

Introduction

Adhesives are characterized by the fact that they adhere simply through pressing together the parts of the joint which requires bonding. They demonstrate a lasting and permanent adhesive effect at room temperature.

Hot melt adhesives are solvent-free adhesives, which are characteristically solid at temperatures below 180°F (82°C), are low viscosity fluids above 180°F, and set rapidly upon cooling. The development of hot melt adhesive technology stemmed from the previous use of molten wax for bonding. When this method no longer satisfied performance needs, 100% thermoplastic systems were introduced. Today, hot melt adhesives are used in a variety of manufacturing processes, including bookbinding, product assembly, and box and carton heat sealing.

There are a number of hot melt adhesives in use, with the most common being those used for hot melt pressure sensitive adhesive applications:

- Ethylene vinyl acetate (EVA) copolymers, compatible with paraffin, the original hot melt;
- Styrene-isoprene-styrene (SIS) copolymers;
- Styrene-butadiene-styrene (SBS) copolymers;
- Ethylene ethyl acrylate copolymers (EEA); and
- Polyurethane reactive (PUR)

Generally, these polymers do not exhibit the full range of performance characteristics required for an end product by themselves. Thus a variety of additives such as resins, waxes, antioxidants, plasticizers and other materials are added to the adhesive formulation to enhance the polymer performance.

Some of these adhesives have been accepted in many manufacturing industries, where they can be applied in small bond points to eliminate use of mechanical fasteners, such as staples, screws, rivets, clips, snaps, nails or stitching.

Uses & Properties

Hot melt adhesives are used primarily for packaging, textiles, labels, tapes, and other pressure sensitive applications, disposable products, stamps, envelopes and product assembly processes.

Typical Processes

Hot melt production is a continuous process. In most cases a twin screw compounder or

co-kneader is used to produce a homogenous melt. The elastomers are metered individually or as a premix, using a gravimetric feeder, into the feed barrel. After plasticizing/masticating and compounding the various rubbers, the resins (solid or liquid) and softeners/oils are added downstream. For larger quantities, the liquid can be fed at several locations along the extruder, using multiple kneading and homogenising stages.

Ingredients and Feedrates

The typical throughput ranges are 100 - 1000 kg/hr, (220 - 2200 lb/hr). Depending on the recipe and number of ingredients, the typical feed rates are as follows: Elastomers: 30

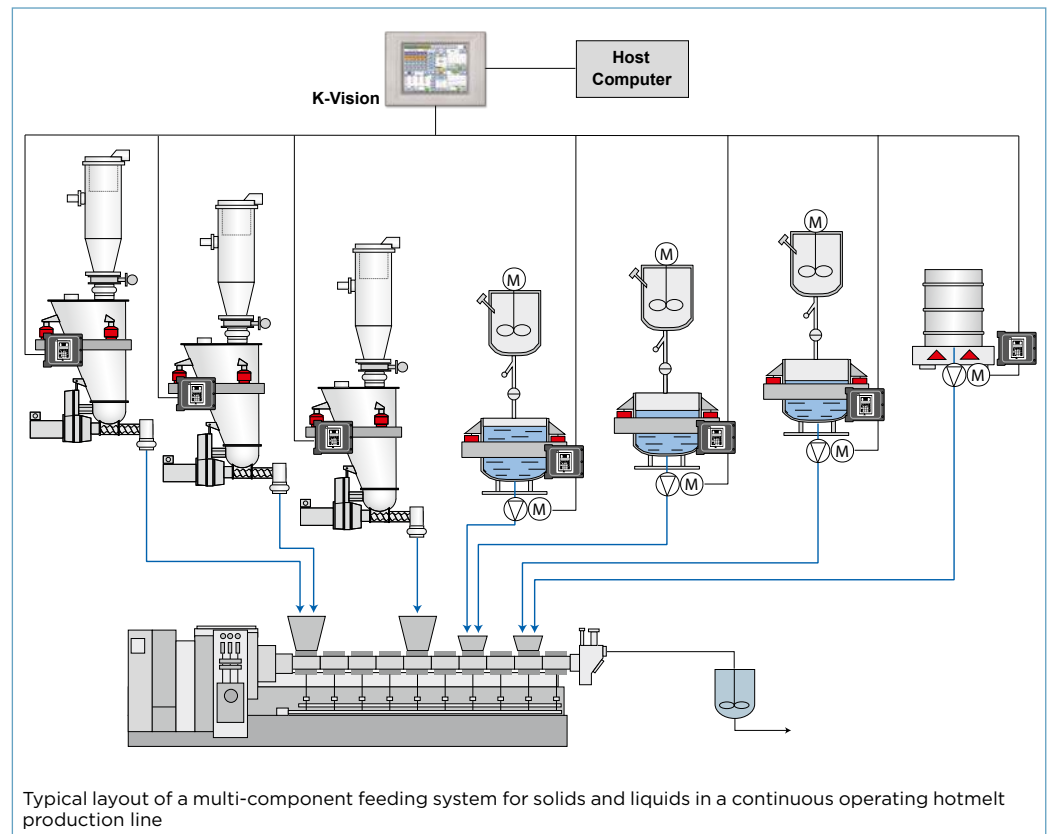
- 50%, Resins: 20 - 40%, Softeners/Oils: 10 - 40%, Fillers: 1 - 10%, Color pigments: 0.1 - 3%, Stabilizers: 0.1 - 3%

High Accuracy Requirements

There are tough performance requirements on the various types of hotmelts with regard to working load and types of stress on the joints, service temperature range, lifetime etc.

Typically there is a rather short residence time (10 - 20 seconds) in the extruder's mixing zone.

To ensure constant high quality of the end product, a consistently high feeding accuracy is required for the additive feeders: $\pm 0.2 - 0.5\%$ at 2 sigma for a sampling time of 10 seconds.



Continuous Hot Melt Production

Typical Feeders

K-ML-KV2 or **K-ML-KV3** vibratory feeders for gentle handling of resin.

K2-ML-S60 or **K4G-L-BS60** single screw feeders can easily be adapted to the characteristics of fair to easy flowing powders and granules, i.e. rubbers SIS, Resin etc.

K2-ML-T35 or **K4G-ML- KT20** twin screw feeders are ideal for feeding fine, poorly flowing powders i.e. stabilizers, fillers etc.

K-ML-P liquid loss-in-weight feeders are the perfect feeding system for a wide variety of liquids with different viscosities, temperatures etc.

To ensure proper and reliable feeding performance of the loss-in-weight feeders, selection of the appropriate refill system is crucial.

Refill

For free flowing solids Coperion K-Tron vacuum conveyors can be used to keep the feeders well supplied. For sticky solid additives such as Irganox, Tinuvin, or CaCO_3 , etc. refill hoppers, extracting devices and shut-off valves or bag dump stations are required.

Control System

The loss-in-weight feeders add the ingredients in a pre-set ratio, set in the operator interface

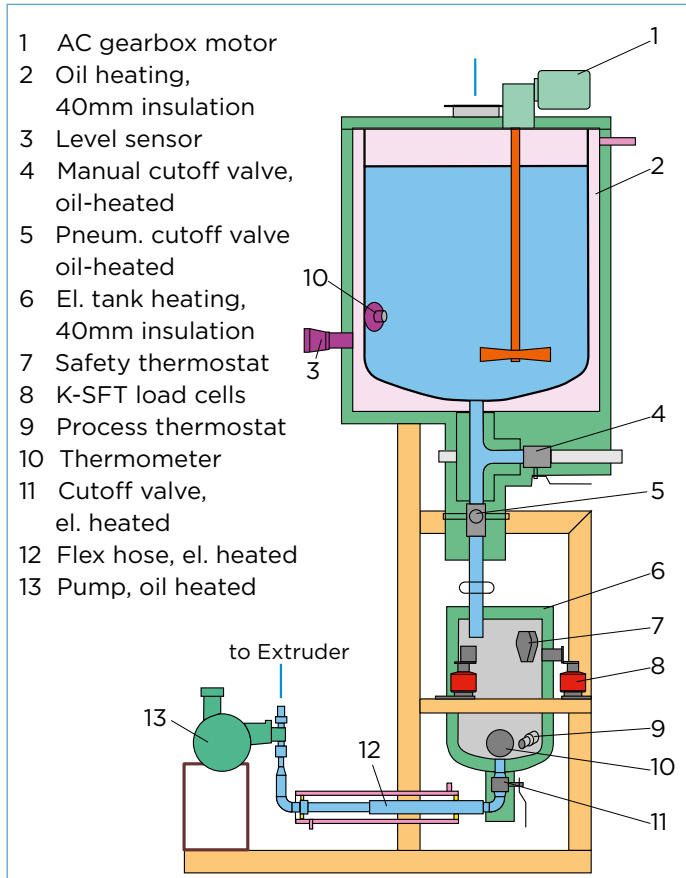
or downloaded from the host computer via line controller (K-Vision) to the locally mounted control module (KCM). All the process relevant parameters for each feeder are stored in the appropriate recipe. The feeder mounted Coperion K-Tron Control Module (KCM) combines the function of motor drive and feeder control in a compact package. In this example the K-Vision Line Controller provides a single user interface for up to 8 feeders in one line.

Coperion K-Tron's modular K2 continuous loss-in-weight feeders with integrated refill systems guarantee high short-term accuracy with a large operating turndown. Coperion K-Tron's advanced Smart Force Transducer (SFT) digital weighing technology offers outstanding short-term accuracy. High resolution weighing and powerful on board digital signal processing ensure precision feeding even at short intervals or in vibration-prone plant environments. Coperion K-Tron's SmartConnex Control technology ensures long-term stability, good repeatability and consistent feeding quality.

Experience

Over the years Coperion K-Tron has supplied many dozens of gravimetric feeders into the hotmelt industry.

3M, Supperfilm, Shurtape, Scanstick, Ritrama, and Coroplast are just a few of the many satisfied Coperion K-Tron customers.



Typical liquid loss-in-weight feeder with double jacketed tanks and oil heated refill tank with agitator for preconditioning of the liquid



Loss-in-Weight Feeders with refill units