 1990 and its associated regulations, places strict controls on VOC emissions from industry.

Under the provisions of Part I of the EPA 1990, metal coating companies that use more than five tonnes of solvent a year are required to register with their local authority for an authorisation to operate. This applies to companies using solvents for cleaning, even if solvents are not used in the coating process itself, eg during powder coating. Under Local Air Pollution Control (LAPC), authorisations are granted by local authorities provided companies comply with the requirements of the relevant Secretary of State’s Process Guidance Notes. Advice about LAPC and other legislation governing your operation is available from the Environmental Helpline on 0800 585794.

Even if your company does not use enough solvent to be regulated under the EPA 1990, using good practice will still enable you to achieve significant cost savings. Companies approaching the registration threshold may also be able to postpone or avoid registration.

Good Practice Guide (GG50) Cost-effective Paint and Powder Coating: Materials Management gives advice on how to reduce paint and solvent use during coating operations. This Guide is available free of charge through the Environmental Helpline on 0800 585794.
2.3 IMPROVING EFFICIENCY

Several alternative materials and techniques for surface preparation have been developed in recent years in response to regulatory pressures relating to the use of certain surface preparation chemicals, eg chlorinated solvents used for degreasing.

Your company may already have been forced to change materials or processes. Or you may now be considering changes. When comparing your current system with alternatives, do not forget to take the cost of rework and customer returns into account.

Even if your company is not considering changing the materials or methods it uses for surface preparation, it may still be possible to identify ways of improving efficiency and hence reduce costs.

Eliminating or minimising the need for surface preparation can be achieved by assessing all the reasons the process is used and addressing each in turn.

- Reducing the length of time taken for surface preparation and improving stock handling conditions can:
  - reduce the amount of surface preparation required;
  - prolong the life of surface treatment agents;
  - remove the need for a particular surface treatment agent.

- Keeping items clean and in a dry atmosphere both during and after manufacture may eliminate the need to degrease and/or shot blast before coating.

2.3.1 Implementing change

The first thing you need to do when changing or improving any process is to identify:

- what is required from the system in terms of surface finish quality for subsequent operations;
- the true costs of running existing equipment.

Surface preparation process improvements can be divided into:

- Changing the material(s) used for surface preparation, ie ‘drop-in’ alternatives.
- Introducing a new preparation technique. This may also include a change of material.

The different surface preparation methods described in this Guide will not be suitable for all situations. When deciding which method is best for your particular application, you should consider the:

- character of the part, eg size, shape and composition;
- nature of the contaminant, eg oil, grease, scale or swarf;
- subsequent coating process;
- finish quality requirements.

Before making a final decision, ask the suppliers of the different technologies to carry out trials on parts used in your processes. Try to have trials performed using typical components with the heaviest normal contaminant. You may also find it helpful to talk to existing users of the system to get their views on how well the system works and to discuss any problems.
Abrasive cleaning is often used to:

- remove oil, swarf, grease and rust from a metallic surface;
- provide a good surface for paint adhesion.

The main waste produced by mechanical treatments is spent abrasive. However, inadequate cleaning leads to rework, which wastes both time and materials.

A variety of mechanical treatment techniques are available ranging from simple brushing to shot blasting.

### 3.1 BRUSHING

This is an effective technique for removing scale, rust, paint and other tightly adhering contaminants. It is not suitable for removing fluids.

The final finish is determined by the quality and cleanliness of the brushes. These should be regularly knocked, scraped or washed to remove built-up materials.

### 3.2 SHOT BLASTING

Most shot blasting systems can use a range of materials. Traditional abrasives include:

- metal particles;
- plastic pellets;
- organic substances such as crushed walnut shells.

Sand or materials containing free silica are not permitted for shot blasting.

Abrasive cleaning processes have also been developed using:

- carbon dioxide pellets which evaporate leaving only the contaminant to be disposed of;
- wheat starch which can be disposed of by incineration;
- sodium bicarbonate which leaves an aqueous effluent.

Given the increasing cost of solid waste disposal, it is worth considering whether your blasting process is making best use of the blasting media. Modern equipment designs and blasting materials allow you to maximise media collection and re-use by separating the blasting material from the contamination removed from the workpiece.

Once the abrasive becomes loaded with oil and grease from the surface being cleaned, it is increasingly difficult to obtain a good clean finish; shot blasting merely projects the contamination back onto the surface together with the shot.

Degreasing to remove most of the oil or grease from the component prior to shot blasting is beneficial.
Most forms of metal coating require the workpiece to be free of oil, grease, swarf and other contaminants (including existing coating).

When reviewing cleaning operations, it is important to consider the following questions:

- Is cleaning necessary?
- Is it possible to reduce the amount of contamination, eg by improving handling procedures or mechanically removing excess soils? Cleaning will then be easier, thus reducing the amount of solvent required or prolonging the life of the cleaning bath.

Some form of chemical cleaning is generally required as mechanical treatment (see Section 3) is often insufficient.

A wide range of cleaning agents is available for use with a variety of cleaning methods. When considering alternative cleaning agents and cleaning methods, it is important to evaluate:

- the effect on finish quality;
- any additional health, safety and environmental requirements.

For example, a substitute material may clean a surface adequately, but may pose a fire risk or require a discharge consent for the rinse waters.

Some of the newer cleaning methods can be used with traditional cleaning solvents as well as with the alternative cleaning agents developed in response to environmental and health concerns.

This Guide brings together information about the variety of cleaning methods that are practised (Section 4.1) and the alternative cleaning agents that are available (see Section 4.2) to help you choose the most cost-effective option for your particular application.

### 4.1 CLEANING METHODS

This Section explains the wide range of cleaning methods now available to remove contamination prior to coating operations. Table 1 presents a comparative summary of their applicability, advantages and disadvantages.
<table>
<thead>
<tr>
<th>Method</th>
<th>Applicability</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
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<td>Spot cleaning or occasional use.</td>
<td>Reduces solvent use when used to clean small areas of a large item instead of cleaning the whole item, eg when finishing off an item that has already been cleaned.</td>
</tr>
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<td>Vapour degreasing</td>
<td>Used widely in the UK.</td>
<td>Proven technique.</td>
</tr>
<tr>
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<td>Degreasing agent is sprayed onto parts suspended on jigs or flight bars.</td>
<td>Economic in medium- to high-volume coating operations.</td>
</tr>
<tr>
<td>Immersion cleaning</td>
<td>Effective in removing soluble fluids and contaminants.</td>
<td>Least aggressive form of wet cleaning. Solvent losses from dip baths due to evaporation can be lower than from some vapour-phase degreasers.</td>
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<td>Effective in removing many contaminants.</td>
<td>Relatively cheap and effective. All sides of the submerged parts are cleaned.</td>
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<td>Megasonic cleaning</td>
<td>Line-of-sight operation.</td>
<td>Less danger of surface damage and erosion than ultrasonic cleaning.</td>
</tr>
<tr>
<td>Spray cleaning</td>
<td>High pressure Line-of-sight process.</td>
<td>Applicable to many contaminants, but particularly to removing particles.</td>
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<tr>
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<td>Low pressure Dissolves contaminants that are soluble in the spray liquid. Used for rinsing parts or removing contaminants loosened by another process.</td>
<td>Can produce all levels of cleanliness.</td>
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<td>Power wash cleaning</td>
<td>Combines techniques such as immersion, sprays and ultrasonics in an automated machine.</td>
<td>Less floor space is needed than for equivalent linear systems. Controlled use of materials. Reduced labour costs.</td>
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<td>Steam cleaning</td>
<td>Removes water-soluble contaminants, oils/greases and other heavy contaminants.</td>
<td>Steam-generating equipment can be portable and usually requires little floor space. Useful for infrequent cleaning of large objects.</td>
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<td>Supercritical fluid (SCF) cleaning</td>
<td>Effective for liquid contaminants including silicone oils, hydrocarbon oils and machining fluids.</td>
<td>Supercritical carbon dioxide is an excellent solvent, capable of penetrating into tiny cracks. Effective for cleaning complex parts with tight tolerances.</td>
</tr>
<tr>
<td>Carbon dioxide ‘snow’ cleaning</td>
<td>Most suited for line-of-sight cleaning.</td>
<td>Effective in removing particles, thin fluid layers, flux and fingerprints.</td>
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<tr>
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<td>Depends on line-of-sight exposure to UV radiation. Best for cleaning simple, flat surfaces.</td>
<td>Removes very thin organic films and produces high cleanliness levels.</td>
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| Table 1 Cleaning methods |
4.2 ALTERNATIVE CLEANING AGENTS

A wide range of materials is now available as alternatives to conventional chlorinated solvents. These alternative materials have a number of advantages including:

- lower material costs;
- reduced evaporation losses due to the use of less volatile materials;
- improved efficiency due to improved cleaning power, use of recyclable cleaning materials, etc;
- lower waste disposal costs for spent cleaning agents;
- reduced VOC emissions with some solvents and particularly with aqueous-based systems.

4.2.1 Organic chemicals

The properties and applications of these organic chemicals are presented in Table 2. Many of these alternative cleaning agents are still VOCs. However, some have the advantage of possessing cleaning power combined with a relatively low risk to human health.

4.2.2 Aqueous systems

The properties of different aqueous systems are summarised in Table 3. Neutral and alkaline aqueous solutions - the most commonly used aqueous systems - can be used as a substitute for organic solvents in most applications.

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**Equipment Modifications Make Solvent Go Further**

Specialist aerospace company, Flight Refuelling Ltd (FRL), operates a wide range of metal treatment processes at its site in Dorset. The Company uses vapour-phase degreasing based on trichloroethylene in several of its operations.

As part of a campaign to reduce trichloroethylene use, three open-top degreasers were replaced with two double-lid vapour degreasers holding 75% less trichloroethylene. Lids on degreasers help to prevent solvent losses caused by draughts and disturbances to the vapour blanket.

Three other open-top tanks were modified so that the freeboard height (the space between the cooling coils and the top of the tank) was doubled from 30 cm to 60 cm. This has the advantages of:

- reducing vapour losses;
- decreasing drag-out;
- allowing a wider range of components to be degreased.

These changes and modifications mean that even though the degreasing units have handled 10% more components each month for the past six months, the amount of trichloroethylene used by FRL has remained constant at 35 000 litres/year.
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<td>Flux, solder paste, inks, greases and oils.</td>
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<tr>
<td>N-methylpyrrolidone (NMP)</td>
<td>Paints and other coatings, including polyurethanes, printing inks, epoxy resins, polyamidimide-based wire enamels and water-based coatings. Plastics, including polystyrene, polyesters and PVC.</td>
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*Table 2* Altern issit cleaning and degreasing.
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For further information on health and safety considerations, please see Health and Safety Executive’s Information (Engineering) Sheet No. 9, *In situ cleaning and degreasing.*
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<tr>
<td>Pure water</td>
<td>Water-based machining coolants. Chlorides and other ionic contaminants. Bulk contaminants such as dirt, grit and grease.</td>
<td>Can be a very effective cleaning agent. Used mainly in steam systems and in high/low pressure spray systems.</td>
<td>Water used for cleaning - especially water from rinse steps - can often be recycled and re-used. Depending on the contamination, the aqueous waste stream may need to be treated prior to its discharge. Demineralisation of some water supplies may be necessary to prevent water spots or other residues being left on the metal surface. Water used in precision cleaning applications may also need to be de-ionised and filtered.</td>
</tr>
<tr>
<td>Neutral aqueous solutions</td>
<td>Light oils. Particles. Chlorides and other salts.</td>
<td>Excellent for use in spray and ultrasonic applications. Also used in steam equipment.</td>
<td>Solutions of surfactants, corrosion inhibitors or other additives. Effective where a high degree of chemical solvency is not required. Not particularly suitable for immersion processes unless agitation is used. Most vapour degreasers using organic solvents need only minor modifications to use neutral aqueous solutions. Potential corrosion problems can often be overcome by changing the process or adding corrosion inhibitors. A drying system may be needed. The quality of the incoming water should be considered for effects on process.</td>
</tr>
<tr>
<td>Acidic aqueous solutions</td>
<td>Scale, rust and oxides.</td>
<td>Acid and additive content depends on metal to be cleaned and contaminant(s) to be removed.</td>
<td>May contain mineral acids, eg hydrofluoric acid, sulphuric acid, phosphoric acid and nitric acid; chronic acids; and organic acids, eg acetic acid and oxalic acid. May also contain detergents, chelating agents and small amounts of water-miscible solvents.</td>
</tr>
<tr>
<td>Alkaline aqueous solutions</td>
<td>Greases, coolants, cutting oils, shop dirt, fingerprints, some water-soluble paints.</td>
<td>Used with all types of liquid processes to clean parts such as hydraulic valve bodies, fuel injector components and machined aluminium castings.</td>
<td>Can clean to high cleanliness levels when combined with good filtration and rinsing. Often contain additives to improve cleaning, eg sequestering agents, emulsifiers and surfactants. Inhibitors are necessary with some metals, especially aluminium.</td>
</tr>
<tr>
<td>Semi-aqueous solutions</td>
<td>Oils, greases, rosin fluxes and drawing compounds.</td>
<td>Can be very effective in cleaning parts with heavy soiling.</td>
<td>Emulsions of water and solvents (usually flammable VOCs such as terpenes, glycol ethers, esters or hydrocarbons). Term also applied to processes where parts are first cleaned using an organic solvent and then rinsed in water. May leave a residue which can be removed by a water rinse; this film is sometimes left on the part to provide a protective coating. Usually employ a partially closed-loop process where the used emulsion is collected and then separated into water and solvent in a decanter. The water can be recycled, while the solvent can often be filtered and re-used in the wash tank. Can also be set up to re-use both the water and solvent in wash or rinse processes.</td>
</tr>
</tbody>
</table>

**Table 3 Alternative cleaning agents: water-based cleaning systems**
Many metal surfaces require treatment with a conversion coating to increase the corrosion resistance of the surface. This category includes phosphating and chromating.

Although there are many different systems in use, they have common wastes which include:

- energy losses during the heating and cooling of dip tanks;
- water rinses;
- excessive use of water;
- drag-out of treatment agents into rinse stages.

Cost savings can be achieved in all these areas and with any conversion coating system.

Good practice involves examining the design, operation and management of the treatment system to:

- maximise productivity;
- reduce waste.

### 5.1 PLANT DESIGN

This is the starting point for reducing waste and operating costs. Many simple design elements which enhance performance can be retrofitted at low-cost.

- Minimise drag-out and spillage by using jigs and baskets without any unnecessary hollows and flat surfaces which can carry coating out of the tank. This coating can fall onto the floor or into rinse tanks, creating waste and increased effluent loads.

- Fit draining boards between immersion tanks to prevent losses through spillage onto the floor. Any drag-out will flow back to the tank provided that:
  - these boards are constructed of suitably resistant material;
  - the boards are angled back towards the tank.

- Ensure that the rinse tank overflow is not situated too close to the inlet valve allowing clean water to overflow while the rinse solution becomes increasingly contaminated.

- Encourage mixing in the rinse tank by modifying the plumbing or inserting a plate between the inlet and outlet points.

- Minimise rinse water consumption by ensuring that the rinse tank receives only enough clean water to allow adequate rinsing - any more is wasted. This can be achieved in several ways. For example, conductivity probes can be installed to trigger the addition of clean water once contamination has reached a pre-set level instead of having water flowing into the tank continuously and regardless of whether parts are being rinsed or not.

- Improve rinse effectiveness by increasing the agitation in the rinse tanks, eg by installing air sparges at the bottom of tanks.
5.2 PLANT OPERATION

- Consider increasing the number of rinse stages and re-using rinse water.
  
  The quality of the rinse water needs only to be fit-for-purpose. Therefore, water used for a final rinse, which should receive only slight contamination, could be used during earlier rinsing stages, ie countercurrent rinsing.

Such systems (see Fig 1) significantly reduce the overall amount of water used. With a two-stage rinse system, water use can be reduced by at least half. With careful thought and application of ‘rinse ratios’, water savings can be much higher. For more details on such systems see New Practice Case Study (NC11) Rinsing and Chemical Recovery System Achieves Large Savings, available free of charge through the Environmental Helpline 0800 585794.

![Fig 1  Schematic of countercurrent rinsing](image)

- Use spray rinses to add extra rinse stages by pumping the water from the following rinse stage to sprays above a rinse bath. This reduces drag-out from rinse baths. On the final rinse bath, the feed water pressure can be used to provide a final rinse with clean water.

- Ensure that tanks are not overfilled, thus eliminating overflow of the bath contents as items are immersed.

- Ensure that there is sufficient time for drainage back into the tank once a part is removed.

- Angle spray jets at the start and the finish of spray tunnels, in large, conveyorised conversion coating systems, in towards the tunnel. In such systems, parts travel on a conveyor through the degreasing area suspended on jigs or flight bars. The equipment should be designed so that spray does not bounce off parts as they move into or out of the tunnel.

- Reduce the amount of drag-out on conveyorised tunnel systems by designing jigs that angle the part so that its lowest point leaves the drip zone of the tunnel last, allowing any drag-out to run back into the tanks.

- Ensure that the parts are immersed for sufficient time to allow the conversion coating to react with the metal and achieve adequate finish quality.

  If a variety of shapes and sizes are used, it may be necessary to verify timings at the start of each run and to ensure that operators are familiar with these variations.

- Implement a good housekeeping programme, eg check tanks regularly for sludge build-up and undertake cleaning when necessary.

- A preventive approach to plant cleaning is better than waiting for problems on finished parts to emerge, causing shutdowns during production time and rework.
5.3 PLANT MANAGEMENT

- Ensure that solutions are maintained within the desired concentration ranges by regular measurement using probes or titration.
- Adjust refilling procedures to cope with production levels.
- Maintain solution temperatures within the design parameters. If the solution is too hot, energy is wasted; if it is too cold, quality is compromised.
- Record tank temperatures regularly to provide better control of the finish quality.
- Lag dip tanks, particularly those held at higher temperatures. Around 85% of radiative heat losses are typically saved by lagging tanks.
- Consider using plastic balls or chroffles to form a penetrable, insulating blanket on the surface of hot liquids. Using chroffles can produce reductions of up to 60% in both surface heat and material losses.
- Instead of sending water from cooling coils (e.g., on a vapour degreasing plant) to drain, consider re-using the water in rinsing baths to reduce overall water use.
- When processing large numbers of parts, consider using compressed air-knives to blow residual moisture from the parts as a quicker and cheaper alternative to hot air drying.
Two main approaches are used to achieve combined cleaning and conversion.

Some systems use a batch multi-stage cabinet spray unit - rather like a large dishwasher - to clean parts using a neutral or alkaline solution, followed by phosphating and rinsing. The need for VOC-based degreasers is therefore eliminated.

Other systems, which also combine degreasing and phosphating, use methylene chloride to degrease components before they are immersed in a dip tank where they receive a phosphate layer. Such systems require less space and are especially suitable for continuous conveyor systems (see Fig 2) or for handling large batches of small to medium-sized parts.

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**Immediate Benefits with Automated Combined Cleaning Machine**

D B Partners is a medium-sized contract finisher in Cheltenham operating a wide range of coating processes including conventional coating, screen printing and conformal coatings (a plastic protective coat applied by spraying or dipping). The Company specialises in finishing components for aerospace, military and general applications. Several coating systems are used including water-based, two-pack solvent-based, and powder coating.

Even though the Company uses less than five tonnes of solvent a year, D B Partners decided to register with its local authority under LAPC and therefore set itself a target for improved environmental performance as part of a bid to be ‘best in class’. One of the most significant changes has been the replacement of vapour degreasing, mechanical cleaning and handwiping processes with an automatic, fully enclosed, aqueous degreasing and phosphating machine.

The immediate benefits include:

- elimination of increasingly expensive solvent purchases for cleaning;
- improved quality and consistency of pre-treatment;
- removal of a bottle-neck in the pre-treatment department.

Plant operators have also expressed their approval, welcoming the reduced possibility of exposure to cleaning solvent vapours.
Another simple approach to combined cleaning and phosphating is to use one iron phosphate tank as a cleaning solution and a second tank to finish off the phosphating. This reduces material use as the uncontaminated iron phosphate solution can be used to replenish the cleaning bath solution.

The advantages of combined degreasing and phosphating systems include reductions in:

- space requirements;
- handling time;
- chemical costs.

Another benefit of combined systems is that parts leave the process after a single stage and are protected against flash rust. Treated parts can, therefore, be stored before coating without the risk of rusting.
Combined Degreasing and Phosphating System Improves Performance

Kaymar Technical Furniture Systems Ltd designs and manufactures industrial, commercial and educational furniture systems. Products include metal-based benches and workstations together with associated storage and handling equipment. A thick, durable finish is applied to product surfaces in an epoxy powder coating plant. This process requires a clean surface to obtain good adhesion.

The Company's vapour degreasing plant was unable to cope with the heavy contaminant left on workpieces and handwiping was often used to remove residual contamination. Not only were two employees required continuously for handwiping, it represented a production bottleneck. As Kaymar often applied colours to order, there was an additional problem with flash rusting of surfaces which needed additional rework prior to coating.

A system that could not only degrease better but which would produce a conversion coating was sought. Kaymar also had limited space available for pre-treatment, while conventional multi-tank phosphating systems would not fit into the existing manufacturing space.

After trials, Kaymar installed a combined degreasing and phosphating system which uses a solution based on methylene chloride in a single tank. This solution not only cleans the workpieces, but coats them with a phosphate layer which protects them against flash rusting and provides a good key for the powder coat.

Elimination of the need for two people to handwipe parts, coupled with the new ability to store parts for a week or more before coating to achieve more efficient colour runs, means that the payback period for the new combined degreasing and phosphating system was less than two years.

Combined System Eliminates Labour-intensive Handwiping

Luxo (UK) Ltd manufactures a wide range of ‘task lighting’ for equipment and structures requiring precision lighting. A typical fitting consists of extending arms with knuckle joints, a base, clamp, shade and diffuser; these are commonly made from several different materials, e.g. plastic, steel, aluminium and zinc.

The Company found its existing vapour degreaser was struggling to remove residual silicone from zinc castings and lanolin from aluminium spinnings. All items needed handwiping, which added considerably to the cost and the time taken to process each part. An acid etch was also used to key the surface of some components.

Several degreasing systems were assessed before Luxo chose a combined degreasing and phosphating system which uses a proprietary mixture of methylene chloride and phosphoric acid in a semi-automatic plant. This plant not only degreases all materials, but phosphates steel components, etches aluminium and degasses zinc - increasing coating adhesion and durability.

Handwiping is no longer necessary, saving on labour costs and reducing the time taken to process each component. The system is estimated to have paid for itself in less than a year in labour costs alone.

According to David Taylor, the Company's works manager, the system does an excellent job and the cost savings have been considerable.
IF YOU WANT TO:

Reduce costs and improve efficiency

- Consider whether you could reduce, or even eliminate, the need for surface preparation.
- Examine ways of reducing your solvent consumption and VOC emissions.
- Identify opportunities for reducing energy and water use.
- Consider whether you are using the optimum cleaning method and cleaning agent for your particular application.
- Examine the design, operation and management of the treatment system with the aim of maximising productivity and reducing waste.
- If you use conversion coatings, consider installing combined cleaning and conversion equipment to optimise surface preparation.
- Contact the Environmental Helpline on 0800 585794 to obtain free copies of the Environmental Technology Best Practice Programme publications mentioned in this Guide, e.g. Good Practice Guide (GG15) *Vapour Degreasing*.

Don’t forget to ask for the three other Good Practice Guides in the series on cost-effective paint and powder coating, if they relate to your operation.

- Good Practice Guide (GG50) *Cost-effective Paint and Powder Coating: Materials Management*
- Good Practice Guide (GG52) *Cost-effective Paint and Powder Coating: Coating Materials*
- Good Practice Guide (GG53) *Cost-effective Paint and Powder Coating: Application Technology*
The Environmental Technology Best Practice Programme is a joint Department of Trade and Industry and Department of the Environment initiative. It is managed by AEA Technology plc through ETSU and the National Environmental Technology Centre.

The Programme offers free advice and information for UK businesses and promotes environmental practices that:

- increase profits for UK industry and commerce;
- reduce waste and pollution at source.

To find out more about the Programme please call the Environmental Helpline on freephone 0800 585794. As well as giving information about the Programme, the Helpline has access to a wide range of environmental information. It offers free advice to UK businesses on technical matters, environmental legislation, conferences and promotional seminars. For smaller companies, a free counselling service may be offered at the discretion of the Helpline Manager.