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Dear readers,

Welcome to the June 2020 issue of *Global Cement Magazine* - the world's most widely-read cement magazine - which has a coronavirus/lockdown focus. First, we speak with OneStone Consulting's Joe Harder about how cement production will be affected over the rest of 2020, 2021 and in the period to 2025 due to the outbreak. The discussion draws on data from OneStone's *Covid-19 Impact Analysis CIC 2025* report, which breaks down changes in cement production for 75 countries that together cover 97% of global capacity. This provides an excellent insight into the cement sectors' near- and medium-term future, over which the coronavirus outbreak will cast a long shadow. While production will fall in every world region in 2020, there will be a major rebound in 2021. Anyone in our sector looking to plot a course for the future should turn to Page 8.

Next up on Page 12, John Kline from Kline Consulting looks at how day-to-day operations changed at cement plants as the outbreak took hold. While John's focus is the US, sadly the worst-affected country globally in terms of coronavirus cases and deaths, the new working practices will be familiar to many throughout the sector. His article offers food for thought as to how cement plant operations may look as restrictions are lifted and the situation reaches a post-outbreak norm. Also looking to the future is Dirk Schmidt from KIMA Process Control (Page 16). Dirk turns his attention to the digital solutions that are currently finding favour with cement producers due to the lack of face-to-face interaction and shows what may be possible after the outbreak has passed. Elsewhere, this issue includes technical features on the future of grinding (Page 22), digital quarrying (Page 26), conveying (Pages 18 & 34), kiln maintenance (Page 20), refractories (Page 37) and chains (Page 52). There's also Edwin Trout's encyclopedic annual review of the UK cement industry over the past 12 months (Page 46).

Throughout the issue, a common thread emerges. Our sector has approached the coronavirus crisis, for the most part, with a calm practicality and acceptance of the current situation. However, there is also an incredible willingness to get back to work as soon as it is safe to do so. While 'production as usual' is still a long way off, many have now reached 'production with constraints.' This is a welcome improvement over 'no production at all.'

Enjoy the issue and stay safe!

Peter Edwards
Editor

Cement Industry Suppliers' Forum

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Interview by Peter Edwards, Global Cement Magazine

Coronavirus effects on global cement demand

Cement sector consultant Joe Harder introduces the key findings of OneStone Consulting's new report *Covid-19 Impact Analysis CIC 2025*, which looks at how the outbreak will alter our sector in the period to 2025.

Above: Joe Harder, OneStone Consulting Ltd. *harder@onestone.consulting*

***Global Cement (GC):* Please could you introduce the report in a few sentences?**

Joe Harder (JH): The CIC 2025 report is a new market report that provides clients with the latest market information about the impact of the on-going coronavirus pandemic on global cement production, with forecasts for 2020, 2021 and 2025. It draws on data taken from 75 countries that jointly represented almost 97% of all global cement capacity in 2019. There are forecasts for the world as a whole, 10 regional areas, four sub-regions in Europe and for the individual countries themselves. It is in executive style, with 109 pages, 70 figures and nine tables, available at a competitive price.

***GC:* Which audiences is it intended for?**

JH: Our idea is to provide our customers in the cement industry with a master study on the impact of Covid-19, with three-month updates if necessary. The new report is intended for cement producers that want to analyse future demand trends, suppliers of equipment, analysts, traders and anyone else with an interest in the global cement industry.

***GC:* At what point in the outbreak did you decide to produce this the report?**

JH: We had already decided to write the report at the start of February 2020, as we had to update a five-year strategic planning report for one of our clients in the cement equipment manufacturing sector.

***GC:* What data does the report draw upon?**

JH: The report relies on data from a number of well-respected sources. We have used the IMF's April 2020 World Economic Outlook (WEO), which looks at GDP growth, as a measure of the likely damage caused by Covid-19 to various economies around the world. GDP is a crucial factor in assessing future construction spending and cement demand. We also took into consideration the longer-term forecasts from the October 2019 WEO.

We have also considered historical cement production data for 2005-2017, as this provides a baseline to what growth we might expect under 'normal' conditions. This information was obtained from numerous sources, including national and regional associations and cement producers themselves. More

Right - Figure 1: Cement production, 2005 - 2025 (forecast).

China
Rest of World

attention was paid to changes in 2018 and 2019, with monthly figures used for these years, plus data for the first quarter of 2020, where available. We have also considered changes to operations due to various coronavirus-related lockdowns around the world.

As part of this, we have looked at projections as to how the coronavirus pandemic will develop in various countries to estimate how long different construction sectors will be affected. With below 5 million cases at present, it is clear that the world needs time to achieve 'herd immunity' to this virus. What we see at present for a large number of countries is that the peak of the virus probably, hopefully, passed around the end of April 2020 to mid-May 2020. The IMF presumes that there is a general reduction in cases in the second half of 2020, with fairly significant resumption of economic activity in most markets by the start of 2021.

***GC:* What does the IMF say about growth in the coming 12 months?**

JH: The IMF has revised its projections dramatically in its April 2020 WEO. Global GDP is now expected to fall by 3.0% in 2020, following a 2.9% rise in 2019. For 2021, however, it expects a major reversal of economic fortunes around the world, with global GDP growth of 5.8%. If realised this will make up for the losses seen in 2020.

The depth of the trough will not be consistent around the world, however. Developed economies are currently forecast to lose out the most in terms of GDP in 2020, with a contraction of 6.1% year-on-year. Meanwhile, developing economies are forecast to shrink by only 1.0%. In 2021 the 'bounce-back' will be 6.6% in developing economies according to current projections, with a lower 4.5% growth forecast for developed economies.

Of the developed markets, the EU is expected to fare worst, with a 7.5% decline in economic output in 2020. The US is expected to suffer a 5.9% contraction, with South America also performing fairly badly. The Middle East and Africa, which have not, so far, suffered quite the massive outbreaks that Asia, Europe and North America have, will contract in the 2-3% range in 2020. I am personally surprised that the GDP decline in 2020 is expected to be *only* 3.0%. However, most surprising is that the IMF expects both India and China to *grow* their economies in 2020, by 1.9% and 1.2% respectively.

***GC:* How will cement production be affected by the outbreak?**

JH: Our projections show that producers should expect a year-on-year decline in global cement production of 9.3% in 2020 compared to 2019. For China, the decrease is projected to be 8.5% and for the rest of the World it is forecast to be 10.4%. For 2021, we forecast a recovery of 8.0% across the rest of the World but a 3.3% fall in production in China. This works out at an overall rise of 1.6% compared to 2020.

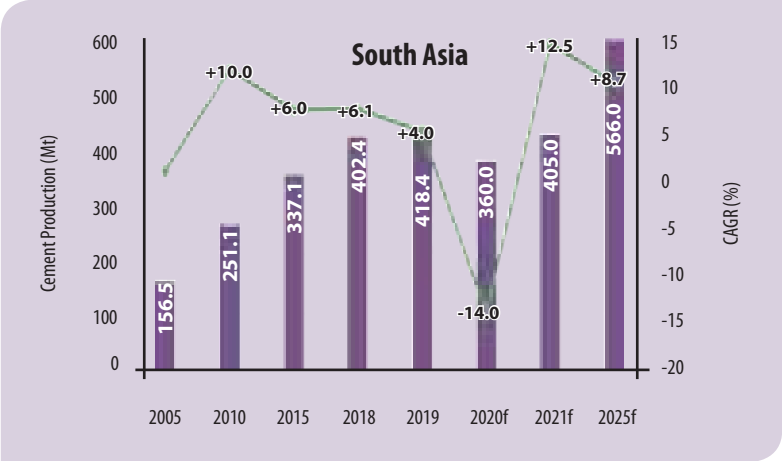
Above: The coronavirus outbreak will leave its mark on the cement industry over the next five years. However, producers and suppliers should remember that the 2020s still hold considerable opportunities for increased cement production and equipment upgrades.

The change in China, by this point, will not be due to coronavirus-related effects, but rather a continuation of China's supply side demand changes. Before the coronavirus we already expected production to fall by about 2% in 2021 compared to 2020. This needs to be considered when looking at these figures.

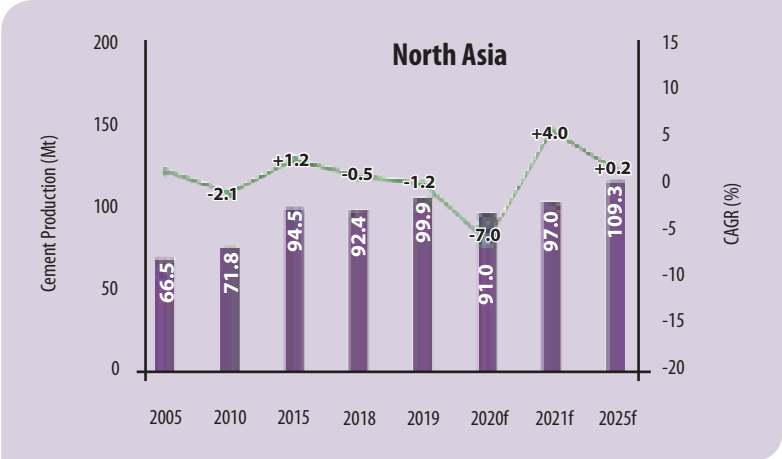
***GC:* Can you break down the regional findings in more detail?**

JH: The most dramatically affected region, by our projections, will be South Asia, comprising India, Pakistan, Bangladesh, Sri Lanka, Bhutan, Nepal and Afghanistan. This will see a 14.0% reduction in cement production in 2020 compared to 2019, but then a massive rebound by 12.5% in 2021 compared to 2020. Unlike some other regions, it will not have a chance to recover in the third quarter of 2020 due to the monsoon season, which sees an annual reduction in construction activities. This will hit producers hard, especially as India in particular had a fairly strong January and February 2020.

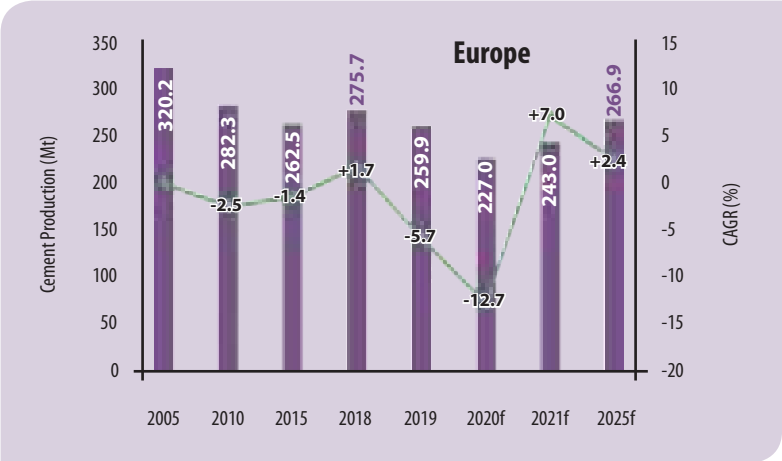
Below: The IMF expects global GDP to contract by 3% in 2020, taking a bite out of construction.



Above - Figure 2: Cement production and compound annual growth rate (CAGR) for South Asia, 2005 - 2025 (forecast).
Production — CAGR



Above - Figure 3: Cement production and compound annual growth rate (CAGR) for North Asia, 2005 - 2025 (forecast).
Production — CAGR



Above - Figure 4: Cement production and compound annual growth rate (CAGR) for Europe, 2005 - 2025 (forecast).
Production — CAGR

***GC:* Which region comes out least affected according to your research?**

JH: Least affected will be definitely North-East Asia, which comprises Japan, South Korea, Taiwan, Mongolia and North Korea. South Korea contained the coronavirus better than any other country, the active cases peaked in mid-March 2020.

Japan and Taiwan are also on a good track, however due to some early lockdown release Covid-19 cases have increased slightly again. Regarding our projection for cement production, we expect only a decrease of 7.0% in this region.

Our projection for Europe as a whole is a 12.7% decrease in cement production. However, we have a breakdown into four sub-regions: Northern, Western, Southern and Central Eastern Europe/Turkey. The Southern region, which includes Italy, Spain, Portugal and Greece, will be mostly affected, with declines in cement consumption of up to 16% in individual countries.

The US still has to decrease its active load of Covid-19 cases, although the construction sites are still open in about 80% of the states. At the moment it is not clear how this situation will change. In our projection we anticipate a decline of 11.2% for the US in 2020 and about 10% for Canada.

***GC:* What else does the report contain?**

JH: We also looked to the capacity utilisation figures, with forecasts for 2020, 2021 and 2025. These show some interesting trends compared to the situation in 2019. In the immediate future, we expect capacity utilisation in 2020 to 'crash.' China operated at 74% capacity utilisation in 2019 and we forecast 70% in 2020. The rest of the World will see capacity utilisation slump from 60.8% in 2019 to 53.8% in 2020. This means that there won't be a large shortage of cement, even if half of the world's cement plants are forced to close due to the virus! On the contrary, the closure of cement plants by producers is necessary to remain profitable.

Between 2019 and 2025, we expect that China will lose around 570Mt/yr of cement production capacity and cut production by around 500Mt/yr. In the rest of the World, we expect that both production and capacity will rise, by 284Mt/yr and 250Mt/yr respectively.

Notice here, something interesting. The increases in the rest of the World figures will not make up the drop in China. Overall production will fall by 216Mt/yr between 2019 and 2025. Global cement capacity will fall by 320Mt/yr.

***GC:* Thank you for a very interesting discussion.**

JH: Thank you for letting me share this information with your audience.

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John Kline, Kline Consulting

Cement production in a pandemic

A look at the measures that cement producers in the US have taken to keep manufacturing during the coronavirus pandemic, plus thoughts on the longer-term effects of the crisis.

Above: John Kline, Kline Consulting.

As in many other countries, large parts of the US have been in 'lockdown' in an attempt to control the ongoing coronavirus pandemic. The situation remains changeable and, in places, politically charged. The US remains the worst-affected country, both in terms of cases and deaths, having exceeded 1 million confirmed cases of Covid-19 in late April 2020. It had registered over 80,000 deaths as at 12 May 2020.

Initial stages...

When the coronvirus outbreak hit North America, many cement plant operators had enjoyed a better-than-usual start to the year. Many were shutdown for annual maintenance and some were operating at full speed. In the background, some plants were preparing for Covid-19 more than others having looked at the spread of the virus around the world.

Kline Consulting surveyed producers in the sector in association with the Portland Cement Association (PCA) in mid-March 2020, when it was clear that the situation had become more serious. By the end of March 2020 we saw the first mandatory plant closures as well as some by producers that anticipated low demand. Many have since re-opened. The situation was changing on a daily basis. Advice valid 48 hours ago was suddenly old news. Many producers were preparing for external factors to come to bear on their operations and putting policies in place, particularly with respect to temporary loss of staff in the event that they had to self-isolate. Questions were being asked: *Would the plant be able to continue with five staff self-isolating out of a team of 10? How many staff truly constitutes a skeleton crew?*

With a rapidly-changing situation, the importance of communication was a common thread across the responses we received from PCA member plants. Many had appointed single individuals to deal with coronavirus-related communications. This was particularly important when dealing with local authorities. Many plants noted that effective communication was crucial in order to be 'ahead' of a forced shutdown or other limitations to activities.

Of course, everyone in the supply chain also needed to be informed of changes, or potential changes, to normal operations. This can be done effectively by push communication via a clear and unambiguous banner on the company's main website and a recorded message on the main telephone lines. This limited the amount of time staff spent repeatedly explaining the changes to different stakeholders.

Below right: Infra-red thermometers could become commonplace at cement plants in the coming months and years.

Right: A foot-operated hand sanitiser dispenser.

This is real...

By early April 2020 operating plants had dramatically limited the number of people on site. The US is quite unusual in that plants rarely have secure formal gates, meaning that anyone can potentially drive in and walk into an office. The most effective solution for many was to put up a sign and lock the main access gates. My suggestion is to display a name and contact number to ensure that the visitor can still contact the plant. Around the same time most US plants stopped their personnel travelling to other locations to minimise the risk of bringing the infection back with them into the plant. Around this time there was patchy coverage regarding screening of employees and contact tracing at some plants.

The logistics around delivery of incoming materials also became more complicated during March and

Left: Cement plant teams are currently limited to as few members as possible.

April 2020. The coronavirus that causes Covid-19 can survive on some surfaces for up to 72 hours, so plants have to be careful when handling materials that may have come into contact with infected persons. As plants can't know the infection status of the sender, precautions should be taken with *all* inbound materials, be it additives, spare parts, office supplies or food for the vending machine. Simple things like the avoidance of face-to-face contact, i.e. leaving packages in a designated drop-off area is now second nature but this was not the case just a few weeks ago. Plants, like the wider public, rapidly adapted to such approaches.

Due to these changes, anyone who could work from home has now been doing so for months. On-site shifts are being handled creatively to minimise contact between workers. For example, instead of having a standard punch-in time of 07:00, a plant might split a shift so that some workers start at 06:45, some at 07:00 and some at 07:15. This avoids contact in offices, at barriers, in changing rooms and other pinch points in the plant.

In day-to-day lockdown operation, crews are kept as small as possible and isolated from each other. This includes having only telephone communication between incoming and outgoing shifts and the disinfection of communal areas and vehicles by the outgoing shift as they leave. Some even reported the allocation of one person to a specific vehicle, for example in the quarry. Doors to meeting rooms and control areas are locked to prohibit unnecessary movement as much as possible. Unnecessary maintenance work has been cancelled. Workers are encouraged to take staggered lunch breaks and to eat in their personal vehicles or in the open if the weather permits.

Producers have also reported looking further down the track for supplies. For example, when sourcing refractory for a maintenance break in two or three months' time, the material will probably still be available. It might not be in the usual place from the usual supplier over the usual timeframe, so it is best to check ahead for disruption.

How will 2020 pan out?

As the pandemic hit when many plants had just completed their winter shutdowns, the effects on cement production are really only beginning to be felt now. Winter shutdowns mean empty silos that need to be refilled and, even with lower demand, this can take some months. This meant that many plants were able to run at full pace in April and May 2020. After June 2020, I expect to see a drop in the number of plants making cement as they switch to running down their stocks. There will likely be a tendency towards campaign operation throughout the rest of 2020 for many of them. With low shipping rates and an even more dramatic slump in construction in the Mediterranean, we could see coastal plants in the US, particularly smaller players, under threat from very cheap imports in the latter half of the year.

The Portland Cement Association's Chief Economist Ed Sullivan reports that 31% of US cement executives expect to see a drop of more than 30% in cement volumes over the course of 2020. This takes you out of the area where it is possible to make a profit. Everyone is holding onto their cash. I think that there will be a U-shaped recession, with a meaningful rebound in the third quarter of 2020. The current expectation is that 75% of US construction projects that are currently on hold will reach fruition in the longer term. In 2021, the next round of housing starts will hopefully boost demand. This would be an appropriate point for government stimulus, perhaps in the form of infrastructure works, to also kick in.

Longer-lasting effects?

The outbreak has accelerated the trend towards digitisation for some plants, as many have limited their paperwork to the bare essentials. Some have done away with real-life signatures on delivery notices to limit contact between plant staff and truck drivers. Other practices include taking photos on smartphones to record plant visitors rather than have them sign a form, pass a pen around, etc. There are many cases of single designated 'post-openers,' who scan and email post to the correct recipient. Others have systems where a single employee with full PPE, would scan the ID cards of teams at the start and end of a shift.

The hands-off approach extends to maintenance and diagnostics. Instead of bringing in a colleague with the right expertise from another shift or another group plant, it's now possible to live-stream the area of interest to that individual so they can help

Right: The Cemex Balcones plant in Texas. In April 2020 Cemex announced the closure and the reopening of its Mexican operations in the space of a few hours due to confusion surrounding coronavirus operating rules. The situation in the US has also been hard to keep up with, particularly as individual States apply different rules.

remotely. This is already the case for a lot of digital solutions. Whoever is advising could even be in a different country. This kind of access could be vital if travel restrictions persist for some time after the worst of the virus passes and may be desirable in any case. Remote problem solving, supervision and advice is likely to be more prevalent once the outbreak subsides than it was in the pre-coronavirus era. This may lead to maintenance managers being split between two or more plants instead of being physically located in just one.

The sector has also tiptoed for a while around the question: *Can the plant be run from another location?* I am sure it can. However, you have to be careful how you do it. Firstly, any remote supervisor lurking in the background behind an on-site operator should leave them to it and not alter the process. Otherwise, they restrict the ability of the operator to learn. Secondly, when we reach the point where the operator is located outside of the plant, there must still be human ears and eyes on the ground to monitor the real-world situation, even if the remote operator is formally in charge of the process.

Below: Fully autonomous, remotely controlled and regular vehicles now coexist on the ground. For instance, the Belaz truck is a fully self-driving vehicle, with loading and unloading operations controlled by a human operator from a comfortable chair in a remote control room.

Headcounts

At present it is necessary to operate cement plants with very few staff. This is something that already happens, for example over the Christmas / New Year break and, in the US, the 4 July holiday. However, this can be difficult to maintain over prolonged periods. Another example of when a plant runs with limited staff is during strike action.

When you strip out all of the non-essential work, it is extraordinary how few people are needed to run a cement plant. At the end of the day, 'make cement' is actually just one of many tasks cement plants carry out. There's also 'report KPIs to head office,' 'carry out capital expenditure project,' 'define new sustainability targets,' 'improve signage' and so on. There is normally a lot of reporting, in my experience excessive reporting, which places a huge burden on cement plant staff. They constantly have to feed reports to satisfy the corporate machine. I was once responsible for a small plant in Canada. We ran it on a campaign basis: one month on, one month maintenance. It employed just 19 people and it made cement. It did not produce reports or plan projects. Those were handled from elsewhere in the group. A centralised approach such as this could reduce the number of on-site staff at other cement plants in the future.

Based on the current reduction in team sizes, it makes sense to ask: *Will the headcount be increased again once the outbreak has passed?* Teams will grow once more, but may not come back to the same size. This is because every time the belt is tightened, there is a net loss of staff over the downturn and subsequent recovery phase. During the economic crisis of the late 2000s, a lot of plants allowed early retirements and did not replace those staff for some years. This will happen again due to the coronavirus outbreak and over the 2-3 year timeframe it could lead to running plants with fewer people.

Another change, certainly for the US, may be the end of the outdated *'If you're not here, you're not working'* paradigm. Even at a cement plant, this is an unhelpful attitude. Most in the sector can now trust their colleagues to work effectively from home and we can expect such practices to extend into the future. Indeed, many of the changes: smaller teams, increased hygiene requirements, masks, social distancing, fewer visitors, etc, will likely persist for some time to come, even when the coronavirus outbreak is well behind us. The current period will leave lessons for cement producers, as it will for many businesses and society as a whole.

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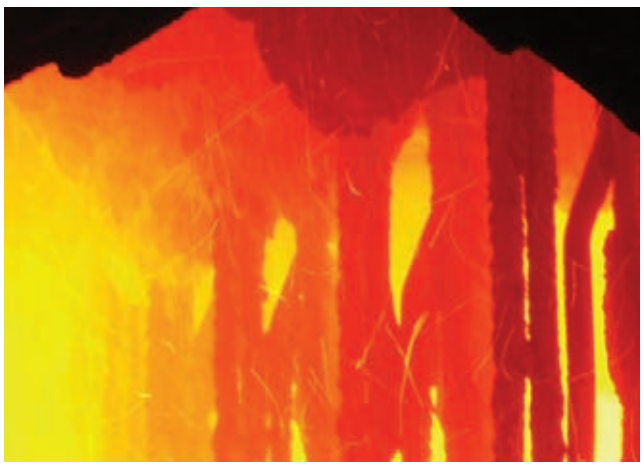

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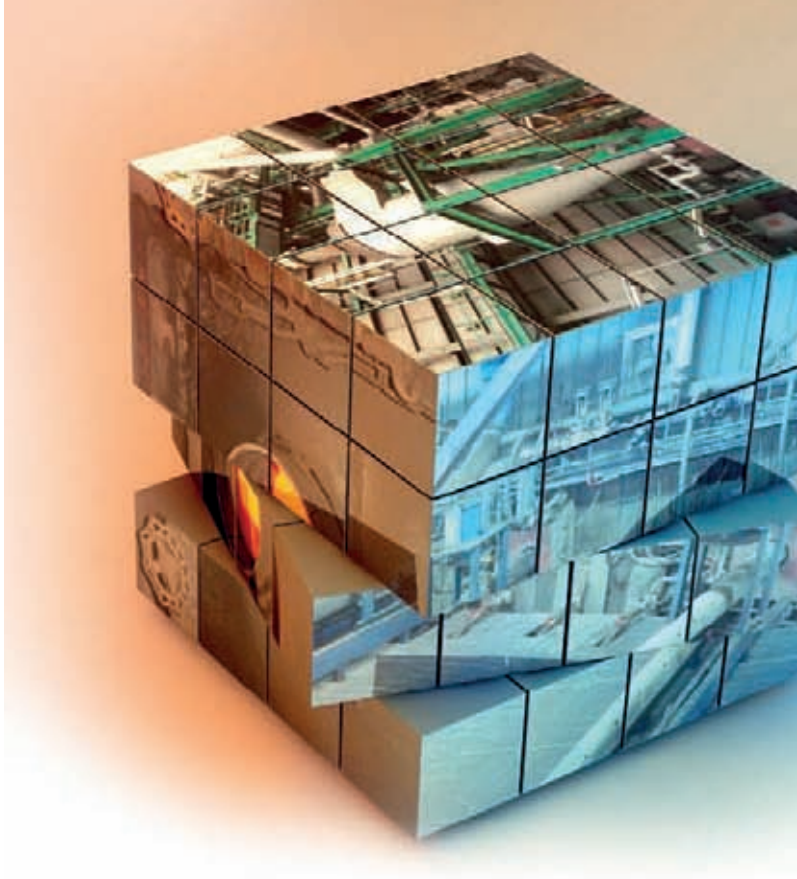

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Dirk Schmidt, KIMA Process Control

Digitisation in the time of coronavirus

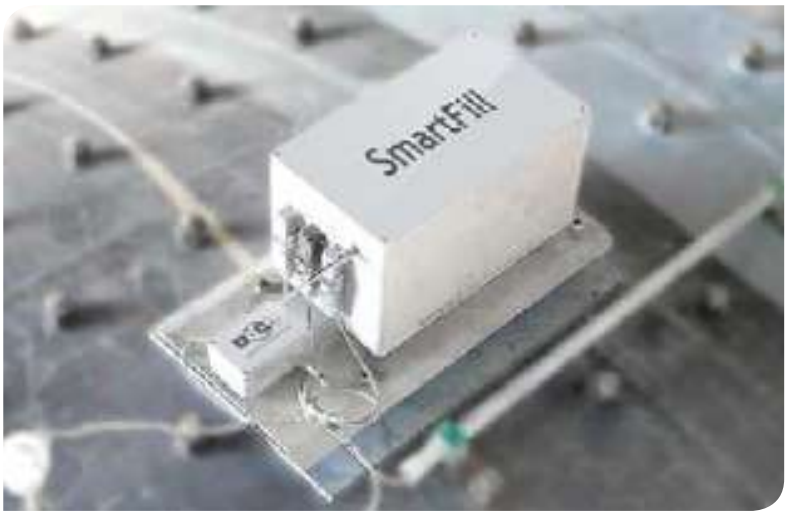
The absence of face-to-face contact due to the coronavirus outbreak has changed the way the world works. Office workers are almost entirely working and meeting online at the click of a button. Those in manufacturing are more affected, dealing with factory closures and new rules for hygiene, social distancing, paperwork, deliveries, logistics and more. In the cement sector, both can be helped by the deployment of existing digital solutions and automation...

Above: Dirk Schmidt, Director at KIMA Process Control.

For the cement sector, the coronavirus outbreak means operating under the new restrictions now familar to many in our sector. For the plant management, remote working, online meetings and off-site access to data are more important than ever before.

Given the impact that the global economy has been dealt by the coronavirus outbreak, it should not be a surprise that many major investment decisions have been cancelled or are on long-term hold. OneStone Consulting's Joe Harder forecasts that the global cement capacity utilisation factor will be just 53.8% in 2020 (See Page 10). Such conditions are not good for major investments. Nobody knows when the outbreak will pass, nor what the economic or social scenery will look like when it does.

However, such conditions represent a strong driver for optimisation. At KIMA Process Control, we believe the move to plant automation and digital solutions in the cement sector can only be accelerated by the coronavirus crisis. Since the onset of the outbreak, we have noted a significant increase in information gathering by cement producers. They are trying to ascertain: *What are the limits to automation in our sector?*



Below: Small devices like the SMARTFILL from KIMA Process can be installed by plant staff and commissioned remotely.

As examples of what the future could hold, we can look at the existing work of KIMA Process, which has long been involved with digital approaches and automation. During the current crisis, KIMA Process has continued to provide online training to cement producers that have recently installed its solutions, holds project meetings with those in the process of designing, implementing and even commissioning projects around the world, all via remote means. When the travel restrictions came in, the company increased services for some products that previously did not have dedicated online support based on increased demand. It is already clear that such support should not be 'removed' when conditions improve.

The potential for automation via artificial intelligence (AI) is highlighted by KIMA's MILLMASTER control system for ball mills. For example, the Loesche LM46.2+3 S at the EQIOM Ciments (CRH) plant in Dunkirk, France, produces slag cement entirely autonomously over the weekend with no on-site supervision. During this period the MILLMASTERis set to Stable Operation mode and controlled using one of KIMA Process' digital modules. From Monday to Friday it operates under the Maximum Production mode, which requires a higher degree of operator input.

This example is by no means an exception in 2020. However, it has taken the staffing restrictions brought about by the coronavirus outbreak for many plants to focus on running mills in this way. A lot of operators have also come to the realisation that 'process optimisation' does not mean 'production increase.' Of course, 'process optimisation' can also mean 'lower specific energy consumption,' 'lower emissions,' 'higher reliability,' or a combination of these. Using the MILLMASTER, the Lukavac Cement plant in Bosnia & Herzegovina was able to produce the same tonnage of cement per day with two hours less operating time. This represents a major saving in power consumption, costs and CO_2 emissions. Process control systems such as this could, in a post-outbreak future, enable opera-

tors to use fewer staff for the same operation or, in extreme cases, extend the periods with no staff present.

The MILLMASTER also shows us what can be done in terms of remote commissioning. KIMA Process recently installed three MILLMASTER systems at separate plants in Australia, for Adelaide Brighton Cement, Sunstate Cement and BGC Cement. All of them were commissioned remotely. KIMA only visited Australia for relatively limited training after the systems were up and running. From a commissioning perspective the visit was not required. KIMA Process has used this technique in more than 50 remote and challenging countries to commission our KILNCOOLER and SMARTFILL systems, the sensor that acts as the input to the MILLMASTER. The fact that there is now a far higher number of inaccessible locations means that this type of working can only increase. The demand is now there.

Other aspects of the plant, for example maintenance have also changed since the onset of the coronavirus outbreak. Applications like TeamViewer Pilot can enable a person at the plant to hold their mobile phone close to the equipment, while the supplier or expert on the remote side annotates areas that need attention and verbally advises the plant staff, as if they were standing next to them. The annotations then stay in the correct place as the camera moves around the plant. KIMA Process recently used its 'remote snapshots' tool with LafargeHolcim in Iraq. The client was very impressed with the functionality.

Post-outbreak there will still be face-to-face meetings and client visits, but all parties will be more circumspect regarding who they meet and how they meet them in the real world. For suppliers, the attention given to travel time will increase, meaning that time-consuming, costly and unsustainable travel will be harder to justify. A possible reduction in flight routes and frequency could exacerbate this.

Left: The EQIOM Ciments Dunkirk plant runs its Loesche LM46.2+3 S completely autonomously from the last shift on Fridays to the first shift the following Monday, using KIMA's MILLMASTER system.

Post lockdown

2020 will be a transformative year for the global economy and we can be sure that the cement sector of 2021 will not have the same priorities and aspirations as that of 2019. With an increasingly sophisticated range of digital and automation solutions from a range of suppliers, the outbreak has opened the cement sector's eyes to the possibilities of remote working, commissioning, plant operation, maintenance and more. It will not be able to 'unsee' these possibilities. Post-outbreak, what cash the sector has will most likely be spent on digital optimisation and automation solutions than any other type of capital investment. The world has long had too much cement capacity. To survive in the post-outbreak economy, producers will increasingly prize efficiency.

Concluding remarks

Like the rest of the global economy, the cement sector has been jolted by the coronavirus outbreak. This has required drastic changes to working practices at producers and their suppliers. Existing digital solutions can help and, when leveraged correctly, could indeed offer massive benefits to producers in the post-oubreak world. Indeed, KIMA Process Control is of the opinion that, in the future, plant managers, production managers and even operators could join their colleagues in the administration department and work from home.

KIMA Process Control believes this is possible in the future but, prior to the outbreak, the wider sector did not think it necessary to share this vision. Now it feels that the sector is at least open to the possibility. While the circumstances surrounding these changes are terrible, we should hope that the benefits of remote solutions will not be lost on the cement sector in the clamour to return to 'business as usual.'

Left: We have the technological solutions to allow key plant staff to work from home.

Leslie David, Conveying Expert

Tightening the belt

Factors to look out for to reduce conveyor belt expenditure...

Above: After spending 23 years in logistics management, Leslie David has specialised in conveyor belting for over 13 years. During that time, he has written numerous technical guidance bulletins and is one of the most published authors on conveyor belt technology in Europe.

Below: Conveyors in the cement sector take a beating. Cheap ones may be appealing but won't last the course.

Conveyors continue to be the most effective method of moving bulk materials in the cement industry. The conveyor belts themselves are often the most vulnerable component and their durability, reliability and cost are critical factors in both productivity and cost management.

The technology used to manufacture conveyor belts has advanced enormously in recent years. Today's users should expect belts to provide operational lifetimes at least 2-3 times longer than those seen even 5-10 years ago. However, most operators continue to replace belts far more frequently than they should need to. Here, conveyor belt specialist Leslie David provides an insight into how taking a slightly more technical approach can significantly reduce the costs of replacing conveyor belts.

Evaluating the *true* cost

Before we talk about the technical aspects of conveyor belts and how to get the best value, let us first deal with the issue of price. Although sales people will maintain that making a choice based on price rather than the quality of the product is not the best way to make a decision, the fact remains that conveyor belts are costly items: price *does* come into it. Also, whether they admit it or not, buyers will almost invariably have price as a major, if not *the* major factor selection criterion. However, in the case of complex components like conveyor belts, knowing its price is not an accurate measure of its value.

The economic value of a conveyor belt can only be properly established (or estimated in advance) by calculating the 'whole life' cost. This is simply done by adding the price paid to other known associated costs such as fitting, repairs and maintenance. The total is then divided by either its actual (or anticipated) operational lifetime in weeks, months, years or operational hours or, alternatively, by the tonnage carried. In my experience it is surprisingly rare to find a conveyor operator that makes such calculations. Some do not even seem to keep date records of when belts are replaced.

Over the years I have often shaken my head in disbelief when I see buyers of conveyor belts that are convinced they are getting a good deal because the price is significantly lower than other offers. Many completely ignore the fact that they will most probably have to use two or three of these 'super value' belts when in reality a single, good quality belt would cost considerably less in real terms.

What is 'quality'?

Almost every salesperson in the world uses the word 'quality' to describe the products they are selling. When it comes to conveyor belts, how can 'quality' be defined and how can it be evaluated? What is 'quality'?

Industrial conveyor belts may simply look like lengths of thick black rubber but the truth is they are surprisingly complex. Perhaps the question I am most often asked is *'How can there be such huge differences in price between one belt supplier/manufacturer and another for belts of apparently the exact same specification?'* The answer lies in the cost make-up of producing a conveyor belt.

There can never be a fixed formula due to the wide variety of individual belt specifications, but the influence of raw material costs on the selling price is hugely significant. As a general 'rule of thumb', raw materials represent some 70% of the cost of producing a conveyor belt. General overheads make up no more than around 10%. Thanks to the high

level of automation, the labour cost element is very low. You would not expect to see more than three or four people manning a typical production line. This fact certainly shoots down the usual assumption that low prices of belts imported from Asia are only lower because their labour costs are much lower than in developed markets.

When faced with a huge difference in price and the fact that raw materials make up the vast bulk of the total manufacturing cost, it is perfectly reasonable to conclude that materials of a lower quality have been used. The pressure to keep costs to an absolute minimum also means that recycled rubber of highly questionable origin may well have been used in the mix. Another cost-saving method is to use cheap 'bulking' fillers to replace part of the rubber polymers in the rubber compound.

Fortunately, the tell-tale signs to look for when evaluating the quality of a conveyor belt can be broken down to its two main constituent parts - the carcass and the covers that protect the carcass.

The carcass

By far the most commonly used type of conveyor belts are those with a multiple layer of reinforcing fabric (usually polyester/nylon) carcass construction known as 'multi-ply' belts. The top and bottom of the carcass is covered by an outer protective layer of rubber. It is the carcass that provides the inherent characteristics of a conveyor belt such as its tensile strength and elongation (elasticity or 'stretch' under tension). Although they may be the same basic specification, there are often huge differences in the actual quality of the fabric plies between one belt and the next.

Nowadays it is unusual to find a fabric that has inadequate tensile strength, so simply comparing tensile strength data will not help. In lower quality (lower cost) fabrics, although the amount of material used in the longitudinal strands of the fabric may be adequate, the amount of transversal weft material is kept to an absolute minimum in order to reduce cost. Although the required tensile strength is achieved, rip and tear resistance is reduced and elongation (stretch) is low. Low elongation may sound good in principle but if the elongation is too low then this can cause problems with transition distances, as well as a general inability to accommodate the contours of the conveyor and its drums and pulleys. Ultimately, this leads to the premature failure of the belt.

Not what they seem

A method of cost cutting that is now becoming worryingly common is the use of totally polyester (EE) fabric plies in a carcass that is declared as having an EP carcass (polyester/nylon mix) construction. The whole basis of using a mix of polyester and nylon fabric is that it has the best balance of mechanical properties that allow a conveyor belt to run straight and true, to trough, to flex round pulleys and drums, stretch, have the optimum transversal rigidity, longitudinal strength and much more besides. As I said earlier, conveyor belts are surprisingly complex components.

Above: What is a 'quality' conveyor belt?

The use of totally polyester (EE) fabric compromises a whole range of essential mechanical properties. The biggest danger is that a polyester weft can cause low transverse elasticity, which reduces both the troughability and impact-resistance of the belt. This consequently causes tracking issues. In addition, less weft in the belt can also reduce rip resistance, fastener strength and the belt's ability to handle small pulley sizes. The seriousness of the detrimental physical effects for the end-user are huge. One test that I witnessed recently revealed that the tensile strength of the carcass was more than 20% lower than the specified minimum.

The simple reason for this deception is that EE fabric costs some 30% less than EP fabric. In itself this may not seem like a great deal, but the fabric plies are a major cost component in any multi-ply conveyor belt. This means that cheaper fabric is a big help when trying to achieve the perception of a lower 'like-for-like' price. As far as the manufacturer using these underhand tactics is concerned, they can 'sleep easy' in the knowledge that it is highly unlikely that the end-user will have the kind of laboratory tests carried out that would ever reveal the deception.

The covers

It is the rubber used for the outer covers that provides the manufacturer with the single biggest opportunity to economise. There are many different types of rubber compound used for rubber multi-ply belts simply by virtue of the fact that belts have to deal with a multitude of different (and often combined) demands, including abrasion, heat, oil, ozone, fire and much more. These cover compounds are

Above: Severe wear caused by heat damage that has been accelerated by UV exposure.

commonly referred to and known as 'cover grades' or 'cover qualities.'

Most of the rubber used in conveyor belting is synthetic. Literally hundreds of different chemical components and substances are needed to create these synthetic rubber compounds that, once vulcanised, are able to meet the specific physical performance and safety requirements. There are three basic aspects that most determine the quality of performance of all the belts used within the cement industry. These are wear (abrasion) resistance; heat resistance and the hugely important but much under-valued resistance to ozone and UV light.

'Abrasion-resistant' is the most commonly used type of cover grade and it is the actual level of abrasion (wear) resistance of any rubber cover that will almost certainly have the greatest influence on the length of the operational lifetime of a conveyor belt before it needs to be replaced.

There are two internationally-recognised sets of standards for abrasion, EN ISO 14890 (H, D and L) and DIN 22102 (Y, W and X). In Europe it is the longer-established DIN standards that are most commonly used. Generally speaking, DIN Y (ISO 14890 L) relates to 'normal' service conditions and is normally the standard most used in the cement industry. DIN X (ISO 14890 H) and DIN W (ISO 14890 D) are usually reserved for when extra resistance to impact, cutting and gouging is required or where especially high levels of resistance to abrasive wear are needed.

Abrasive wear testing

Abrasion resistance (ISO 4649 / DIN 53516) is measured by moving a test piece of rubber across the surface of an abrasive sheet mounted on a revolving drum. It is expressed as volume loss in cubic millimetres, for instance 150mm^3. The most important thing to remember when comparing abrasion test results (or promises) is that higher figures represent a greater loss of surface rubber, which means that there is a lower resistance to abrasion. The lower the figure, the better the wear resistance.

Comparing one offer from another is made very difficult by virtue of the fact that (with only one exception that I know of) the technical datasheets provided by manufacturers and traders almost invariably only show the minimum requirement of a particular test method or quality standard rather than the actual performance that the belt being offered would be expected to achieve.

Wear on the top cover is primarily caused by the abrasive action of the materials being carried, especially at the loading point or 'station' where the belt is exposed to impact by the bulk material and where the material is effectively 'accelerated' by the belt surface. Short belts (<50m) usually wear at a faster rate because they pass the loading points more frequently compared to longer belts. For this reason, the quality of abrasion resistance needed for shorter length belts is even more crucial than usual. Although the thickness of the cover is an important consideration, the actual wear-resistant properties of the rubber are much more important than the thickness. If it is felt necessary to increase the cover thickness in an effort to compensate for premature wear then that is a sure sign that the abrasion resistance is inadequate.

Handling the heat!

Belts that can resist high temperatures are widely used in the cement industry, Of all the demands placed on industrial conveyor belts, heat is widely regarded as the most unforgiving and damaging. High temperature materials and working environments cause an acceleration of the ageing process of the rubber that causes it to harden and crack.

Heat also has a very destructive effect on the carcass of the belt because it damages the adhesion between the covers on the top and bottom of the carcass and also between the inner plies. If the core temperature of the carcass becomes too high then the belt will quite literally start to fall apart. This is commonly referred to as 'de-lamination.'

The temperature limits that a belt can withstand are viewed in two ways – the maximum continuous temperature of the conveyed material and the maximum temporary peak temperature. The two main classifications of heat resistance recognised in the conveyor belt market are T150, which relates to a maximum continuous temperature of 150°C and T200, which is for more extreme heat conditions up to 200°C.

ISO 4195 testing

To provide the most accurate measurement of heat resistance, accelerated ageing tests are conducted by placing rubber samples in high temperature ovens for a period of seven days. The reduction in mechanical properties is then measured. The three 'classes' of ageing within ISO 4195 are: Class 1 (100°C), Class 2 (125°C) and Class 3 (150°C). In order to maximise temperature resistance qualities, at least one manufacturer (Dunlop) also carries out testing at 175°C.

There are three key factors to consider when choosing a heat-resistant belt. The most critical considerations are the actual temperature range of the materials being carried; the level of ambient

temperatures of enclosed running environments and the length of the conveyor. All of these factors have a major influence on the speed of the ageing process. Success or failure will depend on two factors; having accurate temperature data to give to potential belt suppliers and, ultimately, the heat resistance qualities of the belt they supply.

Ozone and UV resistance

There is absolutely no question that *all* rubber conveyor belts should be fully resistant to the damaging effects of ozone and UV light. This is because ozone becomes a pollutant at ground level. Exposure increases the acidity of carbon black surfaces and causes reactions to take place within the molecular structure of the rubber. This has several consequences, such as surface cracking and a marked decrease in the tensile strength of the rubber. Likewise, UV light from sunlight and artificial (fluorescent) lighting also accelerates deterioration. This is because it produces photochemical reactions that promote the oxidation of the surface of the rubber. This results in a loss of mechanical strength. In both cases, this kind of degradation causes the covers of the belt to wear out even faster than normal.

Rubber belts that are not fully resistant to ozone and UV can start to show signs of degradation even before they have been fitted to a conveyor simply by being exposed to the open air and daylight. Sadly, despite its crucial importance in terms of operational lifetime, ozone and UV resistance is very rarely, if ever, mentioned by traders or manufacturers. This is almost certainly because the anti-ozonants that need to be used during the mixing process of the rubber compounds are relatively costly. Building that 'avoidable' cost in would immediately make the belt less competitive on up-front price. My advice is to always make ozone and UV resistance a required part of the specification when selecting any rubber conveyor belt.

Don't accept the inevitable

When belts frequently have to be replaced after only a short period of time there is often the temptation to accept the 'inevitable' and fit 'economy' belts. But there is a lot more to conveyor belts than meets the eye. Good quality, longer lasting belts do cost more to produce but they will almost certainly run two or three times longer before they will need to be replaced. That initial price difference of 30-40% then becomes very insignificant indeed, as well as being a lot less hassle in the long run! After all, the quality of a belt and the materials used to produce it is best reflected by its price!

Interview by Peter Edwards, Global Cement Magazine

Looking to the future at Gebr. Pfeiffer

We delve into the future of cement sector grinding with Gebr. Pfeiffer's Patrick Heyd...

Above: Patrick Heyd has been the Executive Director for Sales and Project Engineering at Gebr. Pfeiffer since 2014. He joined the company in 1995 as a project engineer after a period working with coal and petcoke mills in the power generation sector. Patrick has also previously worked as Area Sales Manager for China and South East Asia for Gebr. Pfeiffer.

***Global Cement (GC):* Please could you introduce the company Gebr. Pfeiffer?**

Patrick Heyd (PH): Gebr. Pfeiffer was founded by the brothers Karl and Jacob Pfeiffer as a small machine factory in Kaiserslautern, Germany, in 1864. Its first products were steam engines and, early on, various mills and wind separators. Very soon the company focused mainly on the building materials industry, with an international orientation.

***GC:* What are its main types of mill?**

PH: The company sold its first vertical roller mill in the 1950s, which later became a success under the MPS name. These have three grinding rollers with a rounded edge that run on a moulded grinding table with a groove. The rollers are held in place by a pressure frame that presses the rollers onto the grinding bed formed on the table. The first MPS mill for cement (the world's first vertical cement mill ever) was ordered in 1979, commissioned in 1980 and remains in operation 40 years later in 2020. MPS mills are well suited to moist materials, several of this type are in operation, which process raw materials with a feed moisture of up to 25%. There are several thousand Pfeiffer vertical mills operating in various sectors.

We started to work on the MVR design in the early 2000s and gained our first industrial operating experience in 2006, with two 'under-the-radar' projects: one in Germany and one in Bosnia & Herzegovina. Once the concept was proven, we introduced the MVR mill to the market in 2010.

Unlike MPS mills, MVR mills have cylindrical rollers and a flat grinding table. Each roller has its own hydraulic suspension and roller arm, which means you can change the number of rollers and even remove some for maintenance while keeping the others operating under a partial load. This is known as 'active redundancy.'

The largest MVR mill is in operation at the LafargeHolcim Barroso plant in Brazil. It produces up to 460t/hr of various slag cements and 178t/hr of CEM I cement with a specific surface of 5500cm²/g (acc. to Blaine). This mill is equipped with an installed drive power of nearly 12,000kW. At present our biggest MVR mills for raw material grinding typically operate at 800t/hr, which is the nominated capacity to serve a 10,000t/day kiln.

***GC:* How did the company traditionally improve upon its designs?**

PH: Gebr. Pfeiffer traditionally approached design improvements from three sides. Firstly, we have a sophisticated process design department with a test station and laboratory that work out the parameters for ideal process design. Secondly, there is the experience coming from the field and thirdly, the mechanical design of the equipment itself, i.e.: proper analysis of the stress and strain within the material of the mill. This provides a 'reality check' on the process designs and allows us to scale up the design to industrial scale. Here it is important that all departments involved collaborate well, otherwise the mill could be oversized. This approach relied on a lot of experience, both from the testing facility and real-world installations.

***GC:* What about product development in 2020?**

PH: The previous approach was very iterative and took a lot of time to produce improvements. Nowadays our clients want faster and faster development. To achieve this, we manage an innovation funnel with universities, institutes and development partners. We have gained a lot of experience with computer-aided tools in recent years and use them to identify promising development paths more rapidly. Keywords are 'simulation of grinding processes' and the use of

'digital twin' technology. Furthermore, we use two-phase computational fluid dynamics (CFD) Two-phase CFD enables us to look at the air volume and the dust flow at the same time. Finite element analysis (FEA) is used to analyse the stresses and strains within the mechanical structure of potential designs.

Our computer-aided tools have cut down development time massively. Of course, you won't see improvements without direction from experienced human design teams but we can now learn more quickly than in the past thanks to these tools.

Gebr. Pfeiffer also uses an approach known as Value Engineering, where representatives from different departments 'workshop' together to identify the current barriers to improvement and how they can be circumvented. This is a collaborative process that seeks to improve the product as a whole, as well as pick up on specific targets for improvement.

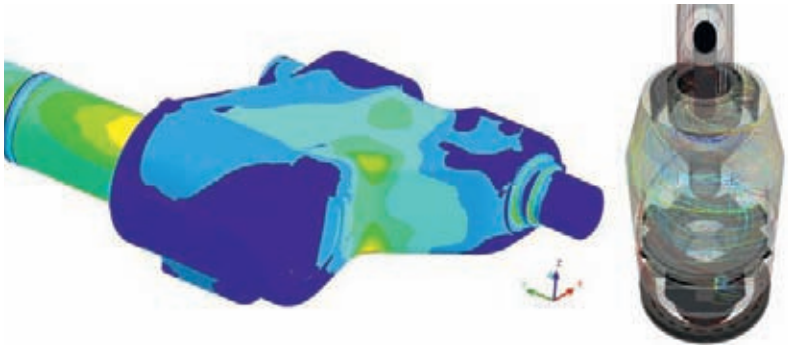
***GC:* What are Gebr. Pfeiffer's main development targets at the moment?**

PH: There are three main areas in which we constantly strive to improve: Sustainability, Efficiency and Digitisation. These are intrinsically linked. Sustainability has come to the fore, quite rightly so, because our clients want to (and are required to) improve their environmental performance and energy use. Efficiency is important for sustainability, as well as for the reduction of production costs. Digitisation feeds into the ease of use of the mill, as well as its process efficiency and, hence, sustainability.

Our consistent product development is oriented to the needs of our clients. Some achievements include: a 10% increase in power density of the current MVR series; increased specific dust load after the mill, which leads to a reduced gas volume flow in the plant; and lower plant fan power consumption. The separation efficiency of our classifiers has also been further increased. Of course we are not only looking at the mill itself, but also at the complete grinding plant. Here, pressure losses have been reduced by further optimising the ducting of our compact grinding plants. These are just a few examples of our activities that save further energy and thus also resources in general, since fewer raw materials have to be used, which only underlines the fluid transition between efficiency and sustainability.

***GC:* Which is the most important of these three for your clients?**

PH: Efficiency is still the starting point for everything. If the mill is not efficient, it will not be sustainable or economical due to excessive power consumption. In future, the economic success of a mill supplier will massively depend on providing best solutions for efficiency, sustainability and digitisation. The mill also affects the efficiency, cost and sustainability of the other parts of the process before and after the mill itself. In answer to the question, all three focuses are very important.



Above: Examples of computer-aided tools. FEM (left) and CFD (right).

***GC:* What are the limits to mill design? Will they reach an efficiency or sustainability limit?**

PH: Designs that are at one point revolutionary are often replaced by improved concepts. Take drive power for example. Before we launched the Barroso mill, with a rated capacity of 460t/hr for slag cement and nearly 12,000kW of installed power, the largest mill operating in the world had an installed capacity of just 6000kW - half the size!

The power was previously limited due to the design of traditional planetary gearboxes. Our response was the MultiDrive® system, which first went into operation in 2008 and was officially launched together with the MVR mill in 2010. This approach uses up to six drives, rather than one, so that the load is shared. This took our designs back to an area where torque was not only 'safe' for installed power of 5000-6000kW, but for as high as 18,000kW.

Of course, planetary gearbox design has come on a great deal over the past 15-20 years, with new designs for inlet and planetary stages for a better balance of torque transfer between the stages, but they cannot offer such high values. In addition, the MultiDrive® system extends the active redundancy to the main drive, because both drives and gear unit can be removed individually from the system and the mill can continue to grind. Together with the rollers, which can be taken out of operation individually, this is the highest level of reliability you can have.

***GC:* Can you expand on the power density?**

PH: Amongst our competitors mill sizes/types are named after the diameter of the grinding table. Mill power is the result of throughput multiplied by specific power consumption. The power density is then the ratio of mill power and mill size.

Throughput can be increased by using a larger table diameter, larger contact area (roller size or number of rollers), faster table rotational speed and higher hydraulic force. Clients are always looking for the best techno-commercial solution. The aim is to

Opposite Page: Double active redundancy: An MVR 6700 C-6 mill in Brazil with a drive power of 11,500kW.

realise this with the most compact design (maximise roller contact area / minimise table diameter). Thus, power density is the benchmark for advanced mill technology.

To illustrate how far power density has come, a 6.6m-diameter MPS mill for a Japanese client, supplied more than 40 years ago, had an installed drive power of just 2700kW. Today, if I wanted a mill with a 2700kW drive, I'd specify a table diameter of approximately 4m. This is due to constant improvement of the power density. This means we don't need as large a table. Of course, the higher the grinding roller contact area, the greater the power density. You only grind under the rollers after all!

***GC:* What do cement producers look for in terms of the cement product itself?**

PH: All of our clients, of course, must meet the requirements of their own clients. Cement is sold on the basis of strength, fineness (Blaine) and a well-defined particle size distribution. In developed markets, this means a trend towards flexibility in cement characteristics. Client A wants cement type 1 and Client B wants cement type 2. This requires a mill that is flexible and can be easily and rapidly tuned to different types of cement and fineness. Vertical roller mills are the perfect answer for that.

In any market with a tendency towards lower clinker factor, our clients are determined to keep the fineness as high as possible. The lower amount of clinker together with the additives in these blends has to work harder to achieve the same strength development and so needs a higher fineness (higher Blaine). Higher Blaine cement is also required due to the decline in overall concrete mass. A reduction in concrete mass means more sustainability overall.

Below: The largest mill in Western Europe, an MVR 5300 C-6 in Belgium, is equipped with GPpro.

***GC:* How do you increase the Blaine?**

PH: Higher Blaine is a play-off between the mill and classifier, which must work perfectly together. As well as the mill settings that I already mentioned, we can change several parameters in the classifier, its airflow characteristics, speed and so on.

Also, the finer you grind, the thinner the grinding bed becomes. It is only possible to maintain a stable and thin grinding bed with a stable mill. Our MVR mill was specially designed to operate perfectly under these conditions and even at very low vibration levels. Typically, vibrations of 2.5mm/s were accepted by cement plant operators as recently as 2010. With the MVR mill for cement grinding, we can now usually achieve vibrations of around 0.5mm/s for standard cements.

***GC:* How does it do this?**

PH: This is to do with the parallel grinding gap. The roller is cylindrical, the table is flat and the gap where the material bed is being formed is the same all the way along. The suspension of the roller arm is only along the vertical axis and there is no interaction between the roller support and the mill housing, other than that it passes through the housing. This means that the torque from grinding process is transferred to the roller support and down to the foundations, not to the mill casing or any other part of the mill.

***GC:* Will there be a point when the MVR also reaches its technical ceiling?**

PH: From today's point of view, our system is highly efficient, but of course we are constantly developing our products in order to improve their capacity, size, efficiency and so on. We currently have six rollers to reach, for cement grinding, capacities of 500-600t/hr. One six-roller 800t/hr raw mill can feed a large 10,000t/day kiln relatively easily, so these are currently the maximum capacities that we are being asked to provide.

This does not mean that larger MVR mills are not possible. Theoretically we could add another two rollers for capacities up to 800t/hr (cement) or 1400t/hr (raw meal), if a cement producer wanted to explore that option. The MultiDrive® allows us to go to 18,000kW so there is a lot of available 'headroom' with this design.

***GC:* Do you think it would be possible to have a single raw mill feeding two kilns?**

PH: I think this is totally feasible and I don't see why one large MVR mill couldn't work at full load across two kilns. Then, due to the active redundancy and MultiDrive® options, you could turn the mill down if one of the kilns were undergoing maintenance. We are prepared for a client that wants to explore the efficiencies that such a large mill would bring.

***GC:* There have been various modular grinding solutions from a number of suppliers launched recently. Are these efficient and sustainable solutions or 'cheap and cheerful' off-the-shelf models?**

PH: I can only speak for our own ready2grind system

which has meanwhile proven itself in the field worldwide. It has fewer options than a traditional mill but can still offer efficiency, sustainability and reliability. We developed this range in response to market demand. After the late 2000s financial crisis, there was a realisation that there was severe clinker overcapacity across our industry. At the same time, there were still several markets with relatively poor infrastructure that were natural homes for small grinding plants of 20t/hr. Now these too have moved to larger capacities to save on capital expenditure as much as possible, albeit in a lower 'capacity window.'

Our ready2grind 1800 makes 25-30t/hr, the ready2grind 2500 makes 60-70t/hr and the ready2grind 3000 is already on its way. These grinding plants are perfect for remote areas or when cement production needs to be very close to the cement consumer, even if the infrastructure is challenging. There needs to be a high degree of prefabrication built in at the design stage so that they can be installed.

Using the ready2grind range, we have developed clients that are not traditional cement producers but rather traders and construction firms. For them, the speed with which the project can be completed is often very important. This is another driver towards a modular, pre-fabricated approach. A further advantage of these systems is that the containerised plant components can be transported and installed more easily. Our 15 references demonstrate that we have also implemented our customers' requirements well in the field of modular systems.

***GC:* What automation and digitisation features does Gebr. Pfeiffer offer to its clients?**

PH: We have followed the Industry 4.0 trend since it became a feature of our sector. It drives our clients and so it drives us. We offer digital 'modules.' Some focus on maintenance, some on enhancing the operation. One of these digital modules is GPlink, which stores sensor data for data analysis. This data can then be transmitted to our service team as a solid support basis for even more rapid and targeted assistance.

GPpro is another one of our digital modules, which facilitates our Advanced Maintenance System. This means that maintenance can be planned and carried out according to actual needs and no longer at fixed intervals. GPpro includes a wider range of sensors as well as a data analysis tool and reports. And we continue to develop this product further and further, thus reacting to the changing requirements of the market.

Another exciting digital topic we are working on is artificial intelligence (AI), because we want to use this technology to optimise mill operations. The benefits of AI are clear. A skilled human operator can certainly set several operating parameters and overlook the interaction of these. With the help of artificial intelligence, you can have any number of parameters examined and always determine the ideal setting values for your application. We see enormous potential here and the first results with an industrial mill have been very promising. Digitisation is progressing and we are following this path.

Above: Modular ready2grind systems are installed around the world. Here is an MVR 2500 C-4 in in Costa Rica.

***GC:* Does this make the human operator available for other tasks or does it make them obsolete?**

PH: The human operator will not become obsolete, but fewer personnel will be needed in the future. We have received more and more requests regarding greater automation due to a number of drivers, even without the coronavirus outbreak. It is clear that the trend is towards greater plant automation in the coming years due to factors like the reduction in skilled workers in the cement sector. If social distancing has to be maintained for many months, or even longer, we may see a need for more automated solutions so that plants can continue to operate without humans coming into close contact with each other.

***GC:* Could a mill of the future operate with zero staff? If it could, who is responsible for it: The cement producer, the mill manufacturer, the software developer, or the mill itself?**

PH: Although Pfeiffer mills are already being operated temporarily with a reduced number of, or even zero, staff, this is a very difficult area that the global community has to answer regarding a number of technologies. Maybe we should ask Elon Musk once he has worked out the answer for driverless cars? Regardless of the eventual answer, I think an 'operator-free mill' 24/7 over a longer time period will not happen any time soon. There will be a need to keep a watchful eye over the technology for some years to come, but we are working on it!

***GC:* Thank you very much for your thoughts.**

PH: You are very welcome.

Steve Franklin, Cement & Aggregate Consulting

The Digital Quarry: Emerging technologies in raw material extraction

How can quarrying approaches be brought into the 2020s?

In 2014 I was working as the mine manager of a raw materials extraction operation for a major cement plant. During this role, I was continually frustrated by the lack of geospatial and geomining data relating to the operation. Simply put, the information required for efficient decision making was either unavailable or out of date. For example, site surveys would be, at best, annual and, in most cases, out of date before even received on site. To compound this, much of the information that could be available was tied up with different consulting groups, which meant that in each instance, I had to guess who might have the data and then pay to access work that the company had previously commissioned.

From this experience, I realised that if I was running into these types of issues, many other mine managers around the world would be in a similar position. By reviewing the situation, I realised that I needed:

1. Regular, up to date surveys and aerial photography;

2. Methods to visualise the site and conduct short term planning without recourse to external parties;

3. A sound geological understanding;

4. An optimised mine design that considered the costs of, and revenue from, extraction;

5. A robust mining schedule to determine the correct extraction sequence to meet plant requirements;

6. Knowledge of and access to all relevant, up to date geomining reports, licenses and approvals.

In short, it was a big ask and certainly one that went largely unanswered during my tenure. This said, I decided to make it a personal mission to solve these problems and from this action list, Cement & Aggregate Consulting was born.

In 2017, something occurred that allowed me to start on the journey to the realisation of my goals. It came in the form of exposure to an Australian company called PropellerAero and resulted in being able to tick off the first wish on the list. The combination of the PropellerAero photogrammetry platform and simple, cost effective drones from DJI led to cheap, reliable and timely survey and aerial photography.

The PropellerAero platform also allows non-technical users to measure volumes, distances and areas and has evolved into a superb visualisation tool, one used at sites around the world to plan and collaborate with stakeholders. Over the ensuing three years, this functionality has continued to increase to the point where my team now find it invaluable.

The next area of investigation was geology. There surely had to be better ways to understand and model limestone deposits than with the then 'industry standard' tools I had been exposed to. Around this time, we became aware of Leapfrog, an implicit geological modelling tool. One of the primary benefits of this tool is that once a model is set up, the addition (or adjustment) of data becomes incredibly simple and the model will automatically re-run without laborious manual editing.

Below: Drones offer cheap, reliable and timely surveys and aerial photography.

Above: Epiroc drill hole navigation system does not require mark-outs.

From this, it was then relatively easy to explore, model and reconcile raw material models. It also allowed us to create web-based models that could be shared with other stakeholders; yet again bringing technical data out of expensive, specialist software (and consultants) and into the hands of operational decision makers.

My experience was that most sites have only a limited understanding of what the correct depth and shape of their extraction area should be. In many cases this is determined by available land and/or expected overburden stripping requirements. My thought was that there had to be a better way.

With sound geological modelling in hand, we investigated the use of pit optimisation techniques to determine the mine plan. Around this time, we had encountered the Deswik.Suite mining software. This is an integrated mine optimisation, planning, scheduling, haulage and rehabilitation platform. Of note in this instance was the mine optimisation module. Mine optimisation involves taking the cost and value of each mining block and using mathematics to determine the correct pit shells based on financial parameters. This approach was first brought to industry notice through the Geovia Whittle software. More recently advances in algorithms have resulted in better and faster results, while the integrated Deswik approach ensures that it is very easy to quickly move data in and out of the system and update it as changes are needed.

With an effective system to create a pit shell that we knew was economically sound, mine design can follow. Not only does optimisation provide an optimised pit shell, but it can also help to provide the pit shells by year (or other period) to help inform scheduling and ensure there is a clear view of stripping and development requirements.

With a sound geological model and an economical pit design, it is then relatively easy to use a scheduling package to determine the best way to extract the deposit, while the use of integrated haulage software can help to determine how many trucks are required and the amount of fuel they will consume.

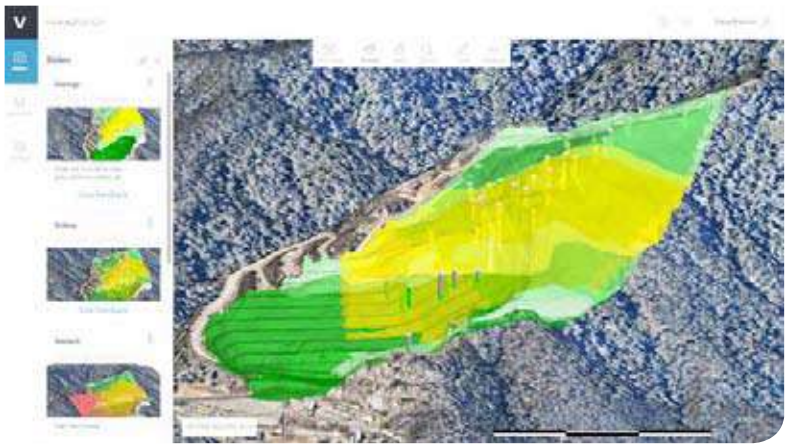
Lastly, integrated environmental software can ensure that water management is effective, and that rehabilitation is planned and carried out in a timely and effective manner.

In summary, we found that a combination of products from PropellerAero, Leapfrog and Deswik resulted in a cost effective and well-integrated technical solution once we had fully learned how best to integrate the platforms and had designed and tested documented and repeatable workflows.

Document access has also been an interesting area to address. Probably one of the best solutions on the market these days is Google G-Suite. Simple, easy to use and with data accessible on and off-line, G-Suite is a viable way to ensure that everyone has access to all relevant data when they need it. This is a great way to ensure that there is that 'one single source of the truth' that people often talk about. What I have found however, is that pulling all this data together can be a task of almost Herculean proportions. Between crucial data stuck in personal files, emails, paper archives and plans, the collection, validation, scanning and conversion of old reports to searchable electronic documents can take some time and effort. It is, however, an effort that has proven very worthwhile.

Interestingly, a requirement I had not really considered in my six point 'wish list' was how we were going to ensure that the designs that were created could be applied on the ground. At the time, we did not have any survey equipment and relied on external surveyors. This was only partly workable as, once

Below: The Leapfrog geological modelling platform.



Right: An overview of Propeller.

A further development in this area has been the greater availability of GPS machine guidance systems for loading tools and hole navigation systems on drill rigs. Both these types of systems provide the opportunity to ensure greater compliance to plan with less survey input.

An additional and new development has been the rise of augmented reality devices that can further help to visualise designs in the field. Yet again, Trimble is a leader in this field, and we have been trialling two different approaches to this technology. Ultimately, we see this as the next major technology pivot and are working on a range of applications to enable this.

again, we had to rely on an external party and any survey that was laid down was easily lost during operations.

A primary step towards resolving this issue was finding the low-cost, high-accuracy GPS survey device by Trimble. For approximately a tenth of the cost of traditional GPS rovers, this device allowed us to easily lay out a design in the field and pick up new survey data as needed (e.g. new services that were laid down etc.)

Right: Machines can be guided precisely.

Right: X marks the spot. Low-cost, high-accuracy GPS rovers open up a wealth of options.

While the above summary can give some sense of the broad systems and approaches taken, the investment in time and effort to work this all out from scratch should not be underestimated. Our goal in doing so was to determine workable software systems and workflows and then determine ways to put these in the hands of our partners so that they are able to run a majority of these processes themselves. This has been no minor undertaking! We are always happy to field questions from those in the sector who are interested in this approach.

The age of the 'digital quarry,' one that utilises cost effective hardware and software solutions to empower stakeholders to make good decisions, remove people from harms' way and make a significant difference to how we do business, is firmly upon us!

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Raylin Ranck, PPC

Kiln shell section replacement and girth gear reversal

PPC's Raylin Ranck gives a detailed report of a recent kiln maintenance project at the company's De Hoek plant in Western Cape, South Africa...

Above: Raylin Ranck.

PPC's commitment to providing 100% quality cement over the past 128 years has seen the business utilise PPC De Hoek plant, located in the Western Cape, South Africa, to bolster cement production and delivery in the region. Addressing the changing economic landscape and capacity requirements in the region, PPC De Hoek plant has continued to sustainably provide 100% local cement in response to a market that continues to ask for PPC by name. Striving for excellence in all its operations, maintenance and strength of structures remain a priority.

In August 2018 during a heat up on the kiln 5 line at PPC's De Hoek plant, a hot spot was observed on the kiln shell scanner. A refractory failure had occurred, leading to shell temperatures increasing to 580°C in the area that failed and a significant shell bulge. The kiln was stopped and cooled down for internal inspection to be conducted. Inspections confirmed the failure was within a section 7m long by 3m wide. Unfortunately it was also across the girth gear section.

Right: The new kiln section arrives at the De Hoek plant.

Thankfully, the plant had performed a hot kiln alignment around two months prior to the failure, which provided a good reference. Runouts (misalignments) on the shell where the gear is mounted were recorded over 20mm, which had a direct influence on the total runouts on the gear. The gear rim runout was recorded at 14mm, whereas the running condition expected runout should have been in the region of 1mm.

Detailed root cause analysis revealed that accelerated wear on the gear and pinion due to bottoming at some point, as well as probability of another refractory failure, were behind the failure. These findings initiated the replacement of the shell section in this area, reversing the gear as well as replacement of the pinion process. To do this, PPC teamed up with the local kiln and mill specialist Robtek. This partnership was driven by PPC's commitment to empowering the community to experience a better quality of life by providing local businesses with the opportunity to share in its passion for its cement products and related materials.

The first task was to design the replacement section so that sourcing, procurement and fabrication of a new 4.35m diameter kiln shell section could take place. Once the 3m wide x 30mm thick plate arrived at Robtek's site, they were cut in square, the edges prepared, rolled, joined and rerolled. The 3m x 3m sections could be aligned and joined to form the total 9m length that would be required. Finally, spiders (supports) were installed inside the new shell for support during transport and installation.

The replacement project began in mid-January 2020 when the new kiln section arrived by abnormal transport to the plant. 11m of refractory was removed from inside the kiln, 1m past both ends of the cut lines. The Robtek crew arrived on 24 January 2020. After site medicals and inductions, the team offloaded containers, inspected its power tools, built scaffolding and laid power lines to the work area. The first tasks on the kiln were to remove the gear guards, to take pre-cut reference runouts on the shell and gear and to mark cut lines on the kiln shell. Spiders were installed inside the remaining kiln ends to

ensure no deformation could occur to the undamaged kiln sections after cutting. Oxy-acetylene was used to cut the shell with a specialised imported kiln cutter. This had a torch nozzle fixed to a track-mounted machine. The track is flexible and magnetised to enable it to bend and fit any size of kiln shell.

The girth gear comprises three segments, which meant that the kiln had to be stopped in the ideal safe rigging position. This left the project team with one section at the top and two sections on the sides. Careful planning of upcoming tasks was crucial, as once the gear comes off, there is no way to turn the kiln during subsequent steps.

The brake on the barring drive was closed and the coupling between the pinion and gearbox opened. The split girth gear sections were removed by taking out the split bolts while keeping the sections together. They were then attached to the rigging equipment from the gear section to the crane hook. The trailing plates were then gouged off, welded and bolted to the kiln shell. The top section was taken off first and scaffolding was removed at both sides during the lifts of the side sections. The side section on the pinion side was removed last after removal of the pinion shaft assembly.

Three large steel structural tower supports were installed underneath the kiln shell near the cut lines. The first tower was located near the cutline, to support the remaining cantilevered section. A second tower was installed at the feed end of the kiln, to support the other cantilevered section. A third tower was installed for the new shell at cutline one and to help prevent movement of the shell section being removed during the first cut.

Above left: Daylight between the damaged and undamaged kiln sections after cutting.

Above: The damaged section is removed.

By the use of jacking cradles on the remaining shell (at points where the spiders were added), the kiln was jacked up to support its weight and cutting could commence. After the first cut was completed, the kiln could be jacked open approximately 100mm by means of plates welded on both sides of the cut. This gap allowed the team to safely rig up the old section. Suitable slings were connected to the shell and attached to the hook of a 220t mobile crane. Once enough weight was supported by the crane, the last cut could be made to free the shell. Strong backs were welded on the inside of the shell over the cuts as a precaution. These would prevent the shell section falling in the event of a crane failure or insufficient weight being supported by the crane. The shell section was then slowly rigged out without any issues.

With the shell section removed, access to the entire circumference of the old shell at both ends was possible. The kiln cutting machine head was angled to 30° enabling the welding preparation to commence on the old shell sections. The new shell was produced from the workshop with matching 30° preparation. The two sections formed a single V-shaped welding site.

The new section was rigged up and, while supported by the crane, temporary erection steel brackets were welded onto the old shell, in line with shop fitted matching brackets. Threaded rods and nuts were used through the brackets to keep the shell in place during rotation, while allowing for axial alignment adjustments to be made by correcting the shell runouts. Next up, the gear and pinion were reinstalled in the reverse order of their removal. The gear was temporarily seated on four large erection brackets that fitted between the shell and gear rim. These brackets had adjustment bolts to enable the gear to be radially and axially aligned. In order to carry

Left: Dismantling the three sections of the girth gear. View from the preheater tower.

Above: Working in a confined space under the kiln.

out the gear alignment, the kiln needed to turn. This was made possible by heavy duty chains running from the shell to the four support erection brackets. The gear was provisionally aligned so that final alignment on the shell could begin, as the gear has to be installed before alignment of the shell.

Initial pre-cut runouts on the shell were recorded as 45mm (cutline 1), and 43mm at the inlet. After three days of alignment, runouts in these areas were brought down to 17mm (cutline 1) and 23mm (feed end). Ideally, one would like to get closer to 10mm but attaching a new round shell section to a deformed one was always going to pose difficulties.

Next came the welding. First a root weld by hand was done in the V from the outside before sub-arc welding began. The portable sub arc welding machinery was mounted on top of the kiln on scaffolding and the kiln was rotated at around 0.03rpm to achieve a speed of 420mm/min on the circumference. Welding on each seam took around 10 hours.

Once the large single V was filled and capped on the outside seam at both cut lines, there is sufficient strength through the welds alone for the internal temporary erection steel brackets to be removed. Next, the first root weld run was gouged out, ground, cleaned and inspected using dye penetration techniques. The inside seam was then welded with sub-arc welding. To do this, the wheeled welding head was placed on a track inside the kiln. It was set to move in the opposite direction of the kiln at the same speed to stay in the same position while welding.

After the internal welding was complete, the surface was ground flat for refractory installation. Third-party non-destructive testing technicians were brought in to do magnetic particle inspection (MPI) tests inside and outside of the weld seams.

Ultrasonic tests were performed on both sides of both weld seams. The MPI picked up a few surface cracks and undercuts, which were removed by grinding and the ultrasound detected no flaws in the weld.

With the welding cleared, the alignment on the gear could continue. During provisional alignment some high spots were picked up on the gear. This could be from deformation due to the original refractory failure. During final alignment the team managed to reduce the runouts to around 1.5mm radially and axially. Ideally one would like to see runouts of 1mm radially and less than 1mm axially. After gear alignment, the gear trailing plates could be welded to the kiln shell. Pinion and drive train alignment was then carried out and, finally, gear flinger rings and guards were re-installed. Packing up and site de-establishment could begin!

Right: An external team identified a few surface cracks and undercuts, which were removed.

Below: The completed repair.

The project was completed on time and within budget, ensuring that PPC has the opportunity to live up to its brand promise, 'Strength Beyond.' While PPC began operating in line with South Africa's Covid-19 regulations in April 2020, the recommissioning of PPC De Hoek kiln will take place once the Covid-19 restrictions are lifted and we are allowed to do so. This will ensure that the business fulfils its commitment to provide quality materials and solutions to businesses that have permits, in addition to essential service providers in accordance with government regulations put in place during the global pandemic and beyond.

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Thorsten Koth, ScrapeTec Trading GmbH

Innovative controls for conveyor system dust

The dream of every plant operator is to eliminate dust and spills on belts and transfer points and to minimise maintenance requirements of the conveyor system. An added bonus is to be able to cope efficiently with the challenges of moist and sticky materials. The contact-free AirScrape® conveyor belt skirting system, developed by ScrapeTec, has been designed to do just that.

The AirScrape conveyor belt skirting system prevents dust formation, reduces material spill, enables thorough belt-cleaning and minimises the risk of explosion at critical sections along the conveyor route and at transfer points. It does this via a highly-effective side seal that lies over the conveyor belt, without contact. It creates negative pressure on the belt due to its specially-designed lamella structure. As the system hovers freely above the conveyor belt, skirt friction and belt damage are eliminated and service life of every component of the conveyor is extended. Unlike conventional systems, it also works well with moist and sticky materials.

The AirScrape handles moist and sticky materials at the Inashco processing plant in Wuppertal, Germany. "Inashco processes slag and ashes from waste incineration plants into usable raw materials, involving the recovery of all metal components from what remains after incineration," explains Marcel Angerhausen, the Inashco's plant's Operations Manager. "Marketable mineral recycling fractions are then produced from residual ashes, which can be used as aggregates in the non-structural concrete products industry."

"The fact that it is possible using our technology to process ashes with a high moisture content directly from incineration, is a real advantage for metal recovery. However, it is a curse for further processing of the remaining minerals into mineral aggregates. Nevertheless, this process is important, because on average, the ashes contain about 80% stone, glass and ceramic contents."

"Material with a grain size of 0-10mm ends up in our plant, which we prepare for recycling via various screening and cleaning stages to 0-3mm and 3-10mm," continues Angerhausen. "The Airscrape system, which was installed in late 2019, has exceeded our expectations. This system works efficiently, even with our difficult materials and significantly reduces material spills on belts and transfers. Prior to the installation of AirScrape at the plant, our team had to spend hours each day, cleaning the belt periphery and all transfer points due to material spills. We had previously tried various methods to cope with material spills in the plant's moist and sticky environment, without success. The six-week trial operation period with the AirScrape showed that, although cleaning at critical points is still necessary once a week, 90% of the time previously spent cleaning is now available for productive work at the plant."

Below: Before (left) and after (right) installation of the AirScrape® system at the Inashco plant in Wuppertal.

Heather Harding, Bricking Solutions

Maximising bricking machine longevity

Refractory installation is a demanding application, as harsh kiln environments take a heavy toll on bricking machines and other equipment. Routine maintenance is vital for facilities and contractors that want to ensure the longevity of their bricking machine. With proper care, a bricking machine won't just be ready for the next job, but for decades to come. Robust engineering and heavy-duty components from top-tier manufacturers play a major role in this reliability, but operators are also responsible for protecting their investment to optimise their return on investment. Here are six ways to do just that...

1. Designate a responsible employee

At facilities that provide a bricking machine for use by third parties, it is important to designate an employee who is responsible for the machine. This employee can work with the bricking crew to ensure the facility's bricking machine is handled properly during setup, operation and teardown. They can also track parts or systems that might need to be repaired after operation by performing after-use inspections and routine maintenance.

Refractory installation contractors that provide their own bricking machine don't need to be reminded how important the equipment is to their operation, but designating a specific employee to oversee maintenance can still ensure things like ordering parts and servicing during downtimes don't fall through the cracks. The contractors that use the bricking machine, as well as cement plant operators, can rest assured that the bricking machine is well cared for and ready for operation when it's needed, helping ensure a successful shutdown and relining project. It also increases rig longevity and overall return on investment.

2. Follow manufacturer instructions

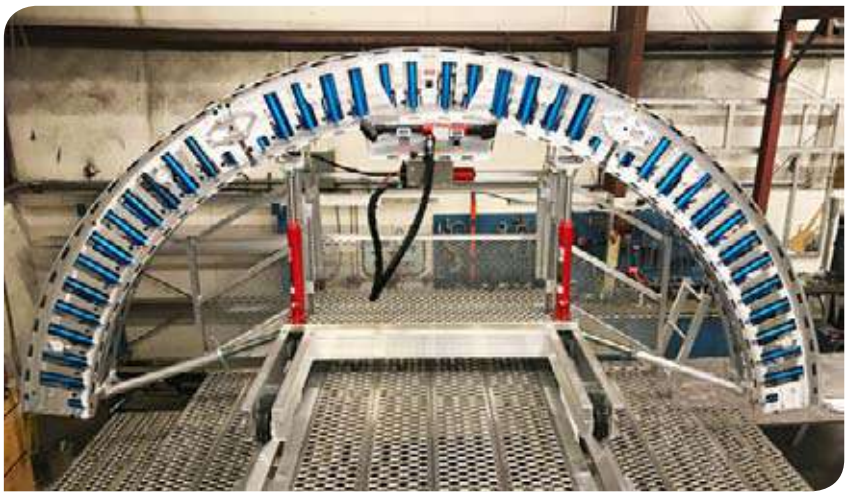
Following manufacturer recommendations is the best way to ensure a bricking machine is ready when it is needed. To help, the industry-leading manufacturers offer on-site training with equipment commission, as well as follow-up training by request. However, since the crew on the jobsite tomorrow might not be the same as the one on hand for the initial training, manufacturers also recommend that operators frequently review key procedures in-house.

It is important to follow operational and maintenance instructions for all bricking machine components. There may also be systems that require extra care and attention. The arch's pneumatic system is chief among these. This system powers pneumatic cylinders that push the bricks into place. These reduce the risk of crew injuries from unsupported overhead bricks, a common issue with earlier bricking methods, and are available on many top-tier bricking machines.

In addition to a visual inspection of the pneumatic cylinders before use, operators should make sure the oil reservoir is full and the lubricator filter is working properly. Two to three drops of oil should fall each time the master valve is cycled. Air pressure should also be double-checked. Optimal pressure will vary by manufacturer, but most require 620-830kPa (90-120psi) for proper function. During operation, masons should keep an eye on oil levels and air pressure.

The pneumatic system is also vulnerable during transportation, since the lubricator filter can be damaged by accidental contact with a wall or other surface. Use a spotter during transportation and take care when hanging or leaning the machine against

Below: To help with equipment inspection and recertification, certain industry-leading companies offer on-site equipment safety evaluations. Such visits include a visual inspection, safety and machine systems testing.



Above: In addition to a visual inspection of the pneumatic cylinders before use, operators should make sure the oil reservoir is full and the lubricator filter is working properly.

walls to ensure all systems are undamaged and ready for operation the next time the rig is needed.

3. Cleanliness is key

Kilns are dirty. Left unchecked, the dust and debris that accumulates on a bricking machine during refractory installation can shorten its useful life and increase maintenance costs, especially for machines with pneumatic cylinders.

For optimum performance, keep bricking machines clean. Wipe down the cylinder rods and other surfaces after each shift. Once the job is complete, a more thorough cleanse is necessary before storage. Clean the arches, handles and cylinder bodies. Open the bleed valves and drain any moisture to prevent rust. Leave valves open during storage, as changing temperatures can otherwise lead to condensation within the bricking machine.

4. Inspect after use

It is natural for tired crews to want to hurry through inspections and maintenance after an installation. But they shouldn't rush: Prevention is better than a cure, especially in the cement industry, where even slight delays cost facilities dearly in lost production. Careful inspection and evaluation at the end of operation ensures maximum lead time for any necessary parts orders or repairs. Some key inspection points include:

Frame: Visually inspect all welds, including the frame itself and all structural members such as leg and outriggers, for cracks, stress or distortions. For machines eight years or older, manufacturers recommend a dye test to ensure the viability of welds, with follow up testing every two years thereafter.

Arch trolley cart: Visually inspect the trolley cart for stress and weld cracks. Ensure that its wheels are lubricated and in good working condition and lubricate with standard grease if necessary. Also check the condition of pins, locks and brakes and inspect the arch adjustment plates for sags and/or bends.

Arches: Visually inspect all panels for cracks, stress or distortions. Ensure that all ledges are straight and free of major gouge and check that hinges are in good working order.

Cylinders and rubber bumpers: Make sure cylinders extend and retract freely and don't leak. The handles should be free of damage. Bumpers should not be able to rotate more than 10° and must be free of major gouges. Be sure to check quick connections for cracks and leaks and inspect hoses for cracks and leaks.

Keying jack: Make sure hoses and fittings are free of leaks, damage and debris and that gauges work properly. Ensure fingertip control and foot treadle are in good working order and visually inspect the swivel feet for cracks and damage.

5. Storage

Once a bricking machine has been cleaned, inspected and disassembled, it should be carefully stored until it is needed again. For contractors working with their own machines, this might only be a short time. However some operators, including cement plants that have invested in their own bricking machine, may have to store the unit for a longer period of time. Under such circumstances, manufacturers recommend a storage location that keeps the machine out of the way of normal operations. This location should be away from the burner to avoid unnecessary heat damage. A specialised container, available from some bricking machine manufacturers, can also help to keep components protected during storage.

6. A partner for success

After five years, manufacturers recommend on-site equipment inspections every 1-2 years. Equipment inspections and recertification help facilities and contractors remain compliant with regulations and provide assurance that equipment is safe and ready for use. To help with this, certain industry-leading companies offer on-site equipment safety evaluations. These one- or multi-day visits include a visual inspection, safety and machine systems testing. At the end of the evaluation, the facility or contractor is provided with a complete report of findings, as well as recommended repairs and replacements.

A bricking machine represents a significant investment. With proper care and routine maintenance, it can last several decades, making that investment a long-term one. For that reason, it's important to choose a manufacturing partner with proven longevity in the industry and a commitment to continued service.

Hasle Refractories A/S

Highlights from Hasle

Denmark-based Hasle Refractories A/S presents some of its news...

Hasle increases lifetime of preheater lining to ≥ 5 years

A 7000t/day cement plant in India that uses coal and petcoke as fuels, was dissatisfied with the lifetime of its low cement castable lining in inlet arch of the preheater. The lining lifetime was less than 12 months and repeated relining was needed.

In 2014 the cement plant installed Hasle's unique Modular Lining in the preheater. A team of Hasle supervisors provided technical support and supervision during the installation, which was up to 50% faster than that of the previously used castable lining. Now, with Hasle's Modular Lining, the lining lifetime in this area has substantially increased and is currently at more than five years. During the last inspection, there was no sign of any coating or abrasion.

Hasle's unique Modular Lining is manufactured at its state-of-the-art plant in Denmark and is both cost-effective and environmentally friendly. Even with cement plants that fire using coal and petcoke, the Modular Lining helps operators achieve a better run factor by avoiding unscheduled shutdowns. The long lifetime of the lining also lowers the overall use of natural resources per tonne of clinker produced.

Left: The lining of the preheater inlet arch in 2014.

Left: The inlet arch after 36 months of operation.

Hasle completes successful cooperation with student consultancy

Hasle has concluded an exciting cooperation with 180 Degrees Consulting, the world's largest international, student driven consultancy, which helps socially conscious organisations achieve greater impact. Hasle's precast Modular Lining and Ceramic Vortex Finder (CVF) in particular help cement plants to lower their use of natural resources and optimise the use of energy per tonne of clinker.

While Hasle has long sought to help its clients with their sustainable development targets, it also wanted to find out how it could reduce its own carbon footprint, hence the cooperation with 180 Degrees Consulting. In recent months the company has been working, remotely of course, with a team of international students from Copenhagen Business School, Copenhagen University, Copenhagen School of Design and Technology and the Technical University of Denmark, to establish a model for calculating its own carbon footprint, from the sourcing of raw materials to final delivery of products to its customers. The team's different cultural perspectives and academic backgrounds have provided valuable insights into how Hasle can achieve the sustainable development goals in its value chain.

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Thailand: KHD commissions mill for Siam City Cement

Germany-based KHD Humboldt Wedag has reported the successful commissioning of a new Comflex grinding line at Siam City Cement's Plant 1 in Saraburi. The line replaces two ball mill circuits, maintaining a production capacity of 350t/hr with a 40% lower energy consumption. The Comflex comprises a roller press, RPM18–200/180 static coarse material separator, VS620 static fine material separator, LS8600 system fan, HKSK 236/346 and four product separation cyclones. KHD says that Siam City Cement awarded it the engineering, procurement and construction (EPC) contract because of the system's low specific power consumption of 13.36kWh/t, compared to over 21kWh/t in the previous system.

Germany: Gebr. Pfeiffer launches end-of-lockdown Get Ready Package

Gebr. Pfeiffer has launched a range of webinars and individual analysis and advice sessions in order to support cement producers preparing for start-up after the global coronavirus crisis. The services include webinars about vertical roller mill grinding and the Gebr. Pfeiffer MVR roller mill range and ready2grind modular system, as well as individual remote inspections. Gebr. Pfeiffer is also offering individual start-up support sessions.

Hungary: Entsorga completes AF upgrade

Italy-based Entsorga has completed the installation of an automated alternative fuel (AF) line at a Hungarian cement plant. The upgrade consists of an Entsorga Spider crane and Pelican power system that will be able to maintain a continuous feed to the plant's calcination system 24 hours a day.

Russia: Emissions system for Krasnoyarsk

Krasnoyarsk Cement has equipped the exhaust stack of its 1.1Mt/yr Krasnoyarsk, Siberia, plant with an emissions monitoring system supplied by Finland-based Gasmet. The system provides continuous NO_x, CO_2 and SO_2 monitoring via a UK-based Oxitec 500E gas analyser, Germany-based Durag D-FL-220 flow rate meter and a Gasmet Simatic computer.

Germany: Fuchs and BASF lubricant study

Fuchs has announced the completion of collaboration with BASF in which it performed a cradle-to-grave analysis of different mineral oil hydraulic fluids that took all environmental and economic aspects of their lifecycle into account. The study found that high performance multigrade hydraulic oil (HVLP) has a lower environmental impact and cost than monograde hydraulic oil (HLP).

Australia: New Flender plant

Siemens subsidiary Flender has published plans for a drives production plant in the Tonkin Highway Industrial Estate, Western Australia, to serve the gear needs of the energy, minerals and cement industries. The unit (below) is a replacement for its existing site in the state and will have a 1.5MW test bench capable of testing drive systems of up to 6.6kV. The plant is expected to be come online in September 2020.

Vietnam: Contract for FCT

FCT Combustion has published details of a new contract with Vinacomin for the supply of an FCT Turbo-Jet burner to its 0.6Mt/yr La Hiên plant in Thái Nguyên Province. The upgrade aims to enable the use of lower calorific coal while maintaining clinker strength and specific fuel consumption in order to reduce fuel costs.

Sweden: Höganäs' Brevik project

Höganäs Borgestad has reported that it has completed refractory maintenance at Norcem's 1.2Mt/yr Brevik cement plant in Norway. It supplied 600t of refractories and 45 workers over a three week period.

Australia: Mideco adds virus protection to Bat Booth® 2.0

The Bat Booth® 2.0, an intelligent device that reduces on-site virus transmission risk in heavy industries has been raced into production by Melbourne-based Mideco. It uses an infrared camera to help protect workers from viral infections and heat stress, while reducing the risk of dust-related diseases such as silicosis, coal workers' pneumoconiosis and farmer's lung (as in the previous Bat Booth® model). It takes just 15 seconds from an employee triggering the automatic recognition system for a temperature check to be completed.

UK: Two new permanent overband magnet models for Bunting

Bunting, a major producer of magnetic separators for the recycling and waste industries, has added two new models to its range of Permanent Overband Magnets.

The PMax Overband Magnet (below) meets the mobile plant industry's move towards lighter and smaller designs of, for example, crushers and screens. It is 15% lighter than the standard PCB model across the range and 12% shorter in length, resulting in a 14% higher magnetic force to weight ratio.

The Easibelt model is for applications where maintenance opportunities are limited. The design allows for a fast belt change, significantly reducing maintenance downtime by at least 50% compared to changing a belt on a standard Permanent Overband Magnet.

US: Terex launches MC320 cone module

Terex has announced the launch of its MC320 cone module (right) for its recently-released MPS TG/TGS Series range of bushing cone crushers. The MC320 cone module features the TG320 or optional TGS320 cone on the same universal base structure as the MC and MV Series modular lines. The all-electric, pre-engineered solution can be easily transported in standard containers and can be bolted together onsite quickly with basic tools and minimal wiring. It can be installed with or without full concrete foundations.

The TG320 is a 300hp bushing cone with large feed opening, adjustable eccentric throw and multiple liners that allow the operator to quickly and easily optimise production output in a wide range of applications.

Cameroon: Calcined clay contract

Thyssenkrupp Industrial Solutions has won an engineering, procurement, construction and commissioning (EPCC) contract with Cimpor Global Holdings for the installation of a 720t/day clay calcination plant at its integrated Kribi plant in south Cameroon. The system calcines clay at just 800°C, which can then replace clinker at a ratio of one to two, lowering the finished cement's clinker factor by up to 33%.

ThyssenKrupp says that use of the system, the first of its kind in Cameroon and second at a Cimpor Global Holdings cement plant, will help cut CO_2 emissions from the plant by 120,000t/yr, a reduction of 40%.

Germany: Award for Vecoplan

Red Dot has awarded Vecoplan its Red Dot Design Award to the new Vecoplan VEZ 3200 pre-shredder for refuse-derived fuel (RDF). The prize 'acknowledges the aesthetics and workmanship' of the product, as well as ergonomics and functionality. Vecoplan CEO Werner Berens said, "The design impacts on the machine construction, making the shredder easier to handle."

Thailand: Largest continuous mat foundation concrete pour in South East Asia

A major construction highlight took place in Bangkok in February 2020, with the largest continuous mat foundation pour ever carried out in South East Asia. The pour, an early step in the construction of the One Bangkok development, saw 547 truck deliveries provide a total of 23,725m^3 of concrete over a 33 hour, 15 minute period.

The 4.5m-thick foundation used 2200t of reinforced steel. The concrete used was a special low-heat material with a compressive strength of 58.8MPa, higher than the compressive strength of the concrete used for the world's tallest tower, the Burj Khalifa in the UAE.

Above: A computer-rendered design of the One Bangkok development, which will open in 2023.

As the health and safety of the employees, partners and visitors at the site are of utmost concern during the continuation of construction work, increased hygiene and cleanliness measures were put in place at the One Bangkok site, to ensure everyone's well-being and to prevent the spread of the COVID-19 coronavirus.

US: Eagle Materials sells ready mix and aggregate subsidiaries

Eagle Materials has sold its Mathews Ready Mix and Western Aggregates subsidiaries for a combined value of US$93.5m. Eagle's President and CEO, Michael Haack said that the transaction represented the sale of non-core assets on the heavy-side of the company that do not provide essential support to its primary cement plant network.

Taiwan: Asia Cement wind contract

Asia Cement has announced its collaboration with Germany-based energy company Innogy on construction of a 448MW wind power plant near Hsinchu City off Taiwan's north-west coast. Asia Cement will supply concrete to the project, which will see power sold to the national grid.

Bahrain: Kingdom Cement to supply Spiral Orchid Residence

Kingdom Cement, a subsidiary of Kingdom Group that operates a cement terminal and packing plant, will supply cement for Orchid Building Contracting's Spiral Orchid Residence skyscraper in Water Garden City, Al Manamah.

Liechtenstein: Concrete Sensors' assets acquired by Hilti

Hilti, a supplier of tools, technology, software, and services to the commercial construction industry based in Liechtenstein, has acquired the assets of Concrete Sensors. Concrete Sensors is a provider of connected devices, software and services that enable improved decision-making and accelerated construction schedules through a better understanding of the concrete curing process.

Italy: Italcementi plant awarded RSS certificate for concrete supplies

Italcementi's integrated Calusco plant near Bergamo has been awarded a Responsible Sourcing Scheme (RSS) certificate for its concrete and related supply chain operations. The certification looks at the entire production process from transportation to recycled raw materials. It is the first cement plant in the Italian subsidiary of HeidelbergCement to obtain the certification.

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EU: Authorities lift lid on potential lockdown exit strategies

The European Council and European Commission have published their joint coronavirus exit strategy, entitled 'European Roadmap Towards Lifting Covid-19 Containment Measures.' It advises EU member states on a course of action aimed to restore community life and the economy, while also preserving public health, after the coronavirus outbreak.

The roadmap consists of a progressive lifting of travel restrictions, initially between border regions, then between regions less affected by the outbreak and subsequently across internal and external borders of the EU. The strategy applies a similar approach to restarting the economy, beginning with 'essential sectors' such as construction. The Commission will maintain a rapid alert system for supply chain disruptions, with the help of existing networks such as the Enterprise Europe Network (EEN), Clusters, Chambers of Commerce and trade associations.

Spain: Coronavirus plunges back to major cement slump

Spanish demand for cement fell to 3.14Mt in the first quarter of 2020, a 13% year-on-year fall from 3.60Mt in the corresponding period of 2019. In March 2020 cement consumption in Spain was 924,000t, down by 28% year-on-year from 1.28Mt due to the effects of the coronavirus outbreak. Local press reported that this was the lowest level of demand in any month since the immediate aftermath of the 2008 financial crash. Construction activity has been restricted by a government-imposed coronavirus lockdown since 14 March 2020.

Armenia: Cement operations allowed to restart

The Armenian government included cement production on a list of permitted economic activities that were allowed to resume from 16 April 2020. The country's wider lockdown is scheduled to continue until 15 May 2020, the date this issue goes to press. Cement and clinker imports from neighbouring Iran, historically the main source of construction cement for Armenia, have continued throughout the coronavirus crisis.

Switzerland: LafargeHolcim sales fall 11%

LafargeHolcim has reported sales of Euro5.03bn in the first quarter of 2020, down by 11% year-on-year from Euro5.66bn in the corresponding period of 2019. Cement sales over the period fell by 10% year-on-year to 45.0Mt from 50.0Mt. The group's earnings before interest and taxation (EBIT) was Euro249m, down by 14% from Euro290m.

LafargeHolcim CEO Jan Jenisch said that the results showed the group's 'resilience, despite the Covid-19 outbreak in China' in January 2020. Other markets were disrupted from mid-March 2020 onwards. "I am confident that LafargeHolcim will emerge from this pandemic as an important contributor to economic recovery as building activity gets back to normal," he added.

LafargeHolcim's coronavirus action plan consists of a Euro380m year-on-year capex reduction, a Euro285m year-on-year fixed cost reduction, realisation of energy price reductions, a review of all third party products and services and a reduction of net working capital in line with the level of activity.

Germany: HeidelbergCement

HeidelbergCement has reported a fall in first quarter revenues by 7% year-on-year in 2020, to Euro3.93bn from Euro4.24bn. Revenues fell by 6% in Western and Southern Europe and by 10% in the Asia-Pacific region, but rose by 11% in North America, by 2% in Northern and Eastern Europe and Central Asia and by 3% in Africa-Eastern Mediterranean Basin. Total cement and clinker sales over the period were 27.7Mt, down by 3.0% year-on-year from 28.6Mt.

HeidelbergCement Managing Board Chairman Dominik von Achten said that sales volumes were 'significantly impaired by the effects of the coronavirus pandemic' from mid-March 2020 onwards due to a major fall in construction. He added that, thanks to its COPE coronavirus action plan, HeidelbergCement has reduced 2020 spending by Euro1.0bn. It says that it has Euro5.7bn of financial liquidity.

Ireland: CRH announces strong three months before virus

CRH has said that it had a 'positive start to the year' in the first three months of 2020. Total sales over the period rose by 3% year-on-year. In the Americas region, cement volumes rose by 4% and prices by 6%. European cement sales were 'broadly in line with the same period of 2019' due to general volume and price increases offset by a fall in volumes in Western Europe.

Government-implemented Covid-19 restrictions on construction towards the end of the period impacted sales in Canada, the UK and France. The likely effects on 2020 profit 'cannot be reasonably estimated at this time.' CRH CEO Albert Manifold said, "With the financial strength of CRH and the experience of our leadership teams, we will endure through these unprecedented and uncertain times."

Greece: Profit falls for Titan

Titan Cement has published its integrated annual report for 2019, a year in which its net profit fell by 5.5% year-on-year to Euro50.9m from Euro53.8m in 2018 and sales rose by 8.0% to Euro1.61bn from Euro1.49bn. The company noted its 'sustained performance and stronger cash flow generation', with growing demand in the US and South-eastern Europe and the beginning of growth in Greece, despite a 7.0% year-on-year fall in cement volumes to 17.0Mt. Conditions in Egypt and Turkey caused the group's performance to deteriorate.

Titan said it expected 'short-term impacts' of coronavirus, including reduced sales volumes, particularly in the second quarter of 2020. It has strengthened its liquidity position to Euro400m.

Denmark: FLSmidth revenue rises in first quarter of 2020

FLSmidth's revenue in the first three months of 2020 was Euro607m, up by 2.5% year-on-year from Euro592m in the corresponding period of 2019. FLSmidth's cement division's sales were Euro240m (40% of total revenue), down by 2.6% from Euro246m. The company said that the coronavirus outbreak impacted results, especially in March 2020, when 'customer hesitation on large investments intensified, particularly in cement,' and customers increasingly deferred large investments. It added, "Demand for spare and wear parts is relatively stable, whereas technical services are challenged by restricted access to sites."

FLSmidth says that it aims to 'carry out business as usual' throughout the coronavirus outbreak, with an increased reliance on 'remote monitoring, maintenance and support.' Its 2020 financial guidance remains suspended.

France: New Cem'In'Eu plant

The modular cement grinding plant operator Cem'In'Eu has announced plans to establish a Euro23.0m grinding plant at Portes-lès-Valence in Drôme department. The La Tribune newspaper has reported that the plant will receive imported clinker produced at Adana Çimento's 5.2Mt/yr integrated Adana plant in Turkey by river and rail from the port of Sète. Cem'In'Eu president and Vincent Lefebvre said that the location, "Allows us to be in the middle of a Lyon-Marseille-Montpellier triangle but also to be connected to the Alpine valleys."

The grinding plant had been due for commissioning in mid-July 2021, but the coronavirus outbreak has delayed the start of construction.

Norway: Brevik CCS plant confirmed 'safe'

Private accreditation body DNVGL has certified Aker Solutions' 400,000t/yr carbon capture and storage (CCS) system installation at Germany-based HeidelbergCement subsidiary Norcem's 1.2Mt/yr integrated Brevik plant in Telemark as safe. HeidelbergCement Northern Europe director of sustainability and alternative fuels Per Brevik said, "The promising results from pilot testing in Brevik give us confidence that realisation of the full-scale capture plant will be successful. We trust that the project risk related to novel technology elements is low."

Germany: Voith acquires ELIN Motoren

Pursuant to a sales agreement dated December 2019, Voith Group acquired a majority share in ELIN Motoren on 30 April 2020.

UK: Hanson workers produce NHS support sign

A team of Hanson employees has produced a sign from recycled materials from around the company's 1.0Mt/yr Purfleet slag cement grinding plant. The 6m-long luminous sign, which reads 'NHS Thank You,' has been installed at the plant on the mill three tower overlooking the QE2 Dartford Crossing close to London.

Spain: Oural plant improves

A 25% alternative fuel (AF) substitution rate has accounted for a 9650t reduction in CO_2 emissions at Cementos Cosmos' 0.7Mt/yr Oural plant in Galicia, lowering the specific CO_2 emissions of its clinker by 45kg/t. A main constituent of the AF mix was olive stones. Cementos Cosmos Oural plant managing director Jaime Santoalla said, "At Cementos Cosmos, we accept our responsibility to meet the global objectives of reducing greenhouse gas emissions."

UK: RDF sets up coronavirus working group

RDF Industry Group has convened a refuse-derived fuel (RDF) industry working group to meet on a fortnightly basis to discuss the sectoral impacts of coronavirus.

The group said that it 'is working with competent authorities to ensure the free flow of RDF is maintained.' It acknowledged that RDF supply is essential to European cement production, adding, "The flow of RDF from the UK to off-take facilities in Europe is continuing, with the industry overall functioning well."

Sweden: New HQ for Höganäs Børgestad

Refractories specialist Höganäs Børgestad opened its new headquarters at Gävle, Gävleborg county on 27 April 2020. The facility will house the Energy and Kiln Engineering, Installation and Management departments.

Norway/Germany: First rail-only RDF shipment

Norway-based Geminor received a batch of refuse-derived fuel (RDF) produced at its Braunsbedra plant in Saxony-Anhalt, Germany for use at Scandinavian cement plants on 23 April 2020. The shipment was Europe's first international shipment of RDF by rail, without the use of trucks. Geminor plans for the 110t delivery to be the first of many on the 50,000t-capacity line.

Geminor CEO Kjetil Vikingstad said, "Since transport by ship is only effective within a radius of 200km from a port, central Germany becomes a natural starting point for transport by train. This is the beginning of extensive waste transport by train in Europe."

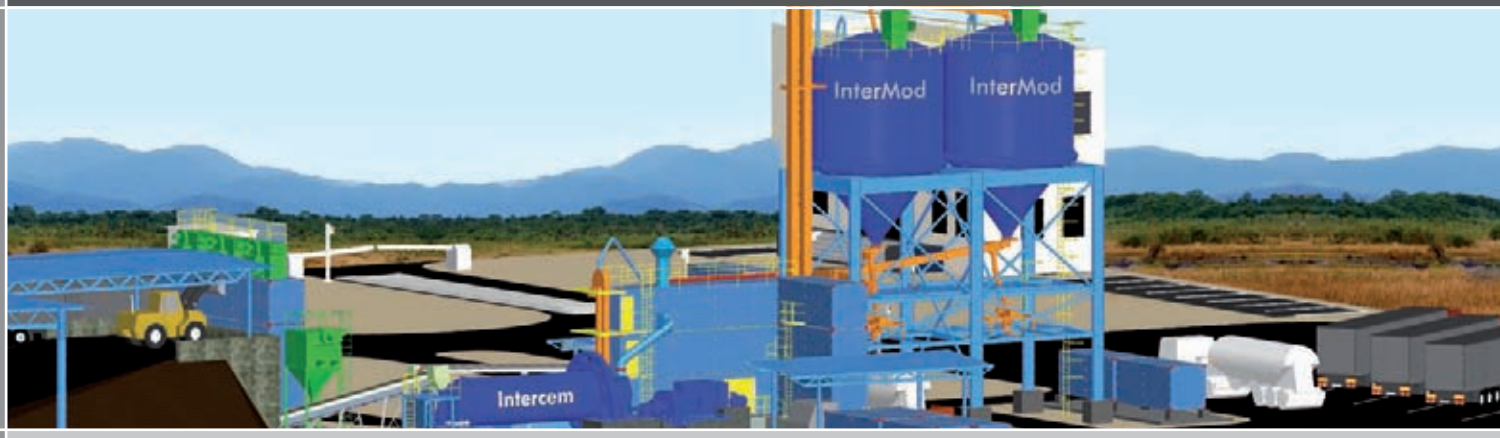
Ireland: Irish Cement alternative fuels progress halted over coronavirus

The Environmental Protection Agency (EPA) has postponed a four-day hearing over Irish Cement's alternative fuel (AF) licence application, scheduled for May 2020, to an as yet unspecified date due to the coronavirus outbreak. Under the terms of the proposed licence, Irish Cement will be able to co-process a maximum of 90,000t/yr of refuse-derived fuel (RDF), including tyres, in the single dry line of its 1.0Mt/yr Mungret plant in County Limerick. The EPA said that emissions from operations under the terms of the licence 'will meet all required environmental protection standards.'

Irish Cement received its preliminary licence to burn refuse-derived fuel (RDF) in September 2019. The move attracted local resistance, with 4500 people participating in a protest on 5 October 2019. The EPA has said that it will give all relevant parties notice 'well in advance' of the date of the rescheduled hearing, which will take place after the government lifts the country's coronavirus lockdown.

Europe: Global Aalborg White website goes live

Cementir Holding, the parent company of Aalborg Portland, has unified its Aalborg White® cement brand with the launch of a new global website that covers its six white cement plants around the world. The company says that the new site is a vital communication platform between it and industrial insiders/stakeholders via various interesting sections of, among the others, innovation, GloCal practices, e-learning courses, global case database and customer voice cases. Many of these aspects have become particularly important during the ongoing Covid-19 outbreak.



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Edwin A R Trout, Cement Industry Suppliers' Forum

A year in the UK cement industry

The UK finally left the EU on 31 January 2020 and, although the details of a trade deal are yet to be thrashed out, Brexit's place in news has been eclipsed by the ongoing coronavirus crisis. Prior to that, a general political malaise affected the market for cement and related construction materials for much of the year. It is fair to say that the UK cement industry has been adversely affected by circumstances far outside its control...

Above: Edwin Trout, Secretary of the Cement Industry Supplier's Forum.

Below: The UK's official departure from the EU in January 2020 has been totally eclipsed in the public consciousness since March 2020 due to the ongoing coronavirus outbreak.

Though the UK cement market fundamentals have been sound for some years, particularly with strong and continuing demand for housing, investor and customer confidence was low in 2019 due to uncertainty about the future caused by the protracted political impasse over the UK's departure from the EU (Brexit). The general election on 12 December 2019 relieved that pressure and there was a brief market upswing in the first two months of 2020 under a new Conservative government. However, this was short-lived due to the cessation of much construction work due to the coronavirus outbreak. Figures from various sources reflect this pattern.

The IHS Markit Total Activity Index (TAI) reflects market confidence by measuring actual purchasing activity in the construction sector. Figures above 50 indicate growth and those below 50 indicate recession. The 12 figures for the period to March 2020 are shown in Table 1. Since April 2019, when the index was 50.5, the market has been 'mired in downturn,' to use IHS Markit's own phrase from September 2019. It reported that the UK construction sector was 'buffeted by client hesitancy, heightened by Brexit uncertainty and a weak outlook for the UK economy.'

May 2019's Total Activity Index was the lowest reading since a snow-related downturn in March 2018 and June 2019 saw the biggest fall in house-building, usually the most resilient category, for three years. The low point came in September 2019, at 43.3, when civil engineering fell at its fastest rate for nearly a decade. In December 2019 it fell at its fastest rate since March 2009.

However, following the General Election in December 2019, the market recorded its first month of growth since April 2019 in February 2020. Reflecting the arrival of the coronavirus restrictions on activity however, this review ends with a collapse to 39.3 in March 2020, with much lower subsequent values.

The Office of National Statistics measures construction output. At the other end of the project process, when work commencing some months or years in the past has actually been completed, the figures are less grim. Output in the third quarter of 2019 increased by 0.6%, largely reversing the fall of 1.2% seen in the second quarter. Growth was driven by a 1.4% rise in new work (rather than in repair and maintenance) and included the private housing, commercial and industrial sectors.

In October 2019 output was down by 2.3%, the largest fall since January 2019, and total output was Euro15.16bn, the lowest since April 2018. However, the three-month period from November 2019 to January 2020 saw a rise of 1.4% compared to the August to October 2019, driven by a 2.4% growth in new work.

Forecasts by the Construction Products Association (CPA), which for much of 2019 downplayed the prospects of growth as largely reliant on uncertain major infrastructure projects, became even more despondent in October 2019 as a result of delays and cost overruns at the Hinkley Point C nuclear power plant, along with the potential abandonment of the High Speed 2 railway project, at that

point under review. The latter has since been officially endorsed and the project and its supply chain have been re-energised.

A statement by the Mineral Products Association (MPA) in August 2019 revealed weak demand for cement-based building materials in the first half of the year, compared with the same period in 2018. Ready-mixed concrete was down by 0.3%, though mortar was up by 1.4%. The figures for cement production, imports and sales, published some months in arrears, also indicate a fairly flat pattern comparable with the immediately preceding years, though still at levels that compare well with those in the long years of recovery after the financial crash of 2008.

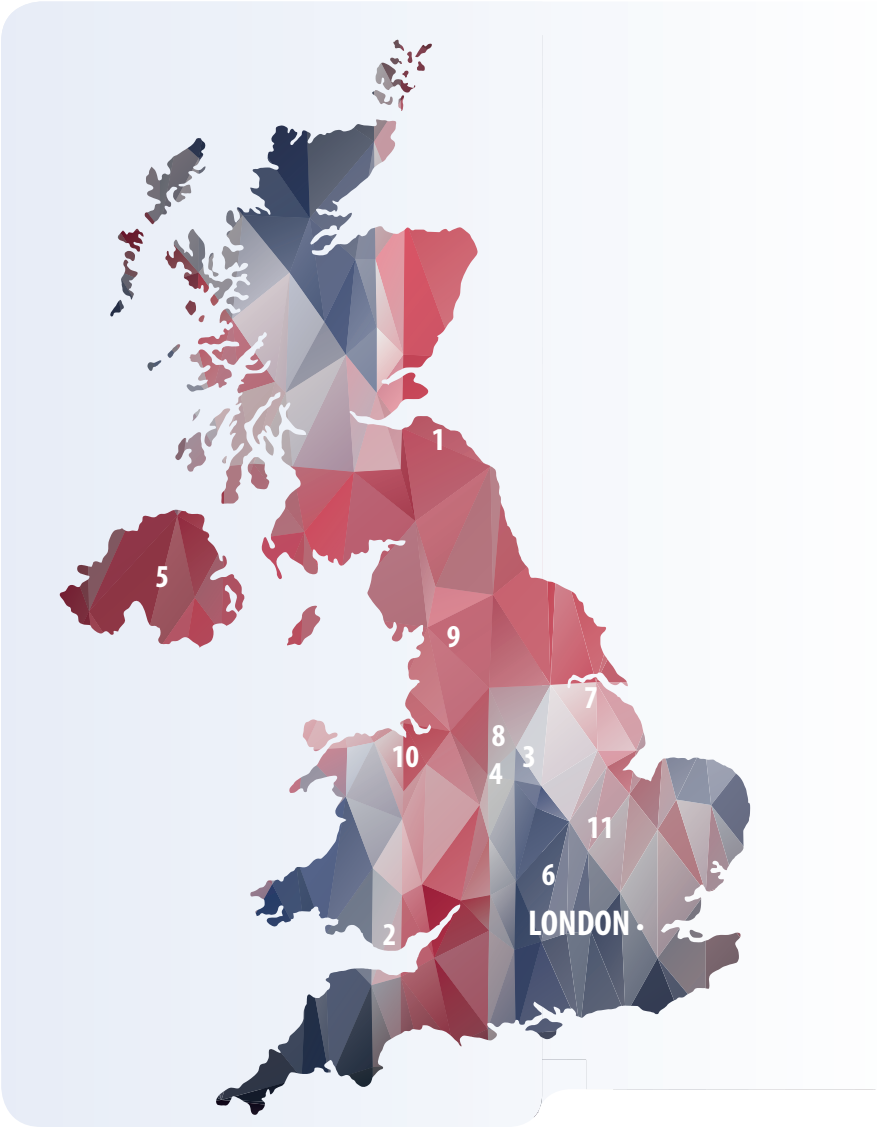
In November 2019 a survey of the cement industry in Great Britain was published by BDS Marketing Research. Among its conclusions, it highlighted a 73% growth in imports over the past five years to exceed Euro273m in value.

Structural changes

Following its acquisition of Hope in 2017 and Lagan in 2018, the big development this year to further consolidate the sector is Breedon Group's proposed purchase of a large part of Cemex's aggregate operation. The offer, made in January 2020, was for Euro176m in cash and liabilities of Euro26m. The 100 operations concerned, employing a total of 650, include 28 quarries, four depots, one cement terminal, 14 asphalt plants and four factories for precast concrete products. As a result of the sale, Breedon would gain mineral reserves of 170Mt, enough to last more than 27 years at current extraction rates. Cemex would retain a substantial presence in the UK, represented still in cement production, ready-mixed concrete, asphalt and paving.

However, progress on the proposal was suspended until the Competition & Markets Authority (CMA) had conducted a regulatory investigation into its potential impact on competition. To initiate this, the CMA issued an initial enforcement order under s72(2) of the Enterprise Act 2020 preventing either party from making significant changes to current operations. The outcome is yet to be announced.

In October 2019 Aggregate Industries acquired the Leicestershire business Maxi Readymix Concrete



Above - Figure 1: The UK's integrated cement plants. **TOTAL** = 10.3Mt/yr.

Tarmac (CRH)
1. Dunbar, 1.0Mt/yr.
2. Aberthaw, 0.6Mt/yr.
3. Tunstead, 0.8Mt/yr.

Aggregate Industries (LafargeHolcim)
4. Cauldon,1.0Mt/yr.
5. Cookstown, 0.5Mt/yr.

Cemex UK
6. Rugby, 1.3Mt/yr.
7. South Ferriby, 0.8Mt/yr.

Breedon Cement
8. Hope, 1.3Mt/yr.

Hanson (HeidelbergCement)
9. Ribblesdale, 0.9Mt/yr.
10. Padeswood, 0.8Mt/yr.
11. Ketton, 1.3Mt/yr.

Year	Month	TAI
2019	April	50.5
	May	48.6
	June	43.1
	July	45.3
	August	45.0
	September	43.3
	October	44.2
	November	45.3
	December	44.4
2020	January	48.4
	February	52.6
	March	39.3

Left - Table 1: IHS Markit Total Activity Index, April 2019 - March 2020.

	Q1	Q2	Q3
Clinker production	1.66	2.16	1.99
Production (MPA Cement)	2.15	2.43	2.36
Sales from UK production (MPA Cement)	2.18	2.40	2.41
Imports (MPA Cement)	0.23	0.20	0.19
Domestic cement sales	2.41	2.60	2.60
Estimated imports by others	0.42	0.46	0.48
Total cementitious sales	2.83	3.06	3.08
Other cementitious (Fly ash, GGBS)	0.81	0.93	1.04
TOTAL	**3.65**	**3.99**	**1.12**

Above - Table 2: Quarterly cement statistics for first three quarters of 2019. **Source:** Mineral Products Association.

Client	Supplier	Product / Service	Location
Tarmac	Hamilton Waste	Solid Recovered Fuel	Dunbar, Scotland
Quinn	Precia Molen	Automated weighbridge	Crievehill, Northern Ireland
Hanson	GB Railfreight	7-year train contract	Ketton, Rutland
	Thermoteknix	ThermaScope HDT cameras	Ribblesdale, North Yorkshire
	MDG Handling	Silo train unloading system	Padeswood, Wales
Cemex	CMB International	Replacement quarry screen	Rugeley, Staffordshire
	BMD Transport	5-year clay haulage contract	Rugby, Warwickshire
	Doosan	Sole supply, wheeled loaders	Nationally
	Turners (Soham)	Haulage contract for 20 units	Nationally

Above - Table 3: Major contracts signed by UK cement producers in the year to June 2020.

Ltd, a purchase in line with the group's Strategy 2022: Building for Growth. Conversely, Tarmac sold its 50% stake in Britannia Aggregates to its joint venture partner, the Brett Group, in January 2020.

Cement producer results

The UK's integrated cement plants are shown in Figure 1 (Page 47). Of the five major integrated cement businesses operating in Britain, only Breedon Group is headquartered in the UK. As the others are part of multinational groups based elsewhere their financial results for 2019 (announced early this year) are less of a reflection of the UK industry than of global trends, though the UK does feature in their commentary.

Full year results at Breedon Group were buoyant for 2019. Revenues were up 8% to Euro1.06bn and earnings before interest, tax, depreciation and amortisation (EBITDA) was up by 13% to Euro132.7m. Against that, net debt of Euro103m was down from Euro353m in 2018. Cement sales remained stable at 2Mt, with ready-mixed concrete down but aggregates and asphalt up.

Tarmac's parent company, Ireland-based CRH, reported a 25% increase in EBITDA in 2019 compared with 2018. In its Europe Materials business, there was a 5% rise in organic sales, with buoyant activity in key markets and price rises across all product lines. "Performance was positive for our businesses in eastern and western Europe," reported the company, "which offset challenging trading conditions in the UK, as construction activity declined amid Brexit-related uncertainty."

HeidelbergCement confirmed a 4.3% year-on-year increase in group revenue to Euro18.9bn. The group's cement and clinker sales volumes, however, dropped 3.1% in 2019 to 125.9Mt, though ready-mixed concrete rose by 3.4% to 50.7Mm^3. The market in western Europe during the fourth quarter of 2019 was described as 'difficult,' with 'local temporary market problems' in the UK, as well as in neighbouring countries. Notwithstanding, Chairman of HeidelbergCement's Managing Board Dominik von Achten said that profit before non-recurring effects and strong cash flow 'exceeded expectations.'

At LafargeHolcim, net revenue at group level increased by 3.1% in 2019. This was driven by growth in Europe and North America and by higher prices across most markets. Despite the increase, global sales of cement and ready-mixed concrete fell by 6.3%, though in Europe cement sales rose from 45.3Mt to 46.3Mt.

Cemex no longer operates its British business as a distinct entity. The group reported falling sales for 2019, down by 1% to Euro12.0bn. Operating EBITDA fell by 10% for the full year to Euro3.1bn.

Investment in production capacity

In an economy ensnared in such protracted uncertainty as the UK's has been over Brexit in recent times, it would be surprising to find much appetite for capital investment in production capacity. Nevertheless, there has been spending, mostly on increasing grinding capacity and the associated cement handling and storage. Hanson's Euro27m investment at its Padeswood integrated plant was completed in July 2019, with the successful installation of a Loesche vertical roller mill, a 'nearly new' piece of equipment that had been reassembled from its former location in Bilbao, Spain. Three new cement silos were installed alongside the existing railhead, allowing three trains a week to take cement to Hanson's depots in Avonmouth (Bristol), Bellshill (Glasgow) or Kings Cross (London).

At Tarmac's Dunbar works, work on the Cemengal Plug&Grind vertical mill installation announced in 2018 was carried out during the past year with the aim of becoming operational during the first half of 2020. Tarmac also started the installation of a plant to process waste-derived fuel, a secondary recovered fuel (SRF) known as 'Specialised Fuel' at its Tunstead cement works in Derbyshire.

Related and downstream plant

The UK's main cement makers also have related interests in aggregate extraction and ready-mixed concrete production. They are also involved in precast concrete manufacture, although to a lesser extent than in the past. Therefore, much investment in recent months has been in associated or downstream activities.

This has been most evident in the ready-mixed concrete sector over the past year. Cemex spent Euro1.1m on its new Eversley plant and Bramshill Quarry in Hampshire. Central to the project was the purchase of a Liebherr 2.25 mobile plant, with storage for 300t of cement and 240t of aggregates. Production is expected to increase from 24m^3/hr in the old plant to 80m^3/hr.

Similarly Aggregate Industries (Lafarge Cement's parent in the UK) opened a second ready-mixed concrete plant in Greater Manchester in September 2019. The Wythenshawe plant has the capacity to produce 200m^3/hr from two twin-shaft mixer units. Cement and aggregates are sourced from Cauldon and Buxton. Ground granulated blast furnace slag (GGBS) comes from the Port of Runcorn. In November 2019, Hanson opened a new ready-mixed concrete plant in Rochester, Kent, replacing its former plant in the town. The company says that it has increased capacity, lowered power consumption and reduced maintenance costs.

Marine dredgers

Two of the biggest individual orders in the sector recently have been for the construction of marine aggregate dredgers. These projects have spanned more than the year in view but either concluded or commenced in the summer of 2019.

The Cemex Go Innovation was officially launched at Daman Shipyard Galati in August 2019. This vessel is the first of the Romanian shipbuilder's new Marine Aggregate Dredger class, a 103.5m-long MAD 3500 that is designed to extract sand and gravel from the seabed at depths of up to 55m. Offering 25% increased capacity, double the dredging depth and 20% greater discharge rate, Mark Williams, project manager for Cemex, said the new ship was, "A significant investment and the first new vessel both in the Cemex fleet and UK aggregate industry in over 20 years."

Hanson has also turned to Daman, authorising the shipyard to build a new dredger as part of a plan to replace its existing marine aggregates fleet, the largest in Europe. Daman held a keel-laying ceremony at its Galati yard in the autumn of 2019 that was attended by Hanson UK's chief executive, Simon Willis. Delivery of the vessel is expected in early 2021.

Haulage and distribution

Cement companies' use of the railway network has been growing for a decade or more, as a consequence of the concentration of production in fewer locations, and the requirements of distribution. These have been met with an eye to both economy and environmental impact, not least CO_2 reduction. A comparison with the equivalent number of truck movements is now a routine feature of any public statement on the industry's investment in railway connectivity.

Cemex and GB Railfreight named a new Cemex-liveried locomotive at Dove Holes Quarry, Buxton, the Cemex Express in June 2019 and the firm celebrated the 10th Anniversary of its railhead at Attercliffe, Sheffield, in December 2019. Since 2009 it has handled 2.5Mt of aggregates and demonstrates the strategic importance of the railways to the company's business. In 2019 Cemex also invested over Euro341,000 in its Salford railhead, upgrading a length of track and all 10 storage bays as part of a four-year programme, "We expect to spend a similar figure every year," said David Hart, Cemex's Supply Chain Director.

Cemex is not alone. Tarmac has recently secured a Euro1.7m Freight Facilities Grant from the Scottish government towards a project to enhance railway capabilities at its Dunbar plant. In December 2019 Hanson signed a seven-year contract with GB Railfreight to convey bulk cement from the Ketton plant in nine trains a week to the company's terminals at Avonmouth, Bellshill and King's Cross.

Depots and terminals

As railway use increases, so too does the need for transhipment and storage facilities near the point of use. A network of depots and terminals has developed around the capital. These include intermodal facilities for use of the railways, roads and river, and one such distribution hub near Wembley is due to open in 2020. In December 2019 DC Rail took delivery of the first of four locomotives that will help reduce future construction traffic on London's roads.

On the River Thames, Tarmac is collaborating with the Port of Tilbury to create the UK's largest construction materials terminal and is building new aggregate processing facilities, including ready-mixed concrete and asphalt plants. 'Tilbury2', on the north bank, will allow materials to be shipped along the river to sites in central London.

On the south bank, Cemex opened a new Euro10m dry discharge system for marine aggregates at Northfleet, Kent in January 2020, the result of a joint investment with the Port of London. It is expected to reduce the tendency of the old wet discharge system to clog, and will increase handling capacity by 350,000t/yr to 800,000t/yr. Handling capacity has increased at Tarmac's redesigned depot

Below: The Breedon Hope works in Derbyshire, England.

Right: *Global Cement* reported on the opening of Cemex's new dry discharge system for aggregates in its March 2020 issue.

at Battersea too. This project included the first UK installation of the Liebherr LH80C 'Supergrab' gantry-mounted materials handler, the raised elevation of which has allowed Tarmac to double the size of the depot's stocking area.

Not all the investment has been in London. In the north of England, Leeds City Council has recently approved a multi-million Euro inland port at Stourton Wharf in West Yorkshire to enable the carriage of freight on the waterways directly to the city from Goole and the Humber ports. Each barge will carry the equivalent of 17 truck loads.

Despite the emphasis on rivers and railways, road vehicles remain essential, both for the carriage of raw materials and the final delivery of product to the customer. With respect to raw material transport, Cemex relies on trucks to carry clay the seven miles from Southam Quarry to the Rugby cement plant and in September awarded BMD Transport a five-year contract to undertake this work. Of note is the introduction of non-tipping belt trailers purchased from Fruehauf. The use of such trailers offers safety and efficiency benefits as, without the need to tip, there is reduced risk of rollover or collision with buildings and less wear to reception hoppers. Moreover, the entire process is controlled from within the cab.

As for deliveries, there have been developments too. Cemex has extended its use of the Blackline G7 safety system, previously used by the 50 night-time truck drivers in the company's cement operations, to its other product lines. In January 2020 Cemex awarded Turners (Soham) Ltd a contract to operate an additional 20 bulk powder tankers and provide greater flexibility to its distribution operations.

Marketing and sales

In June 2019 Cemex announced the completion of its deployment of Cemex Go, with the platform now available in 21 countries, the UK among them. 96% of the group's repeat customers now use it. Since then, Cemex Ventures has invested in GoFor Industries, a logistics marketplace for on-demand delivery of building materials.

Also at the beginning of our period, Quinn Building Products announced that the market research it had previously commissioned had led to a revision of its product packaging and literature, and point of sale materials, as well as online resources. In November 2019 the company launched 'Quinn Delivery Hub,' digitising the coordination of mixed-load logistics and supported by an associated app, 'Genius by Quinn'. Tarmac also introduced innovative software to its ready-mixed concrete clients. The 'Assure' system collects data and manages and records concrete quality at the plant, while in transit and even on site.

Collective endeavour

Leadership in areas of regulation, health and safety, environmental performance and public approval is provided collectively by industry bodies such as the MPA and its constituent groups MPA Cement and the Cementitious Slag Makers' Association.

In the past few months several senior appointments have been made to these representative bodies. The MPA made six changes to its management team in January 2020. Chris Leeds joined as Director of UK Concrete and Phil Cox as Director of British Precast. Neal Weston succeeded Brian James as Director of Membership & Regions and Dr Robert McIlveen took over from Jerry McLaughlin as Director of Public Affairs. Tony Entwhistle joined the association as H&S Manager and Dr Roger Griffiths became a consultant working on research and development projects related to climate change.

On the international stage, the London-based World Cement Association (WCA) announced a number of appointments in September 2019. Ian Riley, the former country head for LafargeHolcim in China, became its first chief executive. Mohammed A Al-Garni (Saudi Cement) was appointed as Vice President. Kirsty Monk took over as company secretary following the retirement of Norman Greig, while Cui Xingtai of China United Cement and Vincent Lefebvre of Cem'In'Eu became joint chairmen.

Research

The other international group based in London, the Global Cement & Concrete Association, has differentiated itself with a focus on research. GCCA and the European Cement Research Academy combined in July 2019 to announce a strategic partnership to foster innovation. Then, in November 2019, GCCA launched 'Innovandi,' a research network between industry and scientific institutions to focus on

process technology, including co-processing, efficiency of clinker production and implementation of carbon capture solutions. This will examine the impact of clinker substitutes and alternative binders, and CO_2 reduction through re-carbonisation.

The MPA secured a Euro6.8m government grant in February 2020 to trial hydrogen and plasma technology in the production of cement and lime. The demonstration projects follow a feasibility study in 2019 that found a combination of 70% biomass, 20% hydrogen and 10% plasma energy could be used to eliminate fossil fuel-derived CO_2 emissions from cement making. The trails of hydrogen and biomass respectively will take place on sites operated by Tarmac Cement & Lime (Tunstead) and Hanson Cement (Ribblesdale).

Appointments

There have been some top-level changes and several managerial appointments over the year. Amit Bhatia, the vice chairman at Breedon Group, took over as chairman from industry veteran Peter Tom on the latter's retirement in May 2019. In September 2019, Breedon's board was strengthened by the appointment of Clive Watson as an independent non-executive director.

At Hanson, the UK subsidiary of HeidelbergCement, there have been both internal promotions and appointments from outside the sector. Dr Nina Cardinal joined Hanson Cement in October 2019, as the new national technical manager, having previously worked for TATA Steel and the University of Sheffield. Andrew Simpson was appointed as the new packed products Director in January 2020 and Andy Murphy assumed responsibility for Hanson Cement's commercial brief. For its part, Lafarge Cement has appointed Stuart Hutchings as its new manager at the 1Mt/yr Cauldon cement plant in Staffordshire.

Sustainability reporting

In early 2020 the MPA published its 2019 Sustainable Development Report, based on data from its five member companies. Aligned with the MPA's seven strategic priorities, the report highlights progress in health and safety; communicating industry value; people; research; climate change and energy; natural environment and; built environment. Particularly notable was that by 2018 emissions had fallen by 25% from 1998 levels due largely to energy efficiency, alternative fuels and renewable energy sources.

Such reporting is also published by individual companies. Reductions in waste-to-landfill and the use of mains water were ahead of the company's 2020 targets, according to Hanson's latest report (published in August 2019), which features the completion of a Euro5.7m programme to minimise cement dust emissions and which records that environmental complaints are at five-year low. At a global level, Cemex published its Integrated Report 2019, with an analysis of the group's strategic vision and operational performance. The group has increased its 2030 target for reducing CO_2 emissions from 30% to 35%, and has set itself a new goal of delivering net zero CO_2 concrete by 2050.

Health and safety

Constant improvement in health and safety performance has long been a preoccupation of the UK cement industry. Tarmac won a gold award at the RoSPA Awards in June 2020, the citation listing a range of initiatives, its three-year health and safety strategy and the involvement of the company's leadership team. Then at the MPA Health & Safety Awards in November 2019, in which there were 140 entries from 27 companies across the minerals sector, Tarmac won three more. Quinn Building Products was recognised at the Institute of Quarrying Excellence Awards for its development of the Quinn Safety Hub.

Sadly, safe outcomes are not always achieved. In October 2019, Cemex UK Operations was fined Euro1.1m at the Livingston Sheriff Court for safety breaches that resulted in the death of a worker during the maintenance of conveying equipment. On 5 November 2019 a fire broke out in the preheater tower at Cemex's Rugby cement plant, spreading to four storeys and requiring the attendance of eight fire appliances. There were, however, no injuries and supplies to customers continued uninterrupted.

Concluding comments

This final phrase could be taken to apply to the industry as a whole over the past 12 months. It has been a year of continuity in difficult circumstances. Demand has dipped below what would have been hoped for, but has largely held up until now. Production has continued efficiently and investment has been maintained, particularly in milling and distribution. Developments in new fuels look promising, but the external challenges of coronavirus and a future UK-EU trade deal remain.

Left: The Palace of Westminster / Houses of Parliament.

John King Chains and Global Cement staff

Queen's Award for Enterprise for John King Chains

John King Chains has recently received two plaudits of note, one from the highest authority in the UK...

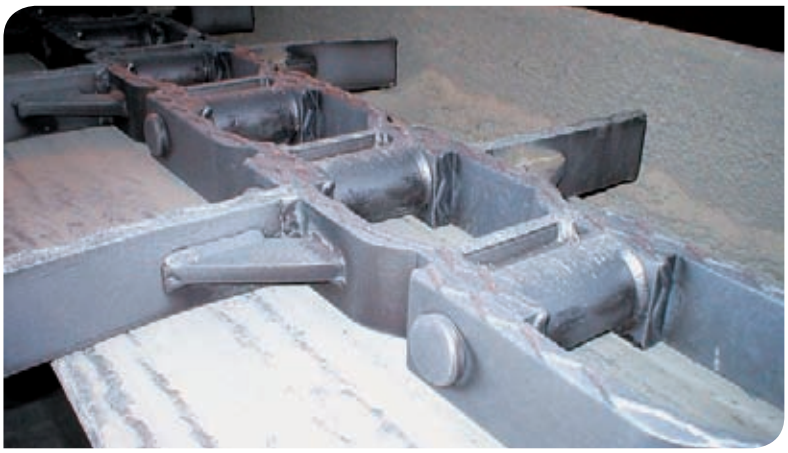
Queen Elizabeth II has approved Prime Minister Boris Johnson's recommendation that John King Chains be awarded the coveted Queen's Award for Enterprise – International Trade 2020. The official announcement aptly coincided with the Queen's own birthday on 21 April 2020.

The evaluation process for the award is rigorous. Recipients must demonstrate a substantial and increasing level of export business over an extended period as well as demonstrating an understanding of the special nature and mechanics of more challenging export markets.

John King Chains exports mechanical handling equipment to over 60 countries, including 22 of the 54 members of the Commonwealth of Nations, of which the Queen has served as leader since it was founded in 1952.

Over the past decade, John King Chains has seen unprecedented success in the development of export markets and has become a very effective manufacturing organisation. Its head office and principal production remains in the UK, but it also operates subsidiary operations in Africa, Asia Pacific, Central Europe, North America and South America. The 2020 business is a lean and focused enterprise employing optimised production techniques. All John King Chains own products (and related products) are produced within the dictates of its management quality system to ISO 9001:2015 standards, in order to ensure supply of consistently high quality equipment.

Right: A John King Chain installation at Cementos Bío Bío's Teno plant.



Below: A Crusader drag chain for clinker.

"The value of this success cannot be underestimated. The Queen's Award for Enterprise is without doubt the most prestigious UK business award and is a tremendous collective achievement," said the company. "We would like to take this opportunity to thank our employees worldwide, our valued customers and all those associated with our business."

The company has a long association with the cement industry. Sales to the sector account for a significant proportion of exports and ultimately the success in securing this accolade. John King Chains has, without doubt, the widest programme of cement chains of any producer, including cast steel drag links in a variety of high performance materials, forged fork link chains where the majority of standards are covered by existing tooling, and engineering class chains of both bush style and roller construction. The company looks forward to further developing its relationships with existing cement industry customers and establishing relationships with new ones.

John King Chains has also been awarded accreditation from Alcumus SafeContractor for achieving excellence in health and safety in the workplace. Alcumus SafeContractor is a leading third party accreditation scheme that recognises extremely rigorous standards in health and safety management among contractors. It is used by thousands of organisations in the UK.

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Mexico: Major players take a knock in first quarter of 2020

Cemex has recorded a consolidated net sales of US$3.1bn in the first quarter of 2020, up by 2% year-on-year compared to the same quarter of 2019. Controlling interest net income was US$42m, compared to US$39m in the same quarter of 2019. Cemex said, "The world is going through an unprecedented time due to the Covid-19 pandemic. Construction activity across most of our markets is being impacted to varying degrees."

Cemex implemented more than 50 new safety protocols in late April 2020 to minimise the risk of coronavirus being transmitted within its cement, ready-mix concrete and aggregates operations. Cemex said that it recognised 'the importance of the construction industry in supporting the maintenance and service of essential infrastructure required to face the pandemic and contribute to the economy,' and would resume or continue all possible operations in line with the regulations of the countries in which it operates.

"The health and safety of its employees is the company's number one priority," said Cemex. "Among the protocols implemented are the company's Personal Hygiene Protocol, Physical Distancing Protocol, Screening at Workplace Protocol, Cemex Truck Drivers Protocol, Workplace Cleaning Protocol, and Commuting To and From Work Protocol." All of these have been developed in line with advice from national and international bodies such as the World Health Organization (WHO). Cemex has also leveraged its Cemex Go digital platform to limit physical contact and 'protect employees, customers and suppliers.'

Meanwhile, Elementia's first quarter sales were US$49.0m, down by 5.0% year-on year from US$52.0m in 2019. Group earnings before interest, tax, depreciation and amortisation (EBITDA) was US$20.4m, down by 7.0% from US$22.0m in the first quarter 2019. Cement volumes fell by 11% year-on-year to 1.08Mt from 1.22Mt. The company suspended all operations in Peru, Bolivia and Ecuador from 20 March 2020 and in Colombia and El Salvador from 30 March 2020. It says that it has moved its 2020 strategic focus to 'inventory reduction and sustained US cement growth.'

Mexico: About turn for Cemex

Cemex announced that would resume its cement manufacturing operations in Mexico on 6 April 2020, just hours after announcing that it would halt all operations in the country. The about turn was due to new government guidelines regarding essential business operations during the coronavirus outbreak.

"In accordance with the technical guidelines published today in the official Mexican gazette, the company will resume operations in Mexico to support the development and the economy of the country during the Covid-19 contingency," said Cemex in a statement. It had earlier announced that it would halt all Mexican operations until at least 30 April 2020.

Cemex separately announced the resumption of limited operations at its 2.8Mt/yr Caracolito plant in Ibagué, Tolima Department on 13 April 2020. This enabled Cemex Colombia to resume supplies to 'infrastructure and public works that cannot be suspended,' as well as for emergency care projects and road projects.

US: Glens Falls closed due to coronavirus

Lehigh Cement has suspended operations at its 0.5Mt/yr Glens Falls, New York, plant and associated Moreau quarry in response to the coronavirus outbreak. The move sees its local staff of 90 reduced to 36 for the duration of the shutdown. Local press reported that Lehigh Cement will cover the 54 dismissed employees' health insurance payments and 'provide assistance in applying for unemployment and other layoff-related benefits.'

Peru: Production halves in March

Total Peruvian cement volumes were 0.42Mt in March 2020, down by 51% year-on-year from 0.86Mt in March 2019 and down by 51% month-on-month from 0.85Mt in February 2020. Clinker volumes fell by 51% to 0.35Mt from 0.71Mt in March 2019, down by 55% month-on-month from 0.78Mt in 2020.

Peru's cement exports in March 2020 were 6200t, down by 46% year-on-year from 11,400Mt in March 2019 and 55% month-on-month from 13,700Mt in February 2020. Imports in March 2020 were 102,000t, down by 3.6% year-on-year from 106,000t and up by 1940% month-on-month from 5000t in February 2020.

Domestic demand fell by 47% year-on-year and 48% month-on-month to 0.49Mt, from 0.92Mt and 0.94Mt respectively.

Colombia: Cemex Latam follows virus trend

Cemex Latam Holdings (CLH)'s net sales in the first quarter of 2020 were US$214m, down by 11% year-on-year compared to sales of US$240m in the same period of 2019. Operating earnings before interest, tax, depreciation and amortisation (EBITDA) throughout the quarter declined by 12% year-on-year to US$46.0m from US$52.3m. Cement volumes over the period were 11% below their first-quarter 2019 level, however prices were 3% higher. Total debt decreased by 8% year-over-year, reaching US$766m as of March 2020.

Cemex Latam Holdings CEO Jesus Gonzalez said, "We came into 2020 with favourable demand momentum in Colombia, Nicaragua, Guatemala and El Salvador, and a stabilising trend in Costa Rica. The coronavirus outbreak began to impact on this in March 2020. With respect to capex, US$20.0m has been postponed until 2021. Also, members of CLH's Board and senior leadership have agreed to voluntarily waive a percentage of their second quarter salaries. Other employees voluntarily deferred a percentage of their salaries for the period. I would like to thank my colleagues for their support in these challenging times."

Credit: Alf Ribeiro / Shutterstock.

Brazil: No dismissals for Votorantim Cimentos

Votorantim Cimentos has said that no employee will lose their job before July 2020 as a result of the coronavirus lockdown. It joins 3300 other employers across Brazil as part of the No Dismissals Movement. Votorantim Cimentos CEO Marcelo Castelli said, "Our goal is to reassure our employees and their families, and to help minimise the economic and social impacts of the coronavirus pandemic."

US: Cemex is Energy Star Partner of the Year

The Environmental Protection Agency (EPA) has declared Cemex USA as an Energy Star Partner of the Year, the highest award for energy-efficient production in the US.

Cemex USA President Jaime Muguiro said, "Sustainability is embedded in our day-to-day operations and is an integral part of our core business strategy. Energy conservation is part of our vision as we are building a better future and believe it's our responsibility to vigorously practice energy management through on-going initiatives and the use of alternative fuels." Cemex USA has earned more than 50 Energy Stars since 2007.

US: TRUE Gold for Roanoke Cement

Green Business Certification (GBC) has recognised Titan America subsidiary Roanoke Cement's successful implementation of its zero waste policy at the 1.5Mt/yr Troutville, Virginia plant with a Total Resource Use and Efficiency (TRUE) Gold award. In 2019 the plant won the GBC's TRUE Silver award.

Roanoke's environmental engineer Lindsey Layman said, "In order to elevate our TRUE Zero Waste certification, we ramped up our zero waste policy to include physical audits of waste and improving recycling practices on-site. As a result, we have created a zero-waste culture and achieved an average of 98% overall diversion from landfill and incineration of solid non-hazardous wastes."

Argentina: Kreisel valves for Loma Negra

South Africa-based Pro-Op Industries has announced the shipment of a set of ceramic rotary valves produced by Germany-based Kreisel to Argentina. The product is to be installed at Loma Negra's 1.5Mt/yr integrated Catamarca plant in Catamarca province. The rotary valves will replace two screw pumps with the aim of 'substantially reducing energy consumption and maintenance costs' at the plant. Pro-Op Industries said, 'We are excited and honoured to be working with the Loma Negra team and to be introducing Kreisel technology to the South American region.'

Mexico: Elementia's Sacristán dies

Elementia has announced the death of its board member Jaime Ruiz Sacristán who died on 12 April 2020. The company said that Sacristán worked with 'tireless dedication' at the company for 20 years to 'build Elementia, contributing knowledge, talent and direction.'

During a distinguished career, Sacristán held positions such as president of the board of directors of the Mexican Stock Exchange, president, partner and founder of Grupo Financiero Ve por Más and president of the Mexican Association of Bankers. He was also a member of the board of directors of numerous companies in the financial, industrial and commercial sectors.

Francisco del Valle Perochena, chairman of the board at Elementia said, "I am very sad to report the death of a great man and friend. He will always be present in our lives and in our hearts. He leaves us an invaluable legacy as a professional and as a great human being. His temperance, wisdom, good sense and prudence are just some of the great qualities that we admired and respected in him."

US: Dust mistaken for plant fire

A cloud of dust from Cemex's 3.3Mt/yr Victorville, California plant caused the fire brigade to be called to the site at 17:00 on 24 April 2020. Local press reported that what onlookers believed to be smoke was actually dust that had escaped during the refilling of a silo. Locals added that dust frequently covers their cars.

GLOBAL CEMENT NEWS: *THE AMERICAS*

Caribbean: Trinidad Cement curtails operations

Trinidad Cement has halted most of its operations in Trinidad & Tobago and temporarily halted operations at its Arawak Cement subsidiary in Barbados following government advice in each country with regards to the coronavirus outbreak. It said that it had stopped 'almost all operations' at its Trinidad Cement integrated plant except for activities related to maintaining the kiln and some port operations.

The subsidiary of Mexico's Cemex said that it expected the global response to coronavirus would negatively affect economic growth in the Caribbean. To counter this it has delayed certain capital expenditure planned for 2020 and it is maintaining inventory at its facilities to serve customer demand.

US: Cement board plant to close

James Hardie has announced the planned closure of its fibre cement board plant in Summerville, South Carolina, which it has announced will close permanently in mid-2020. It was reported that the decision to shut the plant was due to the impacts of the coronavirus outbreak on the global economy.

Argentina: Slow restart for Loma Negra

Loma Negra plans to restart cement production at its plants depending on local demand. It is currently supplying public infrastructure projects from existing stocks. The subsidiary of Brazil's InterCement stopped production following a national quarantine due to the coronavirus outbreak in late March 2020. However, the building materials producer has been included by the government on a list of essential activities so it can resume operation whenever it chooses to do so.

India: LafargeHolcim subsidiaries record coronavirus downturn

The impact of the coronavirus pandemic was visible in the financial performance of ACC, one of LafargeHolcim's major Indian subsidiaries, during the three months to 31 March 2020. For the quarter, the company's consolidated net profit fell by 6.6% on a year-on-year basis to US$42.1m. Its net sales declined by 11% to US$448m on the back of a steep fall in volumes, which came to 6.6Mt, 12% lower year-on-year. ACC's ready mix concrete (RMC) volumes remained stable at 930,000t.

The pandemic mainly impacted sales volumes in March 2020, whereas January and February 2020 saw healthy growth in both cement and RMC sales. ACC said that this was due to a focus on premium products, increase in value-added solutions in its ready mix business, cost reductions on the manufacturing side and logistics-derived savings. Input cost of raw materials were lower on account of material source mix optimisation and supply chain efficiencies. Consequently, the company's earnings before interest, tax, depreciation and amortisation (EBITDA) for the first quarter increased by 10% year-on-year to US$76.4m.

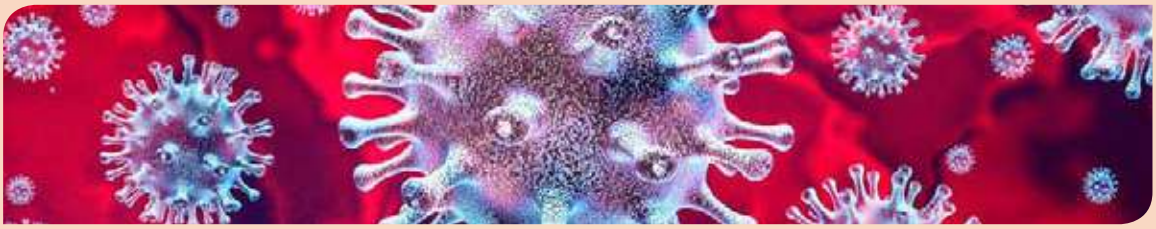
Sridhar Balakrishnan, ACC's managing director and chief executive officer (CEO), said, "We believe that with a high probability of a normal monsoon season, growth in the rural economy will revive and stay strong. We expect cement demand to increase in the medium term once the pandemic subsides and business operations commence".

Ambuja Cements' profit in the first three months of 2020 was US$52.4m, down by 6.5% year-on-year from US$56.2m in the corresponding period of 2019. Sales were US$3.72bn, down by 3.4% from US$3.86bn. The company said the shutdown of all plants in March 2020 due to the coronavirus pandemic 'impacted operations.' It added, "Taking into account directives from the government, operations at a few plants have commenced in a phased manner since 20 April 2020."

India: LafargeHolcim subsidiaries donate to coronavirus relief measures

Ambuja and ACC have donated US$434,000 to non-governmental organisations (NGOs) to provide food and ration kits to vulnerable people affected by the coronavirus outbreak.

LafargeHolcim CEO India and Ambuja Cements managing director and CEO Neeraj Akhouray said, "Collaborative models are more effective in both containment of the disease as well as support for those whose livelihood and even survival is at risk. We believe that our contributions to these NGOs that are delivering grass-roots relief measures, coupled with our own companies' efforts on ground working with local communities, will greatly accelerate the scale and impact we will have."



China: Anhui Conch profit falls by a fifth

Anhui Conch's profit in the first quarter of 2020 was US$690m, down by 19% year-on-year from US$860m in the corresponding period of 2019. Sales fell by 24% to US$3.28bn from US$4.31bn.

The coronavirus outbreak in China impacted the results, notably through decreased sales volumes and a 190% increase in financial expenses.

Philippines: Holcim Philippines profit down nearly 30%

Holcim Philippines' first quarter profit declined by 29% year-on-year to US$9.91m in 2020 from US$13.9m in 2019. Revenues for the period were US$144m, down by 10% from US$160m in the corresponding period of 2019.

The Manila Times reported that Holcim Philippines attributed the declines to 'softer' prices and lower volumes in March. The latter was due to the government-implemented enhanced community quarantine (ECQ) in Luzon, which suspended construction in the capital. The company's Visayas and Mindanao cement plants continue production, but have faced a drop in demand due to various local lockdown measures.

China: CRC profit falls by 25%

China Resources Cement (CRC)'s profit in the first three months of 2020 was US$144m, down by 25% year-on-year from US$192m in the corresponding period of 2019. Sales were US$722m, down by 26% from US$969m. CRC sold 11.2Mt of cement over the period, down by 27% from 15.2Mt, although prices had increased. Cement sales constituted 82% of its total revenue at US$589m, down by 22% from US$752m.

Philippines: Holcim deal falls through

LafargeHolcim's sale of its 86% stake in Holcim Philippines to San Miguel Corporation for US$2.15bn has fallen through after the Philippines Competition Authority (PCC) failed to approve the deal within 12 months of its conclusion. The agreement, dated 10 May 2019, covered the exchange of four integrated plants and one grinding plant.

LafargeHolcim has been divesting assets to pay off debt. The sale of its Holcim Philippines stake would have completed its withdrawal from the South-East Asia market, where its operations across Indonesia, Malaysia, Singapore and the Philippines had been valued at US$4.90bn.

Vietnam: New projects halted

Vietnam Cement Association (VCA) chair Nguyễn Quang Cung has announced the suspension of all cement plant projects scheduled to begin in 2020. Cung said that oversupply and a lack of financial liquidity have made it unfeasible for cement producers to finish cement plant projects.

India: FICCI lobbies government over resumption of building works

The Federation of Indian Chambers of Commerce and Industry (FICCI) has asked the government to restart home and road building to help cement producers. The Press Trust of India newspaper has reported that all construction work has stalled since 25 March 2020 due to the coronavirus lockdown. The FICCI believes that Indian cement demand is currently set to decline by 10-12% year-on-year. To relieve the sector, the FICCI urged the Indian government to lift the lockdown in metropolitan areas in order to allow the continuation of residential construction, which accounts for 60-65% of cement demand.

To protect domestic producers from any import dumping post-crisis, the FICCI has suggested that Indian cement sales should be subsidised. It also requested a 'relaxation of environmental emission norms' until mid-2022 'to save the industry from additional capex expenses.'

Turkmenistan: Basalt-containing cement in bid to cut imports

Cabinet of Ministers' Deputy Chair Shamuhammet Durdylyev has announced plans for the country to produce a new grade of cement. Designated as 500-G20-K, the grade will contain basalt porphyries. Durdylyev has said that the Ufra deposit in the Balkan region of western Turkmenistan will supply the porphyries in an effort to boost Turkmen cement plant productivity using domestic resources.

India: Production partially resumes

HeidelbergCement and UltraTech Cement are among producers that have responded to the government's partial lifting of the coronavirus lockdown for rurally-located industry by resuming partial operations. Producers require the permission of the relevant state government to restart their plants.

Local press has reported that limited transportation facilities, higher than usual inventory and stricter rules regarding labour safety have added a note of caution to resumed operations. Shree Cement managing director Hari Mohan Bangur said, given the continuation of restrictions on construction in cities, "We expect just 10% of normal consumption, with hope of a gradual increase."

indonesia: Taiheiyo buys into Semen Indonesia subsidiary

Japan's Taiheiyo Cement has announced its acquisition of a 15% stake in state-owned Semen Indonesia subsidiary Solusi Bangun Indonesia for between US$186m and US$232m, subject to the terms of a partnership agreement with Semen Indonesia.

Under its '2020 Mid-Term Management Plan,' Taiheiyo Cement says that it aims to become a 'corporate group with a strong presence in the Pacific Rim.' Its partnership with Semen Indonesia is part of Taiheiyo Cement's response to a forecasted long-term decline in domestic cement demand in Japan.

In the first quarter of 2020 Semen Indonesia sold 9.36Mt of cement, up by 7.0% year-on-year from 8.74Mt in the corresponding period of 2019. InsiderStories News has reported that domestic demand in the period fell by 4.9% to 14.9Mt from 15.7Mt, while exports fell by 2.5% to 1.39Mt from 1.42Mt but rose by 6.2% on a month-by-month basis in March 2020 to 3.09Mt from 2.91Mt in February 2020. April 2020's cement sales are expected to have been lower due to the impacts of the coronavirus outbreak.

Kazakhstan: Cement imports from outside EEU banned

The acting Minister of Industry and Infrastructure Development of Kazakhstan has signed an order regarding the regulation of several types of cement. This included the provision for a ban on the import of cement from countries not within the Eurasian Economic Union (EEU) for six months from Monday 27 April 2020. Specifically the ban concerns cement clinkers, Portland cement, alumina cement and other forms of hydraulic cement.

Japan: Taiheiyo and partners to develop CCS solution

Taiheiyo Cement has partnered with JFE Steel and the Global Institute for Environmental Technology to develop a carbon capture and storage (CCS) system. The system will use wet alkaline earth metals extracted from steel slag to produce carbonates from exhaust gases at cement and steel plants. The partners are investigating the possibility of calcium carbonate and magnesium carbonate in particular as additives in cement production at Taiheiyo Cement's plants. Taiheiyo Cement president Masafumi Shigehara said, "With the effects of climate change becoming apparent both in Japan and overseas, the importance of global warming counter-measures is increasing."

Indonesia: Sinoma completes Cemindo Gemilang project

China-based Sinoma International Engineering has completed the installation of a 10,000t/day integrated cement production line complete with raw material processing and clinker storage capacity at Gama Group subsidiary PT Cemindo Gemilang's integrated Bayah II plant.

China Daily News has reported that the Sinoma International Engineering Team worked overtime in order to complete the commission ahead of its scheduled date in May 2020. Project manager Wang Xiaojun said, "The Covid-19 outbreak had a severe impact on on-site construction."

Thailand: Siam Cement's profit rises in first quarter

Siam Cement Group (SCG) recorded a profit of US$215m in the first three months of 2020, down by 40% year-on-year from US$358m in the corresponding period of 2019. Sales were US$3.23bn, down by 6.0% from US$3.44bn.

On 30 April 2020 SCG withdrew its sales forecast for 2020 and reduced its budget for the year to US$1.85bn, down by 14% from US$2.15bn. SCG president and CEO Roongrote Rangsiyopash said, "SCG cannot give a figure for revenue this year because we don't know yet how long the Covid-19 outbreak will last and how much it will affect the economy." Rangsiyopash said that SCG was prepared to cut its investment even more in a worst-case scenario.

Pakistan: Fauji profit plummets

Fauji Cement has reported that its net profit fell by 88% to US$3.53m for the first nine months of its 2020 fiscal year, a period that ended on 31 March 2020. The company reported that its sales plunged, having previously made a net profit of US$32m in the first nine months of its 2019 fiscal year. Lower sales prices, currency depreciation and higher coal prices were all reported to have contributed to the weaker performance.

South Africa: PPC expects 95% slump in sales

PPC has reported that it expects a 95% year-on-year decline in its sales of cement in South Africa in April 2020 due to the impacts of the coronavirus outbreak. Sales in Rwanda and Zimbabwe, where production resumed in mid-late April 2020, are expected to fall by 80-85% year-on-year for the same month.

PPC says that PPC South Africa is preparing to resume production in line with the government's risk-based regulations that were announced on 25 April 2020. The group said, "The uncertainty around the further development of the containment of the coronavirus makes it necessary for PPC to work with various scenarios."

Nigeria: Dangote seeks funds

Dangote Cement, Africa's leading cement manufacturer, is seeking to raise up to US$260m in fresh funds from the bond market under its US$780m Debt Issuance Programme. The investor presentation document prepared by the company was themed 'Building Prosperity in Africa.'

Ghana: Diamond donates

Diamond Cement has donated 250t of cement and US$17,500 to efforts to curb the spread of coronavirus in Ghana. The cement will be used for hospital repairs. Diamond Cement Group chair Mukesh Patel said, "It is crucial that we all work together to minimise the negative impact of the pandemic on economic activities."

Tanzania: DAL kilns for Tanzania Portland

Turkey-based DAL Engineering Group has reported the successful delivery of three kiln shells to HeidelbergCement subsidiary Tanzania Portland Cement's integrated Wazo Hill cement plant near Dar Es Salaam. Tanzania Portland Cement produces the Twiga brand of cement across the 2.0Mt/yr plant's three dry lines.

Qatar: Cement production down in February

The manufacturing sector of Qatar recorded a 2% month-on-month decrease in activity in February 2020 compared to January 2020. Cement and non-metallic mineral product production decreased by 1.6%.

Oman: Clinker delivery for Raysut

Raysut Cement has announced its receipt of 44,000t of clinker via the port of Sohar, Al Batinah North Governorate. The material will contribute to Raysut Cement's strategic stockpile to help meet Omani cement demand throughout the coronavirus crisis.

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Egypt: Triple-whammy for cement producers

Cement sales have fallen by around 35-40% in Egypt. This is reported to be due to a number of factors that have each taken a chunk out of demand, including coronavirus lockdown measures, Ramadan and the start of the wheat harvest season. Cement sales prices are reported to have fallen as a result of the lower demand.

Egypt: Suez Cement managers take pay cut

Suez Cement implemented a 20% reduction in pay for members of the management committee and a 30% reduction in pay for the managing director in the second quarter of 2020. The cuts are intended as a cost-saving measure 'in line with the company's aim to reduce expenses.'

Suez Cement said, "During the last few years the Egyptian cement industry has been going through very challenging times caused by oversupply and a sustained decrease in demand and Suez Cement Group has posted negative results. The covid-19 crisis has complicated market conditions, affecting demand and increasing our costs."

Egypt: Arabian Cement profit drops by 88%

Arabian Cement has reported an 88% decline in profit year-on-year to Euro1.60m in 2019 from Euro13.3m in 2018. Sales were Euro181m, down by 5.5% from Euro192m in 2018 due to depleted demand. Expansión newspaper called 2019 'the worst year in history for Egypt's cement industry,' although *Global Cement* thinks 2019 may only hold this dubious title for the next 6-7 months.

Saudi Arabia: Huge Yanbu contract for FLSmidth

FLSmidth has announced that it has secured an engineering, procurement and construction (EPC) contract with Yanbu Cement for a 'massive' efficiency-increasing upgrade to reduce the heat and power consumption of the 5.9Mt/yr integrated Yanbu cement plant in Al Madinah Province, Saudi Arabia.

FLSmidth previously supplied Yanbu with an automation upgrade and burner system retrofit in 2018 and concluded a service agreement with it in 2019.

Saudi Arabia: Loan for Najran Cement

Najran Cement Company has signed a financing agreement with Bank Al-Jazira for a loan of US$94.5m. Under the agreement, repayments are to be made at a rate of US$13.6m/yr for four years, and the remaining amount settled in the final year of the financing period ending in 2025.

Nigeria: Lafarge donates facilities and PPE

Switzerland-based LafargeHolcim subsidiary Lafarge Africa has donated three of its facilities, along with personal protective equipment (PPE), for use to isolate and treat coronavirus patients. Lafarge Africa chief executive officer Khaled El Dokani said, "Our intervention will relieve healthcare facilities in Lagos and in our host communities, to support those fighting Covid-19."

In addition, Lafarge Africa stepped up its water sanitation and hygiene (WASH) initiatives in its host communities.

Nigeria: BUA provides rice and masks

BUA Cement has donated 350 bags of rice and 22,500 facemasks to people affected by the coronavirus outbreak in Okpella, Okpekpe and Ibie, Edo State and Elele, Rivers State.

BUA Cement CEO Yusuf Binji said, "As a responsible organisation, we understand the plight of our host communities. We believe this donation will go a long way to ameliorate the negative effect of the lockdown."

These pages give *Global Cement Magazine*'s monthly review of global cement prices - in US$ for easy comparison. Some price information is only available to subscribers to *Global Cement Magazine*. Subscribe on Page 64. In this issue subscribers receive information from Ghana, Kazakhstan, the EU, the US, Vietnam, Oman and Pakistan.

Prices are for metric tonnes unless otherwise stated. US$ conversions from local currencies are correct at the time of original publication.

India: On 9 May 2020 the Indian realtors' apex body Credai said that cement prices had increased by 40-50% in recent few weeks despite India's nationwide coronavirus lockdown. This is due to alleged 'price cartelisation and unfair trade practices by cement manufacturers.' The body has written to Minister of Housing and Urban Affairs Hardeep Singh Puri seeking his intervention in the matter.

Across various states, Credai states that there has been an increase of US$1.32-3.31/bag (50kg) cement. "We shall be grateful if the issue of price rise of cement, steel, and other raw materials can be taken up by you with the relevant ministries at the earliest," Credai urged the housing minister, as it warned of knock-on effects for builders and home-buyers across the country.

China: All-China 42.5 grade cement spot prices from sunsirs.com. 6 May 2020 = US$66.62/t; 7 May 2020 = US$66.68/t; 8-10 May 2020 = US$66.74/t; 11 May 2020 = US$66.83/t. Prices are currently around 13.5% lower than at the start of January 2020 when they were US$77.30/t. Some price reduction is usual around Chinese New Year (25 January 2020), but the magnitude and length of the decrease has been marked.

Prices in early May 2020 were very similar to those of early April 2020 in both US Dollar and Chinese RMB terms, but had dipped to around US$65.55/t between 10-26 April 2020. Forecasters had earlier expected that prices would start to recover during the second half of 2020 on the back of higher demand, particularly from the recommencement of infrastructure projects. However, the main thrust of any rise now seems to have been delayed to the third quarter.

Egypt: Ordinary Portland cement prices as at 12 May 2020: Arabian Cement Co (Al Mosalah) = US$47.94/t; Arabian Cement Co (Al Nasr) = US$47.17/t; Cemex (Al Fahd) = US$46.67/t; Minya Portland Cement (Minya) = US$47.17/t; Minya Portland Cement (Horus) = US$46.98/t; El Nahda Cement (Al Sakhrah) = US$46.86/t; Lafarge (Al Makhsous) = US$47.50/t; Medcom Aswan Cement (Aswan) = US$47.00/t; Arish Cement (Alaskary) = US$46.87/t; Sinai Cement (Sinai) = US$46.68/t; Suez Cement (Al Suez) = US$47.31/t; Helwan Cement (Helwan) = US$47.95/t; Misr Beni Suef = US$49.54/t; El Sewedy Cement = US$47.95/t; Misr Cement Qena (Al Masalah) = US$46.87/t; Al Watania Company for Cement (Beni Suef) = US$46.87/t.

White cement prices as at 12 May 2020: Sinai White Cement (Alabid Elnada) = US$158.78/t; Sinai White Cement (Super Sinai) = US$156.24/t; El Menya Cement (Super Royal) = US$151.81/t; El Menya Cement (Royal Elada) = US$154.35/t; Menya Helwan Cement (Alwaha Alabiad) = US$154.03/t.

Blended cement prices as at 12 May 2020: Sinai Cement (Al Nakheel) = US$43.06/t; El Menya Cement (Al Omran) = US$43.07/t; Helwan Cenent (Al Waha) = US$43.51/t. Sulphate-resistant cement prices as at 12 May 2020: Cemex (Al Mukawem) = US$52.08/t; Minya Portland Cement (Asec Sea Water) = US$49.73/t; Lafarge (Kaher Al Behar) = US$52.47/t; Suez Cement (Al Suez Sea Water) = US$49.42/t; El Sewedy Cement (El Sewedy Al Mukawem) = US$49.54/t.

Do you have your finger on the cement price pulse where you are?
If so, *Global Cement Magazine* needs you!

Contact: Peter Edwards
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What do the lockdown and climate goals have in common?

Peter Edwards Editor, *Global Cement Magazine (peter.edwards@propubs.com)*

As one of the 4.5 billion people on earth currently under some form of coronavirus-related lockdown, I have seen a lot of my local area recently. This has mainly been while walking / scooting with my wife and two small children. During a recent jaunt, we noticed how clear the birdsong was on our road. This was due to three factors: More birds in early summer, virtually zero traffic noise and the fact that we ourselves were not racing from A to B in the car. A little further up the road, a question popped up: *Does this situation look anything like a 'low-CO_2 future?'*

There would certainly be similarities, most noticeably regarding travel. Air travel has currently plummeted in the second quarter of 2020 due to a twin collapse of demand (nobody wanted to fly) and supply (closed borders and bankrupt carriers). This dramatic decline is not dissimilar to the low-CO_2 futures advocated by some climate campaigners in which only the most genuinely deserving cargoes (and travellers) can take to the skies.

Coronavirus restrictions have also taken massive chunks out of private vehicle, bus and train usage, with major cities recording journey reductions of 70-95% year-on-year in the spring of 2020. Tom Tom's congestion comparisons for April 2019/2020 are incredible, with Rome a particular highlight.[1] While key workers still need to reach hospitals, police stations, food distribution centres and so on, most office workers can do everything online. It is these people that are not on the roads right now, leading to lower emissions and cleaner air. Campaigners would argue that they should stay at home after the lockdown on public health grounds.

As a subset of travel, tourism, often so damaging to the natural world, has also collapsed. In its place, nature has reclaimed both rural and urban spaces, from improved water quality in the canals of Venice to the reclamation of beaches by wildlife in Thailand and even rogue sheep using children's playgrounds![2] These show the environmental improvements that can be achieved, even in a few weeks.

The economies of the coronavirus world and low-CO_2 future also bear some similarities. Both require lower levels of consumption than we have become used to. With coronavirus, many factories, including cement plants, have been forced to stop, leading to cleaner air in a number of 'pollution hotspots.' Climate activists call for a permanent reduction to manufacturing, especially of short-term and disposable items. Coronavirus has already led the markets into strange places. In late April 2020, the West Texas Intermediate (WTI) oil futures price became negative. Producers literally couldn't give it away, such was the impossibility of affordable storage. For some climate activists, the 'collapse of oil' is a major aim. However, as businesses start to open up again and confidence grows, oil prices will surely regain some lost ground.

A less obvious area of overlap is state support. Governments of every type around the world have been rushing to plug the gap left in their economies by falling demand due to the outbreak. There have been cash packages for core sectors, governments paying portions of private firms' salaries and help for the self-employed. One criticism of the more urgent calls for climate action is that it would blow a hole in the global economy. Well... the economy has a very large hole in it right now, so what a time to change things up! The lessons learned from the economic handling of the outbreak could help to 'cushion the blow' of a future low-CO_2 transition.

On the social side, coronavirus restrictions and a lower-CO_2 world are also somewhat similar. There's a lot more 'staying local' in both situations, and you have to make the most of whatever's on your doorstep. In a lower-CO_2 world, this would include eating what's available locally and making do and mending, rather than buying new. Elsewhere, with many office workers now working from home, commuting will take up less time. This might enable people to return to hobbies and exercise... or perhaps more likely allow them to give over ever larger portions of their home-life to work.

Thankfully, the low-CO_2 world would not mean being in lockdown. You'd be able to visit family, friends and neighbours at will, so long as they live nearby of course. Children would be at school and able to visit their friends for tea. This cannot resume soon enough.

What the restrictions have inadvertently allowed is a collective pause. Do we want to be in a coronavirus lockdown forever? Of course not! Was the world *as a whole* 'better' in January 2020? It depends on which metric you choose. Once this is over, we should take care not to go back to the 'old ways,' but rather take the lessons of lockdown forward for use in 'the real world.' We are all part of an ongoing case-study of what people can be coaxed into doing, *en-masse*, when the dangers are clear and present. The trick for climate activists will be to apply this ability to dangers that are less clear and less present, but ultimately even more deadly.

1. https://www.tomtom.com/blog/moving-world/covid-19-traffic

2. https://www.youtube.com/watch?v=3d9FqqegFl8

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