

Advancements in plural-component dispense for filtration applications



MARKET OVERVIEW

Introduction

Filtration is a significant worldwide industry. Filters are manufactured and used in motor vehicles, industrial facilities, clean rooms, hospitals, water treatment facilities, and in residential homes. The demand for clean air and water has prompted sustainable growth.

Adhesives and potting compounds have traditionally been used to bond and secure filter elements and media into assemblies. During the last two decades, plural-component products have replaced traditional single-component plastisols. Plural-component polyurethanes and epoxies offer room temperature cure compared to oven cure with plastisols. Manufacturing plants are saving energy related costs by switching to plural-component compounds.

In general, these are two categories in the filtration industry: air filters and fluid filters. Applications can be similar in both and present themselves across industries.

Graco has developed two plural-component dispense platforms that greatly improve how adhesives and potting compounds are metered and mixed.

Key applications and industries:

Motor vehicles and internal combustion engines

This is a large segment for filter manufacturing. Air, oil and fuel filters are used. Applications include end cap molding, bonding and sealing. (See Figure 1)

Hepa (High efficiency particulate air) air filters

Most often, these filters are used in hospitals and clean rooms. This application includes bonding filter elements to frames. (See Figure 2)



Figure 2 – Bonding elements to frames

AIR FILTERS



Bonding- Molding

FLUID FILTERS - FUEL, OIL



Bonding



Molding



Sealing

Figure 1

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Liquid purification and separation filters

Adhesives and potting compounds are used in industrial water purification, residential water purification, and medical blood purification applications. (See Figure 3)



Public utility reverse osmosis water treatment plant includes multiple spiral wound membranes



Figure 3
Bonding spiral wound membrane with adhesive for reverse osmosis



Residential reverse osmosis filter system includes spiral wound membrane



Hollow fiber potting for medical filters

Equipment solutions for filtration

Graco offers two product platforms for metering and dispensing adhesive and potting compounds for filter applications.

The Graco HFR™ Metering System is a hydraulic fixed ratio unit with a ratio range of 1:1 to 32:1. Changing ratio with the system is a simple matter of mechanically changing out a metering pump. The Graco HFR Metering System satisfies larger shot applications beyond 70 cc's and higher output adhesive bead situations. (See Figure 4)

The Graco PR70 is a pneumatically-driven system available in both fixed and variable ratio. Ratio range for a production fixed ratio unit is 1:1 to 12:1 by volume. Variable ratio is 1:1 to 24:1. The Graco PR70 is ideal for smaller shot size applications and lower output adhesive bead situations (up to 70 cc output per cycle with a 1:1 material). The PR70 offers metering accuracy of +/- 1%. (See Figure 5 and 6)

As with any plural-component material application, a manufacturer's biggest concern is producing large runs of bad product due to poor mix of the adhesive. The Graco HFR Metering System and Graco PR70 Meter, Mix and Dispense unit both offer assurance that material is being applied accurately and on-ratio with the option for redundant ratio detection.

The standard Graco HFR Metering System incorporates a linear sensor and pressure transducers at the outlet of the metering pumps. The linear sensor tracks pump speed while the pressure transducers detect material pressure points. As part of the initial ratio calibration of the unit, tolerance ranges are set through the Advanced Display Module (ADM) for pressure and flow. If out of specified conditions are detected due to blockage or piston failure during production, the unit will shut down and prevent any scrap production. This same feature is available as an option on the Graco PR70.

Both systems can incorporate high resolution, independent flow meters as an additional ratio monitoring option. With this option, ratios are constantly being monitored by measuring the actual flow rates of the individual components being metered. Once again, out of specified conditions will shut down the unit.

On the Graco HFR Metering System, in addition to the catastrophic detect, ratio recording can be downloaded through the control interface to a memory stick and stored by production lot. This allows manufacturers to improve quality control as well as maintain records for future review.



Figure 4
The Graco HFR Metering System is ideal for larger end cap and Hepa filter potting. In addition the system is applicable for high output and continuous bead applications for spiral wound membranes.

Both the Graco HFR and PR70 Metering Systems are available with fixed ratio, positive displacement metering pumps. This eliminates the chance for operator ratio tampering that may occur with variable ratio machines.

Both systems incorporate piston pumps with severe duty coatings. This allows the system to handle products with abrasive fillers. Unlike gear pumps, piston pumps can handle a wider range of low-viscosity to high-viscosity compounds, from water thin to thixotropic pastes.

Both systems incorporate manual handheld dispense guns and/or machine-mounted fixed dispense valves with disposable static mixers. Static mix is the standard for elastomeric potting compounds and adhesives associated with the application described. Other dynamic and impingement mix options are available for flexible foams on the Graco HFR Metering System and other Graco platforms.

Both the Graco HFR Metering System and the Graco PR70 offer heated hose and tanks if needed. Tanks can be agitated to accommodate keeping fillers in suspension.

The standard feed options for the Graco HFR system are direct pressure feed from tote and/or drum pumps. A second option is to feed from totes or drums to day tanks with auto refill. Both options save space in a plant. In addition, tow motors are not required to stack drums or totes on racks in tight places at the point of dispense. The second option (feed to day tanks) offers uninterrupted production during drum or tote change out.

The Graco PR70 can be used as a bench top with smaller on board feed tanks. It can also be used with simple gravity feed from drums. A third option is to feed from totes or drums to day tanks with auto refill and drum transfer pumps. A fourth option includes high-viscosity accumulators fed from Graco ram transfer pumps.

The Graco HFR Metering System, the Graco PR70, and all feed packages are manufactured by Graco, unlike other platforms where the feed systems can be manufactured by a secondary source. Graco offers the most extensive selection of feed options including direct agitation in drums.



Figure 5
The Graco PR70 Meter, Mix and Dispense unit is a bench top system for manually dispensing smaller shots, end caps or hollow fiber potting applications. Fixed mount dispense valve shown with disposable static mixer.



Figure 6
The Graco PR70 with accumulators can be used for lower output, spiral wound, membrane adhesive bead applications with higher-viscosity materials. Handheld gun shown with disposable static mixer

Graco Control Architecture™

Both the Graco HFR Metering System and the Graco PR70 Meter, Mix and Dispense unit were designed with Graco Control Architecture, the framework that provides end-users with a quantum improvement in their ability to monitor and control fluid management processes. (See Figure 7)

Graco Control Architecture reduces point-to-point wiring. This reduces cost and points of failure. Graco Control Architecture also incorporates shared modular components that are easily upgraded with a software token. Independent control modules include dispense, heat and gateway (HFR only). The gateway fieldbus module allows the Graco HFR Metering System to communicate with other automation systems within the manufacturing process. Gateway is offered in various protocols including Devicenet, Ethernet/IP, Profibus, and Profinet.

An Advanced Display Module provides easy setup, monitoring, and system diagnostics. It also includes a USB interface for data download (HFR only). The Advanced Display Module is independent and can easily be positioned where desired by simply changing the cord length.

The system's standard controls are programmable in 10 different languages. Totalizers can be set and reset to match preventative maintenance schedules. On the Graco HFR Metering System, temperature can also be recorded in addition to pressure, flow, and ratio. The system is also password protected.

Shot size programming and storage are available on both systems. The Graco HFR Metering System can store up to 100 shots and the Graco PR70 up to 50 shot sizes. Both units offer a sequencing option for dispensing a pattern of different shot sizes repeatedly.

Summary

In summary Graco technology offers advancements in both metering and ratio control relevant to adhesive and potting applications within the filter industry. Graco is a global company supported by a highly trained network of local advanced distributors.



Figure 7
The Advanced Display Module, the fluid control module and the Gateway communication module are components of Graco Control Architecture.

BIOGRAPHY

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