PLURAL COMPONENT COATING APPLICATION EQUIPMENT

BASIC CONFIGURATION DESCRIPTION

The Technology Leader for Infrastructural Coatings

Madison Chemical Industries Inc.

INTRODUCTION

One of the Madison's core competencies is our broad range of plural component coatings. These fast setting, solvent-free, high performance coatings have become accepted in a broad range of end uses and industries. For thirty years, they have been preserving and protecting the infrastructure upon which modern society depends: everything from storage vessels to marine vessels, from oil pipelines to water and wastewater pipelines, from things that move, such as transportation equipment, to things that do not, like municipal, industrial, military and commercial complexes.

Madison formulates products in three types of format. This memorandum explores the application of our plural component, fast setting systems. The two other formats are mix-and-apply and preCatalyzed. Products offered in these two other formats can be applied using more paint-like equipment and techniques.

For user-friendliness, all of Madison's plural component coatings are designed to have balanced viscosities and a mix ratio of one to one by volume. Generally speaking, the necessary spray assembly is high pressure, airless, heated equipment. There are several manufacturers to choose from and Madison Chemical is constantly evaluating the latest technology. Currently, Madison works with Graco, Graco-Gusmer and Binks equipment. A large inventory of spare parts is available from Madison to provide the quickest possible service. We have the capability to customize the equipment setup to the individual needs of the customer. This technical capability allows the customer to 'one-stop shop' for their coating requirements to include coating material, application equipment, parts and technical assistance from one source.

Madison provides head office and on-site support to all our applicators and customers. We also supply training to our Approved Applicators, Certified O.E.M. Applicators and to any other customers who wish such training. Madison's TechService on Demand Program provides for the cost of this service to be split between Madison and the customer, thus ensuring that the cost is always reasonable.

BASIC CONFIGURATION OF APPLICATION EQUIPMENT

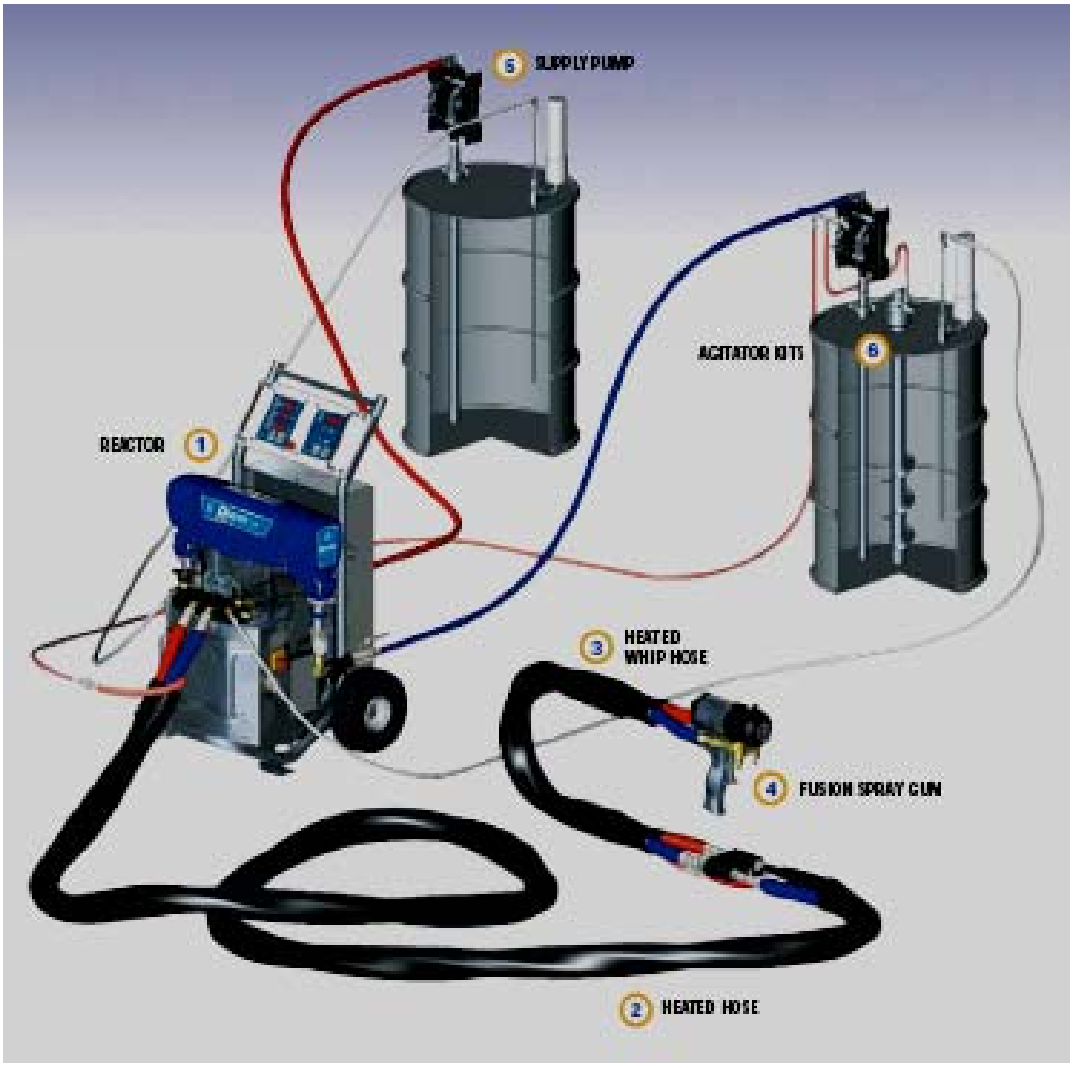
Madison has developed a basic standard configuration for applying our plural component coatings. The spray system is composed of the product storage/supply assembly, a proportioning pump, heated hoses and plural component spray gun. The proportioning pump is sometimes referred to as a displacement pump because it works on the principal of positive displacement. Additional components can be added to this standard configuration for special needs such as high volume applications or the internal lining of pipe.

The coating components, which are designated Part "A" and Part "B", are kept separate until they enter the mixing chamber of the gun. Prior to entering the pump, the individual materials are filtered through "Y" strainers. Each component is fed to the proportioning pump legs (which are driven by an air motor, electric motor or, in some setups, a hydraulic motor) and are pressurized to 2000 p.s.i. or greater. From there, the still-separate liquids go through a pressure relief valve (a safety precaution) and pass through powerful heaters. The materials are filtered again as they leave the heaters. Following this, they enter heated high pressure hoses capable of maintaining the temperature to which they have just been heated. The final

item of equipment is the gun, where both components are, at long last, mixed together and atomized at the tip or nozzle.

Madison's basic set up also includes a recirculation system. This is used to pre-heat and to provide a certain amount of mixing of the liquid coating ingredients. As well, we include transfer pumps (also called supply pumps), designed to provide reliable continuous supply to the proportioner. This eliminates the potential for starving the fluid supply in gravity feed systems. For better mixing, the purchase of power agitators is recommended.

Shown below is a Graco equipment setup, one of the most common configurations on the market. Labeled are the basic components described above.



Basic Plural Equipment Set-Up

PRODUCT STORAGE AND SUPPLY

Madison offers several types of packaging alternatives. Products may be shipped in cans, pails, drums or tote tanks. Specifically, the customer has the choice of 1 gallon (4 litre) cans, 5 gallon (19 litre) pails, 55 gallon (110 litre) drums, or 275/330 gallon (1050/1250 litre) totes. Plural component products are usually ordered in drums or totes. The basic equipment configuration uses transfer pumps to ensure a constant supply of material to the proportioner.

Generally speaking, the coating product should be entering the system at approximately 80°F to 120°F (roughly 25°C to 45° C). For this reason we recommend the use of band heaters on the storage or product supply containers. Madison can supply these. For large volume or industrial applications, other heating systems can be utilized such as hot water jacketed tanks; these are supplied or sourced by the customer.

In their liquid form, polyurethanes are sensitive to the moisture in the air. Thus, a dryer or "desicant" system must be utilized in order to reduce the risk of moisture contamination in the supply container. Generally, we configure for the customer a Drierite ™ assembly in the air intake of the container. Alternatively, a "nitrogen blanket" can be maintained on the surface of the coating after the containers have been opened for use; a slight positive pressure of nitrogen gas will prevent contamination of the liquid coating.

PLURAL COMPONENT PROPORTIONER PUMPS

The equipment alternatives recommended by Madison are:

Pump	Manufacturer	Operation	Comments
Reactor E-XP2	Graco	Electric Motor	Our most popular pump. Suitable for use in small to medium size shops, larger shops with non-continuous production and in portable field coating units. Easy to use with very powerful heaters and low maintenance.
Reactor H-XP3	Graco-Gusmer	Hydraulic Motor	Suitable for large shop operations with long production runs and/or daily use. Hydraulic motor offers excellent long term performance. For particularly high coating throughput, this is the preferred model

These are illustrated below:

REACTOR E-XP2

REACTOR H-XP3

HEATED HOSES

The plural component pump connects to the heated hose assembly. These assemblies come in 50 foot lengths, can be added to each other to a maximum of 300 or 400 feet, depending on the proportioner, and are designed to maintain the product temperature until it is sprayed through the tip of the gun. Madison's basic configuration includes whip ends; a pair of short 8'-10' hoses immediately before the gun, which allows more flexibility for the spray gun operator.

SPRAY GUNS

Madison chemical recommends two different spray guns, which have quite different configurations. With a Binks 43P spray gun, the "A" and "B" mix inside the gun in a "mixing chamber" and then are forced through a standard airless spray tip (or "nozzle"). Static mixers are attached in front of the gun just before the nozzle to ensure a perfect mix every time. The Binks 43P is a solvent purge gun, so there is a third line going to the gun to carry the solvent. Turning a knob on the back of the gun allows solvent to flow through the mixing chamber, static mixer and nozzle. The operation of the trigger is simple mechanical leverage. The advantages of this arrangement are: very thorough mixing of the "A" and "B" components, relatively low output with the self-cleaning Graco RAC Switch Tips. The disadvantages are: the need for solvent to purge the gun after releasing the trigger (which has impacts for VOC restrictions), relatively low outputs and the need to purchase a second pump to deliver the solvent.

A newer gun that Madison recommends is the Graco Mechanical Purge Fusion gun. It is a mechanical purge, solvent free gun. The gun is operated by an air piston, which is activated by the trigger. The material is mixed internally in the gun in a disposable part called a mixing module, and then delivered through the tip. When the gun trigger is released a rod is driven through the module to purge any product from the module and tip. The main advantages of this gun are: it is less bulky and lighter than the Binks unit, it doesn't require a solvent purge, it provides a higher range of output through a large number of module and tip combinations (welcome for larger surfaces and high throughput processes), and is easy to disassemble and clean-up.

These guns and basic properties are illustrated below:

Binks 43 P

Graco
Mechanical Purge Fusion

Solvent purge	Mechanical purge
Mechanical operated trigger	Pneumatic operated trigger
Static Mixer	Mix Module
Low to moderate output	Moderate to high output

AUTOMATIC SPRAYING

Automatic spraying tends to be limited to applications that can be easily applied in an automated environment such as pipeline coatings. In-plant application of Madison's coatings is achieved using an automatic Fusion gun. Various module and tip combinations are used to control the fan of the spray pattern as well as output. Madison can adjust the spray system to alter production rates, coating thicknesses and cure times. Spinning pipes, automated lances, and varying spray tips can be used to coat external and internal surfaces. Pipe with internal diameters ranging from 10 inches to 10 feet have been sprayed automatically using Madison's plural component coatings.

The present document is just a brief description of the equipment technology available from Madison. For additional details on equipment specifications, our equipment training and set-up programs, and a quotation, please contact Madison head office.

(905) 878-8863
www.madisonchemical.com