

# The Cumberland Pencil Company draws on Flexicon's experience.

From humble beginnings in the mid 19<sup>th</sup> century, toiling in the Keswick foothills of Borrowdale in the Lake District, the earliest graphite pencils were manufactured through the cottage industry started by local entrepreneur Mr. A. Wren. This small enterprise was then further developed by Hogarth & Hayes from 1875, before becoming the world famous and respected Cumberland Pencil Co who now manufacture something like 750,000 fine art and graphic pencils every week under the distinguished brand name of Derwent.

Countless grades of lead and coloured pencils simply abound and, as one would expect, the recipes for each are many and varied. Far from all however, require the presence of 'black lead' as mined graphite was locally known and in the manufacturing process of coloured pencils the main raw material ingredient is, in fact, china clay. This is mixed with other additives to achieve the solid or pastel colour pencils, each with its particular string of individual characteristics such as soft, hard, chalky, crumbly, soluble etc.

China clay is a semi free-flowing powder with a tendency to fluidise and aerate. It was sourced in 25kg bags on pallets from where two operatives would manually retrieve individual bags and take them just a few feet to a weigh station where the bags would be split and the contents weighed (along with as many as eight other additives depending on the specific recipes) and re-filled back into already empty bags. When each batch was complete the compound was taken to the mixer, where they were manually dumped, for blending. The splitting of the bags, the re-filling of the bags, subsequent discharge into the blender and final disposal were all contributing to spillage and airborne dust emission. This property caused the considerable disadvantage of fouling the factory environment through the deposits left on surfaces and moreover presented an inhalation risk to operatives, although it must be said that health and safety precautions were always observed in maintaining maximum protection and minimising risk. Nevertheless, this matter of dust control alone was sufficient to prompt the need to review the materials handling side of production.

A number of options were considered and the company eventually settled on a mechanical, bulk solids handling system designed and manufactured by Flexicon (Europe) Ltd.

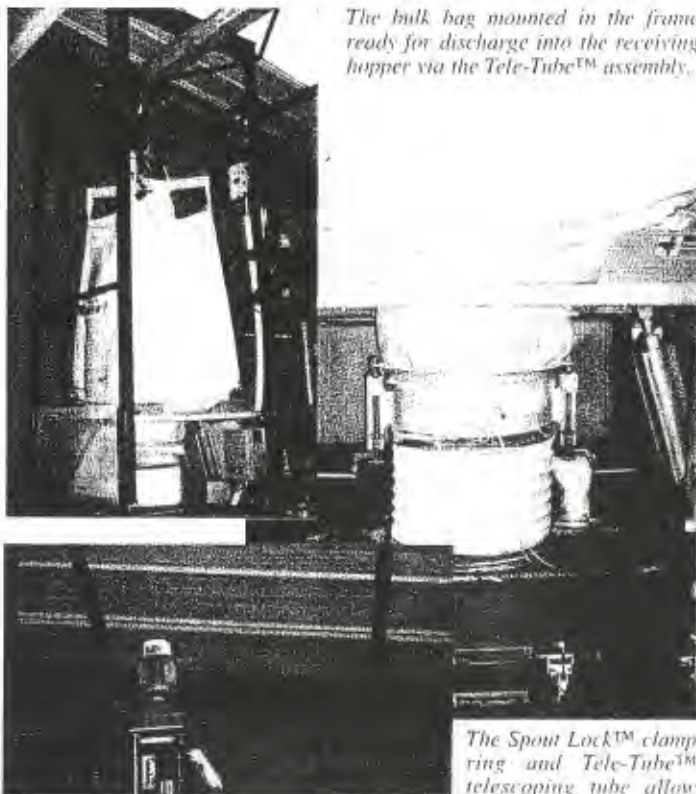
It comprised a bulk bag discharge frame with a cantilevered "T" beam, a receiving hopper to feed a flat screw configured conveyor with a discharge outlet to a second hopper mounted on load cells for gain-in-weight control and a pneumatically operated slide gate valve to discharge the measured batch. The final touch was the control panel to oversee the management of the automatic operation.

The system immediately enabled the acquisition of china clay in 1 tonne, flexible intermediate bulk containers (FIBCs). Now, with the aid of a fork lift truck, either one of the same two operatives can simply position the FIBC in front of the bulk bag frame and attach the carry handles to a cruciform connected to an electrical hoist, enabling precise location of the FIBC onto the frame above the receiving hopper. The bulk bag/hopper interface consists of a manual 'Spout-Lock' clamp ring positioned above a pneumatically actuated 'Tele-Tube' telescoping tube. Together, the devices enable an operator to make a quick, dust-tight connection between the bag spout and hopper, which was most important as the matter of dust control was the vital ingredient of the brief and its operation needs further explanation.

conical weigh hopper mounted on load cells. The load cells transmit gain-in-weight data to the controller where maximum rate filling is reduced to a trickle as the pre-determined target weight is reached. When the target weight is achieved a pneumatically activated slide gate valve opens to allow gravity discharge of the measured batch into a 'soluble' bag, still under tight dust-control conditions, which is then taken to and added - complete - to the mixer for blending with other ingredients of that particular recipe. If any measured batch were to be unused the excess material can be put back into the main hopper flow by lifting an access flap and pouring residues through the sieve for future use.

Although the overall performance characteristics of the china clay includes the tendencies to cake, smear, pack, bridge, cavitate and rathole, which were all overcome thanks to the system's design, it was the minimisation of dust in the environment that was the most important achievement. Improved production was not on an issue although the two operatives are now better employed during the process which is now under management through the control panel.

Just to underline the point, all this is thanks to the shepherds of the 16<sup>th</sup> century, for it was they who, following the destruction caused by a raging storm on a previous evening, discovered graphite under the roots of fallen trees on the slopes of Borrowdale.



*The bulk bag mounted in the frame ready for discharge into the receiving hopper via the Tele-Tube™ assembly.*

*The Spout Lock™ clamp ring and Tele-Tube™ telescoping tube allow*

By simple, push-button control the telescoping tube raises the clamp ring assembly allowing the bag spout to be pulled through the ring. It then lowers and seals the clean side of the bag spout to the clean side of the telescoping tube and continues to lower until the bag spout is pulled taut. Once the spout is untied, the telescoping assembly exerts continual downward tension on the spout, elongating the bag as it empties into the receiving hopper, via a hopper screen to filter out foreign bodies, promoting flow and evacuation. The high-integrity, dust-tight seal between bag spout and clamp ring allows full-open discharge from the bag with no risk of dust inhalation by the operative.

The discharger is also equipped with FLOW-FLEXER® bag activators that raise and lower opposite bottom edges of the bag at timed intervals, loosening compacted materials and promoting material flow into the bag discharge spout. As the bag lightens, the stroke of the bag activators increases, raising the bag into a steep "V" shape. This eliminates dead spots for total evacuation of material with no manual intervention.

From the 225ltr capacity receiving hopper the semi-free-flowing china clay is gravity fed into the throat of the 3m long, flat configuration, screw conveyor assisted by the side-mounted, Flexifinger vibrator, then transferred vertically for discharge under gain-in-weight control into the 40kg capacity



*quick, dust-tight connections between bag spout and hopper and elongates bag as it empties to promote flow.*

*The second in-line hopper mounted on load cells to transmit gain-in-weight information to the control panel.*

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