

# Advancements in plural-component dispense for lamination and flexible packaging applications



## WHITE PAPER

### Abstract

Flexible packaging is used on numerous products: bottle labels for apple juice, lidding structures for yogurt and pudding, pet food, cereal, lawn and garden products, snack foods, meats and cheeses, liquid juice packs, stand up pouches, and boil-in-a-bag products. (See Figure 1)

Flexible packaging is a significant global industry. Advantages of flexible packaging include product appeal, good shelf exposure and packaging creativity. Stand-up pouch structures are cost-effective because they reduce the amount of packaging material required. Their light weight reduces freight costs and since they don't require much adhesive, material costs are lower as well. Typical structures that can be laminated together include plastic-to-plastic film, and plastic film to foil. Plural-component adhesives are used in this lamination process.

With flexible packaging, manufacturers achieve higher speed packaging times. Along with these faster production rates, it is critical that convertors have assurance that adhesives are mixed properly and on ratio prior to bonding the films. Adhesive failure can lead to massive scrapped product and quality control issues. Excessive down time may lead to loss of revenue.

Graco has developed a new plural-component dispense platform that improves how solvent-free polyurethanes are metered and mixed in the flexible packaging industry. This new platform also can verify that the material was dispensed accurately and on ratio.

### Advantages of solvent-free adhesives

Solvent-free adhesives are replacing many solvent-based adhesives for flexible packaging. Here are some reasons why.

- 1. Cost savings.** While solvent-based adhesives are mixed in bulk in a separate mix room and supplied to a laminator, solvent-free adhesives with a shorter pot life require meter mix dispense (MMD) equipment. Using solvent-free adhesives results in a lower plant capital investment in the type of laminator used. Cost savings can also be tied to lower energy requirements due to no drying needed. With solvent-based adhesives, dryers are built into the laminator and used to facilitate volatilizing solvent and to assist in full cure. Full cure may take up to 10 days. In comparison, solvent-free adhesives cure at room temperature with no drying and can offer faster cure times.



Figure 1- Typical products that feature flexible packaging

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2. **Heat Resistant.** Solvent-free adhesives offer excellent adhesion to foil, nylon, barrier films, high slip films, and offer more chemical and heat resistance. These are used in hot fill and boil-in-bag food packaging.
3. **Friendlier to the environment.** Solvent-free adhesives have no solvents, no VOCs and reduce operator exposure.

## Application

Whether it's solvent-free or solvent-based material, the application for flexible packaging is the same. Mixed adhesive is supplied to a nip puddle between rollers or an adhesive pan/sump on the laminator unit. The puddle or sump holding tank is filled with adhesive. When it gets to a low level point, a sensor sends a signal to the dispense unit calling for more mixed material. When the puddle or sump holding tank is full, the sensor shuts down the dispense unit.

### Figure 2 – Solvent-free lamination process

Mixed material is intermittently supplied to a puddle between two smooth rollers on a laminator. This is called the dosing area where the adhesive is applied to application rollers.

### Figure 3 – Solvent-based lamination process

The laminator unwinds film “A” and roll-coats it through an adhesive pan. The coated film is rewound through another nip, mating and bonding it to a secondary film “B.”

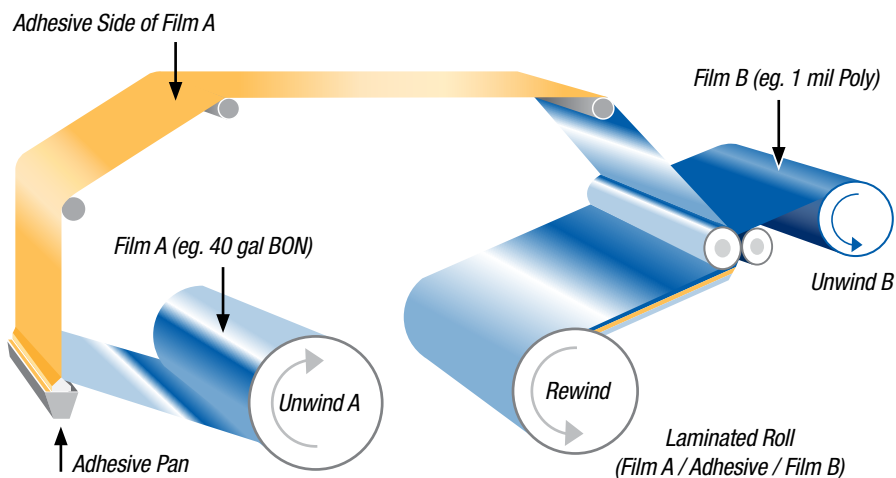


Figure 3



Figure 2 –  
Solvent-free lamination process

## New equipment solution for flexible packaging

Graco has introduced a new product for dispensing adhesive materials required for solvent-free lamination and flexible packaging. The Graco HFR™ Metering System (See Figure 5) is a hydraulic fixed ratio unit with a ratio range of 1:1 to 32:1, satisfying ratio combinations for most common major material formulations. Changing ratio with the system is a simple matter of mechanically changing out a metering pump.

In a flexible packaging production environment, a convertor's concern is producing large runs of bad product due to poor mix of the adhesive. The Graco HFR Metering System is ideal for convertors in the flexible packaging industry because it offers assurance that the material is being applied accurately and on-ratio.

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 HMI for pressure and flow. If out of specified conditions are detected during production, the unit will shut down and prevent any scrap production.

In addition, high resolution, independent flow meters for both the adhesive and co-reactant are available as an additional ratio monitoring option. With this option, ratios are constantly being monitored by measuring and accurately calculating the actual ratio during production. Once again, out of specified conditions will shut down the unit. In addition to the catastrophic detect, ratio recording can be downloaded through the control interface to a memory stick and be stored by production lot. This allows convertors to improve quality control as well as maintain records for future review.

The Graco HFR Metering System is designed with fixed ratio, positive displacement metering pumps. This eliminates the chance for operator ratio tampering as can occur with variable ratio machines.

The system's hydraulic drive package offers added power to dispense higher viscosity products without heat. Traditional gear pump systems have limitations on viscosity without heat. Adding heat to systems can add much cost and just another variable into the process mix.

If heat is needed to temper the material slightly before entering the puddle, heated hose and simple in-line heaters are available.



Figure 5  
The Graco HFR Metering System

The standard feed options for the system are direct pressure feed from tote and or drum pumps. A second option is to feed from totes or drums to 38-liter 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. If desired, feeding directly from stacked totes or drums can be accomplished with booster pumps to the Graco HFR Metering System. The Graco HFR and all feed packages are manufactured by Graco, unlike other platforms where the feed systems can be manufactured by a secondary source.

## Graco Control Architecture™

The Graco HFR Metering System was 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 6)

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. The gateway fieldbus module allows the Graco HFR Metering System to communicate with the laminator and is offered in various protocols including Devicenet, Ethernet/IP, Profibus, and Profinet.

The system's Advanced Display Module provides easy setup, monitoring, and system diagnostics. It also includes a USB interface for data download. 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. Temperature can also be recorded in addition to pressure, flow and ratio. The system is also password protected.



Figure 6  
The Advanced Display Module, the fluid control module, and the gateway communication module are components of the Graco Control Architecture.

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## Equipment for dispensing three-component, solvent-based materials

In addition to solvent-free adhesive dispense, Graco also offers a custom configured solvent-based platform with intrinsically safe controls.

### Summary

In summary Graco technology offers advancements in both metering and ratio control relevant to lamination applications within the flexible packaging industry. In addition, Graco has the capability to design three-component, solvent-based metering systems.

## BIOGRAPHY

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