

One Easy Strategy for Savings, Sustainability, and Productivity

How Automatic Adhesive Fill Systems Help in the Quest to Improve Operational Efficiency

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New standards for packaging are forcing manufacturers to find ways to cut costs and become more “green.” New developments in automatic adhesive fill systems can help packagers reach their goals. Read on to learn more about how automatic fill systems generate savings, create sustainability, and improve productivity.

Introduction: Not All Automatic Fill Systems are Created Equal

Amidst economic pressures, technological advances and sustainability initiatives, the packaging world is redefining itself. Along with package design and materials, adhesive dispensing has become an essential element in achieving securely sealed, structurally sound and effective packaging, thereby playing a significant role in industry changes. New developments and technologies in automatic adhesive fill systems are helping manufacturers enhance their operations and profits by ensuring efficient, sustainable and optimized lines.

But not all automatic fill systems are created equal. Only the most advanced technologies, designed with an emphasis on efficiency, will deliver the savings and optimization manufacturers need.

Fill systems and technologies have been available since the 1980s. Previous generations of fill systems were able to process only a few adhesive shapes, sizes and formulations.

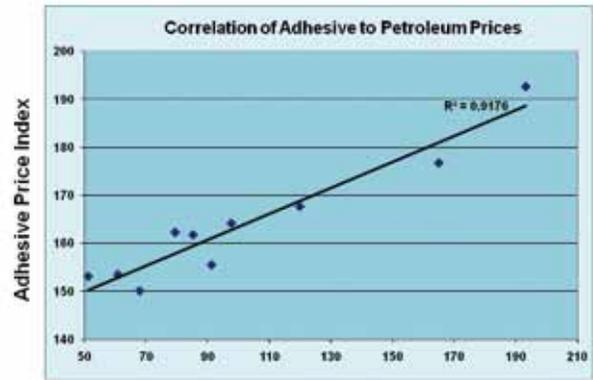
The first melter feeders relied on large hoppers, vibration and gravity to deliver adhesive to the melter tank. Challenges such as adhesive bridging (sticking together before melting) and char formation (burned adhesive residue) resulted in limited user acceptance of these early systems. Adhesives in smaller forms appeared promising, but also commonly suffered from bridging and adhesive clumping issues.

Today, small adhesive pellets are readily transported using pneumatic transport technology to deliver adhesive to the melter tank without the problems inherent in earlier fill systems.

How the Packaging World is Changing

Rising Costs

In recent years, adhesive costs have increased 10 to 25 percent. Some manufacturers are even paying double for the adhesives they need. In addition, increasingly limited adhesive production resources, such as oil and resin, mean that manufacturers are focusing on new ways to apply adhesive with the utmost precision and efficiency to minimize waste of adhesive or product. Packaging manufacturers can no longer afford to apply adhesives in excessive amounts to ensure a good bond.



Adhesive prices rise with petroleum prices

Adhesives are made of three basic ingredients: resin, tacifier and wax. All three have increased in cost and become less readily available over the past several years, a trend that is expected to continue. As a result, adhesive – once just a small fraction of the cost of packaging – has become a significant, variable cost recognized and targeted by purchasing and production departments alike.

Today’s adhesive price situation is somewhat analogous to gasoline prices. When gasoline cost less than \$1 per gallon, few people worried about fuel economy or tire pressure. With low gasoline prices now a thing of the past, the market has responded with hybrid automobiles and information on more fuel-efficient driving.

Similarly, the packaging industry is coming to grips with these same economic realities. It is no longer acceptable to just seal the box. The precise placement and amount of adhesive used on each package is measured, documented and reduced to its optimal point.

The Evolution of the Fill System





Changing Adhesives

Advanced adhesive extrusion technology has given rise to more efficient, smaller adhesive forms. New techniques, such as underwater extrusion, allow adhesives to be cut into shapes, such as pellets.

Adhesive pellets are also more transportable – and more compatible with automatic fill systems. Unfortunately, not all packaging-grade adhesives are available in pellet-shaped form. Adhesives that have a higher degree of tackiness are prone to sticking to each other when in pellet form and are therefore only available in pillow or slat forms, and are not usable in automatic fill systems.

Increasing Efficiency

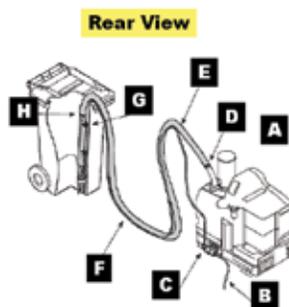
Reducing waste is the key to achieving sustainability. The reject box that won't remain closed after glue application is waste. The box with too much glue is another form of waste. Effective, sustainable packaging minimizes waste in every form. Because sustainable manufacturing practices benefit the environment and bottom line, packaging manufacturers are seeking new strategies that will allow them to work more efficiently. This means they are searching for technologies to help them decrease energy consumption, reduce waste and use more renewable materials while also increasing operator and maintenance staff efficiency.

How Automatic Fill Systems Work

In principle, automatic filling is a simple concept. A sensor continuously monitors the adhesive level in the melter tank. An automatic signal alerts the system when additional adhesive is required. The system supplies small amounts of adhesive to the tank until the sensor is satisfied, keeping the adhesive level relatively constant.

Automatic fill system components

- A – Adhesive melter
- B – Filling air supply
- C – Solenoid valve
- D – Fill tube & exhaust stack
- E – Transfer tube
- F – Hose routing
- G – Adhesive bulk container
- H – Suction tube & conduit



Granular adhesive is deposited into the hot melt tank every few minutes without any action needed by the operator. This may sound convenient – and it is – but the right automatic fill system can offer a variety of benefits far beyond convenience. The right system can:

- Increase production efficiency and enable greater productivity by eliminating manual tank monitoring and filling, and the potential for human error, including overfilling, adhesive spilling/waste or low/dry adhesive tanks
- Deliver superior bonding by maintaining constant adhesive temperature and viscosity
- Reduce production costs by keeping the tank full, preventing dry tanks, thermal shocking and system adjustments
- Help provide a safer workplace by eliminating multiple bending and lifting, as well as limiting interaction with molten adhesive
- Provide a return on investment that easily justifies the cost of the system

With advanced design and intuitive controls, automatic fill systems can help packaging manufacturers substantially increase their productivity, while simultaneously reducing waste and costs.

The Problem of Adhesive Char

Keeping the melter tank at a constant full level keeps the sides of the tank clean of adhesive residue or film. Because adhesive contains oxygen, it can break down and form carbon along tank walls. In most cases, as the tank level falls, adhesive leaves a film on the sides of the tank. This film reacts with the heat and air and forms what is known as char.

Char can result from hot melt adhesives used at temperatures ranging from as low as 200°F to 450°F. Not all hot melts form char, but most can and do. Without an automatic fill system, the tank level will fall as adhesive is pumped and dispensed onto the packages. It will not rise again until an operator manually fills that tank. Then, as the tank containing char is manually refilled, the adhesive breaks, causing multiple problems including: unwanted downtime; malfunctioning guns and hoses; clogged nozzles; and increased parts and maintenance costs.

Char creates efficiency problems in other ways as well. It can cause increased costs due to product rejects and rework, pop-opens, char on packages, and jammed machines. The bottom line: where there's char, there's inefficiency and waste.



Char caused by low/dry tanks and irregular filling impacts hoses, guns and end products

Running on Empty

Char formation is just one of the challenges of a conventional hot melt tank. Put simply, refilling a tank by hand creates inefficiencies.

- First, the operator must turn his or her attention away from another task. Relying on operators to fill tanks can also result in tanks running empty. In today's manufacturing climate, many operators are doing multiple jobs and can easily miss the low tank indicator light.
- Second, opening the tank releases heat and exposes the tank to paperboard and corrugated dust and other debris.
- Third, the operator must fill the hot tank with cold adhesive.

Introducing a large amount of cold adhesive can cause the temperature of adhesive and the tank to drop by as much as 20 degrees, a phenomenon called thermal shock, or "shocking the tank." The remaining adhesive is no longer at optimal temperature, and the new adhesive must be melted.

This phenomenon begins a dangerous and costly chain of events. The tank temperature falls, and the adhesive viscosity increases. The operator may or may not recognize that there is less material now being dispensed on each package.

Failure to see this will result in inadequately sealed packages or "pop-opens." If the lessening deposition of adhesive is recognized, a typical operator may attempt to compensate by increasing system pressure to increase the amount of adhesive being dispensed.

Moving on to other duties, the operator is likely to miss the point at which the adhesive in the tank reaches its correct application temperature and viscosity. Unless system pressure is returned to its correct setting, too much adhesive will be dispensed on each package. Adhesive stringing, squeeze-out on the product and pop-opens (resulting from the excess adhesive not cooling and setting in a timely manner) are common.

Automatic adhesive filling resolves all of these issues, saving operator time, as well as helping prevent thermal shock and adhesive degradation.

Without automatic filling systems, operators must continually refill melter to minimize char formation and the risk of production stoppages.



Selecting the Right Adhesive

Because of the mechanisms that convey adhesive from the holding container to the melter, automatic fill systems are only compatible with non-pressure sensitive adhesives.

A quick test to determine if your adhesive is a good candidate for an automatic fill system is to take a handful of your material and squeeze it. If it falls back apart, it's a good candidate. A few additional tips:

- Most automatic fill system manufacturers will arrange for a free adhesive test.
- If your adhesive isn't non-sticking, that doesn't mean you can't take advantage of the benefits of an automatic fill system. The first step is to contact your adhesive provider to see if another type of adhesive, one that will qualify for use with an automatic fill system, could still meet your product's needs.
- If your adhesive qualifies, you're ready to select an automatic fill system. Contact a sales representative for assistance.

A Solution That Fits Your System

While most automatic fill systems try to accomplish the same end – automatically filling a melter – how they go about the task, and the technology they leverage to do it, is what sets systems apart.

Not every automatic fill system is the same. It's critical that you choose a system that incorporates into your line easily, with minimum interruption and maximum long- and short-term benefits to your operations. Here are a few key characteristics that will help you select an automatic fill system that delivers maximum benefits.

Automatic Feeding Methods

There are three ways to automatically feed a melter using non-clumping granular adhesive using pneumatic transport or vacuum technology:

1. Feeding through a tube and exhausting air through another tube using a sensor and timer
2. Feeding through a tube and exhausting air through the same tube using a sensor and timer
3. Feeding through a tube but using a gating device to control access and closure to the tank

Feeding the adhesive through one tube and exhausting the air through another delivers the best performance as the air has a separate way to leave the tank. This results in less material clogging the filter, better airflow and cleaner operation.

ProBlue® Fulfill™ Integrated Melter and Fill System



Integrated Systems

A fully integrated automatic adhesive fill system – one that includes a melter – ensures a seamless process for anticipating problems before they happen and delivering optimal efficiency in both energy use and production. If a fill system is not integrated with the melter, the two systems often do not communicate, and they work completely independently. The more integrated the system, the more “intelligent” it can be.



Fulfill retrofit systems are available for a wide range of melter sizes and capacities

However, in some cases, retrofit automatic adhesive fill systems can also present an economical solution, and they can be easily and quickly integrated with existing adhesive dispensing systems. Look for retrofit automatic fill systems with pre-calibrated sensors that monitor adhesive levels and automatically refill the tank with small quantities. Systems with pre-set controls – such as adhesive delivery, time delay and overflow alarm – won't require programming, further saving customers valuable time.

The Cost Benefits and Payback of Advanced Technology

Effective systems employ technology that delivers tangible benefits and pays for itself both in the short and long term. The capacitance sensor is an excellent example. Due to the unique contents and conditions of a hot melt tank, accurately detecting the fill level requires an innovative sensor technology. A capacitance sensor provides superior accuracy in monitoring the part-liquid, part-solid contents of a melter.



Capacitance sensor accurately monitors adhesive level in the melter tank

Designed for Efficiency

Effective fill systems are designed for efficient operation and maintenance. An automatic fill system that allows for quick, easy maintenance will perform better and minimize downtime. Being able to easily change air exhaust filters is important as well.

Adhesive formulations commonly contain traces of talc-like and other materials, or “fines,” which are used to prevent adhesive from sticking to itself, or bridging, before it is melted. Talc and fines can collect in the filter and block exhaust air. When the air is not exhausted properly, the system loses suction and transport air velocity – much like a vacuum – and eventually stops working. Easy access to and ease of changing air exhaust filters are important considerations when choosing a fill system.

Safeguards

Look for systems that have lid lock out features. This prevents the system from refilling when the tank lid is opened. When the level sensor communicates with the system, adhesive flow to the melter tank is initiated. Choose a system with overflow protection to prevent too much adhesive from being added, thermal shock, poor bonding, scrap packages and adhesive waste.

Minimal Moving Parts

More moving parts typically translates to more maintenance and cost. Choose an automatic system that has relatively few moving parts, particularly in the air-transfer pump. The most efficient type of these systems is one based on the Venturi principle: vacuum is created by changes in air velocity..

The Benefits of the Right Automatic Fill System

When the design and technology come together, an automatic fill system can start delivering benefits right away.

1. Labor cost savings
2. Reduced downtime
3. Improved safety

As you begin your search for the right system, look for these features:

- Integrated filling, melting and controls: provides the essentials for a simple to operate and maintain hot melt application system solution
- Ability to open the tank lid: allows for secondary inspection of tank level and confidence of operation
- Tank lid lock-out switch, fill time-out and tank level monitoring: protects operators and keeps systems from accidentally overfilling or under filling and stopping production
- Venturi delivery system: efficiently moves many of the new, non-tacky, smaller (under 1/2" diameter) hot melt adhesives being introduced to the packaging market
- Large, single adhesive tote: provides a clean, uninterrupted availability of adhesive to the melter

The most advanced automatic fill systems can handle today's highly efficient materials, keep tank temperatures at optimal levels, maintain good bonding characteristics of the adhesive, reduce production waste, and increase overall sustainability and efficiency. An automatic fill system that unites all of these characteristics will deliver the maximum benefit.

For more information about the savings an automatic fill system can deliver to your operation, call (800) 234 0506, visit nordson.com or click [here](#)



Intuitive controls for integrated and retrofit systems