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MAGAZINE

MARCH 2018

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Gambarotta**

THE INNOVATOR

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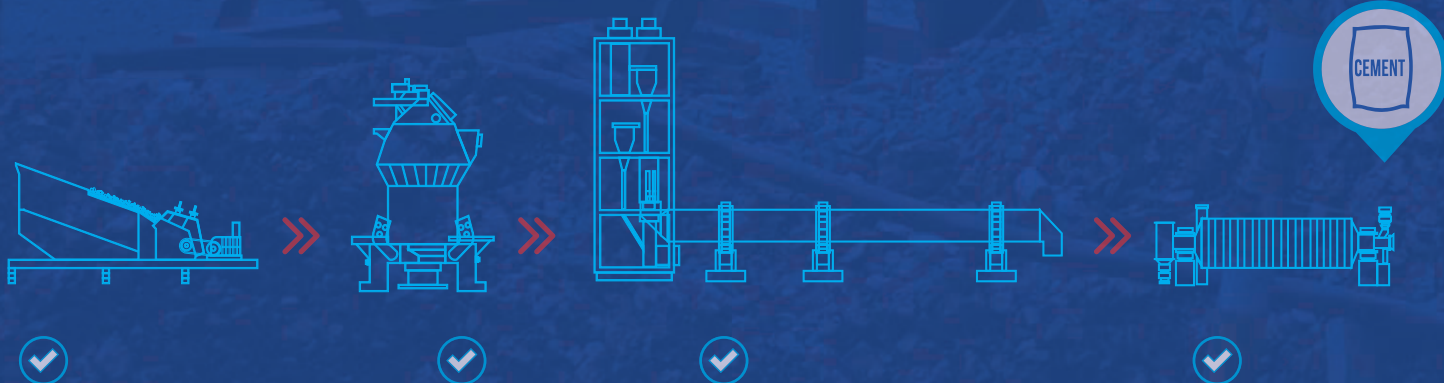
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This issue's front cover...

MDG Handling Solutions Srl was founded on the initiative of Davide Gambarotta, who is a Member and sole Director. The company operates in the field of bespoke design and production of Bulk Solids Handling Systems, in which Mr Davide Gambarotta has gained considerable experience over the 10 years of work done in the family business, operating in the same sector for about 60 years.

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Dear readers,

Welcome to the March 2018 issue of *Global Cement Magazine* - the world's most widely-read cement magazine! This issue kicks off with an in-depth interview with Dr Gaurav Sant, the leader of UCLA's Carbon Upcycling project. His diverse team has been working on a CO₂ capture technology that produces calcium carbonate from lime mortar and untreated flue gas. The project has already ticked off some major milestones and Sant presents a number of ways that the technology could disrupt the established cement and concrete sector - See Page 10. In a second interview, starting on Page 16, Christian Pfeiffer's two new managing directors discuss trends in the cement grinding sector, as well as Christian Pfeiffer's past, present and future.

Also in this issue, Robert McCaffrey visits the site of the DG Khan Hub plant in Pakistan. The plant, now in the final stages of construction, will be one of the most modern in the world when it is complete. FLSmidth is the main equipment supplier, with Loesche supplying grinding mills, Haver & Boecker supplying packaging solutions and IBAU Hamburg providing silo and loading technology. The report also contains a wealth of background on Pakistan's history, cement sector and the reasons behind DG Khan's decision to build the plant.

Last but not least, this issue has a look at natural gypsum supply opportunities by Patrick Whiteway of the Nova Scotia Department of Natural Resources in Canada (Page 22), plus a look at the cement sectors of the Benelux countries (Page 44). This is to tie in with the themes and location of the forthcoming *Global GypSupply Conference in Brussels*, Belgium on 13-14 March 2018. At the time of going to press the event is expected to attract more than 120 delegates from 25+ countries to discuss all aspects of natural, synthetic and recycled gypsum supplies, both for the cement sector and others. To find out more and to register, visit: www.Gyp-Supply.com.

We hope that you enjoy this issue of *Global Cement Magazine*!

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ISSN: 1753-6812

Published by Pro Global Media Ltd
Ground Floor, Solis House, 20 Hook Road,
Epsom, Surrey, UK KT19 8TR
Tel: +44 (0)1372 743837 (switchboard)
Fax: +44 (0)1372 743838



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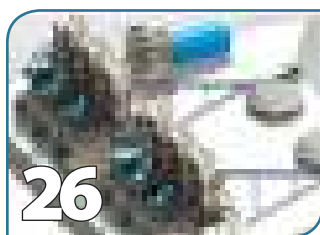
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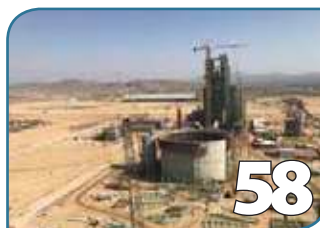


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Interview by Peter Edwards, Global Cement Magazine

Towards a CO₂-neutral cement with UCLA

Carbon-capture and utilisation (CCU) is a growing trend worldwide, as also in the cement sector, with a wide range of methodologies in development. Here, we speak to Dr Gaurav Sant, the leader of the University of California, Los Angeles' Carbon Upcycling effort, about CO₂NCRETE™, a hydrated lime-based pre-cast concrete replacement made with untreated flue gas borne CO₂...

Introduction

Global Cement (GC): Please can you introduce us to the Carbon Upcycling project at UCLA?

Gaurav Sant (GS): The aim of UCLA's Carbon Upcycling project is to create - at scale - a CO₂-neutral cement. It began in 2014 and has since developed a technology known as CO₂NCRETE™, which we have piloted at a scale of several tons of production per day.

GC: Who works on the project?

GS: I am the project leader and helped to put the team together. We knew from the start of the project that the route to a CO₂-neutral cement would be a big technical challenge. However, we also realised pretty rapidly that it would be a challenge to convince the cement, concrete and construction sectors of the benefits and viability of new materials. These sectors are rather conservative and the drivers for producers will not be simply technical, but also based on economics and policy evolutions. These aspects, and those related to codes and construction regulations, must be addressed for any technical solution to be implementable in the real world. Realising

this, we assembled a multi-disciplinary team with representatives from civil engineering, materials science, mechanical engineering, chemistry, economics and policy development. Cement and concrete have served as our primary building materials - in many ways unchanged - for nearly 200 years. So we need to be thoughtful, and expansive in considering every angle if the project is to be successful in changing this status quo.

Making CO₂NCRETE™

GC: Please introduce the concept behind the CO₂NCRETE™ product / process.

GS: CO₂NCRETE™ is the name of both the product and the process. At its heart is the use of lime mortar to make a synthetic limestone, rather than using anhydrous calcium silicate phases that form traditional ordinary portland cement (OPC) today.

Lime mortar is conventionally made by heating limestone (calcium carbonate, CaCO₃) to ~800°C to remove CO₂ and generate lime (calcium oxide, CaO). Water is then added to produce slaked lime (calcium hydroxide, Ca(OH)₂). The great thing about slaked lime is that it naturally absorbs CO₂ from the atmosphere to reform calcium carbonate (CaCO₃). This



Profile: Dr Gaurav Sant

Gaurav Sant says he has been 'at school his entire life,' in that he has never left academia. The son and grandson of civil engineers, he grew up fascinated with construction, specifically how bridges, roads and highways, and sanitation and water supply projects can improve quality of life for local residents. After completing pre-college training in India, Sant went to study for a Bachelors (2006), Masters (2007) and PhD (2009), all in civil engineering at Purdue University in Indiana, US. He spent

time as a post-doctoral fellow at the École Polytechnique Fédérale de Lausanne in Switzerland and, in 2011, moved to the University of California at Los Angeles (UCLA) where he is currently the Director of the Institute for Carbon Management. Since 2014 he has led UCLA's Carbon Upcycling effort. He maintains other research interests in various materials of modern construction including: traditional cement, concrete, alloys, structural ceramics and developing methods for additive manufacturing using these base materials.

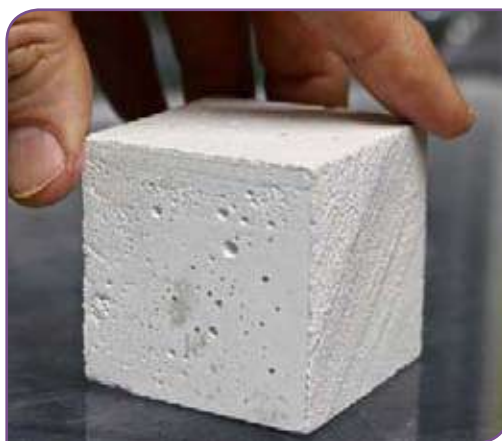


sounds like a good basis for a lower-CO₂ cement or concrete product. However, lime mortar has two big drawbacks. Firstly, it is structurally weak by modern standards. Secondly, it absorbs CO₂ from the atmosphere abysmally slowly.

We wanted to stay true to the idea of making a 'lime mortar-like' material - albeit one that could absorb CO₂ much more quickly. This would allow us to take the CO₂, e.g., from the decarbonation step itself (or elsewhere, e.g., from a coal power plant), and re-insert it into a much stronger final material. Of course, it is most desirable to accomplish this using existing capital equipment - at cement plants that are located close to limestone reserves. This is the concept from which the CO₂NCRETE™ process arose. We first published on the process in 2015, after having worked on it for over a year.

GC: How is CO₂NCRETE™ made at present?

GS: Our pilot scale process is analogous to the process of making pre-cast concrete blocks. A local ready-mix concrete producer mixes our hydrated lime (Ca(OH)₂), with water and other components in a concrete mixer truck and brings the slurry to our facility. The mixture is poured into cylindrical forms 15cm (6") in diameter and 30cm (12") in height and allowed to cure for a few hours to gain 'green strength.' Once they have hardened sufficiently to be removed from the forms, the cylinders are moved to a number of 2m x 2m x 2m chambers that are supplied with flue gas at the right conditions of temperature, relative humidity, and CO₂ concentration. It takes around 24hr for the hydrated lime to almost completely convert to calcium carbonate (CaCO₃). This pilot plant can make 7-8t of CO₂NCRETE™ per batch per day. This is an important test as we have been able to demonstrate a couple of major processing steps,



Left: A sample of CO₂NCRETE™.
Credit: UCLA Luskin and UCLA Samuelli.

at-scale, and offer products that can be tested using industry practices. Working up from the 'thimble-scale' in the laboratory to producing several tons of material represents a major milestone for the project. We have also used this process to produce carbonated solids that can be fabricated using fly ashes as the sole binder ingredient. This work has recently been published. Using fly ash has the added benefit of combining two materials, CO₂ and fly ash, which are both traditionally viewed as 'wastes.'

We have looked at the availability of limestone and fly ash - and especially reclaimed fly ashes - internationally and have yet to come across a market where one of the two methods could not be used due to material supply issues.

An incredible advantage we have compared to other carbon capture and utilisation (CCU) technologies is that the CO₂ stream does not have to be processed before it is used to make CO₂NCRETE™. We can use it from anywhere - from a cement plant, or a coal power plant, without pre- or post-treatment. This offers the potential to 'tap' the flue gas at the stack, put it into CO₂NCRETE™ reactors, use the CO₂ contained within it as needed, and then release the remainder.

Unlike many other CCU technologies, the opportunity to use untreated flue gas is critical to make the process economically viable. We have tested flue gas with CO₂ contents as low as 7% by volume. This is significant, as removing the need to enrich or treat the flue gas reduces the processing costs, and hence the cost of deploying and operating the production facility.

GC: Is it fair to say that the CO₂NCRETE™ process is the flue gas cleaning step?

GS: In a way, yes. It utilises CO₂ borne in dilute flue gas streams (e.g., 5-30% CO₂, v/v), which are the hardest to tackle technologically and economically. Furthermore, it also somewhat removes, and is insensitive to, acidic gases (e.g., SO_x, NO_x) in the flue gas stream, unlike some other CO₂ capture processes that are compromised by the presence of acidic gases.



Left: Placement of cylinders into carbonation chamber.
Credit: UCLA Luskin and UCLA Samuelli.



Right: Large CO₂NCRETE element.
Credit: UCLA Luskin and
UCLA Samuelli.



GC: How does the embodied CO₂ of CO₂NCRETE™ compare with OPC?

GS: At scale, CO₂NCRETE™ has 50-70% lower embodied CO₂ impact than OPC. This is due to the absorption of CO₂ by the hydrated lime, and the lower temperatures at which it can be produced as compared to OPC. Looking at fly ash solutions, the product would have a CO₂ impact that can be up to 100% lower in terms of embodied CO₂ than OPC.

GC: As soon as you use the fly ash, do you not have to take on some of the CO₂ emitted during the production of the electricity?

GS: That's a good point - but, current frameworks do not attribute CO₂ to 'wastes.' If the definition changes in the future, the accounting for this may have to change.

GC: What about the physical properties?

GS: The compressive strength of the materials we have produced is dictated by the mixture formulations - and ranges between 20-35MPa for materials we have produced, which is comparable with traditional materials. This is important as the vast majority of concrete produced globally has a compressive strength less than 35MPa. While we have not tested flexural strength, in general this correlates well with compressive strength, so we don't expect any surprises. We have been able to make materials that flow into the form. A few hours later, it is strong enough for the form to be removed.

We have not sought out performance enhancement, because this is not necessarily rewarded. However, we have a nice bonus in that mature strength is achieved within 14 days (or less), rather than 28 days, which is the standard that we consider for OPC-based concretes. This has some big advantages and shortens the lead-time of production. This could lead to smaller batching plants at local CO₂ production sites in an 'Amazon-type' model. Specify what you need online and a local producer will make it for you and deliver it just-in-time. This reduces the transport distances too, providing further CO₂ gains. This has the potential to develop supply systems with tremendous flexibility, in terms of the shape, size and delivery schedules of building elements.

GC: What is the main disadvantage of CO₂NCRETE™?

GS: It doesn't have 200 years of field-experience and real-life demonstrations behind it. This means we have to build confidence in the product and help producers, designers and end-users/contractors to see the advantages. This is a hard process for new materials, especially in civil engineering, which is a conservative, risk-averse sector.

GC: How water intensive is this process? Are there concerns for use in dry areas such as California?

GS: The process is developed to feature a water intensity less than or equal to traditional concrete. So the process poses no impact whether you're in California, or elsewhere. In fact, we have worked on approaches where the process can recover, and reuse water, so in fact it offers a lower water-use footprint to current methods of concrete production.

GC: Could this be used for ready-mix applications?

GS: We do have strategies in mind for this. However, this may not come to pass for two reasons. First, pre-cast is in the ascendancy. This is because work sites are getting tighter and people want buildings and infrastructure to be built more rapidly. We want to not just conform to the status quo, but promote pre-cast construction, e.g., in the form of large Lego® sets. Secondly, you would have to bring in CO₂ to the site, which is a tremendous undertaking. Moving flue gas makes no ecological or economic sense whatsoever at the current time as we simply do not have sufficient logistical facilities in place for piping CO₂ from source to the point of use.

Marketing CO₂NCRETE™

GC: What have the project's economists and policy experts discovered so far?

GS: From a policy perspective we have spent a lot of time focusing on how to influence the construction industry to use materials that are not conventional; and specifically feature a reduced CO₂ intensity. It has become apparent that the difficulty of this challenge relates to where you are in the world. For example, in California, there is a really assertive move towards CO₂ reduction, including a Global Warming Solutions Act, and recently the Buy Clean California Act which requires that the state use low-carbon materials in its construction projects. These are significant drivers and policy signals that are making CO₂-intensive industries consider their future emissions trajectories much more carefully. This can also be seen in the EU. However, not everywhere is as progressive and more time will be needed.

Our research in this area so far has helped us find the major objections to new materials in the

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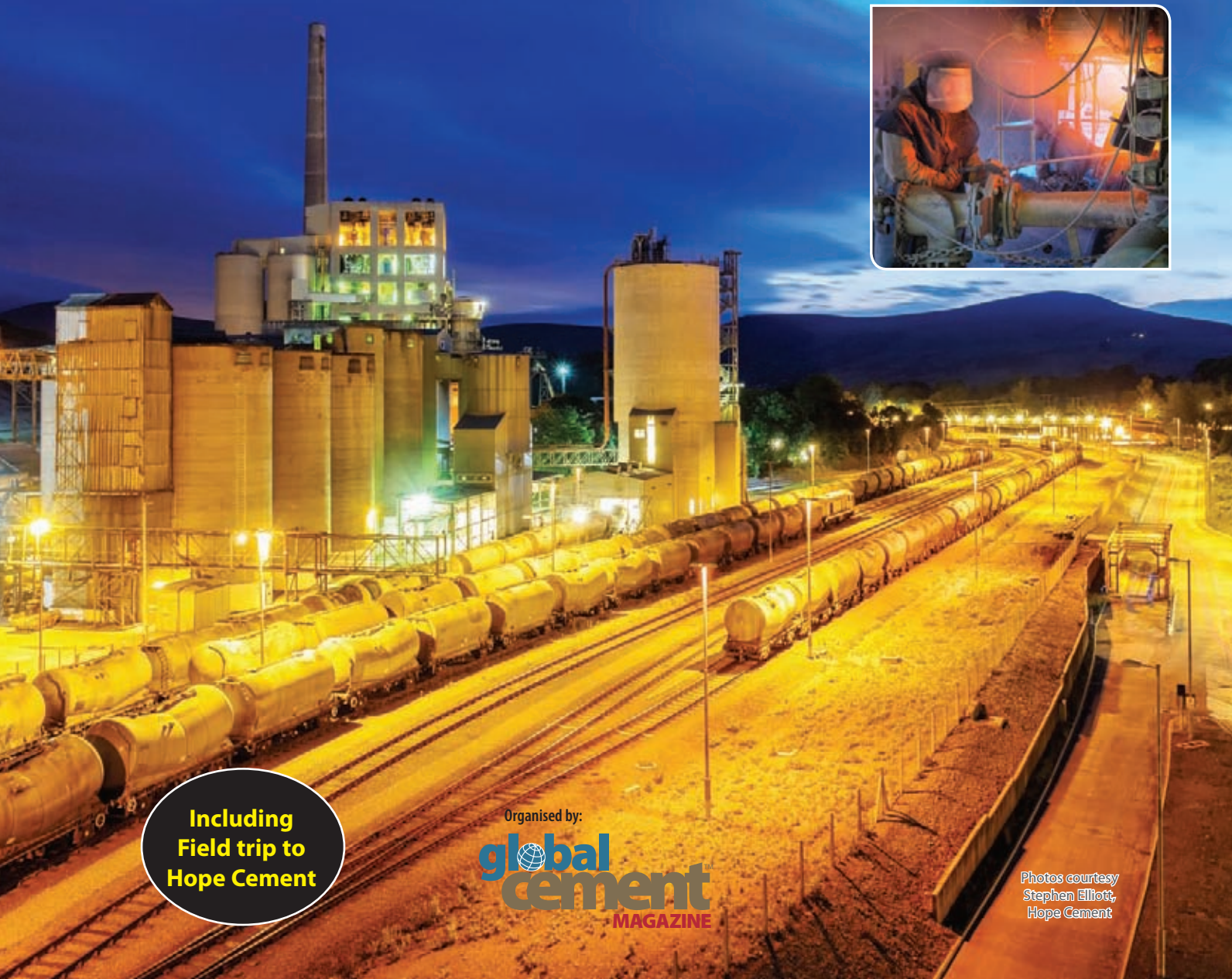
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Right: CO₂NCRETE™ cylinder arranged on a rack prior to strength measurement.
Credit: UCLA Luskin and UCLA Samuelli.

construction sector and, as part of our ongoing commercialisation plan, we are looking at the best ways to respond to these concerns. It helps that we can offer a lime-based material that cement and concrete producers are relatively familiar with - and that can be produced at existing facilities. We have found that the pilot process has been useful to convince industry partners that this process is scalable, and therefore this is a viable way forward. As the result of our efforts on the technical and economic / policy sides, we are in active discussions to commercialise the effort and take CO₂NCRETE™ to market.

GC: Sounds like an exciting point to be at!

GS: Yes, it is really exciting right now. We are projecting cost-competitiveness with ordinary portland cement (OPC) based binders, which is incredibly important if we are to achieve meaningful market penetration. In addition, we have created a product that has a much lower CO₂ footprint. Both aspects are crucial to disrupt a sector that has been nearly 200 years in the making.

GC: Many specifications for cement and concrete are very prescriptive. How is the project battling this issue?

GS: The construction sector has historically sourced cheap materials and has had the luxury of being able to significantly over-design materials and structures. As you go towards low-CO₂ standards, which outline what a reduced CO₂ construction material should look like, there will be a shift away from this obsession with over-design to an emphasis on 'what level of performance is necessary?' And the low-CO₂ building material standard is not hypothetical, it is a reality in California in the form of the Buy Clean California Act - and these measures will propagate globally. This is an important policy signal, which will allow us to break out of the straitjacket to a place where 'more-more-more' is not always good but 'engineering sufficiency (plus more, to account for safety factors)' is what you want. At that point prescriptive standards will suddenly look very old-fashioned and inefficient, which will allow the growth and diffusion of performance-based measures. We will continue to make ourselves heard on this issue.

Another thing to point out is that there are coordinating bodies around the world that help bring new materials to market based on performance-based standards. For example, if the building standard needs material with a compressive strength of 30MPa, you aim for that level of engineering performance, and then work to reduce the CO₂ impact as far as possible.

GC: What are the immediate next steps for the project?



GS: We are looking at the types of components that we should make to most readily penetrate the construction sector with CO₂NCRETE™ elements and build user confidence. In the longer term we are envisioning a demonstration building that is entirely built from CO₂NCRETE™ elements. This would certainly help to prove the concept to more sceptical groups. Our big dream for the 36 month time-frame is a process solution that is fully vetted and mobilised. It would be in operation in more than one place around the world and would be connected to a cement plant or other major CO₂ emitter in at least one of those locations. It would be good to be in a position to advise, demonstrate and define to clients on how to make your own CO₂NCRETE™ elements and associated production plants.

GC: What drivers would you like to see to help the development of CO₂NCRETE™?

GS: Powerful drivers are starting to come about. In Europe, there is a concerted effort to reduce its CO₂ footprint. In the US, while it's not signed up to the Paris Climate Treaty (just yet), there are many states, e.g., California and New York, that are being proactive with committed carbon reduction goals. China and India too, the major developing countries, are looking to be more responsible with the choices they make.

In general, we need an attitudinal shift to recognise the potential of a 'carbon-to-value' (CTV) economy. If we always treat CO₂ as a problem that is viewed negatively, it is difficult to realise market-driven solutions to it. On the other hand, if you turn it around and say: 'Here is this resource that we are simply emitting from the stack. Let's make building materials out of it that we can sell,' you provide opportunities from CO₂. That's important, because you need business to think that it is really in the driving seat, rather than just being directed by restrictions and legislation. This thinking is critical to our perspective, and one that is emphasised by UCLA's Institute for Carbon Management.

GC: Gaurav, thank you for your time today.

GS: You are very welcome indeed!



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**CHRISTIAN
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Interview by Peter Edwards, Global Cement Magazine

In discussion: Christian Pfeiffer Maschinenfabrik

Global Cement recently visited the Beckum headquarters of the expert ball mill, diaphragm and separator manufacturer Christian Pfeiffer. New Managing Directors Uwe Karsunke and Dietmar Freyhammer were keen to discuss the company's past, present and future...

Global Cement (GC): What is the background of the company Christian Pfeiffer?

Uwe Karsunke (UK): The company was established in 1925 by Christian Pfeiffer in Beckum, which is Germany's historical cement hub. It remains a very important area for cement plant engineering to this day.

Firstly, the company produced components and spare parts for the cement industry. It then branched into ball mills, up to diameter of 2.8m and designed and patented its Christian Pfeiffer diaphragm. About 20 years later it introduced separators in Europe.

After the Second World War the company refocused on mill internals and stopped making complete ball mills. This was due to limited production space for the larger mills that the cement sector had begun to demand. That was a period during which the company accrued a lot of knowledge of the working of ball mills from other producers in the 1970s and 1980s. In 1987 Christian Pfeiffer developed and launched its 3rd generation QDK separator. As it did not provide the full mill or complete grinding plants during this time, the company had to add value to its partners. It did that by creating efficient processes.

Dietmar Freyhammer (DF): Since the early 1990s, Christian Pfeiffer has offered complete grinding plants and has also started to produce its own modern ball mills once again. This was at the request of

our customers. They said, 'You know so much about the process. Can you produce a complete plant?'

UK: While the equipment is important, I would say that our main business is not simply the delivery of machines but process knowledge of grinding and separation. The equipment that we make comes from that knowledge.

GC: How is the company structured today?

UK: In our historical base in Beckum we have around 90 employees engaged in engineering and product development. We also make the majority of our diaphragms in Beckum. There are also around 20 engineering employees in Liezen, Austria, where we manufacture separators, ball mills and liner plates. Like the rest of Christian Pfeiffer, this facility is part of Maschinenfabrik Liezen (MFL group for crushers, conveyors etc. in Austria), which bought the company in 1996. MFL group also has a fibre cement board machinery business and other complementary businesses.

Outside of Europe, Christian Pfeiffer also has an affiliate company in China, which produces parts of diaphragms and acts as a local sales office. In Bolivia we have a joint venture with a local foundry that is engaged in the production of liners and sales. We also established a Malaysian joint venture to facilitate the delivery of a turnkey grinding project to CMS. Now

Right: The new Managing Directors of Christian Pfeiffer, Uwe Karsunke (left) and Dietmar Freyhammer (right).



“We must accept that vertical roller mills and roller presses are on the rise. To maintain our position as a grinding expert, we are moving into these areas.”

that the project has been delivered, we are shifting that company's focus into a sales and service hub.

In India we have a joint venture with an Indian licensee of Christian Pfeiffer in New Delhi. It produces and distributes separators and ball mills within India and Bangladesh. Finally, in the US we have an engineering and sales office but no production base at present.

GC: How important is the cement sector to Christian Pfeiffer as a proportion of sales?

DF: Cement was the company's 'first sector' and still represents around 90% of our total turnover of Euro40-50m/yr. We also supply the industrial minerals, mining and power sectors.

GC: How does Christian Pfeiffer interact with customers?

DF: Very often our first contact with a new customer is not about supplying equipment but, as mentioned above, reviewing and optimising existing installations using our process know-how. This builds trust between Christian Pfeiffer and the client and may lead to small projects like replacement of liners and components and then perhaps larger projects like replacement of a separator or even a complete new grinding plant.



Above: A Christian Pfeiffer ball mill.

GC: Can you take us through the production process of, for example, a ball mill?

DF: The lead time for a ball mill in Europe would be six to nine months, depending on the size: Larger mill, larger lead time. The sections of the mill shell are made of rolled up steel plates and are essentially welded together and machined, the shell is prepared to take up the liner plates and the diaphragm. The bearing of larger cement ball mills are designed as pad bearings and the drive system is mainly a lateral gear drive system.

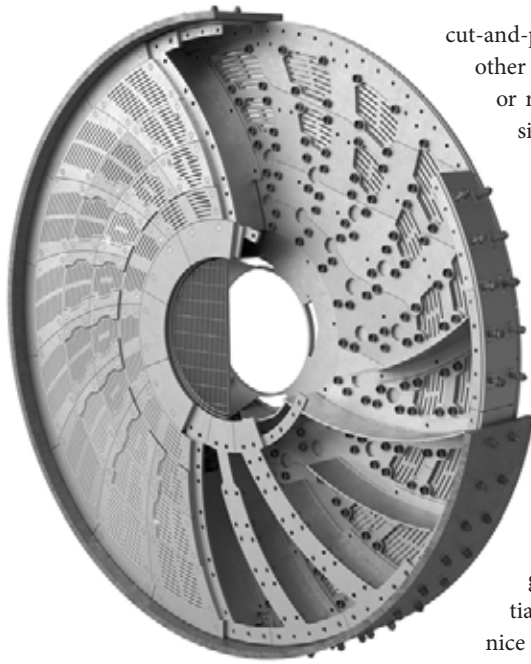
GC: Does Christian Pfeiffer build equipment to the clients' specification or advise on the best solution?

DF: It depends. Sometimes the larger producers will come with an exact specification and say 'build it.' However, we also get a lot of situations where the client says, 'I want to grind 90t/hr. How do I do it?'

Most of our projects are tailor-made but not all. We once made five identical mills for a particular client with the same dimensions, same separator and same diaphragm. However, you cannot simply



Left: Inside the production facility at Beckum.



Above: Christian Pfeiffer is experienced in the design of intricate diaphragms for the inside of ball mills.

cut-and-paste one plant to another in a different location or region. You have to consider the prevailing wind direction and speed, differences in roofs and platforms loads, electrical supply - which affect the type of gearboxes and motors you can use - even the likelihood of an earthquake.

UK: No two projects will be the same, which of course, is a great strength of Christian Pfeiffer. There was a nice recent example in Africa where the client obtained quotes from Christian Pfeiffer and a Chinese firm. The Chinese producer got the plans from the drawer and said 'Here is the plan,' ignoring the fact that the previous design incorporated features that were not required and omitted some of the client's needs. I am glad to say that the contract was awarded to Christian Pfeiffer. We were more expensive, but we provided better value. The costs of building structures are high in Africa, as is the cost of energy. It makes sense that the smaller and more efficient system was preferred.

GC: How does Christian Pfeiffer work with clients during, for example, a ball mill exchange?

DF: We typically send in our field personnel to supervise the mechanical and electrical installation. In most of the cases the construction contractors are acting on behalf of the client. Nevertheless, we are very capable of offering a complete solution.

If we were to replace a ball mill in an existing building, it would take about 2-3 months. There's a lot of work to be done with the foundations. If we think instead of a separator switch, we are looking at a few weeks' downtime, because the new separator can be built alongside the old one while it is still operating.

For the commissioning step, a ball mill by itself would take typically one week to start up and stabilise. Process optimisation can then take from a few days up to a couple of weeks.

GC: How are client demands changing with time, for example for ball mills?

UK: The trend is towards larger ball mills. In the 1990s and 2000s we would see orders for mills of around 3.6-4.0m in diameter but now we are getting

requests for 4.6-5.0m in diameter. We had a client in the UAE that first ordered a 4.2m diameter mill. The next one it ordered was 4.4m in diameter and the next was 4.6m in diameter. Another, in Ukraine, bought a 4.2m in around 2011 but now it is installing two new 4.6m diameter mills. The trend is clear to see.

The biggest mill we have supplied was 5.2m in diameter for HeidelbergCement's Górazdze plant in Poland. It is the largest ball mill for cement in Europe with an installed power rating of 8400kW and a maximum output of ~250t/hr.

DF: This is not the case everywhere though. If you look to Africa, which is seeing a spate of new grinding plants, typical requests are for 30-40t/hr. These are not as sophisticated as some other projects. The same is the case in the Caribbean and parts of South America, very often from concrete producers looking to cover their own demand. This type of request has a 3m diameter ball mill, 9m in length with a drive of 1200 kW or smaller.

This is a type of market in which we are in competition with modular mill producers as well as the established vertical roller mill producers. We do not offer a strict 'modular' system but we can provide a ball mills system that is easy to operate and is quite compact. The modular systems look great on paper, but are not optimal in terms of maintenance and efficiency. In addition, I don't think that anyone has yet dismantled the modular grinding mill and actually moved it to another location, so we question the concept's unique selling point.

UK: Another trend with time is that the energy consumption of the grinding installations and ball mills is decreasing. This has been due to more efficient engineering in the ball mill, more efficient motors and gears but also in more efficient 'packaging' of the equipment around the ball mill. We have reduced the number of transfer steps, for example, the distance that material is transported around the plant, as well as improving the mill efficiency. You can also adapt the ball composition to particular types of cement. However, this is not practical for making a wide range of products. With respect to separators, we have been able to produce far more efficient systems.

You have to look at the system holistically though. A major mistake that cement producers make is to look at the ball mill internals one year, then look at the separator next year. They should always be considered together to reach the desired efficiency.

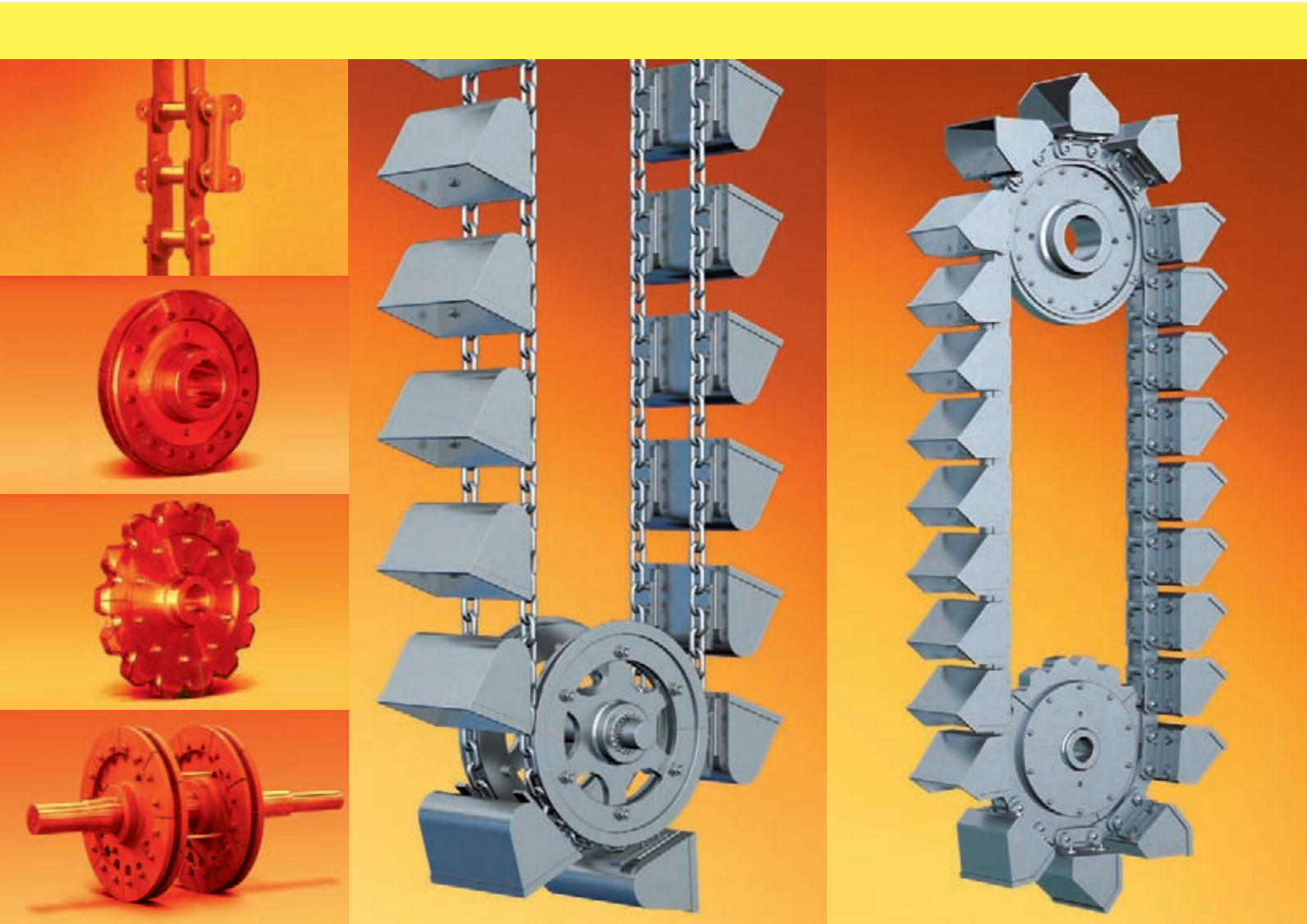
DF: There is also a tendency, depending on project size and location, towards more Engineering Procurement and Construction (EPC) projects. This is due to a loss of expertise at the cement plant in some regions. Of course, the philosophy of the client is also important in decisions of this type.



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GC: You have mentioned several world regions so far. Where is most important at the moment?

UK: In the most recent years we have conducted the majority of our work in Europe, with a lot of efficiency projects, as well as larger retrofit projects and the installation of new equipment. From 2000 to 2010 the most important region was Eastern Europe, which saw a lot of investment at that point. Ukraine and Russia were particularly important, with all of this region representing around 15% of turnover after that period. However, no one has money to invest in Russia at the moment.

Also important during this time have been Arabian countries, with a variation between countries over the years. The US is also an important area, especially that we are now also providing separators to that market. They need to clean up their act and they have fewer specialists in their plants due to the retirement of experts. It's a big growing market and there are lots of plants that need help with their optimisation. We are also convinced that we can take this methodology to Africa.

GC: Are there any regions seeing a decrease in enquiries at the moment?

DF: For us there is no real place that has seen a complete fall off in enquiries. Even in troubled markets like Brazil, existing equipment needs to be serviced and fitted out with consumables. The German market is not expanding, but investment continues. There are many examples of increasing efficiency rather than big new investments.

UK: By doing everything, from the small things to the large things, we have found business in every

market. A particularly stark case is in Georgia. It is a small country with a single cement producer, which has two plants and one terminal. It was operating with small open circuit ball mills and was producing cement with a poor particle size distribution and poor strength.

Turkish cement was flooding in from the other side of the Black Sea because it was better for construction. Georgia was losing its own market. We have now delivered six separators to Georgia, the quality of cement has improved and the influence of Turkish cement has decreased. The technology has the ability to completely alter national markets.

GC: Are there any plans to add further types of equipment to the company's portfolio?

UK: When we look at the cement grinding sector, everyone knows that even a fully-optimised ball mill cannot match a vertical roller mill (VRM) for energy efficiency. As a producer of ball mills, we have to take heed of this. This is particularly the case in South America and Africa, where virtually every new mill is a VRM.

We must accept that VRMs are on the rise. The roller press is also on the rise. To maintain our position as a grinding expert, we are moving into these areas. We have already installed a grinding plant featuring two lines that comprised a roller press and ball mill in Indonesia. In that case the roller press was from a known supplier, but we now work with a supplier contracted to make roller presses for us, tagged as Christian Pfeiffer roller presses.

We also have a prototype VRM design 'ready to go' for any skilled local client that wants to participate in the next step of Christian Pfeiffer's evolution. If we want to maintain our position in this sector, we must act.

DF: There will always be applications for the ball mill of course. The introduction of the VRM is an additional string to our bow and one that will give us even more competence in the grinding arena.

GC: That is a very interesting answer and one that I was not expecting. What other plans does the company have?

DF: We are in the process of almost doubling our office space here in Beckum to meet the future needs of our company as we expand into new products and find new applications for our existing products. We hope to be ready to open our new space by the close of 2018.

GC: Thank you very much for your time today.

UK/DF: You are very welcome indeed - Thank you! 



Right: The company is increasingly a supplier of complete grinding systems.

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Patrick Whiteway, Nova Scotia Department of Natural Resources

Natural gypsum supply opportunities from Nova Scotia, Canada

This article provides a high-level outline of the natural gypsum resources of Nova Scotia. It provides an overview of a quarrying operation that currently extracts natural gypsum and exports it from the Province and outlines the potential opportunities for re-starting operations that were recently placed on care-and-maintenance during the Great Recession. Here Patrick Whiteway describes the current situation and looks at potential for developing Nova Scotia's natural gypsum client base, including into the cement industry.

Nova Scotia is one of Canada's four Atlantic Provinces. About 55,300km² in area, it is home to fewer than a million people (957,600). Annual GDP is about US\$33.6bn, which is growing at an annual rate of about 1.4%. Unemployment is currently 8.0%, one of the highest rates in Canada, and the Provincial debt is about US\$12.6bn.

Geologically, large areas of the Province are underlain by a sequence of evaporites including (from bottom to top): limestone, anhydrite, gypsum, salt and potash. These rocks were deposited in a large inland sea called the Maritimes Basin, during the Mississippian period between 360-320 million years ago. Gypsum and anhydrite units range up to 100m in thickness and are exposed at surface along many natural waterways and road cuts. As a result, gypsum has been identified and quarried for at least 200 years, initially for use as an agricultural fertiliser.

During the 20th Century, the Province's gypsum resources were mined by large-scale open pit methods to supply high quality natural gypsum (>85%) to gypsum wallboard plants in the USA. An estimated 380Mt of gypsum have so far been mined in Nova

Scotia, the vast majority of which was exported to the US for this application.

This article provides a high-level outline of the current state of gypsum quarrying and use in Nova Scotia and outlines some of the potential opportunities for future businesses that could add value and increase the export of this natural resource.

Active quarries and wallboard plants

The only large-scale producer of gypsum in Nova Scotia in 2018 is National Gypsum (Canada) Ltd., which operates a large quarry at East Milford. Quarried rock is transported from East Milford 42km by rail to a dedicated ship-loading facility at Halifax where ships with a capacity to carry up to 55,000t are loaded for export to the US. Raw rock is also transported by rail and truck to local buyers.

The distances to markets in eastern Canada, the US, the Caribbean and South America are relatively short (700km to New York, 1300km to Detroit, 1700km to Jacksonville, Florida, 2100km to Columbia and 7700km to Rio de Janeiro, Brazil).

Below: Ship-loading facility at Little Narrows quarry, operated by CGC Inc.





National Gypsum ships the majority of its production to four gypsum wallboard plants that it operates in the US. In addition, it sells gypsum to wallboard plants in New Brunswick and also sells a small amount of crusher fines to the agricultural market in Prince Edward Island. The three wallboard plants in Atlantic Canada, shown below, all sourced natural gypsum from East Milford in 2017.

Potential opportunities for resource development

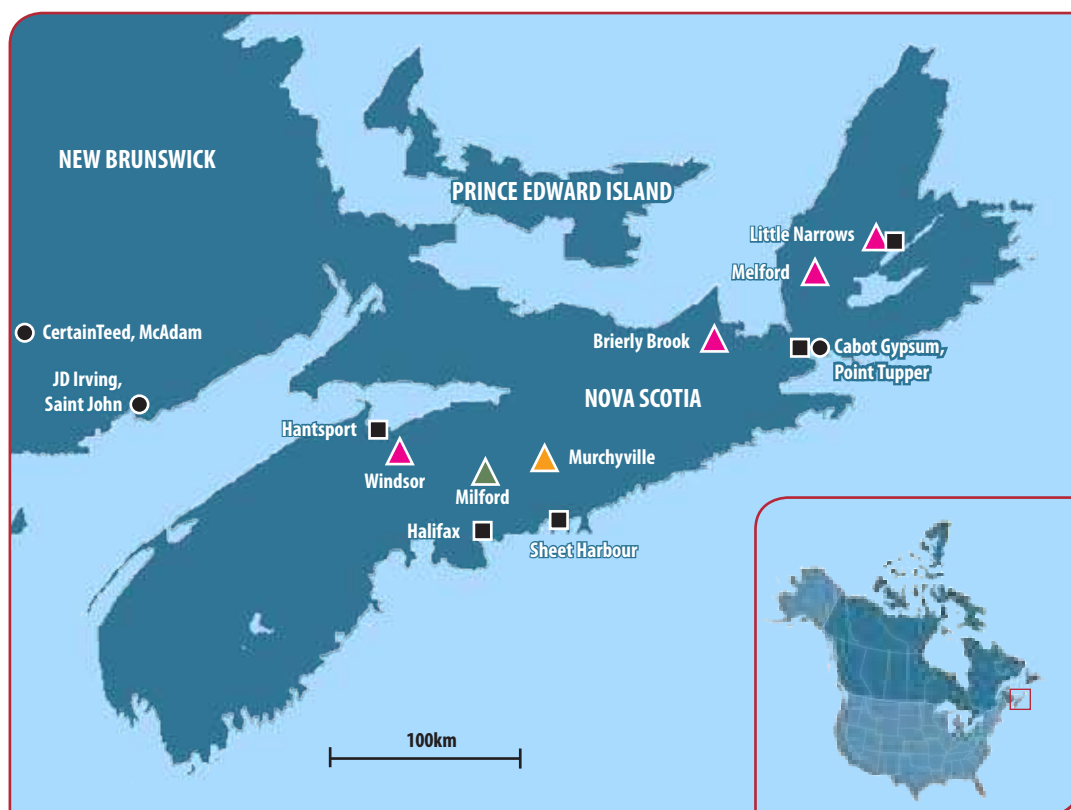
In addition to the East Milford quarry, three large gypsum quarries are on care-and-maintenance in Nova Scotia in 2018. They are: Canadian Gypsum Company's (CGC's) Windsor quarries, CGC's Little Narrows quarries and Georgia Pacific's Melford quarry. With some additional capital investment, all of these operations could restart production. These quarries are capable of producing 1.7Mt/yr, 1.2Mt/yr and 1.4Mt/yr of natural gypsum respectively. Each has its own dedicated ship-loading facility. CGC Windsor's ship-loading facility is in Hantsport, CGC Little Narrows' is located at the quarry site and Georgia Pacific's is located in Point Tupper.

Until the start of 2017, CGC sold anhydrite to cement manufacturing plants in Quebec and Ontario and shipped gypsum to USG wallboard plants in the US. Production peaked at 1.2Mt/yr of gypsum and 120,000t tonnes of anhydrite in 2005 and ceased in 2016.

Georgia Pacific operated two quarries in Nova Scotia as recently as 2010, Melford and Sugar Camp. Resources at Sugar Camp, however, were mined out in 2010. The company subsequently began sourcing natural gypsum for its US-based wallboard plants from Europe. Recently, the company has begun searching for another gypsum deposit in Nova Scotia that could potentially replace Sugar Camp. The company is targeting 2021 as the year for deciding whether to develop a new quarry in Nova Scotia. This could present opportunities to supply natural gypsum to cement producers in Canada and the US, which are also set to be affected by falling synthetic gypsum volumes.

A third, smaller quarry that is also on care-and-maintenance is the Brierly Brook quarry near Antigonish, Nova Scotia. It is owned by Nova Construction, a local Nova Scotia company and is capable of producing in excess of 100,000t/yr of gypsum. It does not have a dedicated ship loading facility, but is easily accessible by road.

In addition to the above-mentioned quarries, another gypsum resource has been extensively explored and government approvals have been issued for future development. It is the 330Mt deposit at Murchville, which is owned by the German wallboard producer Knauf Group. The Murchville deposit averages 30-40m in thickness and lies under about 14m of overburden. A preliminary feasibility study in 2000 envisioned a quarry that could produce 2Mt/yr, with the final product being trucked 65km



Left: Map of Nova Scotia and surrounding Atlantic Canada Provinces. Gypsum quarries, wallboard plants and gypsum ship loading facilities.

QUARRIES

- ▲ Active
- ▲ Care & Maintenance
- ▲ Under development

WALLBOARD PLANTS

- WALLBOARD PLANTS
- SHIP LOADING



over provincial roads to an existing ship-loading facility in Sheet Harbour.

It is worth noting that Atlantic Industrial Minerals is seeking government approvals for a large limestone quarry at its Glencoe property. This quarry could feed a 1Mt/yr cement manufacturing facility that would also require an estimated 50,000-100,000t/yr of gypsum. This proposed project would require an investment of US\$400m to bring into production. The approval process could take up to two years.

There are hundreds of other gypsum occurrences throughout Nova Scotia. These are detailed in an online database available from the Nova Scotia Department of Natural Resources and can be viewed in Google Earth. For additional information on the geology of gypsum deposits in Nova Scotia, a detailed description of gypsum occurrences in the province, and the regulations related to gypsum quarrying, please go to our gypsum landing page.¹ To assist companies to explore for and develop mineral resources, including gypsum quarries, the Nova Scotia government has launched a new Mineral Resources Development Fund. Grants of up to US\$160,000 are available per year for advanced exploration work.²

Conclusion

Nova Scotia has an abundance of high quality natural gypsum resources. The Province has one operating quarry, producing gypsum for export and for local wallboard plants. The operator has its own ship-loading facility and is presently expanding its quarry. Due to demand for natural gypsum at its own wallboard plants in the US and the declining availability of

synthetic gypsum in the US, this quarry may soon stop supplying two wallboard plants in Atlantic Canada. The owners of these plants are therefore seeking another reliable supply of high quality natural gypsum. Nova Scotia is providing these companies with technical and regulatory information and is working collaboratively with geological consultants to facilitate the development of new quarries in Nova Scotia to meet their needs. Other clients, such as those in the cement sector, are actively sought.

Three large-scale gypsum quarries (CGC Windsor, CGC Little Narrows and Melford) and one smaller quarry (Brierly Brook) are on care-and-maintenance. These operations could potentially be reactivated in a relatively short period of time with minimal capital investment.

There are also opportunities to develop greenfield gypsum quarries in Nova Scotia. One such property, at Murchyville, has all of the necessary government approvals to commence development immediately.

The Nova Scotia government is also seeking to attract companies that are interested in investing in small to medium-sized businesses that use natural gypsum in products other than wallboard. Businesses that make value-added products for use in architecture, agriculture, ground support and the absorbency markets could operate profitably in the Province.

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2. <https://novascotia.ca/natr/meb/mrdp.asp>



Right: Aerial view of the East Milford quarry.



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Maerz Ofenbau AG

Lime plant engineering with Maerz Ofenbau

Maerz Ofenbau AG outlines its recently-awarded contracts and completed projects...

Recently-completed projects

Algeria: In early 2016, the Algerian company BCB Baslimane Chaux Berriane placed an order with Maerz for a 300t/day natural gas fired type E5 Maerz PFR kiln, including up- and downstream plant equipment. The dolomite plant is located in Berriane, just north of the city of Ghardaïa in central Algeria. One of the technical challenges of building a kiln in the centre of the desert is the extremely high temperatures, which translate to air temperatures of 50°C in the kiln's blower house. This has to be considered when designing the kiln process. The kiln was fired up in September 2017 and is now in full industrial operation. The burnt dolomite is sold to various industrial customers and, with several steel plants currently under construction in Algeria, Baslimane Chaux anticipates a growing market in the future.

Right: The BCB Baslimane Chaux Berriane plant in Ghardaïa, Algeria was completed in September 2017.

Saudi Arabia: In May 2017 the kiln was lit at Astra Mining Company's new 300t/day R1P type Maerz PRF kiln in the Al Kharj Industrial Zone, around 100km southeast of the Saudi Arabian capital Riyadh. Astra Mining Company was established by Astra Industrial Group (IAG) and Tharawat Trading as a joint venture in 2011.

Right: The opening of Astra Mining Company's lime kiln south of Riyadh in May 2017.



In the development of the plant it was important that Astra Mining design the 'optimum' system to provide the full flexibility to produce a wide variety of products as well as to take a possible future expansion of the lime plant into account. The logistics and arrangement of the limestone stockpile, the kiln, the battery of product silos, as well as the hydration and packing plants were carefully considered. The result is a plant laid out almost in a single line. This will



allow a cookie-cutter-like repetition of this design for future kiln lines.

As part of the order Maerz supplied engineering and key equipment for a 12t/hr hydration plant. Maerz also developed the basic layout of the lime plant together with Astra. During the course of the project Astra also invited Maerz to support its team by providing manpower for project management to check drawings and engineering interfaces for completeness as well as providing field services to assist Astra in successfully completing this huge lime plant project.

As soon as a single section of the lime plant was completely erected and electrified, this specific section was cold-commissioned in order to save time and to prevent unforeseen obstacles during the hot commissioning phase of the kiln. The kiln was lit for the first time in May 2017 and has constantly been producing high quality quicklime since then.

Ongoing projects

India: India has a huge demand for lime. Whereas in the steel industry the required lime is mostly produced in modern captive lime plants, the majority of India's commercial lime is still produced in small traditional field kilns. The limited availability of limestone suitable for calcination leads to a concentration of the industry in two major regions: Central India and Rajasthan.

Subaan Lime is changing the game now in northern Rajasthan, where it entrusted thyssenkrupp Industries India Pvt. Ltd. from Pune, Maharashtra,

together with Maerz Ofenbau AG to set up an entire new lime plant with a production capacity of 300t/day of quicklime. Subaan Lime already operates a quarry, supplying limestone to smaller lime producers in the area. By investing in the new plant, Subaan Lime is not only increasing the overall lime production capacity in the area, but is also taking environmental responsibility by reducing emissions by using state-of-the-art production technology.

Maerz contributed the technology and design of the 300t/day petcoke-dust-fired E5 type Maerz PFR lime kiln. thyssenkrupp Industries India will design the entire greenfield lime plant and will also supply the equipment to Subaan Lime and perform the erection of the new facility. The plant is scheduled to become productive in late 2018 and will set a new benchmark in the Indian commercial lime industry.

Austria: voestalpine Stahl GmbH operates a lime plant with four Maerz PFR kilns in Steyrling, 60km south of Linz. The lime produced in Steyrling is used for voestalpine's own steel plant in Linz. voestalpine signed a contract with Maerz Ofenbau AG for a turnkey project for a 300t/day natural gas fired R1P Maerz PFR lime kiln. The new kiln is going to replace an obsolete kiln, which went into operation in the early 1970s.

This project faced two unusual challenges: the tight time schedule from start to finish and the very confined space between the existing kilns in which to erect the new kiln. The restricted space can be seen below. To counter these challenges Maerz will plan,



Left: Maerz is in the process of building a kiln in a very restricted space for voestalpine Stahl in Austria. Location of the new kiln is shown by the arrow.



manufacture and pre-assemble all the components to the largest possible size that the available driveway and lifting area will allow. The R1P Maerz PFR lime kiln, named K06, with a natural gas firing system will process limestone from the native quarry with a grading of 30-80mm, to produce 300-375t/day of lime.

Recent orders

South Korea: After ordering its first Maerz PFR lime kiln in 2014, DAESUNG MDI (Mining Development Inc.), Yeongwol-gun, Gangwon-do, South Korea, has now placed an order with Maerz for the installation of a second Maerz PFR kiln. The new kiln will process limestone with variable limestone gradings, such as 25-55mm, 40-80mm or 55-100mm and will produce 200-300/t of lime. A solid fuel mixture, consisting of bituminous coal and anthracite, will be used as fuel. Maerz will provide technical assistance services during start-up and commissioning of the kiln plant, scheduled for the second half of 2018.

Argentina: CEFAS S.A., domiciled in Buenos Aires, Argentina, and associated with Grupo Calidra from Mexico, has placed an order with Maerz Ofenbau AG, for the second PFR kiln to be installed in its Padre Bueno Plant, Cienaguita, San Juan Province, Argentina. The 300t/day E5 type Maerz rectangular kiln will have a nominal capacity of 300t/day but production will be determined by the grading of limestone processed. It will be fired with up to 100% petcoke or natural gas, or a mixture of the two.

China: Shanghai DIBO Engineering Technology Co., Ltd., domiciled in Shanghai, China, as the buyer, has placed an order for a 600t/day Maerz PFR Lime Kiln

to be installed in Yong An City, Fujian Province, for Fujian Jingfu Mining Co., Ltd., as the end-user.

Egypt: Uni Lime for Lime Production, from El Mo-handessien, Egypt, has placed an order with Maerz for the supply of engineering, license, know-how, equipment and technical assistance services during commissioning and start-up for one 100t/day natural gas fired E2 Maerz PFR lime and dolomite shaft kiln. Both burnt lime and burnt dolomite will be supplied to El Marakby Steel in Giza, a sister company of Uni Lime and also a member of the MKS Group, headed by Hassan El Marakby.

India: Easternbulk Lime Products Pvt. Ltd. has signed a contract with Maerz Ofenbau AG for the supply of materials and equipment for a Maerz two-shaft lime kiln to be built at its Tuticorin Plant in Tamil Nadu. The new kiln of the rectangular type E2 will process limestone from the Middle East, with different gradings (35-50mm, 50-90mm and 30-60mm) to produce 150t/day of lime. Hard coal dust will be used as fuel.

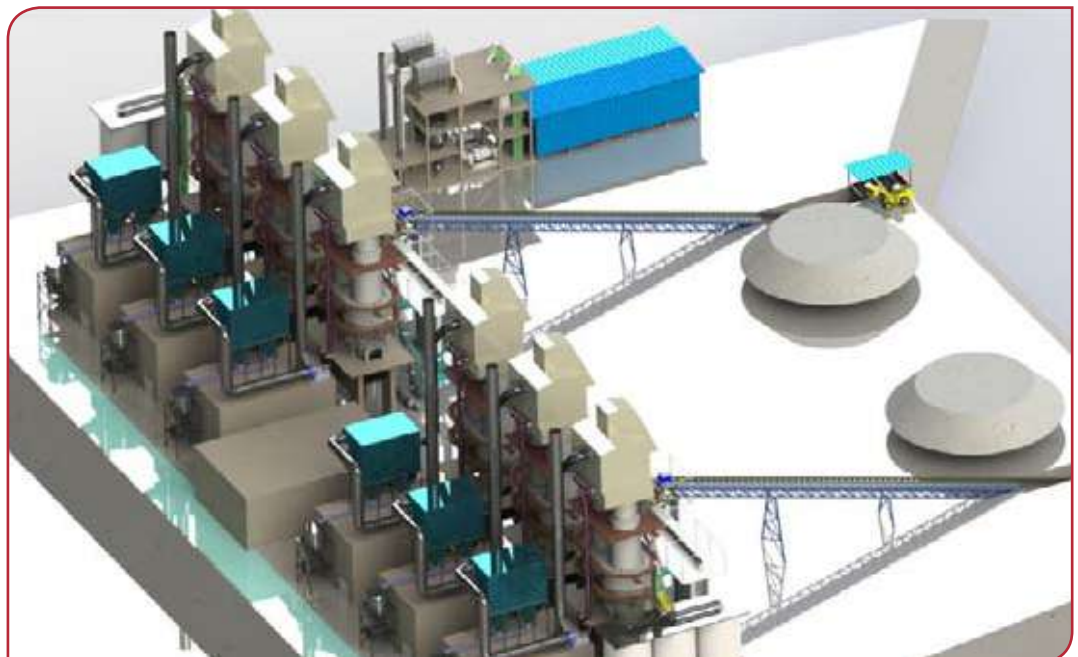
And finally... the largest Maerz plant in the world

China: Sinosteel Co., Ltd., based in Beijing, China, has placed an order for six Maerz PFR lime kilns to be installed in Liuzhou City, Guanxi Province, for Liuzhou I&S Co., Ltd., as the end-user. With Liuzhou Iron & Steel's already existing five 600t/day Maerz PFR kilns, this lime plant is set to become the largest Maerz plant in the world!

The new kilns of the circular R4S type will process limestone with a grading of 40-80mm and will produce 600t/day of burnt lime. Pulverised hard coal will be used as the fuel.



Right: Six further 300t/day R4S circular Maerz PFR kilns will add to Liuzhou I&S's five existing kilns, making the plant in Liuzhou the largest Maerz installation in the world.





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Global Cement staff

Chain sector round-up

Global Cement looks at the latest news from suppliers of chains to the cement sector.

FB rEVOLUTION scraper chains

During a meeting with the maintenance manager of a well-known German producer of chip and MDF boards, FB was challenged to provide a forged scraper chain that could run faster, over a longer distance and had an increased working life with reduced down time. When selecting the type of chain to use in a scraper conveyor the benefits of drop-forged link chains have to be balanced against the advantages of conveyor chains to meet as many of the customer expectations as possible, but there is always some compromise. In this case the customer did not want to make any concessions.

In reviewing the request, the FB team realised that there was an opportunity for an optimised solution of scraper chains for the MDF sector and also for many other sectors with similarly ever-increasing requirements to reduce operating costs and increase operational up time, such as the handling of

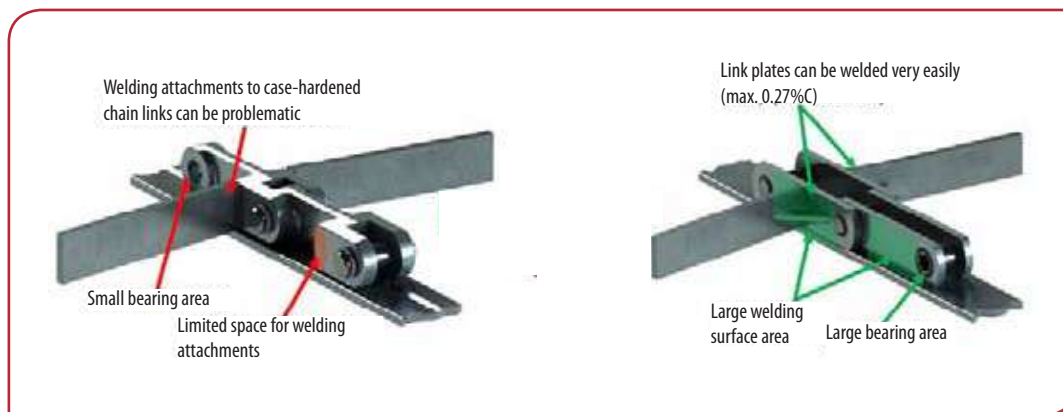
alternative fuels in the cement sector. It therefore decided to design a scraper chain based on conveyor chain to DIN8167/ISO1977 but using a new link plate material, FB1000 and welded pins and bushes.

As a result of using these materials and the optimised construction, the breaking force and fatigue strength are increased by between 30% and 50% compared to DIN-ISO conveyor chains. This new type of scraper chain offers up to 90% larger bearing-area compared to drop-forged link chains or round steel chains. The bearing-pressure can thus often be halved, which has a very positive effect on the wear and the life of conveyor chains and sprockets.

The next challenge was to fit this new chain to the existing conveyor system with no reconstruction works and no impact on capacity or speed. Based on flexible and modern manufacturing capabilities and tools, FB can build almost any pitch chain. The conveyor symmetry thus remains unchanged. This means that the level of chain-guides, pitch circle

diameter of sprockets and diameter of the pulleys require little or no adjustment. Forged chain is mostly driven by split-sprockets with removable-tooth segments. Wear-resistant tooth-segments for the FB rEVOLUTION chains can be fitted to the existing hub body saving time, money and trouble. This style of chain also has a

Below: The differences between a traditionally-made scraper chain and the new FB rEVOLUTION chain.





Left: RUD's new R160 round steel chain in use.

number of other advantages compared to drop-forged link chains or round steel chains, including much more space for welding scrapers or attachments. This increased area allows for a stronger weld and the possibility of a greater variety of shapes and designs of scrapers. This helps to avoid common issues with welded scrapers on drop-forged chain with their case-hardened or high hardness links. If something should get stuck in the conveyor system, FB rEVOLUTION conveyor chains can also be reversed, unlike drop forged chains, which cannot.

The addition of stainless steel and hardened AISI420V pins and bushes allows the chain to be used with moist or acidic conveyed material, such as that found in scrapers used for wet ash, biomass or coal infeed systems, wood chip or bark as well as for alternative fuels in cement plants.

New R160 round steel chain from RUD


RUD reports that it offers its customers double the service life in the use of bucket elevators and ash removal systems – the new round steel chain R160 has been optimised with regard to a longer service life. A specially alloyed chain steel significantly improves the wear behaviour with the same breaking force. With a breaking stress of 400N/mm^2 designed for particularly rough and heavy duty scenarios (e.g. de-ashers with highly abrasive fly ash content in coal-fired power plants), it now claims that it doubles the standard operating life compared with other chain types and thus significantly increases the operating

life cycle of the entire system. It is currently available in the following sizes: $22\text{mm} \times 86\text{mm}$, $26\text{mm} \times 100\text{mm}$ and $30\text{mm} \times 120\text{mm}$. The RUD R160 offers improved technical features that reportedly contribute to higher economic efficiency and operational safety. In combination with other products in the portfolio, RUD claims to offer its customers the most innovative tailor-made solutions.

CICSA - A short history

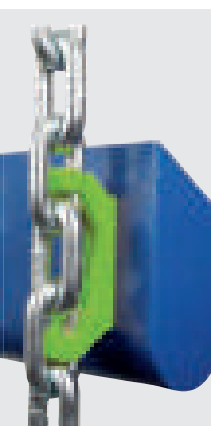
CICSA, founded in Northern Italy in 1941, is a company specialised in the production of chain systems for bulk material handling solutions. Its state-of-the-art technology and know-how has made it one of the leading chain manufacturers on the international market.

CICSA operates in over 60 countries, providing a wide range of products that includes round steel link chains (up to a diameter of 42mm), pin and bush chains, forged link chains and lifting chains, with all the corresponding attachments, driving and return wheels, connecting links and buckets, designed to meet all capacity requirements.

Special solutions are available for transportation of corrosive materials, high temperature operations or particularly demanding environments, as seen in the cement sector. CICSA also manufactures turnkey bucket elevators and chain conveyors, designed and engineered according to the most skilled solutions. 



Left: Examples of CICSA's pin and bush chains and forged linked chains.



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Robert McCaffrey, Global Cement Magazine

Global CemFuels Conference 2018 - Reviewed

The *Global CemFuels Conference* has successfully taken place in Berlin, with 160 attendees from 30 countries, 31 exhibitors and 20 presentations. The conference covered all aspects of alternative fuel use in the cement and lime sectors. The 13th *Global CemFuels Conference* will take place in February 2019 in Amsterdam, Netherlands.

Frank Brannvoll of CEMBUREAU kicked-off the conference with a panoptic overview of the global fuels markets. In the EU28, the thermal substitution rate (TSR) is 43% on average, with around 11Mt of alternative fuels (AF) used each year. Frank pointed out that many countries are below average, with a small number of large countries (Germany, France, UK) at above average TSR and with many countries, notably Ireland and Italy, with huge potential for increased AF use. Frank pointed out that when the US dollar is weak, then fossil fuel energy costs are generally lower in non-dollar local currency terms. This means that the strength of the dollar has a big effect on the choice of fuels used worldwide in the cement industry, particularly with regard to the fossil fuel/AF mix. He suggested that OPEC has decided that US\$60-70/barrel is a level that they can 'live with,' which is just as well, since as the oil price rises above this level, the Americans can bring more shale gas rigs on line to take advantage of the higher prices, naturally capping global energy prices. Frank Brannvoll also pointed out that Chinese coal consumption dwarfs all other coal markets on the planet, but that the Chinese authorities have been trying to exert greater control over the industry and over pricing: mines have been closed or are now more highly regulated, while there has also been a clampdown on coal price speculation, in order to bring coal prices into a preferred price range. However, coal is trading at above the preferred range and the authorities have now stipulated a maximum price (of RMB750/t, US\$118/t). Globally, petcoke prices are strongly correlated with

coal prices, but at a discount (otherwise industrial users would just use coal). India has partially banned the use of petcoke, on environmental grounds. There is normally a US\$10/t spread between 4.5% sulphur and 6.5% sulphur petcoke. "Higher prices for petcoke mean shorter payback periods for AF projects," concluded Frank Brannvoll.

The next speaker was **Andy Hill** of SUEZ Recycling and Recovery UK Ltd, who started off by saying that Brexit will not have a major effect at its start date in March 2019, but that uncertainty is a crucial factor, particularly over the future trading situation and the imposition of tariffs at borders. Andy pointed out that RDF is a lower calorific value fuel, whereas SRF is more highly processed and has higher calorific value. Andy pointed out that environmental taxes have been implemented around the world, but that there is a long way to go to complete coverage. The EU ETS has not been a success so far, with the CO₂ price languishing at under Euro10/t for years. However, the EU ETS Phase 4 is forecast to raise the level to beyond Euro20/t (at which point European cement becomes uncompetitive) to as high as Euro40/t. The Chinese, for environmental reasons, are closing coal, cement and steel plants and are banning the import of many categories of recyclables. This has created massive bottlenecks in European recycling flows. Alternative markets (Turkey, Malaysia, Vietnam) have also pushed up prices and quality standards: "It's a buyers market." Andy suggested that this might signal the 'death' of co-mingled municipal waste collections, in order to force up the quality of waste and

1: Frank Brannvoll from CEMBUREAU looked at coal and petcoke price trends, which impact on the profitability of AF.

2: Andy Hill from Suez presented on the topic of alternative fuel use trends around the world.

3: André van Steenberghe explained how HeidelbergCement is increasing its global alternative fuel utilisation rates.

4: Alternative Resource Partners' Ed Verhamme gave a rundown of trends in alternative fuel use.





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recycling streams. In the meantime, there will be a greater volume of RDF and SRF, with price implications for buyers. In the medium term, there is likely to be a marked change in consumer behaviour which will drive recycling flows.

André Van Steenberge next spoke on behalf of HeidelbergCement and pointed out that the company has a target TSR of 30% worldwide. This target has already been met in Europe, but is at only 10% in North America, only 7% in Africa/Eastern Mediterranean and only 3% Asia-Pacific. New management initiatives have been put in place worldwide in order to push AF use, including a dedicated board member. André pointed out that although some AFs are common around the world, others are more local, such as rice husks, so that development of local markets for AF streams will be critical. André pointed out that Italcementi was more advanced in some areas when HeidelbergCement took it over and the combined group has learned from the purchased company in



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5: Matthias Mersmann from aixergiee Aixprocess explained how the company's computational techniques can help optimise the combustion of AF.

6: Tias Mazza from Loesche spoke about maximising the use of AF in cement plants.

7: Stéphane Poellaer of Alterline presented on how to mitigate the negative effects that alternative fuels can bring to the cement production process.

8: Katrin Christina Salbrechter from Montanuniversität Leoben presented her findings on the fuel drying characteristics of the Loesche Rocket Mill.



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9: Guests from Loesche, Montanuniversität Leoben, Untha, Metso, Weima, Westerier and FCT Combustion at the Welcome Drinks reception, hosted by Entsorga in celebration of its 20 years in business.

10: Borja Alonso (left) and Michael Held (right) on the stand of the alternative fuel co-processing expert Vecoplan.



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11: Felix Bartknecht from SICK on the company's stand.

12: Richard Maslen (left) and Linda White (right) are all smiles on the Fairport Engineering stand.

13: Harald Eirich of Gustav Eirich Mfk. The company produces mixers for a range of industries.



14

order to roll out best practice. For every waste stream that the company is contracted for, there is always a Plan B, and sometimes plans C, D and E, for alternative destinations and users for each material if the first plant cannot accept the material. André suggested that the Chinese ban on impure recycling fractions will lead to a greater requirement for better sorting and that this sorting process might happen in Asia, rather than in the higher-cost EU. Again, lower use of plastics is the outcome.

14: An attentive audience listens to one of the 20 presentations.



15: Richard Tromp (left) and Cor Groen (right) on the joint BHS Europe / Nihot / NRT stand



16: Christian Raestrup (left) and Alexander Hayek (right) from Bernd Münstermann GmbH, a supplier of material dryers and baghouses for electrostatic precipitator conversions.



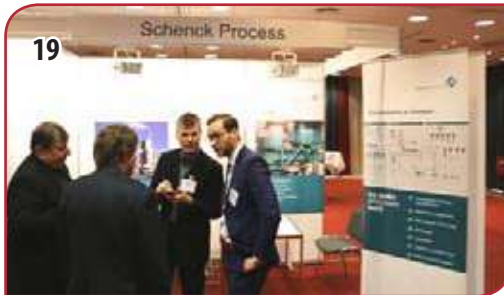
17: A busy scene on the VIDMAR stand, receiving cement producer delegates from Indonesia.



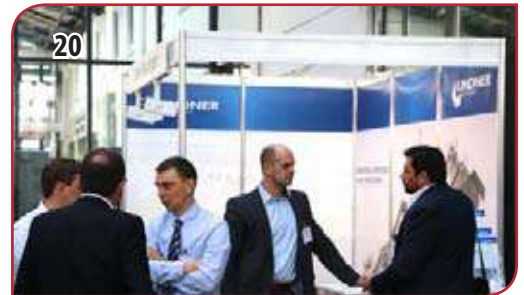
18: A brave delegate dons aixergée Aixprocess' virtual reality headset, which lets you see 'inside' an active cement plant calciner.



19: A lively discussion on the Schenck Process stand.



20: Fritz Driessler from shredding expert Lindner (facing centre) speaking with an interested visitor to the company stand.



21: Jason Titmas from Thermoteknix Systems, producer of high definition colour imaging cameras for cement kiln applications.



22: Delegates from City Cement (Saudi Arabia) ask a question of Basri Ogut from alternative fuel handling expert Walter Materials Handling (ATS Group) (facing).



23: Fabrizio Gasparin (left) and Filippo Cappozzo (right) from screen manufacturer ECOSTAR.



both recycling and the development of a supply of waste-based AF. Southeast Asia and Central America are among those areas with the greatest potential for increase in use of AF. In the longer term, Africa is almost totally undeveloped.

Hansjörg Diller next spoke for MVW Lechtenberg, on how to improve quality of alternative fuels. "Quality management always

Ed Verhamme of Alternate Resource Partners next gave a global overview of AF trends. He suggested that AF has the potential of abating 750Mt of CO₂ per year by 2050 if current trends continue. If all EU countries had a 60% TSR, 26Mt of CO₂ emissions would be avoided each year, 15.Mt of waste would be processed, 11.1Mt of coal use would be avoided and Euro12bn of investment in Waste to Energy plants could also be avoided. Ed suggested that global coal production peaked in 2013-2014 and has been steadily declining since then, but that there is still strong underlying demand, for instance from India. A ban on landfilling, or at least strenuously applied and punitive landfill taxes, will strongly encourage

starts at the source," suggested Hansjörg. At the RDF plant, the incoming waste must be fully characterised. Different categories of waste must be stored separately and any foreign objects must be pre-sorted and removed. Sampling and continuous analysis of waste and product characteristics must be performed and action taken on the results. Materials that are considered to reduce RDF quality should be excluded from AF production, including chlorine-containing and heavy metals-containing materials, as well as those materials with high moisture content and low calorific value. Specific and systematic methods have been stipulated to try to ensure reproducible and representative sampling methods, but with such



inhomogeneous materials, this can be difficult. The RDF producer should make a declaration of the composition of the RDF at regular intervals, perhaps after every 1000 or 4000t produced, including stating the measured limits on minor metals, sulphur, chlorine, moisture content and CV of the AF. In such a case, the recipient of the fuel can accept or reject the shipment of AF.

In the next conference session, on case studies in AF, the first speaker was **Matthias Mersmann** of aixergee Process Optimisation, speaking on the successful optimisation of a secondary-fuel-fired calciner. The calciner in question had fall-out of material in the TAD 'knee,' coatings and blockages in the bottom stage cyclones and frequent CO peaks. The plant wanted to safely combust up to 100% of AF in the calciner and at the same time to increase production by 200t/day, while fitting into the same space and reusing the existing ID fans. Trial-and-error can be used to determine the correct engineering approach, but the smarter method is to use a model-based approach, using a virtual model of the process. Matthias pointed out that the complete characterisation of the RDF is critical, in terms of particle shape, density, calorific value and burn-out behaviour, in order to be

able to correctly model the process. Matthias showed that a 'pumping' or periodic purging of material from the calciner in this case was unavoidable due to the calciner's design, leading to localised reducing conditions and breakthrough of CO-rich gas into the preheater, as well as a carry-over of unburned fuel into the cyclones which led to coating problems. A redesign of the calciner was simulated and perhaps unsurprisingly the most expensive suggested option was found to be the most effective solution, involving slimming the calciner and the introduction of a longer goose-neck. During a six-week kiln stop the designed solution was enacted and as a result, all process aims were met.

Michail Akritopoulos of Cinar Ltd next spoke on calciner upgrades to burn 100% AF and pet-coke. Michail pointed out some of the unavoidable side effects of the use of AF, including an increased heat consumption and to a certain extent, a reduction in production rates. He pointed out that there is a limited potential for thermal substitution on the main burner, of around 40%, whereas on the calciner burner the TSR can be up to 100%: larger particle sizes can also be used in the calciner due to the longer residence times. Due to the wide variety

24: Marcus Wacławik (left) and Andres Salazar (right) of tyre-derived fuel production expert Eco Green Equipment.

25: Representatives from the FLSmidth group, experts in alternative fuel conveying, feeding and dosing. Left to right: Juan José Riesgo (FLSmidth S.A Spain), Daniel Gebert (FLSmidth Wadgassen), Thomas Jennewein (FLSmidth Pfister) and Henrik van Deurs (FLSmidth A/S).

26: Joel Maia (left) and Constantine Manias (right) from burner producer FCT Combustion.

27: Discussions on the stand of gas analyser manufacturer ENOTEC.

28: Peter Streinik (left) and Daniel Wresnik (right) from single-stage shredder manufacturer UNTHA shredding technology.

29: Shredder producer Molinari's Leonardo Casa (left) and Marco Gandolfi (right) on the company stand.

30: Dr Luigi Di Matteo (facing left) and Svetoslav Chopov (facing right) of alternative fuel handling expert Di Matteo Förderanlagen speaking with cement company delegates. Dr Di Matteo won the prize for best presentation, as voted for by delegates.



31: Eric Plantié of tyre recycling equipment producer Precimeca answers a question from a delegate.

32: Jens Ole Simonsen from alternative fuel shredder manufacturer Metso Denmark on the company's stand.



30: Discussions on the Westeria stand. Björn Fahlé from the company is second on the left.



31: Moisés Núñez (facing) of mobile grinding plant manufacturer Cemengal answers a question about his company's equipment.



33: All smiles on the stand of tyre shredder manufacturer Gradeall International. From left to right: Connor Murphy (Gradeall), Stephen Murphy (Gradeall) and Peter O'Kane (PPP Tyre Recycling).



32: Lars Jennissen (right) and Jens Jennissen (facing) from alternative fuel manufacturer N+P answer a question from a cement producer delegate.



34: On the Loesche GmbH stand. From left to right: Katrin Christiana Salbrechter (Montanuniversität Leoben), Johannes Uttinger (ATEC Production & Services), Michael Gramling (Loesche GmbH) and Ayman Elnaas (Loesche GmbH).



35: Alternative fuel handling equipment producer Saxlund International. Left to right: Michael Brehmer, Matt Drew and Manfred Sommer.

36: The stand of Sludge pump manufacturer Putzmeister was manned by Rüdiger Dalhoff (left) and Stéphan Guérin (right).



sible for 44% of the world's waste, but the greatest future increase in waste production will be in poorer Asian countries. Taís suggested that a large cement plant can make about 80% of the value produced compared to a Waste-to-Energy plant, but at only 40% of the capex. She suggested that the first 5% TSR is the hardest, since it involves overcoming barriers in the mind, not just of the plant's neighbours, but also in the operating paradigm of the cement plant's personnel and cement company management. The progressive technical steps towards great AF use are now well-trodden by plants around the world, including the use of a chlorine bypass, perhaps precalciner modifications, the use of AF conditioning capacity...

of configurations of precalciners, calciners, preheaters, goose-necks, TADs, burners and other process parameters, each case must be scrutinised separately and a custom-solution applied and Michail gave a number of examples of successful calciner upgrades. He gave some details of the Polysius Step Combustor, as well as the FLSmidth Hotdisc, both of which can be used to combust bulky alternative fuels. AFS 'skewers' can be used to burn whole tyres, while the 'compact calciner' from PMTEchnologies has also successfully been used to improve AF TSR rates.

Taís Mazza of Loesche GmbH next spoke on an integrated approach to maximise the use of AF in cement plants. Countries in the OECD are respon-

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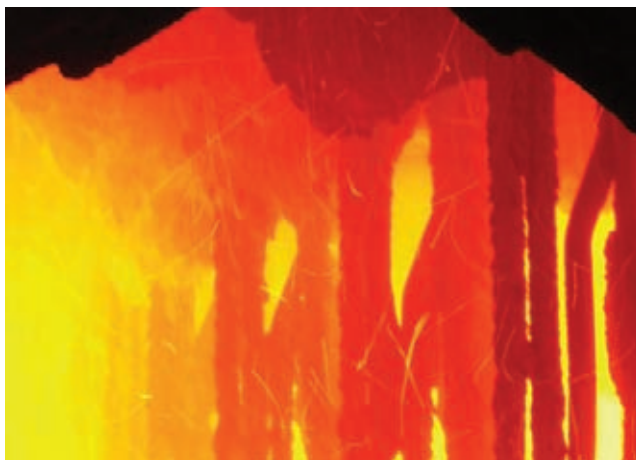


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Nepal: Palpa Cement Industries orders mill from Gebr. Pfeiffer for Nepal

Palpa Cement Industries has ordered an MVR 3350 C-4 mill from Gebr. Pfeiffer for its plant at Sunwal, in the district of Nawalparasi. The vertical roller mill has a drive power of 2150kW and is designed to grind 130t/hr of cement at 3000 Blaine and 100t/hr of blast-furnace cement at 3800 Blaine. Commissioning of the mill is planned for mid-2019. It is the fourth vertical roller mill order from Nepal for Gebr. Pfeiffer over the last year.

Turkey: DAL Teknik Makina completes Nuh upgrade

Dal Teknik Makina has completed an upgrade project on Kiln Line 1 at Nuh Çimento in Kocaeli. Key features of the project included increasing the line's production capacity, decreasing its energy requirements, making savings on power consumption and lowering the exit temperature of the clinker. The work has increased the plant's production capacity from 2800t/day to 3400t/day. Other benefits of the update include decreasing the specific heat consumption of clinker from 870kCal/kg to 740kCal/kg clinker clinker, reducing electrical power consumption by 7kWh/t and increasing the raw mill capacity from 160t/hr to 185t/hr. The exit temperature of clinker was also reduced to 55°C above the ambient temperature.

This project involved the design, manufacturing and erection of the pre-heater tower cyclones group, kiln feed transport system, clinker cooler, kiln hood, removing of dust cyclone at tertiary air duct, cooler vent fan modification, main bag filter duct modification and kiln inlet seal and commissioning of the system.

The first part of the upgrade project was the modification of the pre-heater tower, which as a result reduced the pressure drop, improved heat transfer and separation efficiency, and heat consumption. The second part of the project was the retrofit of the grate cooler. The clinker cooler, kiln hood, cooler fans and cooler vent fan were replaced by Fons Technology International. In this part, the kiln hood, cooler vent, exit pipe of waste heat recovery (WHR) unit and tertiary air duct were also modified. The third part was to replace the horizontal duct of the main bag filter inlet with an inclined one in order to avoid dust accumulation. The last step was the replacement of the pneumatic kiln feed by bucket elevator.

Below: The Nuh Çimento plant in Kocaeli, Turkey.



World: Report on global supply-demand imbalances

OneStone Consulting has released a multi-client market report, *Cement Projects Focus 2022*, which studies the global cement project sector. It finds that cement capacity is growing faster than the demand and investigates the reasons behind the fact that, despite large over-capacities in many countries, capacity addition has not abated.

OneStone analysed 418 new cement plant projects to be commissioned or delivered between 2017 and 2022, together with capacity utilisation rate on a country-by-country basis. It reveals a number of 'game changers.' Instead of new greenfield plants and new kiln lines, more separate grinding plants are being installed.



France: Fives kiln contract at Lumbres

Fives FCB has been awarded an engineering, equipment supply and supervision of works contract for the replacement of a kiln at the Lumbres cement plant. The work covers replacing the downstream shell of the 42.2m kiln, including the tyre. The project is part of the cement producer's plan to adapt Kiln 5 at the site for the installation of a new clinker cooler.

China: Gambarotta receives order from CBMI-Sinoma

Italy's Gambarotta Gschwendt has received an order from CBMI-Sinoma for four surface feeders and five apron feeders. The company manufactures bulk handling equipment such as elevators and conveyors.

Finland: Metso upgrades plant

Metso has upgraded its Tampere plant to focus on track-mounted crushing units. The new assembly line has increased mobile crushing plant production by 25%. Metso can build a 50t track-mounted crushing plant in two days.

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Belgium: HeidelbergCement breaks ground on LEILAC carbon capture trial

HeidelbergCement has hosted a ground breaking ceremony for the Calix carbon capture pilot at CBR's cement plant at Lixhe. The ceremony itself took place at the Liège Oupeye Water Treatment Plant near Liège as part of the inaugural Innovation in Industrial Carbon Capture Conference. The two-day event, which took place on 7 – 8 February 2018, was organised by the Low Emissions Intensity Lime And Cement (LEILAC) Consortium, a European Union (EU) Horizon 2020 backed research and innovation project.

Construction work on the pilot at the cement plant is scheduled to start imminently. The project will test Calix's carbon capture technology for two years at an operational cement plant. The technology has previously been used in the magnesite calcining sector.



Over 130 delegates from industry, academia and government attended the conference, including *Global Cement Magazine*. The agenda was designed to encourage discussion and knowledge sharing across key stakeholder groups with a strategic interest in innovation in carbon capture technology. As part of the programme, the wider challenges faced by the cement and lime sectors in Europe were also explored, with a focus on how EU industries can contribute to reaching climate change targets, the role of innovation and company entrepreneurship and a knowledge exchange fair on technology.

The LEILAC consortium, which consists of representatives from the lime and cement industries, technology and engineering providers and research institutes, has been set up as an industrial project with Euro12m in EU funding in order to demonstrate technology to reduce CO₂ emissions from cement and lime making.

Left: The preheater tower at the CBR Lixhe plant.

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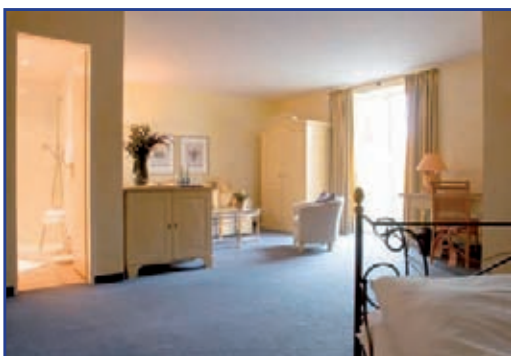
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Helmut Stichling and family look forward to your visit in the near future.





Italy: Buzzi reports on improved 2017

The Board of Directors of Buzzi has approved the preliminary accounts for 2017, which see sales of cement at 26.8Mt, an increase of 4.4%, and consolidated revenues of Euro2.67bn, an increase of 5.1% year-on-year.

In Italy, Buzzi's position benefited from the takeover of Zillo Group, which helped to raise clinker and cement volumes by 19.3%. However, average selling prices were down 'significantly' year-on-year. Overall consolidated sales were up by 14.0% year-on-year at Euro428m. Consolidated sales would have increased by 2% in the absence of the Zillo acquisition.

In Germany, cement sales were up by 4.5%, with total sales of Euro588m, a 2.7% year-on-year rise. In Luxembourg and the Netherlands, cement sales were also up by 4.5% year-on-year at Euro187m.

Sales were also improved in Poland (+0.7%), Czechia (+8.2%), Russia (+1.5%), the USA (+0.2%) and Mexico (12.7%), while they declined in Ukraine (-1.5%).

Denmark: Strong orders for FLSmidth, despite cement sector

Cement plant manufacturer FLSmidth has announced its financial results for 2017, which show, overall, its strongest order intake for four years. Total orders grew by 6% year-on-year in 2017, bolstered primarily by the company's Minerals division.

Cement sector orders for the year were Euro611.0m, 1% lower than the Euro615.0m seen in 2016. Revenue from cement sector orders came to Euro547.9m, 5% lower than the US\$576.0m orders received in 2016.

"2017 probably marked the trough of the business cycle and, based on our good positioning and strong life-cycle solutions, we expect our business to start growing again in the coming years. Our order intake increased and the momentum in the mining sector continues in 2018, while cement market conditions are expected to remain unchanged," said CEO Thomas Schulz.

For 2018, FLSmidth anticipates an overall revenue from all activities of Euro2.42-2.68bn (2017 was Euro2.42bn).

Austria: Appointment at w+p Zement

Christoph Stotter has been appointed as the head of Development & Quality Assurance at w+p Zement. He succeeds Walter Steinwender.

Stotter studied at the Montanuniversität in Leoben and has since gained experience in process engineering, research and development and product management.

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UK: Cement sector emissions fall

CO₂ emissions from cement production in the UK fell by 2% year-on-year to 696kg/t in 2016 from 709kg/t in 2015. Data from the Mineral Products Association (MPA) Sustainable Development (SD) Summary Data for 2017 report shows that local cement sales rose by 3% to 10.5Mt from 10.2Mt at the same time. Alongside this, waste and by-products recovered as raw materials and fuels by the cement industry fell by 6% from 1.6Mt to 1.5Mt.

"The MPA supports the industry's continuing commitment to measuring and reporting data and to transparency on performance. The reporting process is now evolving to reflect the seven strategic priorities set out in the MPA Charter and as part of this process we will be working to further improve the quality and coverage of our sustainability data," said Nigel Jackson, the chief executive of the MPA.

UK/World: Global Cement & Concrete Association launched

Nine cement and concrete companies have launched the Global Cement & Concrete Association (GCCA), a new association that intends to develop the sector's role in sustainable construction. The association also wants to build innovation throughout the construction value chain, in collaboration with both industry associations and architects and engineers.

The GCCA will be led by international cement companies and headquartered in London, complementing and supporting the work done by existing associations at national and regional level. Membership of the GCCA is available for cement manufacturers from all over the world that share the organisation's values, and partnerships will be developed with organisations that share its vision. GCCA's founding members are Cemex, CNBM, CRH, Dangote, Eurocement, HeidelbergCement, LafargeHolcim, Taiheiyo and Votorantim. They represent 1046Mt/yr of cement production capacity, according to the *Global Cement Top 100 Report*.

France: Calcia plant blockaded

Access to the Calcia cement factory in Calvados was 'blocked' on Wednesday 7 February 2018 by protestors from the General Confederation of Labour (CGT). They were protesting against the salary policy of the company, as well as job cuts taking place across France. The move followed the collapse of annual pay talks between the HeidelbergCement subsidiary and the CGT.

Bertrand Moreau from the CGT said that the unilateral 1.3% pay increase offer from Calcia was not sufficient and that workers had witnessed 'deteriorating working conditions' since HeidelbergCement took over the company in 2016. He also expressed disappointment at plans to cut 22 jobs at Calcia's Cruas plant in the Ardèche. The company employs around 1300 people across 10 sites in France.

France: Sector to increase use of wood waste

The French cement industry union (SFIC), plus three other professional organisations, has announced that it has committed to increase the amount of wood waste used in France's cement plants. It has committed to increasing the amount used by 90% compared to 2015 by 2020.

90,000t of wood was used as fuel in cement production in 2015. The goal is to use 170,000t in 2020. Four cement plants will act as pilot sites. The wood used must be from the same region as the plant burning it. According to the SFIC, alternative fuels account for 41% of cement fuels used in France.

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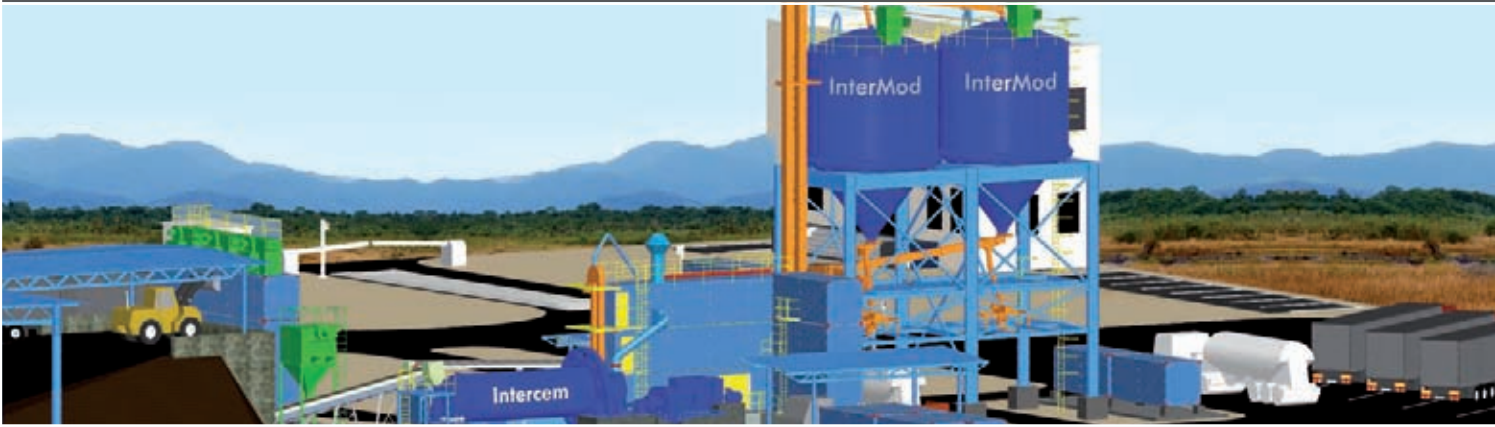
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Italy: ECRA launches oxyfuel pilot project

The European Cement Research Academy (ECRA) has launched its oxyfuel carbon capture pilot projects at HeidelbergCement's Colleferro plant in Italy and LafargeHolcim's Retznei plant in Austria. The two locations were chosen from a shortlist of five sites. The pilots will test oxyfuel technology on an industrial scale. The test phase of the research is expected to cost Euro80m and the cement industry has contributed Euro25m towards this. 'Substantial' funding from European or national research schemes is being sought.

"The technical feasibility of oxyfuel technology can only be proven in real-scale application, but we have sufficient information from our research to believe that we will obtain a positive result after the trials" said Daniel Gauthier, chairman of ECRA.



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Peter Edwards, Global Cement Magazine

Cement in the Benelux countries

To fit in with the location of the inaugural *Global GypSupply Conference* in Brussels, Belgium on 13-14 March 2018, *Global Cement* turns its attention to the Benelux countries...

Belgium

The Belgian cement sector is the largest of those in the Benelux region. It has four active integrated cement plants (6.6Mt/yr) and four active clinker grinding plants (3.2Mt/yr) that give a total national capacity of 9.8Mt/yr, according to the *Global Cement Directory 2018*. There is also a 0.2Mt/yr white cement plant in Harmignies, Hainaut, which no longer makes cement.

As shown in Figure 1, the integrated plants are predominantly in the Province of Hainaut, close to areas containing limestone. One of the integrated plants is located close to the Dutch and German borders in Lixhe, in the far east of the country. All of the integrated plants are in the French-speaking region of Wallonia. By contrast, the cement grinding plants are exclusively in the Flemish/Dutch-speaking Flanders region, with plants in Antwerp and Ghent, both historical port cities.

Producer breakdown

All of Belgium's cement plants are operated by four foreign multinational producers. The largest producer by capacity is the German multinational **HeidelbergCement**, which operates two integrated plants (2.4Mt/yr) and two grinding plants (1.7Mt/yr) via its local subsidiary Cimenteries CBR Cementbedrijven, which traces its history back to 1929. There is also a white CBR plant of 0.2Mt/yr that no longer operates.

While the above capacities add up to 4.3Mt/yr (43% of national capacity), there is significant clinker transport from the integrated plants at Antoing and Lixhe to the grinding plants. Both integrated plants are located directly on the inland waterways. CBR's website states that its cement production capacity is actually 3.8Mt/yr, once the movement of clinker is taken into account. The Lixhe plant also ships 30% of its finished product by water.

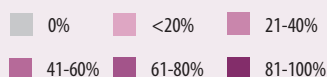
Right - Figure 1 & Table 1:
Capacity of Belgian Provinces, with locations of cement plants shown. Provinces are colour-coded according to cement capacity, relative to Hainaut, the Province with the highest capacity.

* = Includes closed plant (4).

** = Includes non-cement-producing Provinces.

INTEGRATED

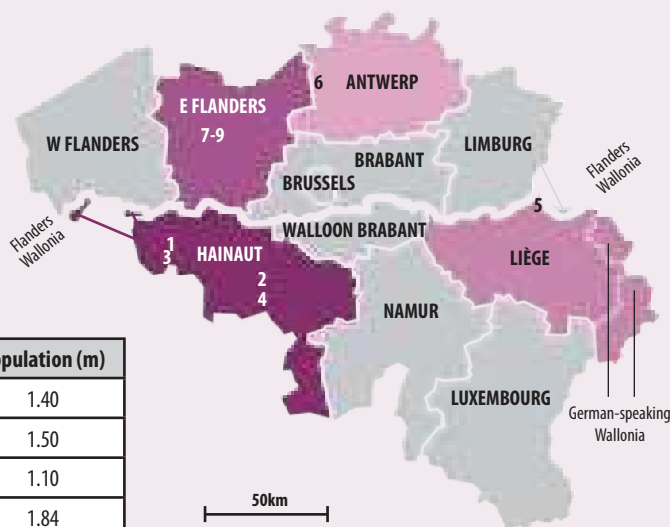
1. Compagnie des Ciments Belges (CCB) (Cementir Holding), Gairain-Ramecroix, Hainaut, 2.5Mt/yr.
2. Holcim Belgique (LafargeHolcim), Obourg, Hainaut, 1.7Mt/yr.
3. CBR (HeidelbergCement), Antoing, Hainaut, 0.9Mt/yr.
4. CBR (HeidelbergCement), Harmignies, Hainaut, 0.2Mt/yr (White / Closed).
5. CBR (HeidelbergCement), Lixhe, Liège, 1.5Mt/yr.



Province	Capacity (Mt/yr)	Population (m)
Hainaut	5.3*	1.40
East Flanders	2.6	1.50
Liège	1.5	1.10
Antwerp	0.6	1.84
BELGIUM	10.0*	11.35**

GRINDING

6. VVM nv (CRH), Antwerp, Antwerp, 0.6Mt/yr.
7. VVM nv (CRH), Rieme, Ghent, East Flanders, 0.9Mt/yr.
8. CBR (HeidelbergCement), Ghent plant 1, East Flanders, 1.5Mt/yr.
9. CBR (HeidelbergCement), Ghent plant 2, East Flanders, 0.2Mt/yr.



The second-largest cement producer in Belgium by installed capacity is **Cementir Holding** via its local subsidiary **Compagnie des Ciments Belges (CCB)**. CCB was established in 1906 and was previously part of Ciments Français, Italcementi and (briefly) HeidelbergCement. It was bought by Cementir in 2016 following the merger of HeidelbergCement and Italcementi. The combination of HeidelbergCement's and Italcementi's cement assets in Belgium would otherwise have led to HeidelbergCement having an unacceptable 73% of the national capacity. CCB operates a 2.5Mt/yr integrated cement plant in Gaurain-Ramecroix, Hainaut, which gives it a 25% share of national capacity.

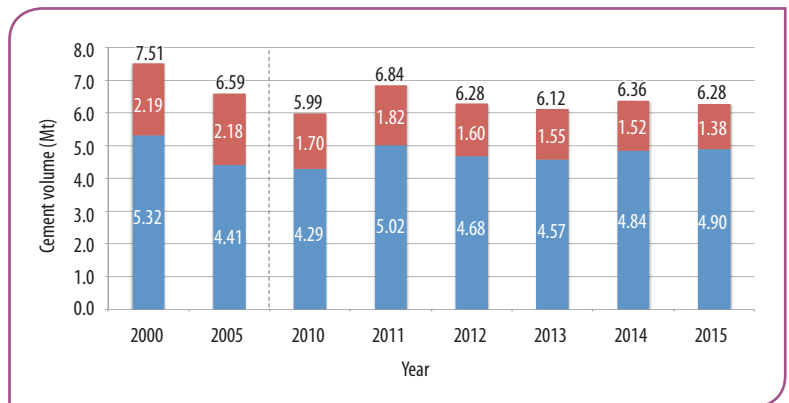
LafargeHolcim, via local unit **Holcim Belgique**, is the third-largest cement player in Belgium by capacity. It operates a 1.7Mt/yr integrated plant at Obourg, Hainaut and a terminal in Antwerp, giving it around 17% of national capacity. It also operates Geocycle, an alternative fuel preparation / sewage sludge treatment facility that provides fuels to the Obourg plant. LafargeHolcim has been active in Belgium since 1925 when the former Holderbank Group (later Holcim) took over the activities of Ciments Artificiels de et à Obourg. The plant had a production capacity of just 11,000t/yr when it was established in 1911.

The final player in the Belgian cement market is Ireland's **CRH**, which operates two grinding plants in Antwerp (0.6Mt/yr) and Ghent (0.9Mt/yr), around 15% of national capacity, as **VVM nv**. CRH has been active in the local market since 2011 when it bought out the family-owned business for Euro100m.

In addition, it was reported in October 2016 that Germany's Gebr. Pfeiffer had been awarded a contract to supply a vertical roller mill by an independent operator, **Cemminerals**. The company's website states that the plant will become active 'in 2018' and will be capable of producing 140-200t/hr (3360-4800t/day, 1.1-1.5Mt/yr) of cement, depending on the grade. It will also grind slag cement.

Production trends

Figure 2 shows the deliveries of cement by Belgian plants from 2000 to 2015, the last year for which data has been made available by Febelcem, the Belgian Cement Association. It also shows cement exports.



Above - Figure 2: Cement deliveries by Belgian cement plants in the 21st Century, with breakdown between domestic consumption and exports.

Source: Febelcem.

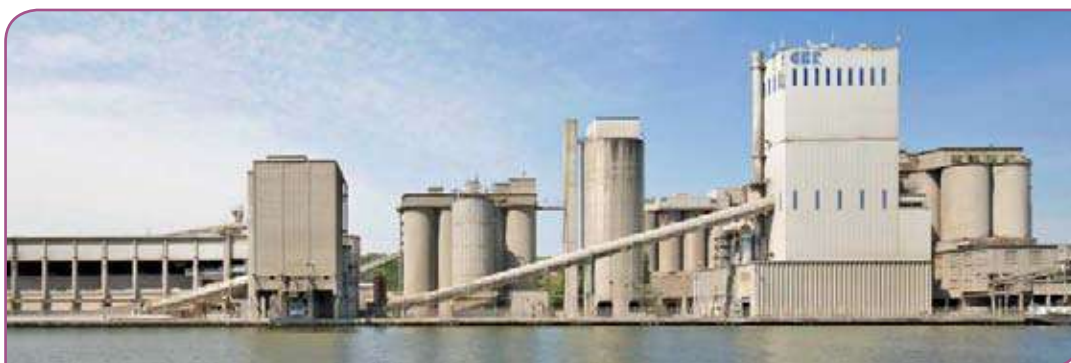
Of this period, production was highest in 2000, with a slump seen in the period around 2010. After a resurgent 2011, production has since levelled off at around 6.2Mt/yr, indicating a capacity utilisation rate of around just 62%.

Over this period, deliveries to Belgium itself have been in the region of ~4.7Mt/yr, with exports making up the balance. Belgium exported 1.38Mt of cement in 2015, around 22% of the cement that it produced. Of this 99.1% went to EU member states, the vast majority to France and the Netherlands.

Recent news

Catching CO₂ at Lixhe: On 7-8 February 2018 HeidelbergCement hosted a ground breaking ceremony for the Calix CO₂ capture pilot at the CBR plant at Lixhe. The event was organised by the Low Emissions Intensity Lime And Cement (LEILAC) Consortium, a European Union (EU) Horizon 2020 backed research and innovation project. Construction work on the pilot at the cement plant is scheduled to start imminently. The project will test Calix's carbon capture technology for two years at an operational cement plant. The technology has previously been used in the magnesite calcining sector.

New CCB boss: Philippe César was appointed member of the board of directors of CCB in January following the Cementir purchase in late 2016. He was also appointed as the Chairman of CCB's board of directors.



Left: The Lixhe cement plant, operated by HeidelbergCement subsidiary CBR, is located directly on a canal.



Netherlands

Right: View along the long wet kiln at the ENCI Maastricht plant in Limburg.

The cement sector of the Netherlands is fairly modest, with just one integrated cement plant (0.9Mt/yr) and three grinding plants (2.8Mt/yr), according to the *Global Cement Directory 2018*. This gives a total capacity of 3.7Mt/yr. The integrated plant is inland, located in Maastricht, Limburg, while, like in Belgium, the grinding plants are all coastal or located on inland waterways.



Producer breakdown

HeidelbergCement is the dominant force in Dutch cement production, in operation via its local subsidiary Eerste Nederlandse Cement Industrie (ENCI). It operates an integrated cement plant in Maastricht (0.9Mt/yr) and two of the three grinding plants (2.0Mt/yr). This gives it 2.9Mt/yr of cement capacity, around 78% of national capacity. All of the plants operate in close collaboration with CBR in Belgium as part of HeidelbergCement's Benelux operations.

ENCI was founded in 1924 and built its first cement plant at Maastricht. It began production in 1928. It has been upgraded extensively over the years and is now part of HeidelbergCement.

In 2010 ENCI and the Dutch government came to an agreement to stop extraction of limestone in the plant's quarry by July 2018 at the latest. Following the final quarrying, clinker production

will also cease by July 2019 at the latest. After that point, the plant will switch to grinding clinker from HeidelbergCement's other operations in the region. When it ceases production, HeidelbergCement will lose one of its strongest alternative fuel performers. The plant uses over 90% alternative fuels, with around 50% of total energy coming from biomass.

ENCI IJmuiden, the larger of the two grinding plants at 1.4Mt/yr, was established in 1931. It is located next to a major TATA Steel plant and produces a high proportion of slag cement. ENCI Rotterdam was built in 1964, also in a steel production hub. It has a capacity of 0.6Mt/yr.

The only other player in the Dutch cement sector is **Orcem**, a local subsidiary of Ireland's **Ecocem**. It opened its slag cement grinding plant at Moerdijk, North Brabant, in 2002. The plant was recently up-

Right - Figure 3 & Table 2: Capacity of Provinces of the Netherlands, with locations of cement plants shown. Provinces are colour-coded according to cement capacity, relative to Noord Holland, the Province with the highest capacity.

* = Includes non-cement-producing Provinces.

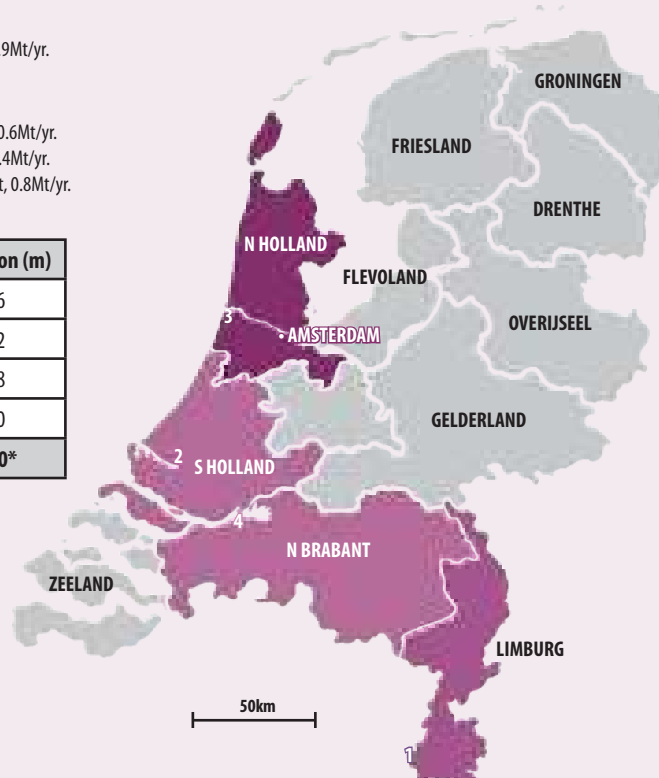
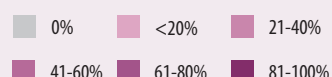
INTEGRATED

1. ENCI (HeidelbergCement), Maastricht, Limburg, 0.9Mt/yr.

GRINDING

2. ENCI (HeidelbergCement), Rotterdam, S Holland, 0.6Mt/yr.
3. ENCI (HeidelbergCement), IJmuiden, N Holland, 1.4Mt/yr.
4. Orcem (Ecocem Netherlands), Moerdijk, N Brabant, 0.8Mt/yr.

Province	Capacity (Mt/yr)	Population (m)
N Holland	1.4	2.76
Limburg	0.9	1.12
N Brabant	0.8	2.48
S Holland	0.6	3.60
NL	3.7	17.00*



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Right: Image of the Cimalux grinding plant at Esch-sur-Alzette.
Source: Visit Luxembourg.



graded with the introduction of a KHD roller press. The capacity was increased from 1320t/day to over 2400t/day (~0.8Mt/yr).

Recent news

Ship upgrade: The Damen shipyard at Oranjerwerf, Amsterdam has upgraded the cement carrying capacity of the merchant vessel (mv) [*LeLie C*] owned by Cebo Marine. Eight new cement silos, with a capacity of 40m³ each, have been installed on the vessel alongside general maintenance. The silos were previously fitted on the mv [*VOS Symphony*] prior to it going for scrap. Damen Shiprepair Oranjerwerf removed the tanks, refurbished them and then installed them on board the mv [*LeLie C*].

INTEGRATED

1. Cimalux (Buzzi Unicem), Rumelange, 1.0Mt/yr.

GRINDING

2. Cimalux (Buzzi Unicem), Esch-sur-Alzette, 1.4Mt/yr.



Left - Figure 4: Cement plants in Luxembourg.

Luxembourg

The first cement plant in Luxembourg was established in 1884 by Brasseur Lambert et Cie in Rumelange. In 1897 it merged with a new company *Compagnie Générale des Ciments*. The new company opened a grinding plant in Dommeldange, which has since closed.

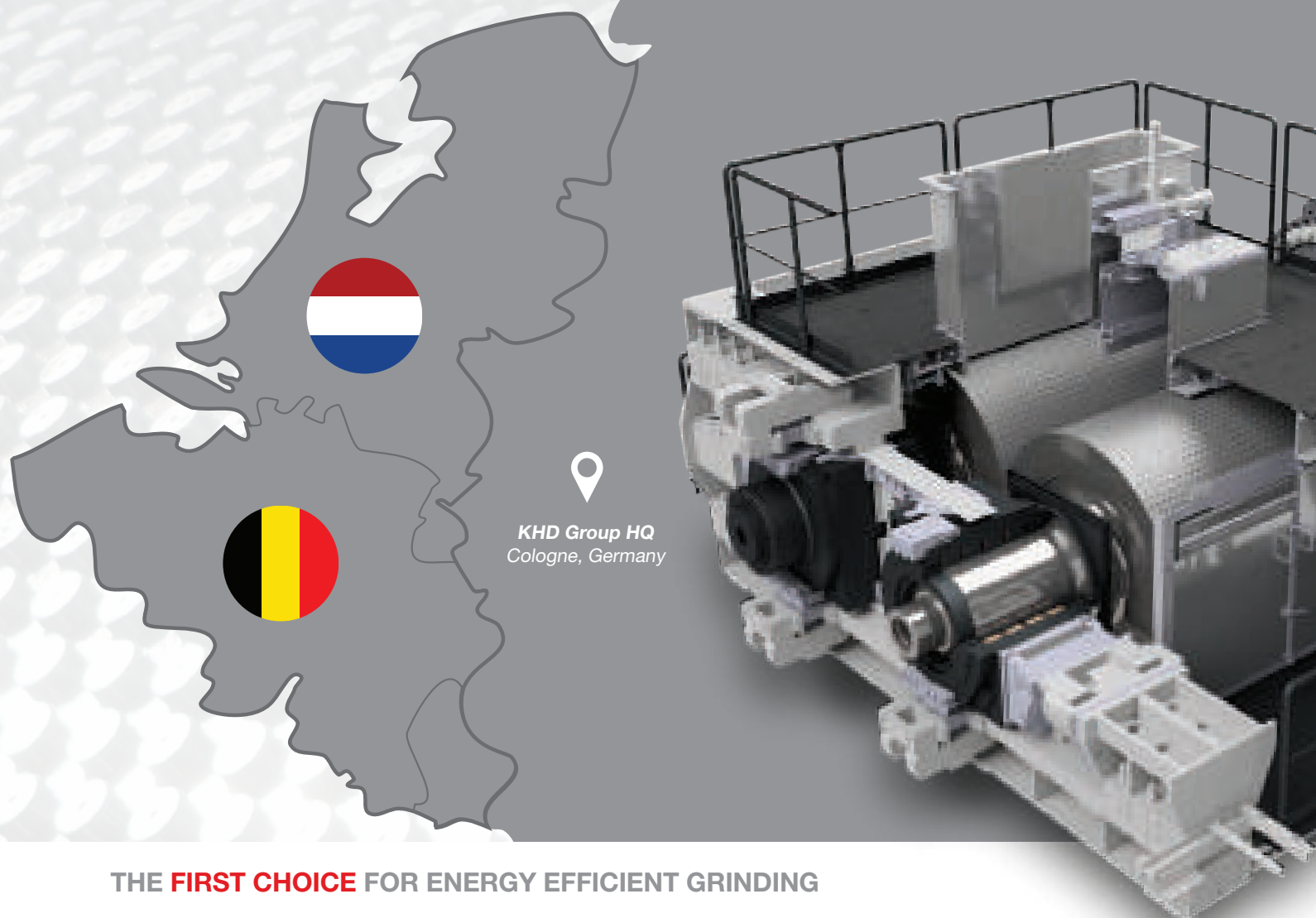
Ciments d'Esch came online in 1912 and produced slag cement as well as Portland cement. It was established by the steel maker ARBED adjacent to its steel plant in Schifflange. In 1920 *Ciments Luxembourgeois* was formed by the merger of *Ciments d'Esch* and *Compagnie Générale des Ciments*. At this point the company was involved in the production of granulated blast furnace cement and slag-based bricks. There were only two kilns, each with a capacity of 150t/day. Annual production was only ~50,000t/yr. Alongside *Ciments Luxembourgeois*, *Materiaux SA* was established to market and sell the products.

Production continued through much of the 20th Century. However, Germany's Dyckerhoff became a 98% shareholder in *Ciments Luxembourgeois* in 1994 when ARBED closed the steel plant. In 2004 the company became part of the Italian group Buzzi Unicem, when it bought Dyckerhoff.

Ciments Luxembourgeois and *Materiaux* merged in 2007 to become Cimalux. Today the company retains its monopoly with respect to cement production in Luxembourg. It continues to operate the Rumelange cement plant, now upgraded to produce 1.0Mt/yr of clinker, and a modern grinding plant at Esch-sur-Alzette, which has been part of Cimalux / *Ciments Luxembourgeois* since 2005.

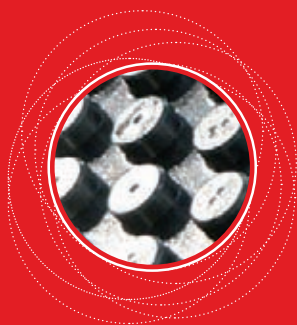
The two plants effectively represent a single cement production base. Limestone from across the border in France is made into clinker at the Rumelange integrated plant (1.0Mt/yr) before being transported 15km by train to Esch-sur-Alzette. The overall capacity is 1.4Mt/yr, thanks to a vertical roller mill installed at Esch-sur-Alzette in 2010.





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Brazil: Further declines in January

According to data from Brazil's national cement industry union SNIC, domestic cement sales in January 2018 were down by 0.1% compared to January 2017, at 4.33Mt. However, average sales per working day increased by 0.2% over the same periods. Apparent consumption in the period stood at 4.4Mt, down by 0.5% from January 2017. The results for the period were in line with SNIC's expectations, with sales forecast to drop in the first quarter of 2018, before seeing growth in the second quarter of 2018.

In the 12 months ending January 2018 domestic sales saw an accumulated 6.2% drop in comparison with the previous 12 month period, at 53.77Mt. SNIC forecasts a 1-2% increase in cement sales in 2018.

Mexico: Cemex dragged down by US

Cemex's operating earnings fell in 2017 due to a lower contribution from the US and South America despite growth in Mexico and Europe. Its operating earnings before interest, taxation, depreciation and amortisation (EBITDA) fell by 7% year-on-year to US\$2.57bn in 2017 from US\$2.75bn in 2016. Its net sales grew by 2% to US\$13.7bn from US\$13.4bn and its cement sales volumes remained stable at 68.5Mt. The cement producer also reported an unexpected loss in net income of US\$105m in the fourth quarter of the year, which it blamed on taxes on other costs.

"Although 2017 was a challenging year, we had important headwinds during the year: underperformance in Colombia, Egypt and the Philippines as well as increased energy costs, mainly in Mexico. As we have done in the past, we focused on the variables we control to dampen these headwinds and we continued to deliver solid results," said Fernando A Gonzalez, Chief Executive Officer (CEO) of Cemex.

Mexico: Tula plant temporarily closed

Cruz Azul has been forced to partially close its cement plant in Tula, Hidalgo due to a lack of an active environmental clearance certificate. Personnel from the Federal Attorney for Environmental Protection made an inspection of the facilities at the cement plant. When verifying the documentation, they found that it lacked the current authorisation issued by the Ministry of Environment and Natural Resources. In this situation, the temporary partial closure of the plant was imposed as a safety measure.

US: Eagle records record revenue

Eagle Materials has reported its financial results for the third quarter of the 2018 fiscal year, which ended on 31 December 2017. It recorded record revenues of US\$359.4m, a rise of 19% compared to the same period of the 2017 fiscal year.

Third quarter gross profit improved by 8%, reflecting the financial results of the recently acquired cement plant in Fairborn, Ohio and related assets (the Fairborn Business) and improved net sales prices across most of Eagle's businesses. 'Cement, Concrete and Aggregates' revenues for the third quarter, including joint venture and intersegment revenues, totalled US\$161.6m, 17% higher than the same quarter last year. Total cement sales volumes for the quarter were 1.3Mt, 12% greater than the same quarter a year earlier. Like-for-like average net cement sales prices increased by 4% and sales volumes declined by 2%, respectively, versus the third quarter of fiscal 2017. This comparison excludes cement sales from the Fairborn Business since its acquisition date.

Operating earnings from cement activities for the third quarter of the 2018 fiscal year were a record US\$52.5m and were 16% greater than the same quarter a year ago. The earnings improvement was driven primarily by earnings from the Fairborn Business and improved average net cement sales prices offset by lower sales volumes from Eagle's legacy facilities.



Peru: Pacasmayo ends 2017 strongly

Cementos Pacasmayo has announced its financial results for the fourth quarter of and the full year of 2017.

In the fourth quarter of 2017, sales volumes of cement, concrete and blocks increased by 7.3%, primarily due to increased sales volumes to the self-construction segment and to a pick up in public sector spending. The company's cement-based earnings before interest, tax, depreciation and amortisation (EBITDA) increased by 13.9% to US\$32.3m, but consolidated EBITDA decreased by 35.7% due to a write-off in a water-desalination project.

For the full year, sales of cement, concrete and blocks decreased by 0.8%, despite the significant decline in sales volume during the first four months of the year due to the effects of the El Niño. It is important to note that year-on-year sales volume has increased steadily every month, from May 2017 through to the end of the year. Cement EBITDA for the year reached US\$114.9m, a decrease of only 2.2%, despite the aforementioned detrimental El Niño effects on both sales and costs.

Colombia: Cement production falls

Cement production in Colombia fell by 1.5% year-on-year from 12.5Mt in 2016 to 12.3Mt in 2017. Sales fell by 1% from 12.1Mt to 12.0Mt, according to data from the National Administrative Department of Statistics (DANE). Sales in Antioquia, Caldas and Nariño rose by 5.7%, 16% and 17.1%, respectively. However, sales in Casanare, Cordoba and Santander dropped by 29.5%, 15.9% and 7.4%, respectively.

Colombia: Argos reports loss in Q4

Cementos Argos has reported a net loss of US\$23.4m in the fourth quarter of 2017 due to lower prices and higher costs, primarily due to economic deceleration in Colombia. The net loss was a contrast to the US\$21.6m profit made in the same period of 2016. Earnings before interest, tax, depreciation and amortisation (EBITDA) fell by 8.9% to US\$126.7m during the quarter.

"The fall in income and EBITDA of Cementos Argos is best explained by the price of cement in Colombia, which reached its lowest level in the second quarter of the year," said the company in a statement. Imports from countries that subsidise industrial energy costs and exchange rate changes led to the fall in prices.

For the whole of 2017 Cementos Argos' net profit slumped by 86.3% to US\$27.0m, compared to US\$196.9m during 2016. EBITDA for the full year 2017 was down by 15% to US\$497.0m.



Colombia: Cemex reports on Maceo situation

Cemex Latam Holdings, the subsidiary of Mexican cement company Cemex in Central and South America and Caribbean region, has confirmed that it is 'solving' the legal issues that prevent the opening of its new plant in Maceo, Antioquia, Colombia. The inauguration of the facility was postponed in May 2017 after authorities stated that the plant had not obtained all the permits to start operations. Jaime Muguero, president of Cemex Latam, said that the company was still awaiting authorisation for the expansion of the plant's installed capacity, which is currently artificially limited to 0.25Mt/yr. The plant has a design capacity of 1.3Mt/yr and has so far cost Cemex US\$420m.

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Honduras: New grinding plant

Cementos Argos plans to spend US\$20m on building a new cement grinding plant at Choloma, Honduras. The unit will have a production capacity of 0.44Mt/yr. It will join the cement producer's integrated plant in Comayagua and another grinding plant in San Lorenzo. The new grinding plant, located in the north of the country, is intended to integrate into Cementos Argos' logistics network in the wider region. It will create 200 jobs.

Earlier, the Colombian cement manufacturer reported a positive performance in Honduras. The company, which entered the domestic market in 2013, sold over 1.1Mt of cement in the local market in 2017, a record figure that was 15% more than the 0.95Mt it sold in 2016.

Paraguay: Expansion to go live at INC in March 2018

Industria Nacional del Cemento (INC) expects to begin March 2018 with a 30% production rise, following the opening of a new mill, according to its president Jorge Mendez. Production will increase to 1.4 million bags per month, from 1.1 million bags per month at present. Its market share will increase to 70%-75%, from 51% at present. This is anticipated to add an extra US\$50m to the company's turnover. The new mill is currently 90% complete and has cost the company US\$11.5m.

US: Harbison Walker to close plants

Refractory manufacturer HarbisonWalker International has decided to close its plants at Oak Hill, Ohio and Sproul, Pennsylvania as it opens a new US\$30m refractory plant at South Point, Ohio in early 2018. The closures will affect around 88 employees. Previously in 2016 the company negotiated an end to 11 months of industrial action at the Oak Hill site.

US: Two Energy Stars for LafargeHolcim

Two LafargeHolcim US cement plants have been awarded the Environmental Protection Agency's (EPA) Energy Star award. The EPA recognised the Holly Hill plant in South Carolina and the Devil's Slide plant in Morgan, Utah.

"Receiving the Energy Star award this year at two sites is an affirmation of the hard work all our employees are devoting every day to meeting our environmental goals," said John Stull, CEO of LafargeHolcim's US Cement unit.

This recognition is the eighth time the EPA has awarded both the Holly Hill and Devil's Slide plants with the Energy Star award since 2009.

Argentina: Sales rise in January 2018

Cement producers in Argentina sold 1.03Mt of Portland cement in January 2018, including exports. This represented a 3.2% increase compared to sales in December 2017 and was 17.3% higher than sales made in January 2017, according to data from AFCEP. Domestic sales, including imports, totalled 1.04Mt, 3.9% above the same sales in December 2017 and 19.4% higher than sales in January 2017.



Bolivia: Itacamba to ramp up exports

Itacamba plans exports of 119,000t of cement to Paraguay and Argentina in 2018. It will send over 60,000t to Argentina alone. It will also begin exports to Paraguay. Itacamba exported 4000t to Argentina and 158,000t of clinker to Paraguay in 2017.

Peru: Unacem profit rises

Unacem's profit in 2017 rose due to a higher selling price of cement. Its net profit rose by 47% year-on-year to US\$143m in 2017 from US\$971.1m in 2016. Its income increased by 2.5% to US\$595m from US\$580m but its cement production fell slightly to 5.01Mt from 5.14Mt. Clinker production and cement despatches also fell. The cement producer blamed poor weather in the first half of 2017 that affected shipping at its Condorcocha plant as well as a general slowdown in the construction sector. It also reported that clinker exports more than doubled in 2017 to 0.55Mt from 0.21Mt.

US: United States Lime & Minerals revenue increases in 2017

United States Lime & Minerals grew its sales revenue in 2017 due to higher business from its oil and gas services and industrial customers. Total revenue grew by 4% year-on-year to US\$145m in 2017 from US\$139m in 2016. The producer raised the price of its lime and limestone products in 2017.

"Demand for our lime and limestone products in the fourth quarter and full year 2017 remained steady. In addition to the St Clair replacement kiln project, we continue to seek innovative ways to enhance efficiencies at all of our facilities so we can compete in what remains a challenging pricing environment," said Timothy W Byrne, president and chief executive officer of United States Lime & Minerals.



Australia: Boral benefits from Headwaters purchase

Boral Ltd has announced that its profit for the first half of the 2017-2018 fiscal year (from 1 July 2017 – 31 December 2017) rose by 13%. The company benefited from the 2017 acquisition of the US-based building products firm Headwaters Inc. and continued growth in its Australian business.

It reported a net profit of US\$136.0m for the six month period, a rise of 12.7% compared to the same period of the 2016 – 2017 fiscal year when it made US\$120.7m. Its profit before amortisation and significant items increased by 58% to US\$186.5m.

"These strong results confirm that our transformation strategy is on track," said Chief Executive Mike Kane. "The Headwaters acquisition has helped transform Boral into a construction materials and building products

group with a greater geographic reach and improved prospects for growth."



Boral's US business, which was only breaking even in 2015 – 2016, recorded a four-fold rise in earnings, despite adverse impacts from bad weather, including two hurricanes.

Kane also said Boral's Australian arm, its largest division, was 'exceptionally strong' during the half. Boral reported a 12% rise in earnings before interest, tax, depreciation and amortisation from that business.

"Higher revenues and earnings were driven by increased spending on infrastructure, in line with our expectations that a large proportion of our work would gradually shift from residential to infrastructure projects, primarily in the eastern states," said Kane.

Vietnam: Exports of 3Mt in January alone

Vietnam exported 2.9Mt of cement and clinker worth US\$101.1m in January 2018, a 32.3% rise compared to January 2017 in volume terms and 30.3% more in value terms, according to the General Department of Vietnam Customs. Bangladesh, the Philippines, Peru, Mozambique, Malaysia and Taiwan remained the biggest importers of Vietnamese cement and clinker in the month, the department added. The average price was US\$34.86/t.

At present, Vietnam has 82 cement production lines with a combined capacity of 97.6Mt/yr. The Vietnam Cement Association (VNCA) has warned that Vietnam will face a glut of 25-36Mt/yr of cement by 2020 as production completely outstrips national demand.

Vietnam: Third line for Thanh Thang

Thanh Thang Cement is spending US\$35m to develop a third production line at its cement plant in Thanh Nghi, Ha Nam. The government has agreed the investment at the 2.3Mt/yr unit over the 2021 – 2025 period, according to the Đầu tư newspaper. A second production line at the site was inaugurated in July 2017.

Cambodia: Kampot kicks off production

Chip Mong Insee Cement has launched its new plant in Kampot province. Prime Minister Hun Sen attended the event in the Banteay Meas district of Kampot. The US\$262m plant has a cement production capacity of 5000/day or nearly 2Mt/yr. The plant is a joint venture between Chip Mong Group, which owns 60% of the shares, and Thailand's Siam City Cement. The project is intended to meet growing demand for cement in the country.

India: Big Birla improvement

Birla Corporation has declared its results for the quarter and nine months that ended on 31 December 2017. The consolidated results include the financials of Reliance Cement Company Private Limited (RCCPL), a wholly-owned material subsidiary of the Company.

The corporation made 3.06Mt of cement in the third quarter, a 22% rise compared to the same period of 2016-2017. In the nine months to 31 December 2017 it produced 9.1Mt of cement, a 11.9% increase year-on-year. It despatched 3.04Mt of cement compared to 2.49Mt in the quarter and 8.98Mt in the nine month period, a 12% rise year-on-year. In financial terms it took in US\$215m in gross sales during the quarter, a 12.7% rise year-on-year. In the nine month period it took in US\$667m, a 27.8% rise. Earnings before interest, tax, depreciation and amortisation (EBITDA) for the three months were US\$23.6m and for the nine months they were US\$93.0m.

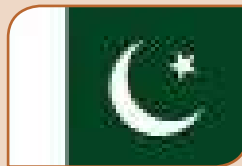


Above: Silos at the Chip Mong Insee plant in Cambodia.



Pakistan: Takeovers in the Pakistan cement sector

A consortium of investors including Denmark's FLSmidth have purchased a stake in Power Cement. The investors include the Danish Investment Fund for Under-Developed Countries (IFU) and IFU Investment Partners (IIP). As part of the deal the board of the cement producer has approved the appointment of Anders Paludan as a director.



Mega Conglomerate says it plans to buy an 87.5% stake in Dewan Cement. The buyer operates in the dairy and real estate sectors. Dewan Cement operates two cement plants. Bestway Cement and Fecto Cement have previously made bids for Dewan Cement.

Iran: Production drops by 4.8%

Cement production fell by 4.8% year-on-year to 37.7Mt in the eight-month period to 21 November 2017. The decline has been blamed on a recession in the construction industry, poor natural gas supplies and falling export rates, according to the Trend News Agency. The country produced 54.1Mt of cement in its last financial year. Cement production capacity has risen significantly locally from 29.5Mt/yr in 2001 to 83Mt/yr in 2017. The number of cement plants has grown from 30 to 72.



Above: Looking over the kiln at Sabzevar Cement. **Source:** Seyed Mohamad Ali Alavi, *Global Cement Photography Competition*.

Japan: Taiheiyo revenue rises

Taiheiyo Cement has released its financial results for the nine months to 31 December 2017. They show a 10.3% rise in revenue for the nine month period from US\$5.40bn in the first nine months of 2016 to US\$5.96bn. Its operating profit was up by 10.1% from US\$403m to US\$444m over the same period but its net profit fell by 43% from US\$520.9m to US\$297m. For the full year to 31 March 2018, Taiheiyo Cement advises that it anticipates a revenue of US\$7.9bn, an operating profit of US\$611m and a net profit of US\$347m.

India: UltraTech mine gets the nod

The Environment Ministry has approved a US\$9.4m opencast limestone mine project by UltraTech Cement in Bhavnagar district, Gujarat. The cement producer has proposed to lease a 632 hectare site with a production capacity of 2.07Mt/yr, according to the Press Trust of India. The mine has total mineral reserves of 63.6Mt with a lifespan of 32 years. Conditions of the approval include relocating 147 families and a group of local farmers.

Limestone from the mine will be used to support a proposed cement plant in Bhavnagar district. It will also be sent to UltraTech's other plants in the state.



India: ACC profit rises dramatically

Cement maker ACC Ltd has announced that its fourth quarter profit for 2017 was more than double that of the same period of 2016. Its profit rose by 126% to US\$32.1m in the quarter that ended on 31 December 2017, from US\$14.1m in 2016. Its net sales for the quarter were 30% higher at US\$531m.

Pakistan: Clinker duty to rise

The local cement industry has asked the government to increase the custom duty on imported clinker to support local production as export rates continue to decline. The industry has also recommended that cement importers should be registered with the Pakistan Standards and

Thailand: SCG revenues rise 3%

SCG Cement's sales revenue rose by 3% year-on-year to US\$5.5bn in 2017. Its earnings before interest, taxation, depreciation and amortisation (EBITDA) fell by 6% to US\$705m. The cement producer reported that overall domestic Ordinary Portland Cement demand fell by 5% in 2017 due to a slow recovery in the private sector. Total domestic consumption of cement was around 37.5Mt 2017 and exports rose from 3.7Mt in 2016 to 4.0Mt in 2017.

Quality Control Authority (PSQCA) and country of origin bodies, according to the Nation newspaper. Falling exports to Afghanistan have been blamed on Iranian competition and high local energy costs.



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Uzbekistan: Qizilqumsement production rises in 2017

In 2017 Qizilqumsement JSC, the biggest cement plant in Uzbekistan, increased cement production to 3.6Mt, 1.9% more than in 2016. 60% of the production volume was sold through exchange trades, 23% to direct contracts with regulated prices, 15% was exported and 2% was sold according to direct contracts based on exchange quotations. According to the business plan of Qizilqumsement JSC, cement production is expected to be at least 3.5Mt in 2018.

Indonesia: Palembang terminal for Indocement

Indocement Tunggal Prakarsa, a subsidiary of HeidelbergCement, plans to open a new 1Mt/yr terminal at Palembang in South Sumatra in the first quarter of 2018. The unit is in the final stage of construction and scheduled for commissioning in March 2018, according to Kontan News. The new unit will allow the cement producer to sell bulk cement and it is expected to increase its presence in Sumatra.

Bangladesh: Gas price dispute for LafargeHolcim

LafargeHolcim Bangladesh has entered into a dispute with the government-run Jalalabad Gas Transmission and Distribution Systems (JGTDS) over the price of natural gas for a captive power plant at its Chhatak cement plant. JGTDS has argued that the cement producer is paying less than the rate fixed by the country's energy regulator, according to the Financial Express newspaper. However, LafargeHolcim claims that it is paying a tariff set by a gas sales agreement (GSA) signed between JGTDS and Lafarge Surma Cement in January 2003. The row has been referred to the Energy and Mineral Resources Division (EMRD) of the Ministry of Power, Energy and Mineral Resources for clarification.

India: Worker killed at Ambuja plant

A contract worker has been killed in an accident at Ambuja Cement's Maratha plant in Maharashtra. An apparent electrical problem in a wagon loading machine caused the incident that crushed the 32 year old worker, according to the IndustriAll union. The union says that mechanical problems had been reported previously in the plant's packing unit. LafargeHolcim, the owner of Ambuja Cement, reported 86 fatalities at its sites in 2016.

Pakistan: Lucky unlucky on fuel costs

Lucky Cement's profit after tax fell by 2% year-on-year to US\$77.6m in the half year to 31 December 2017 from US\$79m in the same period in 2016. The cement producer said that its cost of sales had increased by 21% due to rising coal and other fuel prices. Its sales revenue grew by 5.2% to US\$297m from US\$283m. Its cement production rose by 5.4% from 3.49Mt to 3.68Mt.

The company completed a new 1.25Mt/yr production line at its Karachi cement plant in December 2017. It is currently seeking government approval to build a new 2.3Mt/yr plant in Punjab Province. However due to the delay it is considering expanding its Pezu plant by 2.3Mt/yr instead. The cement producer also expanded its grinding plant in Iraq by 0.87Mt/yr to 1.74Mt/yr.

India: JK Cement receives approval for upgrade at Mangrol

JK Cement has received approval for an upgrade at its Mangrol cement plant near Chittorgarh in Rajasthan. The plant will have an investment of US\$312m, according to Accord Fintech. Following the expansion, the plant will have a cement production capacity of 4.2Mt/yr. Cement grinding will be supported by units in Uttar Pradesh and Gujarat.

Nepal: Clinker imports via Narayanpur

Cement producers in the Parsa-Bara industrial corridor have started importing clinker from the Narayanpur railway station in Bihar. The change in the supply chain has followed disruption in clinker imports via the Raxaul-Birgunj border crossing on environmental grounds, according to the Kathmandu Post newspaper. The longer route has raised production costs due to higher transport fees.



India: Dalmia leads field in Kalyanpur bids

Dalmia Bharat is the frontrunner to buy Kalyanpur Cement following an auction for the Bihar-based cement producer. The bidding process follows a debt resolution plan for Kalyanpur Cement. Dalmia Bharat's winning bid has been submitted by the creditors to the Kolkata bench of the National Company Law Tribunal for approval.

Kalyanpur Cement owes more than US\$94m to its creditors and it was declared bankrupt in May 2017. It operates a 1Mt/yr cement plant at Banjari.

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A giant rises from the desert

Main photo: During an early stage of building, the kiln and cooler are already in place, the pre-heater tower is under construction and the raw meal silos and other process buildings are also under way.





DG Khan Cement, part of Nishat Group, Pakistan's largest industrial conglomerate, is in the final stages of building a giant cement plant in the southwest of Pakistan, on the shores of the Arabian Sea. *Global Cement* visited the plant site to find out more about this world-class project, and about the company and its other plants.





Robert McCaffrey, Global Cement Magazine, with kind assistance from DG Khan Cement staff

A giant rises from the desert

On the edge of Baluchistan, close by where the Arabian sea gently laps the shore at Sonmiani Bay, a giant cement plant is rising from the earth. Just along from the famous Gaddani Ship Breaking Yard, visible from the top of the preheater tower, and a 70 minute drive from the heart of nearby Karachi, DG Khan Cement has built a huge cement plant using some of the most sophisticated equipment currently available, to create a factory that can stand shoulder-to-shoulder with any on the planet. How did we get to this point? Why is the plant being built here? And why now? To answer these questions, let us take a view first of the wider picture.

Pakistan - Background

Pakistan is now set to become one of the world's largest economies, but the country has humble origins. Agriculture and settlement has been recorded in the area for thousands of years, with archaeological evidence of longer-term habitation stretching back over 6000 years. Around 2000 years ago, the region was one of the world's richest, but a glittering prize can become a trophy to be gained by fair means or foul. What is now Pakistan has been fought over and ruled by many different empires over the centuries, including the Persians, the Mongol and Mughal Empires, and most recently the British Empire. The Dominion of Pakistan (formed from West and East Pakistan) was created at midnight on 14 August 1947, when

the muslim-majority territory was divided from the hindu-dominated Republic of India. During the partition process, around 14 million people were displaced during a protracted and violent refugee crisis, which led to colossal loss of life. The reverberations of the Partition crisis continue to poison relationships between India and Pakistan to this day. In 1971, East Pakistan achieved independence from West Pakistan after a fairly short but vicious 'war of liberation,' to form Bangladesh, which is itself now the world's seventh most populous country.

The former West Pakistan became the Islamic Republic of Pakistan, which is now the world's fifth most populous nation, with a total of around 210m inhabitants and a population growth rate of 2.0%. The country has a GDP (purchasing power parity, PPP) of US\$1.06tr (26th largest), or US\$5374/capita, but a nominal GDP of US\$303bn (41st largest) and US\$1629/capita. Pakistan's GDP growth rate is around 5-6%, with the economy backed by 'one of the world's largest and fastest-growing middle classes,' totalling some 40 million today but projected to become 100m by 2050.¹ Fully 35% of the population is under 15 years of age, offering a huge development potential for the future.

Pakistan was created as an independent federal parliamentary constitutional republic for Indian Muslims, and the country's official religion is Islam: All laws must conform to the injunctions of Islam.

Below: Rebar preparation on the roof of one of the cement silos at the Hub plant, with the rest of the plant site seen on the right hand side of the photo. Of particular note is the large clinker silo.





Pakistan has suffered from many terrorist attacks over the years, partly due to its position in a geopolitically precarious region, situated between Iran, Afghanistan and India, and with a large and restive collection of tribally-governed, contentious and semi-autonomous regions throughout the country. During *Global Cement's* visit to Pakistan, although security was tight at significant points of infrastructure (road junctions, hotels, airports etc), the inhabitants of the country were obviously intent on going about their business, living their lives and making money.

The country's economy is strongly based on agriculture, with 21% of GDP generated in this sector, and with industry (20%) and services (59%) making up the rest.

Karachi is Pakistan's largest city, with a population of around 25m (making it one of the top 10 most populous cities in the world), followed by Lahore (11m - making it one of the world's top 20 largest cities by population), Faisalabad (4.3m), Hyderabad (3.5m), Rawalpindi (3.3m), Multan (3.2m), Gujranwala (2.8m) and Peshawar (2m). Islamabad, the 'capital territory' and seat of government, has a population of 1.9m.

Pakistan consists of four main provinces (Punjab, Sindh, Khyber Pakhtunkhwa ('KPK') and Baluchistan - also spelled 'Balochistan') and a number of smaller administrative units. Karachi is the capital of Sindh province, but is located directly on the border with Baluchistan. Karachi, as well as being the most populous city in Pakistan, is also its major commercial location and is a major sea-port and entrepôt for the country. Karachi's population is growing even faster

than the rest of the country, at a rate of around 5% per year. A 'mega-city' such as Karachi generates an enormous demand for cement. The new DG Khan Cement plant at Hub will bring an additional 3Mt/yr of cement production to the city's doorstep.

DG Khan: Local beginnings, Powerful parent

DG Khan Cement started with a single plant at Dera Ghazi Khan, a city in Punjab province often abbreviated to DG Khan, situated in the foothills of the Koh-Suleman (Sulaiman Mountains) and reputed to be one of the hottest places in Pakistan, with summer temperatures up to 46°C. The plant was originally





Above: The 'original' DG Khan cement plant, with the UBE-built line on the left and the newer FLSmidth-built five-stage preheater in the background on the right.

Right: Bagged cement is a primary mode of packaging, with heavily-loaded lorries a common sight on local roads.

Below: A closer view of the Hub plant's clinker silo, with the plant's preheater tower and raw meal silos also visible.

established by the State Cement Corporation of Pakistan Limited (SCCP) in 1978. The plant commenced production in 1986 with a UBE-built four-stage preheater line with a capacity of 2000t/day. The company was privatised by the government and was purchased by the Nishat Group in 1992. In 2004 the capacity of the line was increased to 2700t/day with the addition of riser-duct firing. A second line at the plant was built by FLSmidth in 1997, consisting of a five-stage preheater with inline calciner and with 3300t/day nominal capacity. The capacity of the second line was increased to 4000t/day in

2005. The plant produces OPC and SRC and sells into southern Punjab, Sindh, Baluchistan and abroad. The plant has a coal-fired captive power station (30MW), three 8.2MW gas-fired Wärtsilä engines, four 5.9MW fuel-oil fired Niigata engines, a waste-heat recovery power plant of 10.4MW maximum capacity and an allowed load from the local WAPDA grid of 20MW, to achieve a maximum power supply of 108.8MW.

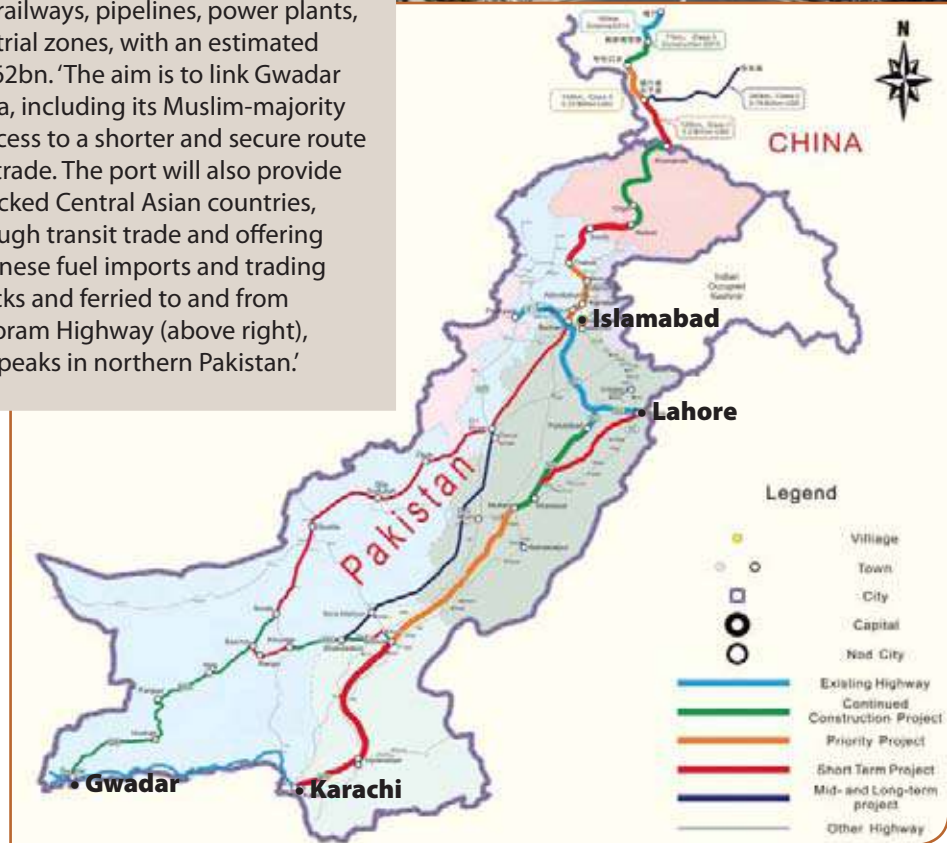
After the establishment of the original Dera Ghazi Khan cement plant, another was built in 2007 between Islamabad and Lahore, at Khairpur, Chakwal district, and this impressive plant, also recently visited by *Global Cement Magazine*,





Belt and Road in Pakistan

China's Belt and Road project involves major infrastructure investment in Pakistan as part of the China-Pakistan Economic Corridor (CPEC) 'sub-project', with a transport corridor through the country terminating at the Gwadar deep-sea port, some 650km east of Karachi. According to VOA News,² the CPECC deal includes the construction or improvement of highways, railways, pipelines, power plants, communications and industrial zones, with an estimated Chinese investment of US\$62bn. 'The aim is to link Gwadar to landlocked western China, including its Muslim-majority Xinjiang region, giving it access to a shorter and secure route through Pakistan to global trade. The port will also provide the shortest route to landlocked Central Asian countries, including Afghanistan, through transit trade and offering transshipment facilities. Chinese fuel imports and trading cargo will be loaded on trucks and ferried to and from Xinjiang through the Karakoram Highway (above right), snaking past snow-capped peaks in northern Pakistan.'



will be covered in a future issue.

Although DG Khan Cement is a major cement producer the company is just a part of the larger Nishat Group, which is Pakistan's largest industrial conglomerate with assets of over US\$12bn. The group was based on a family textiles business, and has been hugely expanded by Pakistani





Above: The world's largest raw materials grinding mill, under construction at the Hub cement plant project site. The 654t/hr raw mill from Loesche features a COPE drive from RENK.

Right: Attention to detail: the best technology from around the world has been imported for the Hub plant. Pictured is a valvelT DN300 PN25 control valve, in full stainless steel, with adjustable pressure relief and sustaining pressure for sea water.

business magnate Mian Muhammad Mansha, and has major interests in power generation, insurance, banking, car assembly, hotels, dairy products, paper products, aviation and shopping malls. DG Khan Cement Co. Ltd. is ISO 9001:2008 & ISO 14001:2004 certified.

Hub plant project

The critical thing to realise about the Hub plant is its massive size, while the second thing to realise is that the plant is being built with extensive use of world-class engineering and technology. FLSmidth is the main equipment supplier, with Loesche supplying three complete grinding plants, Haver & Boecker supplying packaging solutions and IBAU Hamburg providing silo and loading technology. The Civil Engineer is giant local company Izhar Construction (Pvt) Ltd, with Zealcon Engineer-

ing (Pvt) Limited as the mechanical erection contractor. FLSmidth has imported 8733t of equipment, while at the same time fabricating around 3800t of equipment locally: 6000t of local steel structures are being used in the build. In total, around 350,000m³ of concrete will be used in the construction of the plant, with 50,000t of rebar used.

When asked by *Global Cement* for the reasons behind the plant, the executive in charge of the project, Dr Arif Bashir, was clear: "Well, there are many reasons!" He continued, "The project will cater for the ever-increasing demand for cement in Pakistan and abroad. There will be a huge cement requirement for Gwadar port as part of the China-Pakistan Economic Corridor, as well as housing schemes and other infrastructure projects. Cement will flow to Gwadar, to Karachi, and to other cities, in Sindh, and also to the northern part of Pakistan. In addition, there are a number of other benefits to the project, including direct and indirect employment opportunities, the technical education of local engineers including 20 trainee engineers from Baluchistan, substantial taxes which will be paid to the government on the sale of the cement in the country and of course foreign exchange for the country in the case of export sales."

The plant has a nominal capacity of 9000t/day of clinker from a single line, using 12,000t of limestone per day from the plant's own on-site quarry. The plant will use two 750t/hr TST 1900 primary jaw crushers to crush below 400mm and a 950t/hr Raptor® XL1100Ce secondary cone crusher to crush to below 100mm - all from FLSmidth. Two FLSmidth EH 150x120 crushers for additives will also be used. A 3km-long conveyor, with belting from Italian company SIG, is used to transport the material to the 600m-long raw material storage building. Each day 3000t of clay and 650t of iron ore will also be used in



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CONGRATULATIONS DG KHAN

Cement Co. Ltd.
for this milestone of a cement project!

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Construction underway on the six-stage preheater tower - a first for Pakistan - with the raw material hall in the background and clinker silo in the foreground.



The vast scale of DG Khan's Hub plant is shown by the apparent size of workers seen from the top of the cement silos, as they walk to their lunch in the works' canteen.



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GLOBAL CEMENT: DG KHAN CEMENT - PAKISTAN

1. Anwarzaib White Cement, Bholari, 0.1Mt/yr (Closed)
2. Army Welfare Trust, Attock, Punjab, 1.0Mt/yr
3. Attock Cement Pakistan, Hub Chowki, 1.8Mt/yr
4. Bestway Cement, Chakwal 1, 3.6Mt/yr
5. Bestway Cement, Hattar, Haripur, 1.0Mt/yr
6. Bestway Cement, Hattar, Haripur, 1.3Mt/yr
7. Cherat Cement, Cherat, Nowshera, 2.4Mt/yr
8. DG Khan Cement, Dera Ghazi Khan I/II, 2.1Mt/yr
9. Dadabhoy Cement Industries, Nooriabad, 0.5Mt/yr
10. Power Cement, Nooriabad, 0.5Mt/yr
11. Fecto Cement, Islamabad, 0.8Mt/yr
12. Galadari Cement (Gulf), Hub Chowki, 1.0Mt/yr (U/C)
13. Javedan Cement, Manghopir, 0.5Mt/yr (Closed)
14. Kohat Cement, Kohat-Rawalpindi, 2.7Mt/yr
15. Lucky Cement, Karachi, 3.6Mt/yr
16. Lucky Cement, Pezu, 3.8Mt/yr
17. Maple Leaf Cement, Iskanderabad, Punjab, 3.4Mt/yr, 0.2Mt/yr (White)

18. Pakland Cement, Dhabeji, 1.5Mt/yr
19. Pioneer Cement, Chenki, 2.0Mt/yr
20. Dewan Cement, Kamilpur, 1.7Mt/yr
21. Thatta Cement, Karachi, 0.6Mt/yr
22. Zeal Pak Cement, Hyderabad, 0.4Mt/yr (Closed)
23. Flying Cement, Lilla, 1.2Mt/yr
24. Askari Cement (Army Welfare Trust), Nowshera, 1.8Mt/yr
25. Associated Cement Rohri, Sukkur, 0.2Mt/yr
26. Dandot Cement, Lahore, 0.5Mt/yr
27. Fauji Cement, Attock, 3.4Mt/yr
28. Gharibwal Cement, Chakwal, 2.1Mt/yr
29. Javedan Cement, Karachi, 0.6Mt/yr
30. Kohat Cement, Kohat, 2.7Mt/yr
31. Bestway Cement, Hattar, 1.1Mt/yr
32. Pakistan Cement, Islamabad, 2.1Mt/yr
33. Zaman Cement, Khushab, 1.3Mt/yr
34. Askari Cement, Rawalpindi, 1.1Mt/yr
35. Askari Cement, Nazampur, 1.6Mt/yr

36. Mustekham Cement, Hattar, 0.9Mt/yr
37. Dewan Hattar Cement, Hattar, 1.1Mt/yr
38. Dandot Cement, Jehlum, 0.5Mt/yr
39. Bestway Cement, Chakwal 2, 1.8Mt/yr
40. Dewan Hattar Cement, Karachi, 0.8Mt/yr
41. Thatta Cement, Hyderabad, 0.3Mt/yr
42. Zeal Pak Cement, Hyderabad, 0.4Mt/yr
43. AC Rohri Cement, Rohri, 0.2Mt/yr
44. Dewan Cement, Kamilpur, 1.6Mt/yr
45. DG Khan Cement, Kholfi Sattai, 2.0Mt/yr
46. DG Khan Cement, Kahar, 2.0Mt/yr
47. Fecto Cement, Islamabad, 0.8Mt/yr
48. DG Khan Cement, Hub, Karachi, 3.2Mt/yr
49. Yantai Baoqiao Jinhong / Punjab Government, Salt Range, (Announced in 2015)
50. DG Khan Cement, Lasbela, Baluchistan, 2.9Mt/yr (U/C)
51. Asian Precious Minerals, Khyber Pakhtunkhwa, (Planned).

Right: Map of Pakistan's cement plants with location of major cities and States shown.

* = Jammu & Kashmir is administered by India and claimed by Pakistan and India.

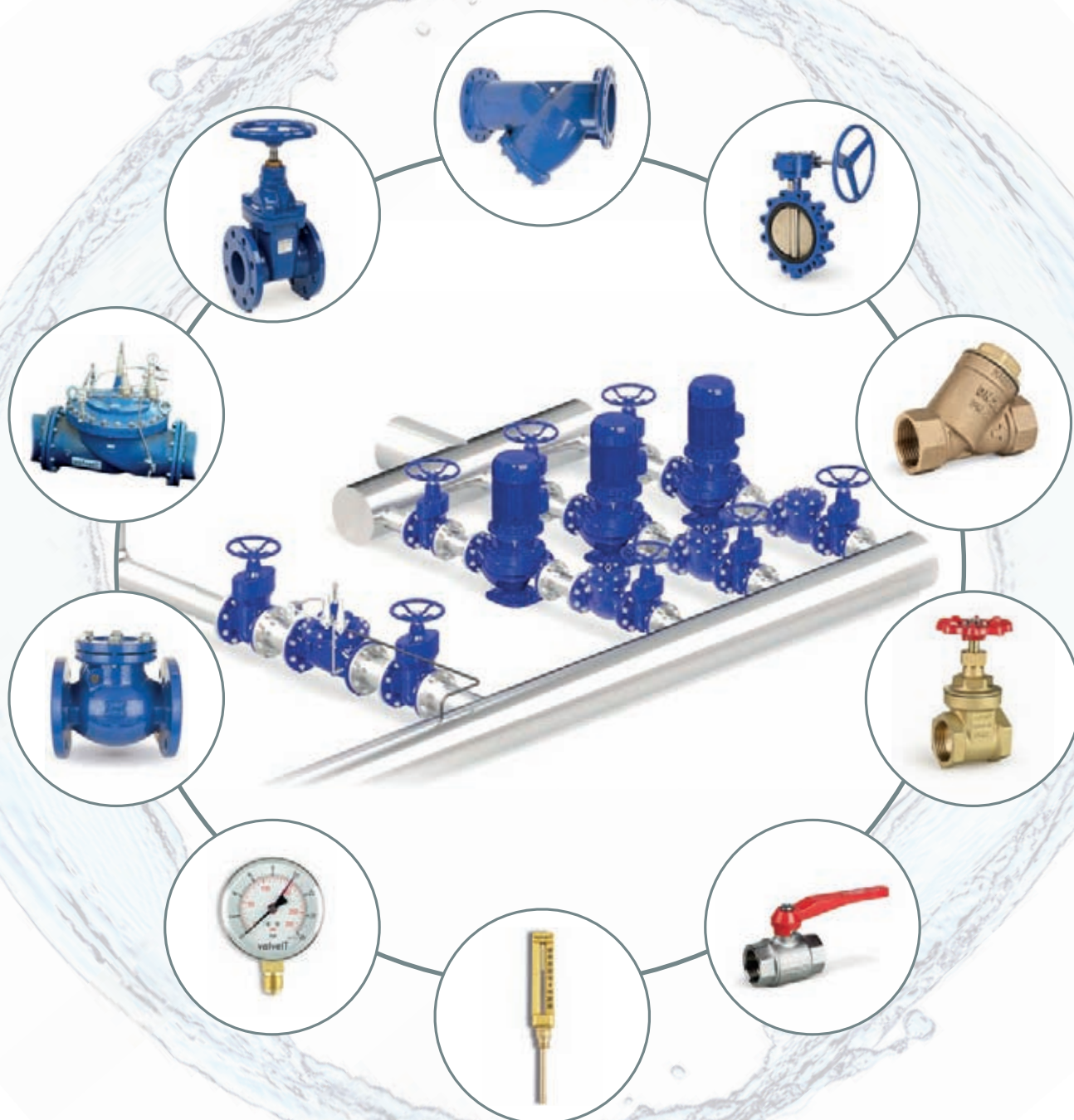
FATA = Federally Administered Tribal Areas.



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Above: The COPE drive from RENK can be linked to up to eight motors for ultimate redundancy.

the raw mix.

The Hub plant is approaching the future with a single minded purpose and the vision of Chief Executive Mr Raza Mansha: Maximum reliability from individual pieces of equipment. There will be a single raw mill for up to 700t/hr, single coal mill for up to 70t/hr and single clinker mill for up to 500t/hr (depending on grinding fineness), with all of these vertical roller mills being provided by Loesche. In addition, the raw mill and clinker mills will be provided with COPE drives from RENK. COPE drives can take power from up to eight drive units, offering full redundancy at those drive units. Additionally, the Loesche unification concept for grinding technology means that all key parts will be interchangeable between the cement and the raw mill, reducing DG Khan's supply inventory. The raw mill is claimed to be one of the biggest raw material mills in the world.

After raw meal grinding, the raw meal is transported to a CF silo with a capacity of 26,400t. The CF ('controlled flow') silo from FLSmidth is a continuously-operating system for blending and storage of cement raw meal. Material is extracted simultane-

ously at different flow rates from a number of outlets in the silo bottom. The CF system ensures stable kiln feed composition at minimum power consumption and investment cost.

The pyro-processing line at the Hub plant consists of a six-stage, two-string pre-heater, a two-base kiln, and a 18 x 70 IHRB9 cross-bar® cooler. Sized at 5.75m diameter by 69m in length, the kiln is the largest two-base kiln ever sold by FLSmidth. The big ID fans at the plant are from Ventilatorenfabrik Oelde in Germany.

From the FLSmidth Crossbar cooler, the clinker goes to the 110,000t clinker storage silo, which

boasts a first in Pakistan in that it has no internal columns and the roof stresses are held up solely by the walls. The silo was designed and constructed by local engineers AA Associates. From the clinker storage silo, the clinker passes to a series of hoppers, along with gypsum, limestone and other supplementary cementitious materials such as slag. A Schenck dosing system is used for weighing of materials before they pass along the conveyor belt to the clinker mill. The dosing system under the CF silos and the coal dosing system are also from Schenck. The main drives in the mill department are from Siemens.

After the clinker vertical roller mill, the resultant cement is transported by a Beumer bucket elevator to the multi-chamber cement silo designed and supplied by IBAU Hamburg to store different types of cements. Cement is extracted from the multi-chamber silos, and proceeds to the packing section, which is equipped with six Haver & Boecker RotoPackers, each with eight spouts (each capable of packing 2400 50kg bags per hour, for a total of 120t/hr each). Bags will come from the Nishat Paper Plant at the Khairpur

Right: The Hub plant's clinker and cement silos under construction, with the shoreline of the Arabian Sea just visible in the far distance.





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Above: The 1MW solar plant is already operating at the Hub plant, with solar panels supplied by AE Solar of Germany.

cement plant, where all of the group's 50kg printed cement sacks are produced. The packing station also features a jumbo bag packer from Haver & Boecker, and bulk loading system. Weighbridges for cement trucks are from Avery. None of this equipment will work without a stable and well-engineered electrical supply and the plant's 40MW requirement has now been energised from the national grid. All 13 substations are also powered up. The plant already boasts a 1MW solar power plant, and is actively collecting preliminary meteorological data as a precursor to setting up a wind farm on the site.

Joined-up thinking: Fringe benefits

Dr Bashir gave some indications of the additional advantages of having the Hub plant on your doorstep. "The Hub plant is not just about making cement, but also for creating benefits for its workers and for the local community. For example, the plant offers free medical services to the local community, as well as a free factory ambulance for local patients. The establishment of a 50-bed hospital (with the collaboration of the Indus hospital) is already underway. It will consist of a trauma centre, out patient department and a women and child care centre. Unskilled

labour is engaged entirely from the local population, providing much-needed employment and economic stimulus. The plant project has a significant educational focus, with the establishment of a school up to 'Matric level' in the planning stage, as well as the provision of books and stationery free of charge to students of adjoining communities. Establishment of a technical training institute for locals is also underway. At DG Khan we have already partnered with various universities and institutions, from all over Pakistan, to encourage their students to come to learn and to take up internships and apprenticeships." During the construction phase, the workforce

peaked at around 7000 workers, but the plant will still need 500-600 workers when it is fully operational and producing at a rate of 3Mt/yr. The proactive education of the local population to a high level is a smart move for a major industrial facility that will need a steady supply of able engineers over the coming decades. Looking after the medical needs of its workers and the surrounding community is an excellent example of 'joined-up thinking.'

Dr Arif Bashir pointed out that the Hub plant has the unique distinction of showcasing new technology in Pakistan for the first time in a number of areas. "For example, this is the first time that a six-stage preheater tower has been built in Pakistan, and to cope with the output, we have the largest kiln in the country, with 9000t/day capacity. This is also the first time that a combination of jaw and cone crushers will be used for raw material crushing. We have the largest raw and clinker grinding mills in the country, equipped with multi drives, and also full redundancy of spare parts on the mills. These are all new for Pakistan."

Dr Bashir is also proud of the project itself: "You have to realise that this is a very high-quality project, with precision engineering in the concrete and steel construction works. Despite this meticulous approach to construction, the project will be complete in near-record time, just 33 months from contract signing and 28-30 months from project execution." That's just one more impressive fact about this giant, modern and world-class project rising from the desert in Baluchistan.



1 <https://en.wikipedia.org/wiki/Pakistan>

2 <https://www.voanews.com/a/pakistan-china-gwadar-port/4084175.html>



Right: Engineers stand proudly in front of the giant Loesche mill grinding table after its delivery to the Hub plant.

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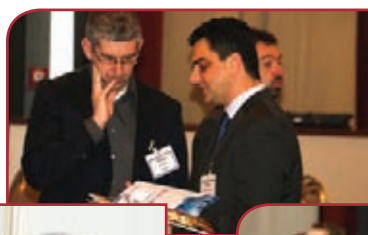
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South Africa: Demand falls by 3-4% in 2017

PPC estimates that local cement demand fell by 3-4% in 2017 due to a lack of large infrastructure projects. In an operating update for the nine months to 31 December 2017 it reported that its cement sales volumes fell by 1-2% year-on-year, although it had increased its prices. It increased its exports by 23%. The cement producer also reported that its Slurry Kiln 9 project was 90% complete, with commissioning scheduled for the second quarter of 2018.

Elsewhere in Africa, PPC's sales volumes rose by 20-30% in Rwanda due to a rise in bulk cement sales and higher exports. In Zimbabwe sales volumes grew by 30-40%, supported by retail sales.

Kenya: New plant inaugurated

President Uhuru Kenyatta has inaugurated National Cement's US\$280m integrated plant in Kajiado County. The clinker plant has a production capacity of 1.2Mt/yr and is set to employ 700 workers, according to the Agence de Presse Africaine. The plant also includes a 15MW captive power plant.

Bahrain: Construction to benefit from lifting of Saudi tariffs

The Bahraini construction sector is expected to grow following the lifting of export duties on cement by Saudi Arabia. Saudi National Committee of Cement Producers chairman Jehad Al Rasheed said that cement export duties were cancelled at the end of January 2018, according to the Gulf Daily News newspaper. Export tariffs were originally set at US\$23 – 35/t but were then halved in July 2017 to encourage the market.

Bahrain had been the only country allowed to import cement from Saudi Arabia since 2009. However, the price rose significantly in March 2017 after the Saudi government introduced new tariffs and permitted cement exports globally.

Right: The King Fahd Causeway between Saudi Arabia and Bahrain.

UAE: Results from the Emirates

Fujairah Cement Industries Co (FCIC) has reported a decline of 9% in its profit for the fourth quarter of 2017 compared to the same period a year earlier. Earnings decreased to about US\$2.7m in the fourth quarter of 2017 from US\$3.0m in the fourth quarter of 2016.

During the 2017 fiscal year, the cement producer posted a drop of 35% in its profit to US\$10.1m compared to US\$15.4m in 2015. This was in part due to a 7% decrease in revenue and higher general and administrative expenses, which rose by 29% to US\$6.4m.

Meanwhile, National Cement Company (NCC) has reported a decline in its profit to US\$14.59m in the full year 2017 from US\$24.24m in 2016. Revenues also fell to US\$55.77m from US\$64.11m.

Burkina Faso: Grinding project starts

Cimburkina has started upgrading its Kossodo cement grinding plant. The US\$28.5m project will centre on the installation of a new mill. This will double its production capacity to 2Mt/yr. Other works will include a new 2000t limestone silo and a new bagging unit. The new mill is scheduled to start production in December 2018.

The plant, a subsidiary of Germany's HeidelbergCement, produces two types of cement: CEM II 42.5 R and CEM II BL 32.5 R. Clinker for production comes from the group's Scantogo plant in Togo.



Ivory Coast: New mill for LafargeHolcim...

Jean-Claude Brou, the Minister of Industry and Mines, has inaugurated a new mill at LafargeHolcim Ivory Coast's plant at Abidjan. The new mill has increased the unit's production capacity to 2Mt/yr, according to the Agence Ivoirienne de Presse. LafargeHolcim Ivory Coast re-used a ball mill from a Spanish cement plant that was dismantled and shipped to Abidjan. The mill uses a 4.5MW motor and the cement producer says it is the largest horizontal ball mill in French-speaking West Africa. The project cost a total of US\$28.5m.



...and quality commission for cement

Jean-Claude Brou, the Minister of Industry and Mines, has announced the creation of a commission for the quality control of cement. The minister made the statement at the opening of a new mill at LafargeHolcim plant at Abidjan, according to the Agence Ivoirienne de Presse. Brou added the country's demand for cement rose to 5Mt in 2017 from 2.5Mt in 2015.



Tunisia: Carthage Cement results

Carthage Cement's turnover fell by 12% year-on-year from US\$82.6m in 2016 to US\$72.8 in 2017. Clinker production dropped by 17% to 1.3Mt and cement production by 12% to 1.4Mt. Local sales of cement decreased by 2% to US\$52.7m and exports fell by 80% to US\$1.9m. The cement producer blamed its poor sales on a decline in the export market.

Tunisia: Carthage Cement ships clinker to Sub-Sahara

Carthage Cement has completed the loading of its first clinker shipment to Sub-Saharan Africa. The 38,000t consignment was loaded at the port of La Goulette. It is part of a 350,000t deal that the cement producer announced in December 2017.

Right: The SOTACIB white cement plant has closed.

Tunisia: White cement shortage

The National Chamber of Ceramics Manufacturers has expressed concern about the a shortage of white cement following the closure of the Société Tuniso-Andalouse de Ciment Blanc's (SOTACIB) plant at Férien. The ceramics association has called for the government to speed up the import process, according to the *L'économiste Maghreb* magazine. SOTACIB's 0.65Mt/yr white cement plant closed on 19 January 2018 for a six-month period following a strike by workers in December 2017. Spain's Cementos Molins is the majority shareholder in the company.



Ghana: Ghacem opens new terminal at Sefwi Dwenase

Ghacem has opened a 3000t cement terminal at Sefwi Dwenase in the Sefwi-Wiawso Municipality. The unit is the cement producer's sixth terminal in the country, according to the Daily Guide newspaper. The subsidiary of Germany's HeidelbergCement has also purchased new trucks to support the site.

Meanwhile, Ghana's cement producers are lobbying the government to build new roads using concrete in order to use surplus cement. The country has a production capacity of 12Mt/yr but it only uses 8Mt/yr, according to Citi Business. The producers are calling on the president to make good on a previous statement on the matter.



Mozambique: African Elephant suffering from low cement demand

The African Elephant cement grinding plant is operating at a third of its production capacity due to low demand. The Chinese-owned plant near Pemba, Cabo Delgado in the north of the country is producing around 300t/day despite the plant's production capacity of 1000t/day, according to sources quoted by the Mozambique News Agency. The plant's manager expects demand to pick up once investment in the gas industry increases. The company has suffered from imports from Tanzania.

Syria: Lafarge investigation looks at links to French diplomats

Lafarge Syria's former director Christian Herrault has claimed that Eric Chevallier, the former ambassador to Syria, knew about payments to armed groups by the cement producer. French investigators questioned Herrault in the presence of Chevallier, according to a source quoted by the Agence France Presse. Herrault allegedly said that he had met Chevallier several times, that he knew about the situation and that he said that the company should stay as, "...these problems won't last long."

Jean-Claude Veillard, the group's former security boss, has said he regularly informed French intelligence services about its operations in the region. Investigators have also found evidence of meetings between Lafarge and diplomats, including a note suggesting that one took place in Paris in January 2013.

The investigation is attempting to determine whether LafargeHolcim's predecessor company Lafarge Syria paid terrorist groups in Syria and how much managers knew about the situation.

Algeria: Biskria Cement ignites second kiln

Biskria Cement has started the kiln on its second new production line at its plant in Biskra. The 6000t/day line was supplied by China's Sinoma. The Chinese plant builder announced the US\$267m order in 2015. It included two production lines from raw materials to despatch. The cement producer operates three cement production lines at its plant, with a combined production capacity of 4Mt/yr.



Philippe Fonta Managing Director, Cement Sustainability Initiative (CSI) of the World Business Council for Sustainable Development (WBCSD)



A year of the Concrete Sustainability Council

The Concrete Sustainability Council (CSC) has concluded its first year successfully. More than 60 certifications and 175 licences have been issued since the system went live one year ago. And there is more encouraging news for the organisation...

The Concrete Sustainability Council (CSC) system went live on 1 January 2017. The organisation was created with the mission to promote, improve and demonstrate sustainability in concrete production and its supply chain, thus enabling the construction industry to make informed decisions.

In fact, creating a responsible sourcing certification system for concrete was imagined by some member companies of the Cement Sustainability Initiative (CSI), a sector project of the World Business Council for Sustainable Development (WBCSD), striving to demonstrate the sustainability of concrete and its value chain in a transparent way.

Today the CSC encompasses 22 committed members, including trade associations in Europe, the US and Latin America, as well as concrete producers and certification companies that share the same vision: to build a sustainable, safe, durable and comfortable future.


In only one year, more than 60 plants on two continents (Europe & North America) were certified and more than 175 licenses were issued. Getting a license is the first step for companies aiming to achieve the CSC certification. In the end, the CSC label can be awarded not only to concrete plants, but – in the form of a dedicated CSC supply chain label – also to other producers along the supply chain, such as producers of cement, cementitious products and aggregates. This is a significant success for such a young organisation!

Obtaining recognition from the various rating systems for sustainable construction as well as by green public procurement is key to providing value for the certifications. The CSC certifications have recently been

formally accepted by the Building Research Establishment Environmental Assessment Method (BREEAM), which is the leading green building label in Europe renowned for its robust process. Discussions are also taking place with other leading green building labels, such as LEED, DGNB and Envision.

In parallel, the CSC certification system is expanding fast in terms of geographies covered. Mostly implemented in Europe and North America as of today, the organisation has recently been granted funding from the 10 Year Framework Program of the UN Environment Programme (UNEP) for a roll out of the certification system in Latin America. This is another testament to the incredible progress of the organisation.

Concrete is by far the most widely used building material in the world. The CSC created an easy tool which allows companies to measure and reduce their impacts, saving costs and increasing sustainability awareness in the whole concrete value chain.

Leveraging the success of 2017, the CSC will continue expanding in 2018 all over the world. The organisation will also continue to attract new members and to promote the CSC amongst the main green building labels and other sustainable construction initiatives. "Progress in 2017 has been better than expected; now we have to keep the momentum and particularly certify more plants to make sure that the CSC certification delivers on its promise to become a widely recognised brand that will deliver benefits for the whole sector," says Dr Alexander Röder, Chair of the CSC. Please contact us at info@concretesustainabilitycouncil.org to see how you can be part of this movement for change. 





Here *Global Cement Magazine* presents its monthly review of global cement prices, in US\$ for easy comparison. Much more price information (including the latest information on prices and market trends throughout the global cement industry from our price correspondents) is only available to subscribers of *Global Cement Magazine*.

To get additional prices, you should subscribe - **See page 80**. In this issue subscribers receive information from eight more countries, including Uzbekistan, Kyrgyzstan, Belarus, Bangladesh, Zambia and Bahrain.

Egypt: Ordinary Portland Cement prices as of 16 February 2018: Arabian Cement (Al Mosalah) = US\$49.26/t; Arabian Cement (Al Nasr) = US\$47.58/t; Cemex (Al Muhandis) = US\$54.91/t; Building Materials Industries (Altaamir) = US\$48.13/t; Elnahda Cement (Al Sakhras) = US\$47.55/t; Wadi El Nile Cement = US\$48.02/t; Medcom Aswan Cement = US\$48.00/t; Lafarge (Al Makhous) = US\$48.43/t; Suez Cement = US\$49.14/t; Tourah Portland Cement = US\$49.14/t; Helwan Cement = US\$49.14/t; Shora Cement = US\$47.74/t; El Sewedy Cement = US\$49.25/t; Misr Cement Qena = US\$47.59/t.

White cement prices as of 16 February 2018: Sinai White Cement (Alabid Elada) = US\$100.76/t; Sinai White Cement (Super Sinai) = US\$97.94/t; El Menya Cement - Super Royal = US\$97.37/t; Menya Helwan Cement = US\$97.37/t.

Blended cement prices as of 16 February 2018: Helwan Cement - Alwaha = US\$46.34/t. National Cement - Altawfir = US\$47.55/t; Helwan Cement - Alwaha = US\$46.92/t. Sulphate-resistant cement prices as of 16 February 2018: Cemex (Al Mukawem) = US\$55.23/t; Lafarge - Kaher Albehar = US\$51.23/t; Suez Cement (Al Suez Sea Water) = US\$50.94/t; El Sewedy Cement = US\$51.23/t.

India: IIFL states that All-India average cement prices were largely stable in the second two weeks of January 2018. The price hikes seen in first two weeks of 2018 were maintained, despite a deceleration in demand growth compared to December 2017. The All-India average price at the end of January 2018 was up by 7% year-on-year and by 3% month-on-month. They are in the region of US\$4.04-4.50/bag (50kg).

China: SunSirs Commodity Data Group reports All-Chinese cement prices: 10-11 February 2018 = US\$65.83/t; 12-15 January 2018 = US\$65.31/t.

Kenya: Two new plants by Devki Group could reduce prices of cement in Kenya, which are currently around US\$6.21-6.90/bag (50kg).

Mexico: Baja California Sur has the most expensive cement in Mexico at a cost of US\$270/t, rather than ~US\$189/t in the rest of the country. This is due to the infrequent deliveries by small boats, including ferries.

Mauritius: Lafarge (Mauritius) has increased its cement prices by US\$0.08-0.13/bag (25kg), effective 26 January 2018. Thus, a 25kg bag now sells in the range of US\$3.83-3.89 instead of US\$3.78.

Darshan Baijnath, Commercial Director of Lafarge (Mauritius), told local press that the increase was due to several factors. "The rising cost of freight, bunkering, wages and production have contributed to this situation," he said, noting that the previous price increase for cement dated back to 2015.

Lafarge increased the price of its Baobab Cement brand from US\$3.42/bag (25kg) to US\$3.55/bag. Its Baobab 6 product now costs US\$3.30/bag instead of US\$3.22/bag and Baobab's Lakaz cement price rose from US\$3.21/bag to US\$3.30/bag.

Kolos Cement says that it has no intention of raising its cement prices but the Consumers Association of Mauritius is following the issue closely.

Nigeria: Prices of 50kg bags of cement according to WealthResult.com on 16 February 2018: Dangote Cement = US\$7.12/bag; Ibeto Cement, WAPCO, Reagan Cement, Eagle Cement, UNICEM, Ashaka Cement & BUA Cement = US\$7.06/bag.

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CIFF {+ the named port of destination} = Cost, Insurance and Freight: The cargo insurance and delivery of goods to the named port of destination (discharge) at the seller's expense. Buyer is responsible for the import customs clearance and other costs and risks.

ASWP = Any safe world port.

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Thinking about killing a rhino to get a 'lift'? There's an easier way.

Robert McCaffrey Editorial Director, *Global Cement Magazine* (rob@propubs.com)



Have a guess at how many rhinoceroses there are left on the planet. How many leopards? How many lions? Go on, have a guess.

I guessed 100,000, 100,000 again and two million for lions. Then I looked up the numbers on the internet and I was shocked. For all five species of rhino, there are in total around 30,000 individuals (but only 61-63 examples of the Javan rhino and 100 of the Sumatran rhino). The most common species, the white rhino, has about 20,000 individuals. There used to be millions of these things, wandering around, eating the greenery.¹

As the 'Save the Rhino' charity says, 'The first period of decline was caused by wholesale Colonial-era hunting and habitat loss as land was increasingly turned to agriculture and urban development. However, large-scale poaching of the now critically-endangered black rhino resulted in a dramatic 96% decline from c. 70,000 individuals in 1970 to just 2410 in 1995,' although numbers have now risen to around 5000 individuals through hard conservation efforts.

How many leopards? Estimates vary, from 30,000 upwards, but there are certainly not as many as there used to be. According to Panthera², 'panthers are now extinct in six countries and possibly extinct in six additional countries where they formerly roamed and have vanished from at least 49% of their historic range in Africa and 84% of their historic range in Eurasia. The species is threatened by illegal killing for their skins and other body parts used for ceremonial regalia, conflict with local people, bushmeat poaching and poorly managed trophy hunting.'

As for the number of lions, I was way out: one source³ suggests fewer than 40,000 lions now live in the wild, fewer than the number of people who live in the little town where I work: 'Lions have disappeared from 90% of their historic range due to habitat loss, hunting and poaching, ...killings by livestock owners, loss of prey and other factors. Just over a century ago, there were more than 200,000 wild lions living in Africa. Today, there are only about 20,000; lions are extinct in 26 African countries.'

It seems that whenever humans and the 'megafauna' come into contact, there is only one 'winner' in the long term. Generally, the megafauna (the big beasts) gets wiped out. There used to be sabretooth tigers, woolly mammoths, woolly rhinos, giant beavers and giant armadillos, but we, as a species, killed them all.⁴

Of course, in the beginnings of our world-wide killing spree, we did it for meat, to eradicate competi-

tors and to reduce risk of attack. However, for the last 6000 years or so, we have had access to technology and knowledge, that have allowed us to farm using agriculture and domesticated animal husbandry. The majority of the human race does not need to kill the megafauna for meat.

Instead, many of these animals are now being killed by poachers for the body-parts of the animals. I needn't list the various alleged benefits of ingesting rhino horn, bear testicles, musk deer glands, or tiger or elephant parts. The use of body parts harvested from primates - our closest cousins in the animal kingdom - for 'medicinal' or 'magical' purposes is a continuing threat to the survival of these species.⁵ 'Traditional Chinese Medicine' is a major user of animal body parts, not just as 'curatives' but also as enhancers (such as for improving memory, circulation or libido)⁶. The suggestion that the 'medicines' become more effective as the animals in question become rarer (and more expensive), surely spells doom for them all.

We might laugh at the notion that eating a bear's penis might endow us with super-human powers, but I suspect that we are all a little more susceptible to 'magic thinking' than we might like to admit. If you've ever 'knocked on wood' in the hope that something will happen (as I regularly do myself), or grasped a rabbit's foot (yes, really) for good luck, then you are thinking magically. In fact, we may as well just stop doing these things for all the difference that they actually make in the world. As for taking powdered rhino horn as an aphrodisiac? Well, rhino horn is composed of keratin, the same stuff found in hair and in animal hooves. There's another handy supply of keratin that we all have access to, so the next time you need some 'aphrodisiac' with the exact same composition as rhino horn, instead of killing a rhino and making a powder of its magnificent appendage, please just bite your finger nails.

¹ https://www.savetherhino.org/rhino_info/rhino_population_figures

² <https://www.panthera.org/cat/leopard>

³ <https://www.mnn.com/earth-matters/animals/blogs/how-many-lions-are-left-in-the-wild>

⁴ Lewis J. Bartlett, David R. Williams, Graham W. Prescott, Andrew Balmford, Rhys E. Green, Anders Eriksson, Paul J. Valdes, Joy S. Singarayer, Andrea Manica. Robustness despite uncertainty: regional climate data reveal the dominant role of humans in explaining global extinctions of Late Quaternary megafauna. *Ecography*, 2015; DOI: 10.1111/ecog.01566

⁵ http://news.bbc.co.uk/earth/hi/earth_news/newsid_8589000/8589551.stm

⁶ <http://www.dailymail.co.uk/news/article-3021541/From-crocodile-jaws-bear-testicles-bizarre-animal-parts-sale-China-s-medicine-markets-endangered-species-healing-qualities-believed-have.html>





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