Spray application

Scope

This guideline is valid for all Hempel's liquid coatings suitable for spray application.

Spray application is the preferred application method on large regular surfaces, but often it is necessary to combine the spraying technique with a manual application on smaller areas where spraying will not give a good result. For more details see the separate technical guidelines for brush and roller application and for stripe coating.

The guideline provides general recommendations only, hence the information should be supplemented with more details regarding the actual product as outlined in the Product Data Sheet and/or in the Hempel specification.

Safety precautions

Use adequate personal safety equipment and follow sound procedures. Apply only in well ventilated areas. Observe safety labels on packaging and paint containers and consult Hempel's Safety Data Sheets for the products to be applied.

Introduction

Spray application is often the preferred method to achieve good wetting of the substrate, high productivity and the required finish. Spray application covers airless methods and conventional methods.

Airless spray is the main application method in the heavy duty industry for applying paint to steel constructions and marine vessels.

Conventional / HVLP (High Volume Low Pressure) air spray systems are used across a very wide part of industries and sectors such as automotive, decorative, yacht, architectural coating, furniture finishing and cosmetic industries.

Compared to airless spray equipment, pneumatic (air spray) equipment has a lower speed of application and typically also a lower transfer efficiency.

Equipment

Airless spray

General
Airless spray pump ratios and size shall be suitable for the product and in accordance with the specification.

Available air pressure and capacity for spray equipment shall be appropriate to the chosen airless equipment and be able to deliver the necessary amount of air. For specific details, consult the supplier of the equipment.

Inline filters can be used, and it is important to ensure that the right mesh size is used for the product to be applied. Use new filters when starting up and implement a filter cleaning procedure.

Dual feed Application
Dual feed or plural component application requires volumetric check of the mixing ratio (utilizing a ratio monitoring system) before and during the application process. Any variation in the product colour during the process will also indicate that the plural pump is off ratio.

Consult the equipment supplier to ensure the correct procedure. The plural component unit should have a facility for heating the base and curing agent components to the optimal product temperature for spraying.

Line flushing on plural pumps is done by an individual flush pump; always ensure the correct solvent is added. In larger setups for plural application, feed pumps are often used.

Hempel recommends installing feed pumps in connection with an inline low-pressure heater as well as a recirculation loop, so it is possible to pre-heat and recirculate products individually without using the high-pressure pump.

Heaters
Use of inline heaters and/or insulated or trace heated lines may be required to reduce viscosity and pressure loss and maintain the required temperature for the application.

Heaters can be used on both single and duel feed equipment, most common is the inline heaters mounted on duel feed equipment. They can be supplied in both low pressure and high-pressure versions, and pending on needs and setup, contact the equipment supplier for specific details.

The use of inline heaters will influence the pot life; contact Hempel for advice.

Setup check points
Follow the equipment supplier's recommendations when setting up the airless spraying equipment. The following should be checked:

- Ensure that equipment is intact and suitable for the required pressure as well as for the product in use.
- Ensure that air supply is sufficient, check the condition on compressor volume, check the oil / water separator.
- Control the air hoses' conditions before connecting, make sure the pressure regulator on the pump is in minimum position.
- Always regulate the pressure on the regulator and NOT on the on/off valve.
- Check that all connections are tightly closed.
- Always flush and test the system with solvent before starting to fill in the product. Begin with low pressure and increase to maximum working pressure.
- Check that all packings, etc. are suitable for the solvent used.
- Ensure that the right filters are fitted for the product.

Nozzle
Find the recommended nozzle size in the Product Data Sheet and use this as a starting point. All recommendations regarding nozzle size, pressure and angel are for guidance only and should be adjusted on site if necessary. See illustrations below:

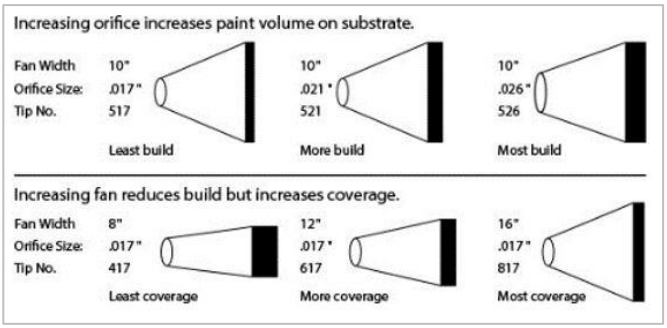


Illustration 1. Relation between tip size, orifice size and fan width on film build and coverage.

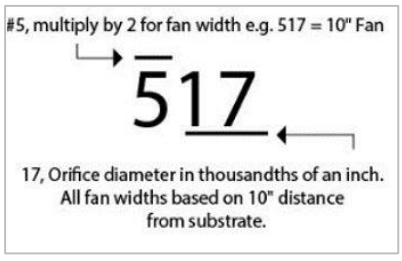


Illustration 2. Example on how to calculate fan width from tip size and how to choose tip size based on orifice recommendation.

Pneumatic spray - conventional and HVLP

General
Conventional and High Volume Low Pressure (HVLP) spray guns are very similar. Both types utilise compressed air to atomise the paint in the pneumatic spray gun. The paint is being atomized by compressed air after passing through a volume regulating nozzle. The nozzle delivers the paint to the airstream where it is atomised and accelerated, forming a spray fan that can be directed towards the object to be painted.

The three standard ways to feed paint to a pneumatic or conventional spray gun are:

- Suction feed (siphon) where the paint is in a cup attached below the gun.
- Gravity feed with a cup on the top of the gun.
- Pressure pot where the paint is under pressure and is being delivered directly to the gun.

The HVLP spray gun requires lower pressure and higher volume of air as compared to the conventional spray. The result is a higher amount of paint reaching the surface with minimal overspray, less material consumption and less contamination of the surrounding area.

For HVLP, the rule of thumb says: two thirds of the coating is delivered on the substrate and one third is lost in the air. True HVLP guns use 8–20 cfm (13.6–34 m3/h); an industrial compressor with a minimum of 5 horsepower (3.7 kW) output is required.

Setup check points
The equipment components required for conventional spray are:

- Compressed air supply
- Moisture and oil separator
- Air supply hoses and regulator
- Paint supply
- Fluid supply hoses (for pressure-pot fed guns)
- Spray gun

For detailed information regarding the appropriate equipment facility, refer to the manufacturer or supplier.

During application, several factors may influence the process and should be checked before start:

- Air capacity from compressor
- Oil and moisture separator (some paints are water/humidity sensitive)
- Air hoses – size pressure rating and integrity (condition)
- Temperature (substrate, paint and air)
- Paint viscosity
- Nozzle/ cap size
- Ventilation, flow and direction

Mixing and thinning

Take care to achieve the correct mixing ratio as stated in the Product Data Sheet. The individual components must be thoroughly stirred before they are combined.

Note the pot life during the application process. Do not try to extend pot life by changing the mixing ratio or by adding solvent towards the end of the pot life; pot life cannot be extended by thinning.

If thinning is needed to adjust viscosity, use only the thinner recommended in the Product Data Sheet. Using the wrong thinner may negatively affect the properties of the paint.

Add thinner to the mixed product, not to the individual components. Do not exceed the recommended maximum percentage.

Application

Spraying technique
Apply the material in accordance with the specification and the information provided in the Product Data Sheet.

The distance of the spray tip to the surface must be controlled. All areas should be easily reachable, keeping the spray fan at 90º to the surface and a distance of 30 to 45 cm (12-15 inch), for airless spray and 20 to 35 cm (8-14 inch), for pneumatic spray. See illustration 3 below.

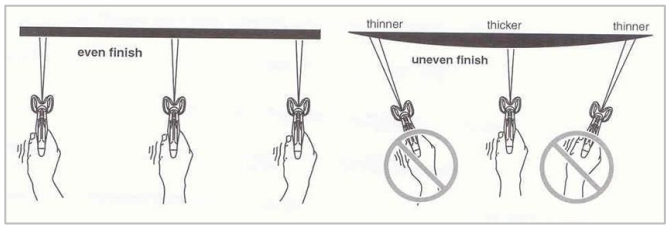


Illustration 3. Correct positioning of spray gun.

The specified thickness must be achieved on the entire area. It is important that overlapping areas are sprayed with caution to achieve a homogeneous result and avoid excessive film thickness. The best way to control this is with a new tip that has an angle suitable for the area to be painted, see illustration 1. Avoid overlaps on welding seams.

It can be necessary to cross spray to obtain cosmetic smoothness as well as even film thickness.

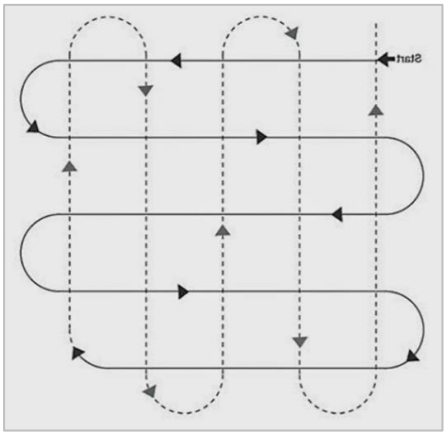


Illustration 4. Cross-spraying of paint to achieve proper finish and even film thickness on the entire surface.

Overspray / spray-dust can occur and it is important to plan the application and ventilation to make sure to minimize the risk of spray dust to stick to the surface.

Film thickness
To achieve the full protection of the coating system, it is important that each layer is applied in the correct film thickness and without holidays. It is important to check the wet film regularly during the application. The necessary wet film thickness can be calculated as:

$$\text{Wet film thickness} = \frac{\text{Specified dry film thickness}}{\text{\% volume solids}} \cdot 100\%$$

For protective coating systems, it is typically recommended that the minimum thickness is in accordance with the so called “80/20 rule”. This is the case in ISO 12944-5, that makes reference to ISO 19840 where the acceptance criteria are defined in this way:

- The arithmetic mean of all the individual dry film thicknesses shall be equal to or greater than the nominal dry film thickness (NDFT).
- All individual dry film thicknesses shall be equal to or above 80% of the NDFT.
- Individual dry film thicknesses between 80% of the NDFT and the NDFT are acceptable provided that the number of these measurements is less than 20% of the total number of individual measurements taken.
- All individual dry film thicknesses shall be less than or equal to the specified maximum dry film thickness.

Cleaning of equipment

Waterborne
Flush all materiel with tap water, followed by isopropanol. Then clean with Hempel‘s Tool Cleaner 99610 or follow the procedure as for solvent borne. If switching back to waterborne, flush with isopropanol followed by water.

Solvent borne
Flush with the Hempel solvent recommended for dilution of the product, followed by proper cleaning with Hempel‘s Tool Cleaner 99610. Do not store equipment with thinner or cleaner.

Solvent free
For solvent free epoxies flush with Hempel’s thinner 08540 followed by proper cleaning with Hempel‘s Tool Cleaner 99610. Do not store equipment with thinner or cleaner.

This document is intended for professional use and provides generic advice in respect of the subject matter only. It is not intended to be used as a comprehensive guide. The buyer/applicator should always read the relevant Product Data Sheet (“**PDS**”) and Safety Data Sheet (“**SDS**”) relating to the Products ordered which are available for download on www.hempel.com. If in doubt, please contact your local Hempel representative for further advice. To the extent relevant, the disclaimer set out in the relevant PDS(s) applies to this document.