As an applicator, you are probably familiar with most application techniques and equipment: brushing, rolling, and various forms of spraying, such as conventional air and airless spraying.

This month’s column will introduce you to plural-component spraying, a method of paint application that requires specialised equipment, very careful attention to equipment set-up, and proper maintenance.

To become proficient with plural-component spraying, you will probably need specific training to become fully familiar with the equipment, the techniques for proper use of that equipment, and the possible chemical reactions that can occur with the component materials.

**Definition**

Plural-component spraying is a method of paint application in which two-component, catalysed coatings are mixed and proportioned automatically by the spray equipment system (Fig. 1).

Plural-component equipment is used to spray very high and 100% solids coatings with pot lives that are very short—from as little as 30 seconds up to a few minutes.

To prevent a 100% solids coating from setting up too quickly and becoming unusable, the resin and catalyst are mixed at the spray gun or at a manifold that connects to the spray gun. The mixed components are then immediately sprayed onto the substrate. There is no single container from which the mixed components are drawn.

**Reasons for Use**

Very high solids and 100% solids coatings are used for two main reasons.

First, because they have little or no solvent content, they make it possible to comply with environmental regulations that limit solvent emissions from coatings.

As a result, plural-component equipment has gained a considerable market share throughout Europe.

Second, these coatings have special performance properties that make them useful in harsh environments. For instance, they can be applied as thick as 2 mm or more in one coat to form an effective protective barrier for concrete or steel in harsh chemical exposures.

An additional reason for using plural-component spray is its efficiency of operation. Multi-component materials can be applied with this equipment on a continuous basis without mixing and measuring components by hand, thereby increasing productivity and also reducing labour requirements.

Advantages of using plural-component equipment are outlined in the box on p. 20.

**Plural-Component Equipment**

There are two basic types of plural-component spray equipment: fixed ratio and variable ratio.

A fixed-ratio system provides only one ratio of volume for the multiple components of the coating, such as 1:1. To spray other ratios, a fixed-ratio system usually must be retrofitted to alter not only the volume but also the pressure ratio of the plural-component proportioning pump. Nowadays, however, some plural-component fixed-ratio systems can be adjusted to another mixing ratio by simply exchanging the hardener pump. In some cases, this can be done in as little as 15 minutes.

Since the volume capacity of the proportioning pumps is fixed, there is no possibility to mistakenly set
Some systems have dual bar mounts to provide for a third material to be metered and pumped in addition to the resin and catalyst.

Heaters sometimes are required for plural-component spray systems, depending on the viscosity of the material being used. Heaters may be positioned at the material container or inline or both. Heat is used to reduce viscosity and, therefore, to improve the flow of material.

To apply materials requiring a very high temperature at the spray tip (up to 70°C), it would be necessary to have other heating arrangements, such as heated fluid hoses or additional flow heaters at the proportioning equipment and, for long lengths of fluid hoses, either before or at the mixer manifold.

Factors of Operation and Maintenance

It is essential that the two or three components of a multi-component coating are delivered to the spray gun in the proper proportions, because if they are mismetered, then the applied coating may be defective. In the worst case, it could have to be removed from the substrate, which can be a very difficult and time-consuming job.

Therefore, the equipment must be set up correctly. The most important consideration is that the equipment system is matched with the coating material. Each component may require different temperatures, supply pressures, hose sizes, spray gun types, and check valve configurations.

To assure that the equipment is matched properly to the coating, you can work with the equipment supplier and the coating manufacturer. You might even want to run a test of the coating material with the spray equipment.

Proper maintenance of the entire equipment system and careful flushing when the work is done of all parts that have come into contact with the mixed material are absolutely critical to plural-component spraying. Poor or improper maintenance can lead to the coating
Advantages of Plural-Component Spraying

Material and Manpower Savings
• No staff is required to proportion the two components manually in the proper mixing ratio and to agitate the paint.
• As a result of the large delivery volume and the high pressure ratio of some plural-component equipment, it is possible to achieve very high film thickness in one pass, which may save having to apply additional passes.

Material Cost Savings
• Coating materials can be purchased in reusable and space-saving bulk units (e.g., drums, tanks, containers, etc.) at economical prices.
• There is no waste of paint residues in emptied pails.
• In most European countries, the very expensive disposal of paint pails with paint residues is eliminated.
• The high cost for solvents is eliminated since solvents are only required in small amounts for the purpose of cleaning the material from the plural-component equipment.
• There is no material loss from having excess pre-mixed materials since the plural-component equipment will only deliver and mix the coating material actually required.

Reduced Drying and Storage Costs
• By applying high-build materials with short pot lives, it is possible to reduce dry-docking costs in shipyards and storage costs in other industries.
• Energy costs and investments for drying systems can be eliminated.

Improved Environmental Protection
• Spray fog is minimised due to the absence or reduction of solvent in the coating material.
• Solvent-free application also reduces unpleasant smell of coating material during drying time.

Chemical reactions from use of different types of coating materials can also cause problems and under certain circumstances even clog the entire system. Especially for the changeover from epoxy materials to polyurethanes, or vice versa, it is essential to ensure that all equipment components, including the hose, gun tip, etc., are thoroughly cleaned after contact with the coating material.

You must carefully follow the directions of the equipment manufacturer as they appear in the manual for operation and maintenance.

It is especially important that plural-component equipment has an automatic monitoring device to signal, by means of an alarm, mistakes that might lead to incorrect mixing ratios or, even better, to shut itself off automatically. In this way, faulty coating applications resulting from damaged or clogged equipment components or parts can generally be eliminated.

Conclusion

If you are using plural-component spray equipment and materials for the first time, it is important to get the proper information and instruction before you begin the job. Talk with an experienced applicator, get instruction, and then follow the equipment manual and the coating material data sheet very closely. If you proceed in this way, you will be able to take advantage of the capabilities of plural-component spraying.

Next month:
Why good housekeeping is important in cleaning and painting operations