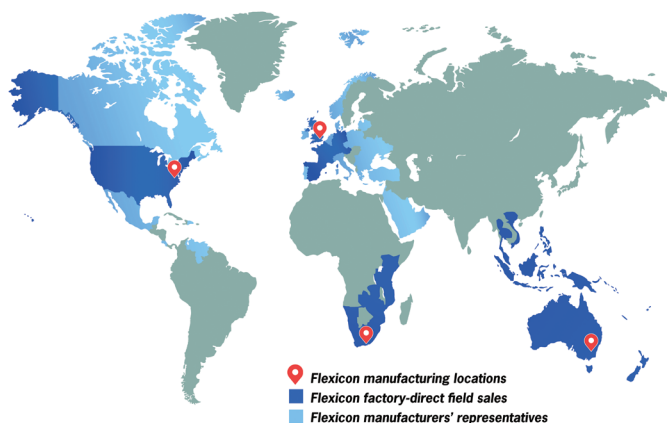




Offset, Gravure Ink Pigments Weighed by Bulk Bag Discharging Systems

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SUSSEX, WI — From its humble beginnings in 1971, with a rented press and a borrowed binder in an abandoned millwork factory in Pewaukee, Wisconsin, Quad Graphics (www.qg.com) has grown to become a \$4.8 billion global provider of print and digital communications. Today, the company has approximately 24,500 employees working from approximately 60 locations in North America, Latin America and Europe.

A key to the company's success is its emphasis on seamlessly integrated services from data management and creative development through electronic imaging, print production and distribution. This includes manufacturing its own printing inks — not only offset and gravure, but also metallic and fluorescent inks and invisible inks used as security markings. The company even produces glow-in-the-dark inks based on a proprietary blend of varnish and crystals that absorb and store ultraviolet (UV) light and release a specific wavelength (color) depending on the type of crystal used.

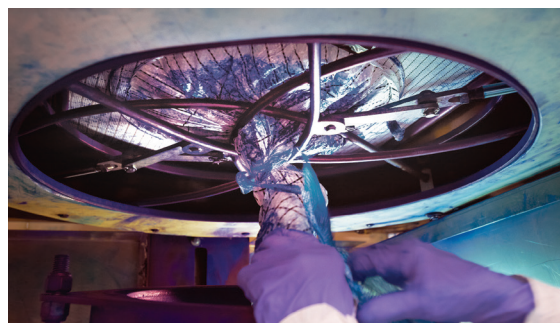
Quad Graphics' Chemical Research/Technology (CR/T) division is responsible for all facets of ink production, from R&D through formulation and manufacturing. Environmentally friendly offset inks with renewable content as high as 27 percent are manufactured at a fully integrated facility in Hartford, WI, while solvent-based gravure inks are produced at a manufacturing facility located in Martinsburg, WV. At both facilities, pigment for producing various colors is received in bulk bags weighing from 600 to 2000 lb (272 to 907 kg) apiece, which are emptied and conveyed into mixing tanks using a bulk bag unloading system from Flexicon Corp.

Offset Inks Formulated For Sustainability

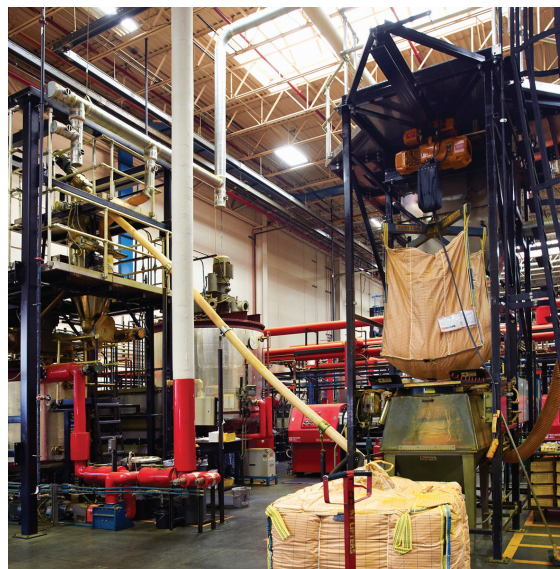
Using the highest quality materials and state-of-the-art processing facilities, CR/T began formulating and manufacturing its EnviroTech offset inks in 1982. "These inks have renewable resource content, including vegetable oils and pine resin, of approximately 27 percent — well above the industry standard of minimum 20 percent," said Charlie Buckett, Manufacturing Manager at the Hartford facility.

"Offset printing is done with four different colored inks applied in a photographically generated dot pattern," Buckett explained. "The inks, known as CMYK, are Cyan (blue), Magenta (red), Yellow and Key (black, the color to which the others are keyed). Cyan, Magenta and Yellow are produced from correspondingly colored pigments, Key from carbon black."

Upon delivery to the Hartford, WI facility, the bulk bags are loaded into Flexicon bulk bag dischargers, one dedicated for each of four pigment colors. Each model BFC discharger is equipped with an electric hoist affixed to a trolley that rides on a cantilevered I-beam, allowing bags to be raised from floor level and rolled into the frame without the use of a forklift.



A POWER-CINCHER® flow control valve regulates flow and permits closure of a partially emptied bag by concentrically cinching the spout.



In producing offset inks, pigments for each basic color (e.g., cyan, left and magenta, right) are transferred to a premix tank from a dedicated BULK-OUT BFC bulk bag discharger and 32 ft (975 cm) long flexible screw conveyor, both from Flexicon Corp.

Pigment powders are notoriously difficult to handle, with physical properties that cause packing, caking, smearing and high amounts of dust. To deal with these conditions, design features of the material handling system must be properly engineered and carefully selected. To eliminate dust and promote flow while discharging, a manual SPOUT-LOCK® clamp ring is raised pneumatically by a TELE-TUBE® telescoping tube, allowing the operator to make a high-integrity, sealed connection with the bag spout. The telescoping tube, with a 6 in. (15 cm) OD vent port for interface with a customer designed dust collector, maintains constant downward tension on the bag as it empties/elongates, promoting complete discharge of the non-free flowing pigment into a 9 cu ft (0.25 cu m) capacity Type “T” pyramidal floor hopper measuring 32 in. (81 cm) square by 42 in. (107 cm) high. The dischargers are constructed of stainless steel and include a POWER-CINCHER® flow control valve for regulating flow and permitting dust-free retying of partially emptied bags.

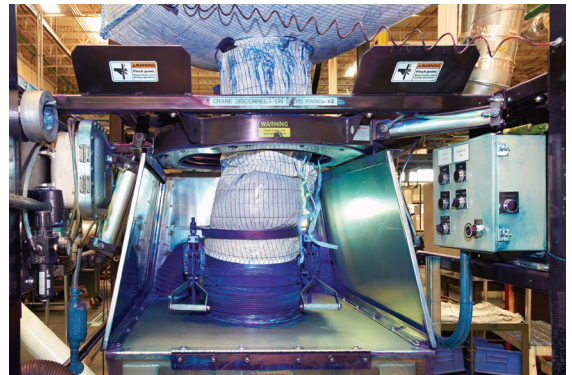
From the hopper, the pigment enters a separate 32 ft (975 cm) long flexible screw conveyor, which employs a flexible stainless steel screw having specialized geometry to move non-free-flowing materials. The conveyor transports the pigment at a 45-degree incline, discharging it into one of four loss-of-weight feeders, each dedicated to a 21 ft (640 cm) high premix tank located approximately 23.5 ft (716 cm) from the hopper, where it is blended with varnish to form an approximately 30 percent solids slurry.

The flexible screw conveyor discharges according to the amount of weight lost, whereby load cells on which the discharger is mounted, send signals to a PLC to activate the screw when 20 lb (9.1 kg) of pigment have been released into the hopper, and cycle five times to feed 100 lb (45.4 kg) into the premix tank.

“Individual slurries are then fed into a holding tank with separate compartments that can hold up to 4 premixes,” said Buckett. “From the holding tank, the different color slurries are fed separately into dedicated horizontal bead mills, each with a capacity of approximately 53 gal (200 l), for particle size reduction and encapsulation of the pigment to create the finished ink base for each color. Various proprietary ingredients are then added to each base to formulate the finished inks.”

Gravure Inks Require Special Handling

The same pigments that produce heat set inks at the Hartford, WI, facility are used at the Martinsburg, WV, plant to produce solvent-based gravure inks. “Here four bulk bag dischargers, each with an auxiliary manual bag dumping station, are installed on the second floor,” said Glenn Gogin, CR/T Process Specialist Manager. The operator uses the dumping station to introduce a 50 lb (23 kg) bag of special additives which are conveyed through a flexible screw conveyor along with the pigment to a hopper above a mixing tank dedicated to each color. The pigment and additives gravity feed into each mixing tank when called for by the process.



At the bag spout interface, a SPOUT-LOCK® clamp ring (left) and a TELE-TUBE® telescoping tube (right) eliminates dust and control flow. Also at right, FLOW-FLEXER® bag activator plates promote flow from the bag.



Offset inks begin as CMYK (cyan, magenta, yellow, key [black]) pigments. Each powder is transferred by its corresponding-colored bulk bag discharger system.



The contents of each mixing tank are then fed into a holding tank similar to the holding tank used at the Hartford facility. Unlike Hartford, however, the Martinsburg plant uses a novel concept, painting the bulk bag dischargers, hoppers, mixing tanks and other plant equipment to match the color of the pigment each is handling.

“Because the pigments are mixed with toluene, a volatile and flammable organic solvent, the finished inks are blended in explosion-proof mixing tanks located downstream of the holding tank,” Gogin noted. “To keep Volatile Organic Compound (VOC) emissions to a minimum, a gravure pressroom engineered as a permanent total enclosure is located within the Martinsburg facility. Large diameter piping allows nearly all of the solvent-laden air within the pressroom to be captured for reuse. The system routinely achieves efficiencies, which are considerably above the standard of 92 percent required by the EPA and the 96.86 percent industry average.”

For both bulk bag unloading systems, Buckett says “We sent samples of each color pigment to Flexicon for analysis and specified the feed rates we needed. They took it from there and designed the system to meet these criteria. The system works so well that in the Hartford plant we routinely process about 160,000 lb (72,575 kg) of dry pigment each week through the four bulk bag dischargers with no problems at all.”



Non-free-flowing pigment powders tend to cake, smear and create dust.



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