

Application Details

Super Absorbent Polymer (SAP) consists of small gel-like beads that have all the water removed. When water is reintroduced, the crystals absorb the water and expand into a gel. SAP is an essential component in baby diapers, feminine hygiene products as well as incontinence products and pet hygiene products. Personal hygiene products which involve SAP are a steadily growing market.

In the 1980's the worldwide annual production of SAP was about 400,000 metric tons. In 2000 the worldwide consumption reached 3 million metric tons and the market continues to expand rapidly. The huge increase is due largely to the use of SAP in the personal and pet hygiene products industry.

Typical Process

The production of these personal and pet hygiene products is a continuous process and one of the most critical tasks is the accurate, uniform and even distribution of SAP onto the fast-moving band of cellulose or bicomponent fiber. The short term accuracy and uniformity of the SAP-feeding device are key to the quality of the end

product. Traditionally, diaper manufacturers use gravimetric single or twin screw feeders.

Product Characteristics

SAP is a free flowing, very hygroscopic polymer based bulk material with a typical particle range of 50-500 μ . When SAP comes in contact with liquid it forms into a gel that traps moisture and will not release it, even under pressure.

Typical Rates

Depending on the size and throughput rates of the diaper forming machine the typical flow range is 10 to 1,500 dm³/h [0.35 - 53 ft³/h] or approx. 5 to 750 kg/h [11 - 1,650 lb/h] at bulk densities of 0.5 to 0.75 kg/dm³ [31 - 47 lb/ft³]. Typically, an accuracy of $\pm 0.5 - 1\%$ 2 Sigma standard deviation is required, with a 1-5 second sample time and a turndown of 1:5 from the maximum setpoint.

Feeding accuracy determines end product quality. The level of short term accuracy required for this application can only be achieved when the refill systems are optimally configured to suit the feeding systems. Coperion K-Tron's vacuum conveying systems offer a wide range of solutions for this purpose.

Feeder Details

Traditionally, typical feeders for such an application would include K2-ML-T35 twin screw or K2-ML-S60 single screw feeders with a 50-110 liter hopper, stainless steel construction and standard 2B finish. In some cases K3-ML-V200 vibratory feeders can also be used.

The unique Bulk Solids Pump (BSP) feeder with its outstanding feeding performance, is a real alternative for this application. Test results as well as positive experience at customer sites have clearly shown that the BSP is the ideal feeder for SAP thanks to the uniform, pulse-free flow of material.

The unique Coperion K-Tron Bulk Solids Pump (BSP) feeders have been specifically designed and engineered to provide gentle, precise feeding of free-flowing pellets, granules, flakes, powders and friable products.

The BSP feeders do not use the

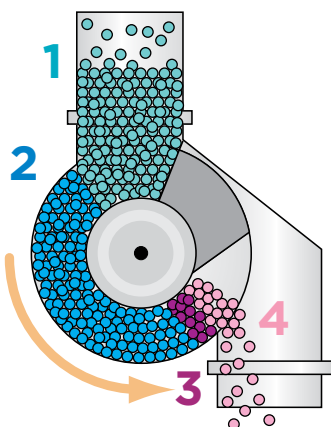
usual screws/augers, belts or vibratory trays to convey the material. Instead, they utilize positive displacement action to feed free flowing materials with astounding accuracy, offering uniform discharge, consistent volume and gentle handling.

All BSP feeders have vertical rotating discs that create a product lock-up zone, conveying the material smoothly from storage hopper to discharge outlet, achieving true linear mass flow. Utilizing a simple design and the principle known as "lock-up", the material in the feeder is moved together in true positive displacement, producing excellent linearity and breakthrough accuracy levels.

Gentle Conveying

SAP can be conveyed in both dilute and dense phase systems however, dense phase conveying is more gentle and will reduce product degradation. The

Positive Displacement Principle



Zone 1: CONSOLIDATION

Interparticle forces produce lock-up at the end of Zone 1.

Zone 2: ROTATION

Material is in lock-up condition throughout Zone 2 and rotates as a solid body.

Zone 3: RELAXATION

Interparticle forces fall below lock-up threshold.

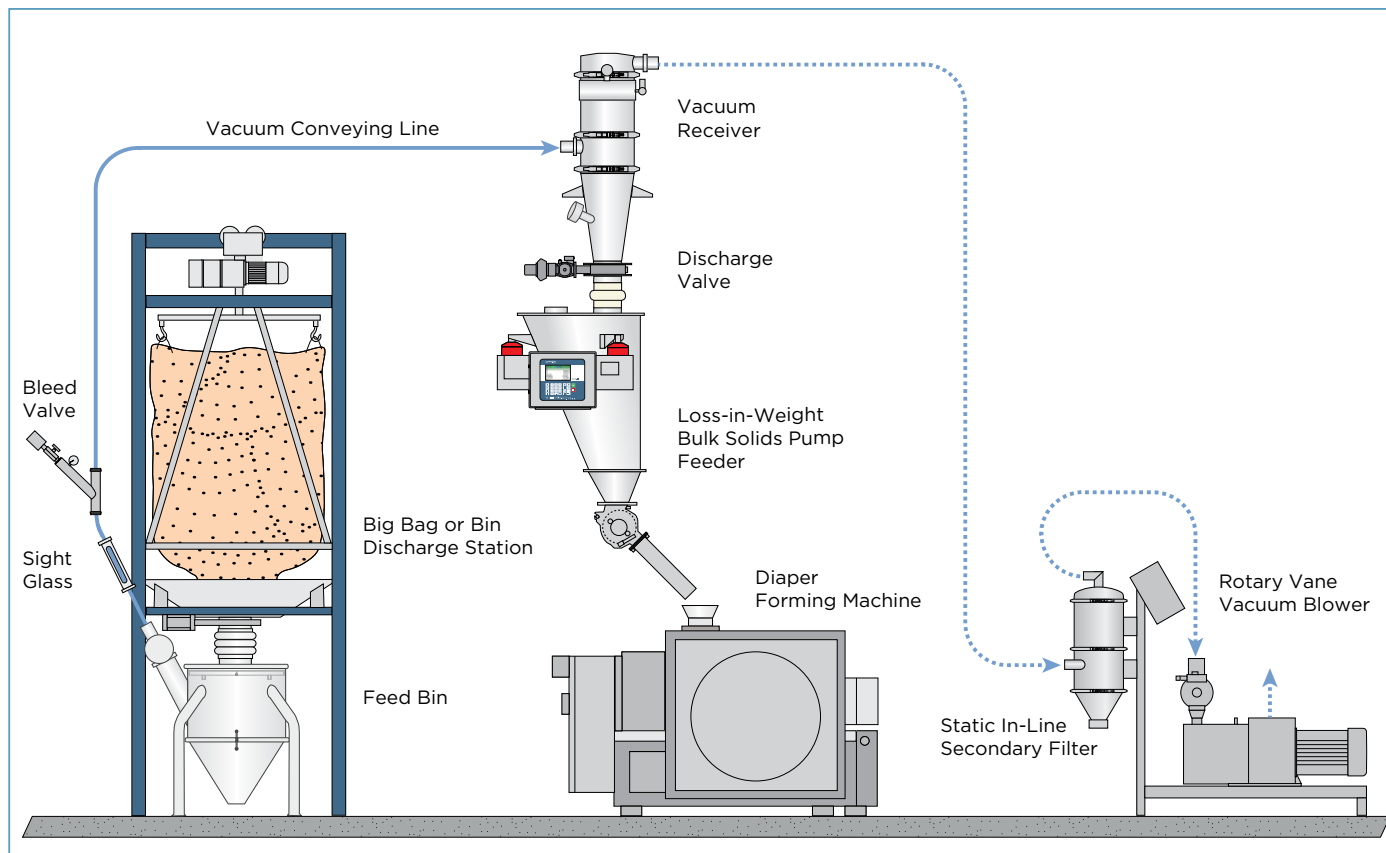
Zone 4: DISCHARGE

Flexible guide aids material discharge.



The BSP-150-S is ideal for SAP feeding applications.

Conveying and Feeding Super Absorbent Polymer (SAP)



Typical system setup for conveying and feeding super absorbent polymer.

SAP beads can be damaged or broken into dust with conventional conveying methods. Accordingly, Coperion K-Tron developed an innovative method of slow velocity vacuum dense phase conveying to gently move the product from source container to the feeder above the process without damage.

Dense phase vacuum conveying uses a high vacuum low air volume rotary vane pump to produce slugs of material that move slowly and in unison in the convey line. The slugs are formed using a "bleed valve" in the line near the material pickup

point. A sight glass installed in the convey line near the pickup point allows the operator visual observation of the slug formation size, while adjusting the bleed valve.

SAP travels the length of the pneumatic conveying system and is collected in a receiver at the destination, above the feeder. PTFE-coated filter media in the receiver efficiently filters the air before it is exhausted from the system by the rotary vane vacuum pump. A vacuum breaker valve mounted on the rotary vane pump breaks the vacuum in the conveying line,

stopping material flow into the receiver. A pneumatic slide gate on the receiver's discharge cone opens when the feeder below the receiver calls for a refill.

Coperion K-Tron Advantage

- > High performance SFT digital weighing technology, which gives outstanding results in short term accuracy.
- > BSP technology provides superior gentle & uniform SAP-feeding into the diaper forming machine.

- > Dense phase pneumatic conveying gently moves the SAP from source to destination, reducing product degradation.
- > SmartConnex control system ensures long term stability and consistent feeding quality.

