

The quiet revolution



Situated in the UK in the beautiful Cambridgeshire countryside lies a 127 hectare (1.27 km²) biological Site of Special Scientific Interest. Part of it is also a hugely popular Local Nature Reserve. These flooded former gravel pits are of national importance for wintering wildfowl including large numbers of herons, coots and moorhens. Amazingly, immediately adjacent is a flourishing sand and gravel quarry owned by Aggregate Industries. The very fact that such harmony between heavy industry and nature is possible is an achievement in itself but what makes this whole situation even more remarkable is that the quarry is the scene of a quiet revolution of its own.

LITTLE PAXTON QUARRY

Although quarrying in Little Paxton has been going on for more than 30 years, the quarry remains highly productive, producing some 360,000 tons of sand and gravel annually with plans to increase output further still. Within that picture of normality are two rather unusual factors, both of which involve the network of conveyors.

As with any operation of this kind, the efficiency and effectiveness of the conveyors is key. The first unusual aspect is that although Aggregate Industries own the central plant conveyors, all of the field conveyors are owned and maintained by Leicestershire-based conveyor specialists, MES International. This came about because a few years ago, the Little Paxton quarry had been 'mothballed'. When Aggregate Industries decided to re-open the quarry, they approached Leicestershire-based conveyor specialists and Dunlop Service Partner, MES International. A contract was agreed whereby MES build, own and maintain the site's six field conveyors. In addition, MES were also contracted to provide maintenance services

for the main plant conveyors, which continued to be owned by Aggregate Industries.

Very significantly, MES are paid a rate per ton, which therefore puts the pressure to maximise output fairly and squarely on their shoulders. "It is a good arrangement for both parties", explains MES owner and managing director



The field conveyors at Little Paxton are owned and maintained by MES International.



Paul Anderson
Managing
Director of MES
International.

Paul Anderson. "Owning and operating the conveyors means that we are in control of our own destiny and being paid on output is the perfect incentive".

EFFICIENCY INCENTIVE

Having an outside contractor own conveyors is certainly unconventional but it clearly works in this case. Some quarry owners employ their own on-site conveyor engineers and maintenance crews but the most commonly found arrangement is where an external vulcanizing and maintenance company is contracted to carry out the routine conveyor maintenance, repairs, splicing and belt fitting. This usually also includes the supply of replacement components such as rollers and the conveyor belts themselves. However, this exposes the site owners to potential waste and inefficiency in comparison to paying the contractor based on site output.

"In our view, if a contractor is charging for carrying out repairs, supplying replacement components and charging



Out with the old – ruined and worn out imported multi-ply belting from the pre-Dunlop days.

labour costs then you could reasonably argue that there is insufficient incentive for that contractor to provide the highest quality, most reliable and longest lasting equipment" explains MES purchasing manager Jack Allen. "However, if that same contractor was, as we are, being paid on the basis of output then it is very much in the contractor's best interest to invest in higher quality components and equipment that will last longer and need far less intervention in terms of repairs and replacements. Less unplanned stoppage means greater output; to us it really is as simple as that".

BLUEPRINT FOR THE FUTURE?

Some eighteen months ago, MES built conveyor No. 6. At 650 meters long, it is the longest conveyor on site. Initial trials took place using a conventional 500/4-ply belt imported from China that had been supplied by a former contractor. MES then replaced it with a revolutionary single-ply belt, Ultra X, which had been developed and produced by Netherlands-based Dunlop Conveyor Belting who MES represent as a service partner. The change to Ultra X impressed everyone so much that MES were encouraged by Aggregate Industries on-site management to change the other field conveyors over to Ultra X. At the same time, they are also replacing their own plant conveyors with Dunlop Ultra X3. So far, three have already been changed. "We have seen for ourselves that Dunlop Ultra X belts are much stronger and more reliable," says quarry operations manager Michael Kyriakos.

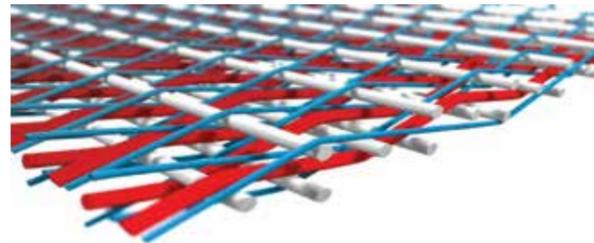
"We have proved to our company accountants that paying a higher initial price saves the company a lot of money because we don't have to keep stopping to repair the splices. The Dunlop belts also last three or four times longer because they have much better rip, tear and wear resistance so we do not have buy and fit replacement belts so often. This means that we are much more productive. Eventually, every belt on site will be Dunlop. I think that what we have done here could become a blueprint for many other locations in our company".

WHAT MAKES THE DIFFERENCE?

Dunlop Ultra X is a unique single-ply, super-strength 'breaker weft construction' belt based on an amazingly tough patented fabric, which is exclusively made in their Fenner Dunlop sister company's in-house fabric weaving facility in the USA. According to the technical experts in Dunlop, the specially woven carcass uses crimped warp polyester yarns to provide high strength and low stretch. These are combined with strong 'binder' and 'filler' yarns to create strength and stability under load.



Michael Kyriakos. Quarry Operations Manager. "Dunlop Ultra X belts are much stronger and more reliable".



The big secret – a super-strength 'breaker welt construction' fabric made only by Fenner Dunlop.

"At the moment there are two strengths of Ultra X although there will be additional strengths added to the range very soon", explains Paul Anderson. "The Ultra X1 (Type 330), is designed to replace EP315/2 and 400/3 conventional ply belts and Ultra X3 (Type 550), which is what we use here, is designed to replace EP500/3, 500/4, 630/3 and 630/4 ply belts". "The fact that Ultra X is a single-ply construction belt certainly raised a few eyebrows when we first told the Aggregate Industries team what we were planning to do. The first question, not surprisingly, is how can a single-ply belt provide sufficient tensile strength and durability?"

"The answer to that question is the unique fabric that they use. Besides being able to withstand the kind of punishment that would destroy a normal belt, Ultra X has amazing tensile strength. The longitudinal tensile strength of the X1 is 330N/mm and the X3 has a longitudinal strength of 550N/mm. We stepped away from the conventional multi-layer belting for several good reasons. First and foremost, we already knew that the Ultra X belt would give us much greater reliability, which is always important but especially so when you are being paid on tonnage. We also wanted stronger and more reliable splices. Single-ply belt requires a finger splice joint, which is a big advantage because they retain up to 90% of the belt's tensile strength. By comparison, a 3-ply step joint only achieves a maximum tensile strength of 67%". "Ultra X is also perfect for using mechanical fasteners on the shorter conveyors if we want to so we have the best of both worlds".

Following training provided by Dunlop, MES splicer Aaron Johnston made the first finger splices. MES site engineer Jack Armstrong, who assisted Aaron, feels that they did a good job. "The operations managers from Aggregate Industries came over to inspect Aaron's handiwork. It took them more than half an hour examining the belt before they eventually found where the splices actually were!"

No. of plies	Maximum % tensile strength
1	90%
2	50%
3	67%
4	75%
5	80%

Finger splice joints provide the greatest strength.

"Not only do they look good, they are also standing the test of time. On the imported multi-ply belt, we had to replace splices every three months but since we fitted the first Ultra X belt 18 months ago, we have not had to make a single splice repair or replacement. It's quite amazing really and a huge time and cost saver". "But what we had not reckoned on was that there would be a lot of other benefits and advantages that we never expected."

THE QUIET REVOLUTION

When travelling around the quarry, it is very easy to forget that it is bordered by a nature reserve where peace and tranquility is essential not only for the wildlife but also for its many human visitors. Quite understandably, the quarry operators are subject to strict regulation and monitoring, including noise pollution. "The multi-ply belts used previously made the head drum squeal constantly and the rollers would emit a constant, loud rumble. To dampen the noise we had to resort to using piles of spoil as a form of sound barrier. It was a very pleasant surprise when the first Ultra X3 conveyor belts started to run because the squealing stopped completely and the whole noise level of the conveyor dropped by at least 50%. It was so quiet it was amazing. We could make it even quieter if we used nylon rollers rather than steel but there is no need and steel rollers last longer than nylon," said Armstrong.

The engineers in Dunlop are happy to explain the 'silent running' phenomenon. "The biggest factor is actually the rubber because it is much higher quality compared to low grade 'economy' belting and contains much higher proportions of top grade polymers and essential additives such as carbon black than you would normally find in economy products. Rather than being rigid, the rubber is highly elastic, which helps to reduce its rolling resistance. This means that it requires less drive power and makes less noise as it passes over the rollers" explains Dunlop Conveyor Belting's manager of application engineering, Rob van Oijen.

MIND BLOWING

Paul Anderson is clearly not only proud of what is being achieved but also very excited. "Everyone here in Little Paxton quarry has been blown away by how well these belts run and what they are capable of doing compared to conventional belting. We have found so many advantages it is hard to know where to start. Apart from being much quieter, one of the first things we noticed is that with multi-ply belts we had to use double drum drives but with Ultra X we only need a single 37kw drum, even when the sand is wet. The capacity is no longer limited by the belt; it is only limited by the drive head. Also, if you overload multi-ply belts they will eventually snap but Ultra X seems to be able to handle everything we put on it".

"Yet another big advantage is how well the covers stand up to abrasive wear, trapped rocks and stones and the damaging effects of ozone and ultra violet light. Even belts that have been running for more than 18 months look like they were fitted only a few weeks ago. We also have far less wear on the drums and bearings because we do not need to run at high tension, in fact the belts are almost slack but they seem to have a lot more grip so they are no problem at all even in the cold and rain" continued Anderson.

ON THE RIGHT TRACK

Site engineer Armstrong certainly shares Paul's enthusiasm. "For me personally, I would say that a big

advantage of these belts is that they are very quick and easy to re-align. When multi-ply belts run out they are quickly damaged by the framework of the conveyor".

"With the Ultra X belts I can see a response to my tracking adjustments almost instantly, usually within the space of only three or four rollers". "It's a big time saver, especially because we are regularly adjusting the length of the conveyors".

EXCEEDING EXPECTATIONS

Although the praise is no doubt welcome, the most important thing in business are results. Some might argue that MES took a gamble by introducing single-ply construction belts but Paul Anderson did not see it as a risk. "Actually, it would have been much riskier and ultimately much less successful if we had stuck with conventional multi-ply belting.

The results speak for themselves. Before we introduced Ultra X the maximum hourly output was around 170 tons, normally less in the winter, but with Dunlop Ultra X belts it has increased to over 200 tons per hour all year round. In fact we are now delivering over 50% more than the contracted volume"

NOT SURPRISED

Andries Smilda, Dunlop Conveyor Belting's sales & marketing director, is naturally delighted about the enormous success at Little Paxton and the contribution made by Dunlop Ultra X belts but he is not surprised. "The original objective of our R & D teams in The Netherlands and the USA was to design a belt that had a much higher resistance to impact, ripping and tearing while at the same time be more economically priced". "We knew that the solution lay in the construction of the carcass because our



Misaligned multi-ply belts are quickly damaged when they hit the framework of the conveyor.



With Ultra X belts, output has increased significantly.

rubber compounds were already well-recognised as being the hardest wearing and longest lasting" explains Smilda. "What they came up with was actually beyond our wildest dreams because Ultra X possesses more than 3 times greater longitudinal rip resistance, up to 5 times better tear resistance and a far superior resistance to impact compared to traditional 3-ply or even 4-ply belting. At the same time, it also has incredible tensile strength. An Ultra X3 single ply belt is able to pull up to 56 tonnes in weight, which as you have seen at Little Paxton, means that it can even handle adverse weather conditions without losing productivity". "The teams at MES and Aggregate Industries in Little Paxton deserve a lot of credit for what has been achieved there".

SETTING NEW TRENDS

The undoubted success of Dunlop's single-ply revolution is certainly not an isolated case, with other operations such as an alluvial sand & gravel quarry in France reporting an incredible 87% increase in output as a result of changing to Ultra X. However, the catalyst for the success in Little Paxton has clearly been that the conveyor contractors are paid on the basis of output rather than effectively being 'rewarded' for each repair, failed component and prematurely replaced conveyor belt, as is the case with conventional 'maintain and repair' contracts.

Although MES and Aggregate Industries have an 'own and maintain' agreement, it is not strictly necessary for the vulcanising and maintenance service provider to actually own the conveyors. For example, they could simply lease belts as part of a 'supply and maintain' contract in return for an agreed rate per ton. Such arrangements certainly provide both site operators and service providers with a win-win situation. Firstly, they are an excellent way of overcoming the obstacle of obtaining CAPEX approval from head office. At the same time, they reward the service provider for supplying belts and components that minimise downtime and maximise efficiency and output. It could well be that Aggregate Industries and MES have created a winning blueprint for the future. There are certainly lessons to be learned and hopefully what has happened in Little Paxton will help set a new trend in the mining and quarrying industry.

BOB NELSON

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