The fastest sand line in the West?

Mansfield Sand's Ratcher Hill Quarry

An automatic FFS (Form-Fill-Seal) bagging system for sand extracted from Mansfield Sand's Ratcher Hill Quarry represents the first installation of such a system in a UK quarry. But given that it has doubled throughput without the need to increase labour, it is unlikely to be the last. Jon Boulton, quarry manager and director, Mansfield Sand explains.

Bagging operations at Mansfield Sand have moved forward rapidly with demands from both sales success and legislation over the past 10 years. Six men manually placing 40 kg bags on pallets were replaced some years ago with an automatic bag placer feeding a heat sealer, a Webster Griffin supplied bag turner, bag flattener and an A1500 Robot palletiser.

An in house designed pallet conveyor was made to bring an empty pallet forward whilst moving the completed pallet to the 'shrink wrap' station. The continuous conveyor stretching outside the building buffers ten full pallets ready for the forklift to remove to the stocking yard. At the time that the bag placer was installed an output of 500-600 bags per hour seemed unbeatable and impressive – but now, compared with our new FFS line is pedestrian.

With the ability to dry and store 1000 tonnes of silica sand in silos next to the bagging plant, product availability to the bagging operation was never an issue. Three grades of quality controlled dried sand covers the foundry, industrial and pavior markets Mansfield Sand supplies.

The gradual but continual reduction in bag size from 40 to 25 kg however did put strains on production especially during periods of peak demand when 40 kg instead of 25 kg bags per pallet reduced the daily production tonnage. Increasing sales and new product lines eventually resulted in 24 hour working with very little margin for downtime.

The sand bag line at Mansfield Sand from the FFS bagging system to the robot palletiser

Webster Griffin were approached and the company promoted the installation of a flat film FFS machine from B&C, which offered the benefits of a higher production output using flat film – costing less than conventional 'pre-made' bags. With ever increasing Oil and Polymer prices, sack and drying costs were rising monthly.

The Webster proposition seemed to fit all of our requirements but a sack supplier advised me that the dust from our dried products would affect seals and therefore a Form Fill Seal (using flat film) would not be suitable – panic!

These doubts were swiftly answered by Webster Griffin, which whisked me off to Spain and Mallorca to see several operations using B&C flat film FFS machines. Within the space of two days I witnessed all types of dry and moist products being bagged, the overwhelming impression I remember was how far behind the times we were in the UK! My final doubts disappeared completely at one installation - white dust everywhere, yet the FFS machine pumped out bags continuously. Far worse than any dust we produced!

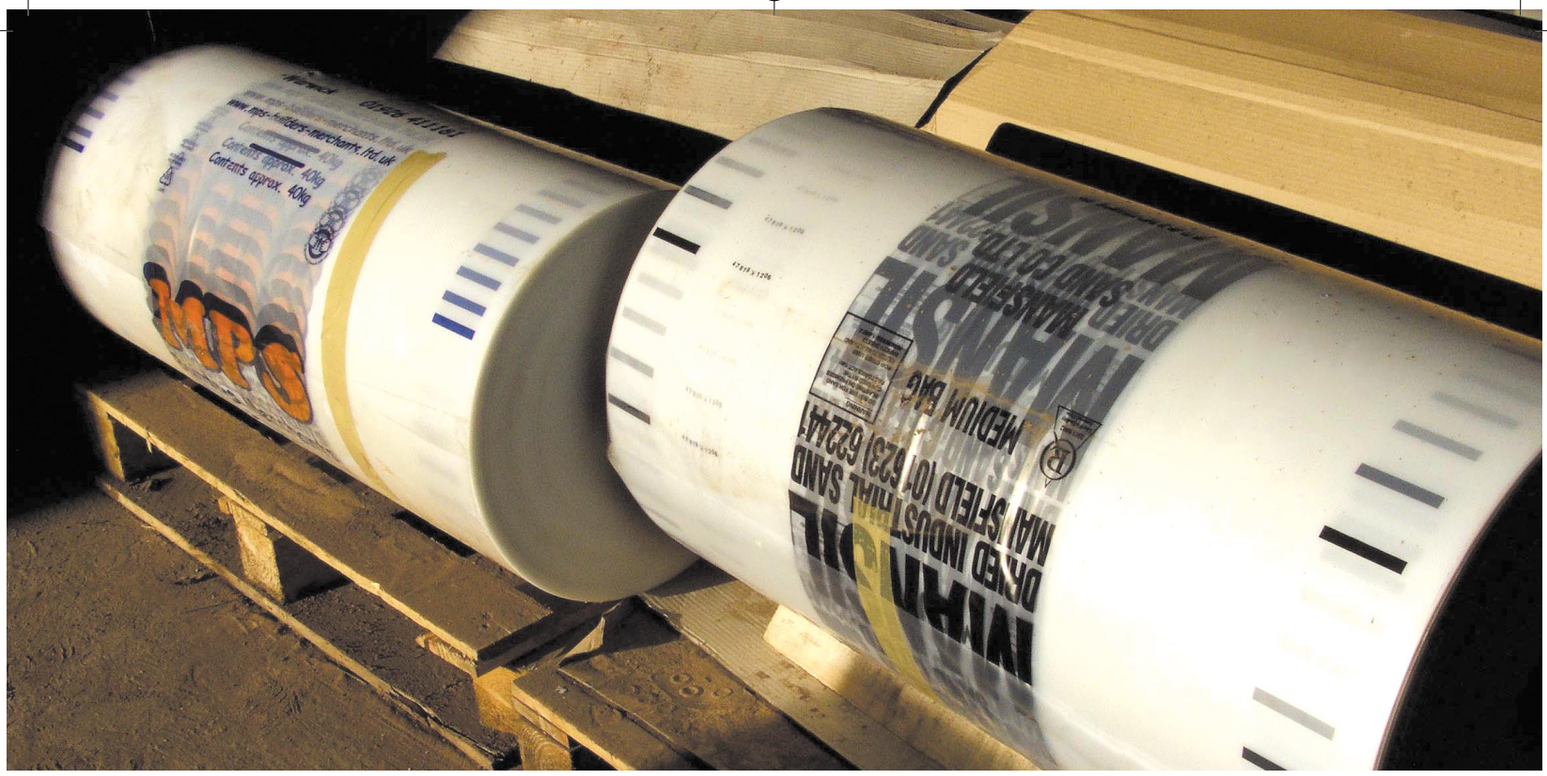
The order placed with Webster Griffin specified a packing rate of 1000 bags per hour on 12.5, 25 and 40 kg bags. It also included a volumetric dosing system to cope with both moist and dry products.

As I wanted the capability of running either the old line for pre-made bags or the new FFS line, so the challenge to Webster Griffin also was to fit the new system along side the old line in very limited space, principally to allow nil production downtime during commissioning but also to be able to use up old stock of sacks.

The objective was achieved by the design team at Webster Griffin with cunning use of angled powered conveyors and a second bag pick up conveyor for the Robot.

New dust extraction equipment was bought and film trials carried out. A point of note here, film recipe is critical. From the two major suppliers used during the trials, one got it completely wrong and caused considerable production problems. Good film will run endlessly, in fact we are now enjoying further savings on reduced gauge.

The FFS bagging system



Glancing round the sandbags

Ross Matthews visits Mansfield Sand's Ratcher Hill Quarry site to see the bagging system in action.

"We wouldn't be without it," was the overwhelming view of those who run Mansfield Sand's new bagging system at the Ratcher Hill Quarry. According to the system's supplier this is the first installation of this kind of technology in a UK quarry but given impact it has had on Mansfield Sand's operation - - doubling the production rate without an increase in staff - it is unlikely to be the last.

Many similar quarries will already have a robot for palletising bags, but this low cost automatic packing line offers an example of what can be done for an investment of well under £100,000: The new bagging line can reach peak rates of 1200 bags an hour – that's 30 pallets an hour and double the previous rate.

"In this industry quarries are under pressure to deliver; if product doesn't show up on time, a quarry can lose an order," says Mark Wilson, director of Webster Griffin. Furthermore, by increasing just-in-time production sites can minimise the need for buffer stocks of bagged products.

Creating a reliable, efficient production process for a relatively low value product such as sand helps improve the bottom line on what is essentially a low margin business. Factor in the health and safety considerations such as manual handling regulations, and the advantages of the scheme stack up as quickly as the bags of sand on the pallet.

Mansfield Sand had previously been operating an automated packing line for 'pre-made' sacks combined with the A1500 Robot supplied by Webster Griffin. However, the addition of the FFS bagging system has had a dramatic impact.

The FFS bagging machine runs continuously, forming a bag by wrapping plastic film around a tube and sealing it together. Once the bag has been filled it is sealed at the top and, in the same action, the bottom of the next bag is made.

With a normal bag produced from a 'tube' of polythene there are only two seals: one at the top, the other at the bottom. The flat film FFS adds a vertical seal running down the back of the bag. Concerns over dust getting into the seals are negated by simple, yet clever technology combined with an effective dust extraction system. As witnessed by Jon Boulton during his visit in Spain, dust does not present any problems to the seal.

"People often assume three seals must be worse than two, however they'd be wrong as the vertical seal is not a weak point," explains Mark, this is endorsed by the fact that Mansfield have shipped out thousands of 40 kg bags since last May without a single customer complaint.

Not only is the FFS system quicker but it also allows Mansfield Sand to make a shorter bag thus achieving a saving in polythene costs. Generally speaking pre-made bags need to be 120-150 mm longer so that they can be clamped to the spout of the filling machine and then heat sealed using hot air.

"It is 1.5 to 2.0 pence cheaper per bag, depending on the amount of bags being used," says Mark. "Given the relatively low cost of the product, minimising the cost of the bag across volume production is important. Over a year, the shorter bags can make a significant saving when you take into account the cost of polythene at well over £1000 per tonne."

He adds: "While the doubling of production at the same time as saving labour cost is the main advantage delivered by the FFS machine, reducing costs on polythene film is a further bonus."

The bagging system works a 9 hour day without a break and is generally set at a rate of 17 bags/minute – an optimum speed that avoids wear and tear. This can be adjusted through a control panel that also allows other variables to be altered, such as dosages of what goes in the bags.

Automated processes can be hypnotic in their rhythmic consistency but Mansfield Sand are not just packing one product for the same customer all day – product type, film and bag size are changed according to orders in hand.

Operatives can change a film reel, which makes approximately 4000 bags, in 10 minutes.

When changing over from 12.5 to 40 kg bags all machine re-sets are automatic, sliding a new forming tube into position and loading on a new reel of film takes 20 minutes, though the current record stands at 17 minutes.

"The FFS bagging system keeps up with demands for production and places Mansfield Sand in a better position to win new business," Mark concludes.

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Who are Mansfield Sand?

Trading since the middle of the 19th Century, the modern-day Mansfield Sand Group is privately owned and comprises three operating divisions based in Mansfield, north Nottinghamshire: Mansfield Sand Company, Fibres and UK and Mansfield Brick Company. In addition to the Ratcher Hill Quarry the company has a production site at Sandhurst Avenue Brickworks.

Since the late 1980s the company has developed a reputation as a specialist supplier of a comprehensive range of materials for the construction and maintenance of sports and landscape surfaces.

The path to the bag

Outside in the quarry, extracted sand is washed and screened before being delivered by conveyor into a hot air drier. The sand then continues to a cyclone where air is re-circulated back into the process. From the drier the sand is taken to storage silos. From here it goes into the bagging plant via a specially designed inclined conveyor, which transports the sand to the bagging machine where bags are formed, filled and sealed. The bags are conveyed through a flattener, round to the robot palletiser, which stacks the bags on a pallet according to the selected program.

A control panel at the robot palletiser allows the operative to easily select a program for a different customer, bag, stack profile etc. The menu-driven system allows operators to simply key in the three-digit number of the palletising program required. The robot provides a very neat stack – all the better for shrinkwrapping.

Once the pallet has been stacked it is transported to the shrink wrapping station. The conveyor stretching outside the building buffers ten full pallets for a forklift to take to the stocking yard or load onto waiting transport.