

A U S T R A L I A N

BULK HANDLING

R E V I E W

www.bulkhandling.com.au

Volume 12 No 4

May/June 2007

- Australian Bulk Handling Awards November 15, 2007, Sydney
- ✓ "It's easy to nominate for an Award"
- ✓ Sponsorship packages available
- Innovative Conveying System readied for commercialisation
- Draft program for ICBMH 2007
- Case study: dust prevention at pencil manufacturer
- Technical article: design considerations for belt conveyors

NEW
IMPRESSIVE HDO

Guaranteed Quality from "The Gearmotor Specialists"



BONFIGLIOLI

TRANSMISSION AUSTRALIA

MORE TORQUE

MORE ACTION



PH: 1300 656 757

Bulk handling system prevents dust at pencil-manufacturing plant

Plagued by dust in its handling of china clay, Cumberland Pencil has adopted an automated, bulk-solids handling system designed and manufactured by Flexicon (Europe) Ltd. Besides eliminating dust, the sealed system has also minimised the clay's tendencies to cake, smear, pack, bridge, cavitate and rathole.

Borrowdale, in England's picturesque Lake District, is well-known among hikers, but it also has another claim to fame as the home of the Cumberland Pencil Co. Started as a cottage industry in the mid-19th century to make pencils from locally mined graphite, the company now produces some 750,000 fine art and graphic pencils per week. The pencils are sold worldwide under the brand name of Derwent.

While graphite was the foundation of Cumberland's business, the product mix now includes multiple grades of both "lead" and coloured pencils. In the case of coloured pencils, the main raw material ingredient is china clay. This is mixed with other additives to achieve the desired solid or pastel colours and other characteristics — for example, a pencil may be soft, hard, chalky, crumbly, or soluble.

China clay is a semi free-flowing powder that tends to be aerated when it is exposed to the atmosphere, and the way it was handled in the plant caused a problem of airborne dust.

Cumberland received the clay in 25-kg bags, which were manually carried to a weigh station. There, the bags were opened and the contents weighed, along with as many as eight other additives needed for the recipe. The material was refilled into empty bags, and when the batch was complete the bags were manually dumped into a mixer for blending. The emptying



Figure 1: A bulk bag is mounted in the frame, ready to discharge clay into the receiving hopper via the Tele-Tube assembly.

MEASUREMENT & CONTROL for POWDER, DUST, and BULK MATERIALS

- Complete Instrument Solutions
- Proven & Reliable Product
- Competitive Prices

Dwyer Instruments, Pty. Ltd.
Telephone: 61 2 4272 2055
Fax: 61 2 4272 4055



www.dwyer-inst.com.au www.dust-controls.com

and refilling of the bags, and their subsequent discharge into the blender, all contributed to spillage of material and airborne dust.

After considering possible solutions, Cumberland settled on an automated, bulk-solids handling system that transfers clay to the blender with no exposure to the atmosphere.

Designed and manufactured by Flexicon (Europe) Ltd., the sealed system consists of a discharge frame that empties bulk bags of clay into a receiving hopper, from which the material is transferred by a flexible screw conveyor to a weigh hopper. Besides eliminating dust, the system has also minimised the clay's tendencies to cake, smear, pack, bridge, cavitate and rathole.

Under the new arrangement, clay is received in one-tonne bags. When a bag is needed, it is transported by a forklift truck to the bulk-bag discharge frame, which has a cantilevered I-beam, electric hoist and trolley. The bag's carry handles are attached to a cruciform connected to the hoist, then the bag is located precisely above the receiving hopper.

The bag's contents are discharged into the 225-litre hopper through a sealed, telescoping tube, called a Tele-Tube, that provides a dust-tight interface. The bottom end of the tube is connected to a collar in the lid of the sealed hopper and the top end has a patented Spout-Lock clamp ring that attaches to the bag's spout.

After considering possible solutions, Cumberland settled on an automated, bulk-solids handling system that transfers clay to the blender with no exposure to the atmosphere.

A push-button, pneumatic control raises the top of the telescoping tube toward the bag, with the clamp ring in the open position, allowing the bag spout to be pulled through the ring. The clean side of the bag spout is pulled down over the clean side of the telescoping tube and the ring is locked in place over it, then the tube assembly is lowered until the bag spout is pulled taut.

Once the spout is untied, the telescoping tube assembly exerts continual downward tension on the spout, elongating the bag as it empties into the hopper. The tension keeps the spout



The Spout-Lock clamp ring and Tele-Tube telescoping tube allow a quick, dust-tight connection between the bag spout and the hopper and elongate the bag as it empties, thereby promoting flow.



Figure 3: A flexible-screw conveyor (the narrow tube in the middle of the photo) transfers product to the weigh hopper, which is mounted on load cells that transmit gain-in-weight information to the control panel.

Offering solutions to a broad range of storage applications. Products stored include grain, processed grain products, polymers, powders, and fertilisers.



We have the expertise and capacity to engineer, design, and install a bulk storage and handling system to suit any need.

- Storage capacity ranges from 19 to 4700 cubic metres
- Celebrating over 50 years of agricultural engineering 1953-2006
- Australian owned, Australian designed, and Australian made

Modern Engineering & Construction Co P/L
ABN 16 079 134 802

60 Commercial Street, Walla Walla NSW 2659
Ph: (02) 6029 4700 Fax: (02) 6029 2307

Email: mec@kotzur.com Visit us online at www.kotzur.com



"KOTZUR" SILOS
shaping the future
in bulk storage
and handling

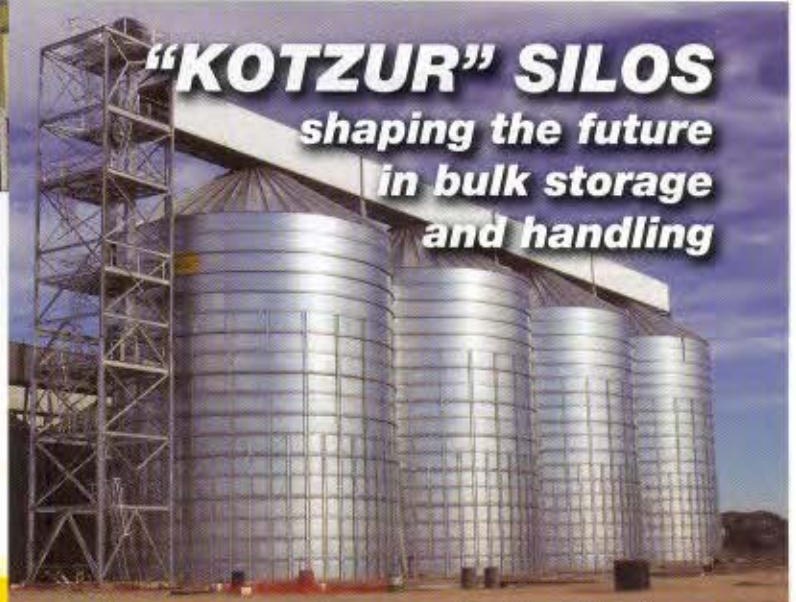




Figure 4: When the weigh hopper reaches its target weight, the batch of clay is discharged into a bag and taken to the blender.

taut and helps maintain a steady flow of material. The discharger is also equipped with Flow-Flexer bag activators — two pneumatically driven plates that raise and lower opposing bottom edges of the bag at timed intervals, loosening compacted material and promoting material flow into the discharge spout.

As the bag lightens, the stroke of the bag activators increases, forming the bag into a steep "V" shape. This eliminates dead spots and results in total evacuation of material, with no manual intervention. A hopper screen filters out foreign bodies from the clay.

From the receiving hopper, the clay is gravity fed into the throat of a three metre flexible screw conveyor that transfers the clay vertically into a 40-kg-capacity conical weigh hopper. Feeding is assisted by a side-mounted, "Flexifinger" vibratory flow-promotion device.

The screw conveyor consists of a flexible screw, housed in a 168-mm diameter tube. The screw has a "flat" configuration, designed for efficient transport of non-free-flowing materials. It is driven from its top end by an electric motor with right-angled gear drive assembly that is located above the material-discharge point, thereby preventing powder from contacting and damaging the drive seals.

Since the screw is fully enclosed, there is no spillage or dust. Unlike rigid auger screws, the flexible screw self-centres within the conveyor tube as it rotates, providing ample clearance between the screw and the tube wall to reduce or eliminate grinding of material.

The weigh hopper is mounted on load cells that transmit gain-in-weight data to the control system, which reduces the flowrate to a trickle as the batch nears its pre-determined target weight. When the target weight is reached, a pneumatically activated slide-gate valve opens to allow gravity discharge of the measured batch into a bag, still under tight dust-control conditions. The bag is then taken to the mixer for blending with other ingredients of that particular recipe. If any material from a measured batch is unused, the excess can be returned to the main hopper by lifting an access flap and pouring the powder through the screen.

Today's Cumberland Pencil operation would no doubt be a source of wonder to a group of 16th-century shepherds who kept their flocks in Borrowdale. It was they who discovered graphite under the roots of fallen trees on the valley slopes, following the destruction caused by a raging storm.

Contact: sales@flexicon.com.au



Figure 5: China clay makes a pretty reflection in repose, but can cause airborne dust when it is transferred in the open.



Figure 6: A sample of Cumberland's Derwent pencils.