



Conveying Changes Direction

Energy efficiency and other pluses boost mechanical movement

By Seán Ottewell, Editor at Large

CHEMICAL MAKERS increasingly are turning to mechanical conveying, often to overcome the cost and limitations associated with pneumatic systems.

For example, Nynas Bitumen, Ellesmere Port, U.K., a bitumen, bitumen emulsion and polymer modified binders manufacturer, recently made the switch. The company, faced with the need for a major upgrade, decided that opting for mechanical conveying would obviate two major problems of its pneumatic conveying system: the wear and tear that dry additives were having and the sizeable filtration system required.

Nynas installed four aero-mechanical conveyors and associated equipment from Spiroflow Systems, Monroe, N.C. Ranging in length from 23 to 72 ft, the conveyors operate in vertical, inclined and horizontal directions and can handle 1.5 ton/hr of polymer additives. Because there's no net displacement of air, the plant doesn't need any venting or filtration equipment. The new system reportedly provides a substantial increase in output and much improved process cleanliness over the previous pneumatic system.

The quest for better energy efficiency increasingly

is driving the choice. "A typical pneumatic conveying solution can use as much as ten times the energy consumption of one of our mechanical solutions. In the past this wasn't an issue because a solution was proposed by engineering and procurement went out and bought it. Now procurement has a much closer understanding of plant operating costs. This effect is even more profound in Europe, where operating costs are that much higher than in the U.S.," notes Jeff Dudas, Spiroflow's CEO.

Spiroflow offers flexible screw conveyors and aero-mechanical units (Figure 1), both with capacities up to 40,000 lb/hr. Its 2010 acquisition of Dynamet added both cable and disk and chain drag conveying to that portfolio. The latter suits very heavy duty, 24/7, 365-day/yr applications where servicing is difficult and materials need to be moved up to 450 ft. "Heavy duty drag conveying is a real problemsolver especially for materials that are very heavy, very adhesive, or easily fluidized. It makes them 100% conveyable," notes president Michel Podevyn.

Testing of solids often is crucial to coming up with the optimum conveying solution. "You can

test two samples of the same material from different plants and each could need a different method of conveying; so we never set out with the intent to sell a particular solution,” says Dudas. He cites the case of two carbon black samples from different manufacturers tested last year. They had been processed in different ways, resulting in different particle sizes and shapes. “Both companies wanted to transport, bag and densify their carbon black, but each needed a different solution.” Spiroflow’s labs in Monroe and Clitheroe, U.K., so far have tested over 8,000 material samples from customers.

“I wouldn’t like to guess how many samples of calcium carbonate we have tested over the years and many are totally different. But it is very important for our customers that the solution we offer gives them product consistency,” adds Podevyn.

Spiroflow also cites the importance of its systems group. “This was set up to overcome a big change we have seen in customers over the last few years — engineering outsourcing. So we have to be able to offer systems integration,” says Dudas. The group also heavily focuses on improving the automation of conveying technologies. “We fine-tune all of the equipment here, replicating, for example, path runs, throughput rates, drive speeds and angles. None of our competitors offer the same service,” boasts Podevyn.

Spiroflow sees two main challenges emerging from the chemical industry today: the demand to increase production while reducing costs, and new legislation.

“A good example of what the industry expects from us is highlighted by a project we are currently working on. A new U.S. molybdenum plant wanted a packing system that can handle 200,000 lb/hr of product. The company only wants three people to run the packing facility. Adjusting to current economic activity, companies want to increase productivity without increasing headcount,” says Dudas.

“Coming down the line, we are seeing increased movements of safety standards more in line with the stricter requirements currently seen in Europe. We are gearing up for all our equipment to be designed and built to those same European explosion-protection standards. Environmental issues are becoming far more important, too, particularly cleaner air and a better working environment for operators within plants,” adds Podevyn.

ANOTHER CHANGEOVER

Dhunseri Petrochem & Tea Limited (DPTL), Haldia, India, produces 200,000 metric tons/yr of bottle-grade polyethylene terephthalate resin.

AERO-MECHANICAL CONVEYORS



Figure 1. Two units transfer tin oxide from storage to packaging. Source: Spiroflow Systems.

TUBULAR DRAG CONVEYOR



Figure 2. Such units generally use far less energy than pneumatic systems. Source: Hapman.

The facility relied on pneumatic conveyors to move truckloads of purified terephthalic acid (PTA) from ground level to a staging silo 115 ft above. However, the conveyors were proving costly both in terms of energy and nitrogen consumed by their compressors.

DPTL switched to a tubular drag conveying system from Hapman, Kalamazoo, Mich. “After much research we realized tubular drag conveying would be the most efficient and effective means for conveying PTA powder. We chose Hapman because they provided a better design and robust construction of drag conveyor,” explains Subrata Mazumdar, DPTL senior general manager.

The tubular drag conveyor (Figure 2) consists of a stationary outer casing through which a sprocket drive pulls a chain that has flights attached at regular intervals. The endless chain and flight assembly

moves bulk material from the in-feed points to the discharge ports.

DPTL reduced energy consumption by 225 kWh and nitrogen consumption by 2,500 Nm³/d.

For Hapman, tubular drag conveyors are a key offering, especially for the chemical industry. "Chemical companies are focusing more on the cost of ownership. Lower cost of ownership was one of the market forces behind the development of the Hapman tubular drag auto-tensioner," says Joe Zerbel, product manager. That device effectively obviates periodic and labor-intensive chain tightening — increasing conveyor performance and reliability.

"The most notable shift in market trends is the increased concern over energy consumption. Hapman has always featured the low-speed, high-torque operation of our tubular drag conveyors as energy efficient, but until recently this feature has rarely been the compelling reason for chemical processors to make a purchase.... When compared to [large pneumatic] systems, tubular drag conveyors generally require a fraction of the horsepower to handle the same volume," he adds.

The continued emphasis on environmental and worker safety are basic reasons why the chemical and mining industries desire tubular drag conveying technology to move dry bulk product, believes Zerbel: "Clean, safe plant environments, free of airborne dust and the many associated hazards is a key concern of these industries. The ability to seal to both upstream and downstream process equipment while maintaining an inert environment is the primary interest in tubular drag conveyor technology."

In addition, the chemical industry is demanding shortened project cycle times, even for very complex

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systems involving product flow design of multiple bulk products with tight controls and reaction time, coupled with highly accurate measuring, mixing and blending requirements, Zerbel says.

"I see two main reasons for this trend. First, economic uncertainty has caused companies to delay capital expenditures until a level of certainty is satisfied or until failure to act will create potential revenue and market share losses. Risking downtime and lost production, they impose accelerated deliveries. Second, fluctuation in market prices for raw materials and finished goods has caused unanticipated and instantaneous high demand for certain end products. Many companies will release capital projects in an attempt to capitalize on macroeconomic factors if they can implement capital projects quickly. Accelerated project time for engineering, equipment manufacturing, and installation are becoming more the norm in today's market climate. Finally, the lean nature of large manufacturing companies requires increasing responsibility and accountability for critical-success-factor suppliers.

"We have changed internal processes to accommodate the shift in project cycle times. Our design engineering team focuses on a collaborative design process with the end customer and third-party engineering company; we have revised our handling of inquiries to react to customer questions quickly and effectively; and we have optimized our production

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LIGHTWEIGHT UNIT



Figure 3. Wire-rope/plastic-disk conveyor usually doesn't require structural supports. Source: Floveyor.

system to move work-in-process through our plant with short lead times," he notes.

MORE SUCCESS

Floveyor, Bayswater, Australia, also is seeing more plants switch to tubular conveyors from conventional pneumatic and bucket-and-elevator systems. These wins stem from its conveyors' ability to transport 100+ ton/hr using at most only a 7.5-kW motor, and with no requirements for dust extraction and other costly ancillary machines, says Rhys Walker, commercial manager. Other advantages include its suitability for Atex zoning and ability to handle delicate materials. "The Floveyor also benefits over other systems by being a 'light' conveying solution. We generally do not require any structural supports for the installation of our machines, which translates to lower installation costs," Walker adds.

The conveyor (Figure 3) consists of a steel wire rope on which plastic discs are fixed at equal intervals, and two terminal sprockets of a specially developed shape.

"A number of companies specify the Floveyor in all their plants and operations now," says Walker. Orica Ltd., Melbourne, Australia, for example, uses it in many different configurations to handle a range of chemicals including sodium sulfate, ammonium nitrate, sodium sulfite and hydrated alumina. Dynea Oy, Hensinki, Finland, specifies Floveyor for handling urea and melamine within its adhesive plants across the Asia Pacific region, he notes. ●