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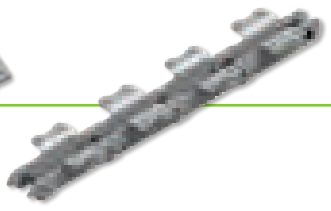

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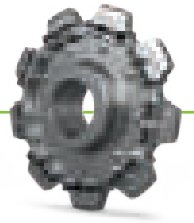

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This issue's front cover...

...shows the Titan Cement Company Drepano plant, in a photograph taken by Paul Touliatos. Paul says, "In the picture you can see the cement plant with the packing plant, the preheater of kilns No 1 and No 2, the gas cooler of kiln No 1, and at the right of the picture there is the clinker silo. The picture was taken with 70mm zoom lens, with HDR technique. I used a neutral density filter and two violet gradient filters. The time was late evening, just before dark, with no wind and the mirroring of the cement plant in the calm sea surface makes a unique view."

This front cover is produced to celebrate 20 years of Global Cement Magazine - 1997-2017.
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global cement MAGAZINE

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Dear readers,

Welcome to the January 2017 issue of *Global Cement Magazine*, the world's most widely-read cement magazine. We hope that the Christmas and New Year holidays provided a chance to rest and recuperate ahead of what will undoubtedly prove to be another challenging year, both for the cement sector and for the wider world.

We are celebrating 20 years since we first produced the 'earliest ancestor' of *Global Cement Magazine* - in January 1997. Please see page 65 for a look back - and forward.

In this issue we take a look at a ground-breaking project that will investigate the practicalities of capturing the process (i.e. calcination) CO_2 from the cement and lime production process. So often we hear that there is 'nothing that can be done' about these emissions. The EU-backed Low Emissions Intensity Lime and Cement (LEILAC) project, to take place at HeidelbergCement's Lixhe plant in Belgium, will use the Direct Separation Reactor (DSR) developed by Australian based technology firm Calix. Already a success in the magnesite calcining sector, the DSR keeps combustion gases and the raw meal stream completely separate. This means that the calcination CO_2 can be separated from the calcined meal and condensed with ease. Technical issues for the LEILAC project to investigate include the larger scales and higher temperatures required by the cement and lime industries compared to magnesite calcination. Our discussion with Calix's key staff starts on Page 16.

Elsewhere in the issue, we look at how one Chinese cement plant improved its burning of low-quality alternative fuels (Page 22), recent environmental advancements at the Kirchdorfer Zement plant in Austria (Page 26) and the factors that affect wear of large fans (Page 32). Our popular series of regional cement industry reports heads to South America (Page 46) and we also showcase the best entries from the *Global Cement Photography Competition 2017*. The winner, runner-up, third place entries and other commended entries can be found on Pages 8-15.

As ever in 2017, you will always be able to keep up-to-date with the latest global cement news and trends in the print and digital versions of *Global Cement Magazine*, online at *www.GlobalCement.com* and via our *Global Cement Weekly* newsletter.

We hope you enjoy this issue of *Global Cement Magazine* - the world's most widely-read cement magazine!

Peter Edwards
Editor

Cement Industry Suppliers' Forum

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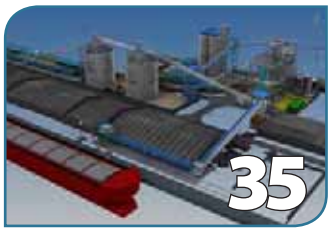

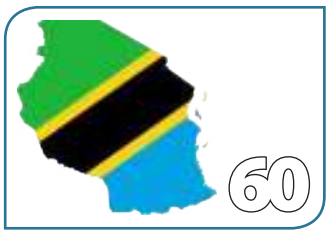

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POWTECH 2017
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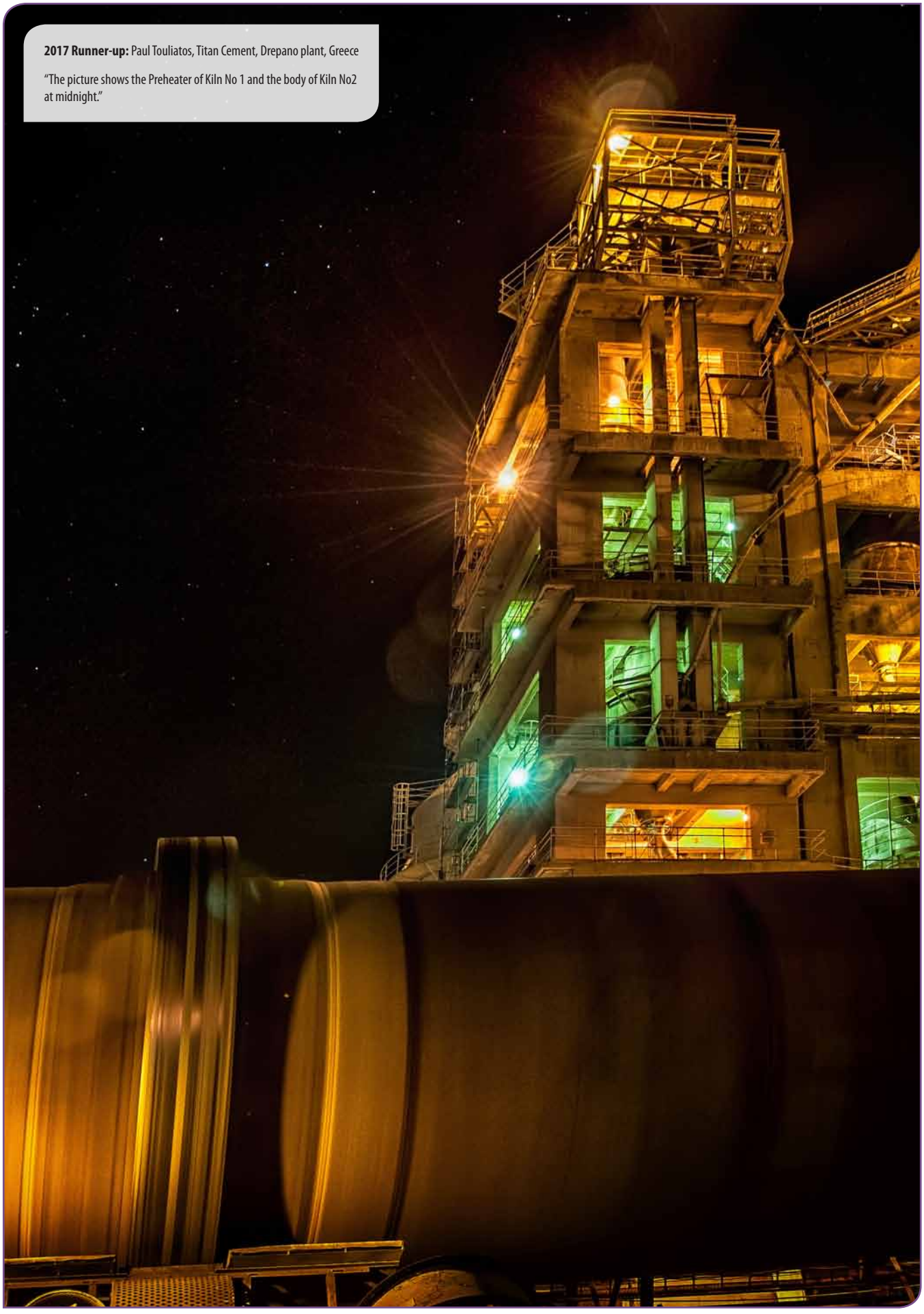
2017 Winner: Abbas Beigi, Fars Cement Company, Kharameh Project, Iran

"Fars Cement is located in Shiraz in the centre of Fars Province. Due to growth of the city and to reduce environment pollution, we decided to move the factory to another location, Kharameh, with new machinery and technology."

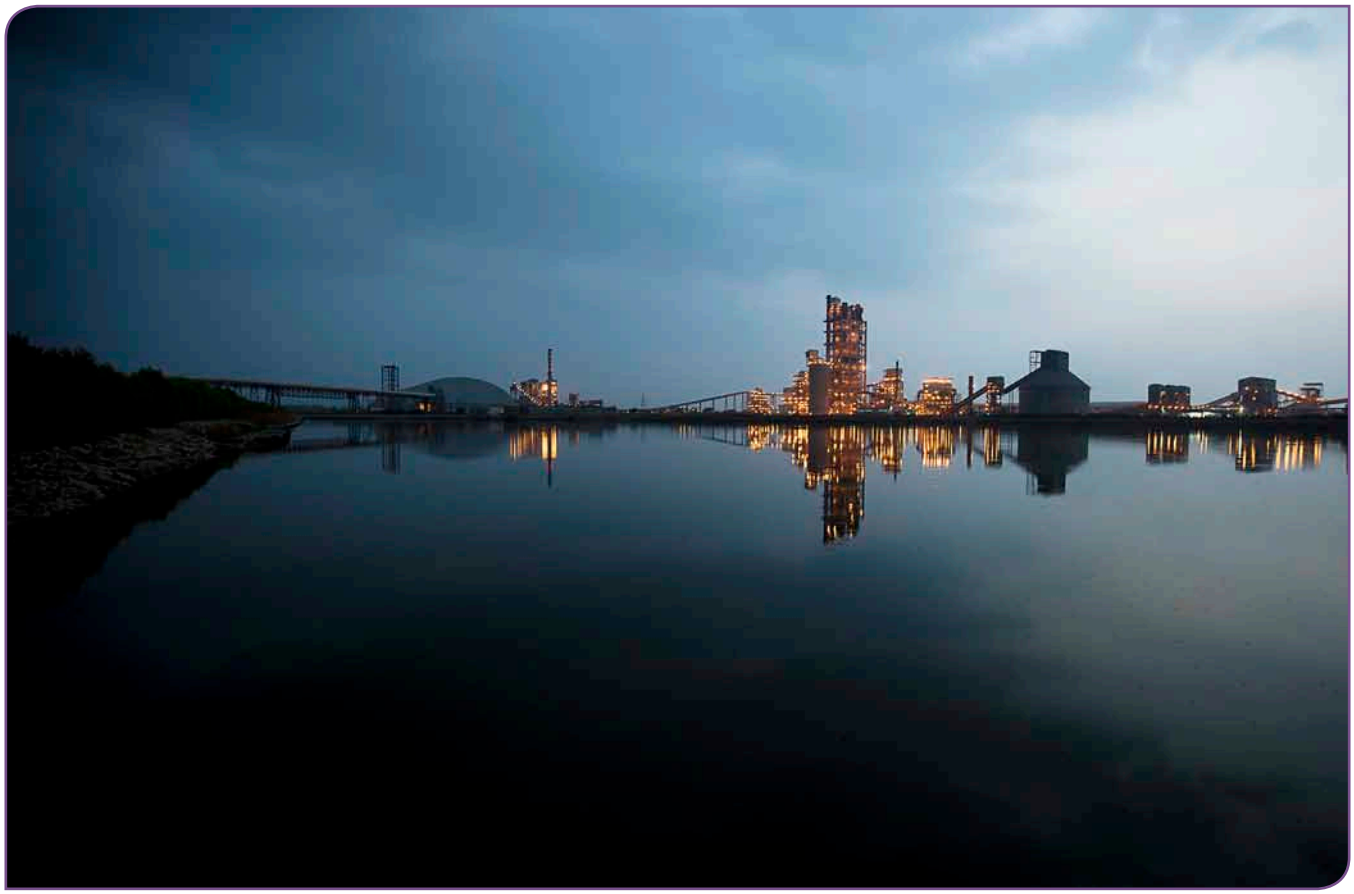


2017 Runner-up: Paul Touliatos, Titan Cement, Drepano plant, Greece

"The picture shows the Preheater of Kiln No 1 and the body of Kiln No2 at midnight."

Above - Joint third place: Ankit Patel, thyssenkrupp Industries India. Image is of Vicat Sagar Cement in Chatarsal, Karnataka, India.

Below - Joint third place: FLSmidth. Image is of Orient Cement, Chittapur, Karnataka, India.



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Above - Finalist: FLSmidth
WNCC, Egypt

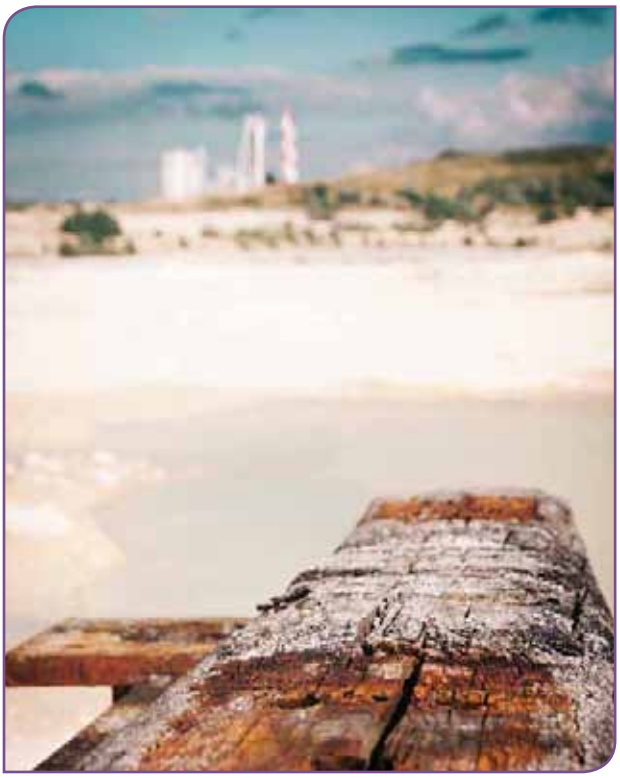
Above - Finalist: Seyed Mohamad Ali Alavi
Sabzevar Cement, Iran

Above - Finalist: Roland Martini, Suez Cement
Helwan, Egypt

Above - Honourable Mention: Greg Curley, Irish Cement
Platin Works, Ireland

Above - Highly Commended: Robert Nadratowski, Quarry at cement plant in Ozarow, Grupa Ozarow SA, Poland

Above - Finalist: Mohamed Hamada Ali Ahmed, Al Nahda Cement, Qena, Egypt



Above - Finalist: Waldemar Baka, Grupa Ozarow SA, Poland

Above - Highly Commended: Rosley Majid, Titian Kencana Studio, Public escalators that became a symbol of the KL Sentral commercial complex, Malaysia.

Above - Honourable Mention: Stanisław Dunin-Borkowski, Elements of the pre-heater tower at cement plant in Ozarow, Grupa Ozarow SA, Poland

Thank you to all entrants this year! ***See the Global Cement Photography Competition 2017 movie*** on YouTube, with the winner, runners up, highly commended entries and many more finalists than we have had space to show here!

See more
http://bit.ly/
2gYx0oT

Interview by Peter Edwards, Global Cement Magazine

Trapping process CO_2 emissions with the LEILAC project

Around 60% of a cement plant's CO_2 emissions are from the calcination step. Received wisdom in the sector is that such emissions cannot be avoided and reduction of combustion CO_2 through dry processing, alternative fuels, waste heat recovery or other advanced solutions has historically been preferred. However, the Direct Separation Reactor from Australian firm Calix, which will be used in the Low Emissions Intensity Lime and Cement (LEILAC) project, will tackle the issue of CO_2 emissions from calcination head on. The technology has already been used commercially in the magnesite calcining industry. Peter Edwards spoke to key staff from Calix about the technology and its potential for the cement and lime sectors.

Background

***Global Cement (GC):* Can you summarise the LEILAC project?**

Daniel Rennie, Project Coordinator (DR): The Low Emissions Intensity Lime and Cement (LEILAC) project aims to pilot a breakthrough technology to replace an existing part of the cement and lime making process. The Direct Separation Reactor (DSR) from Calix will enable the capture of unavoidable process CO_2 emissions from the calcination step, without significant energy penalty at comparable capital costs to conventional cement and lime production equipment.

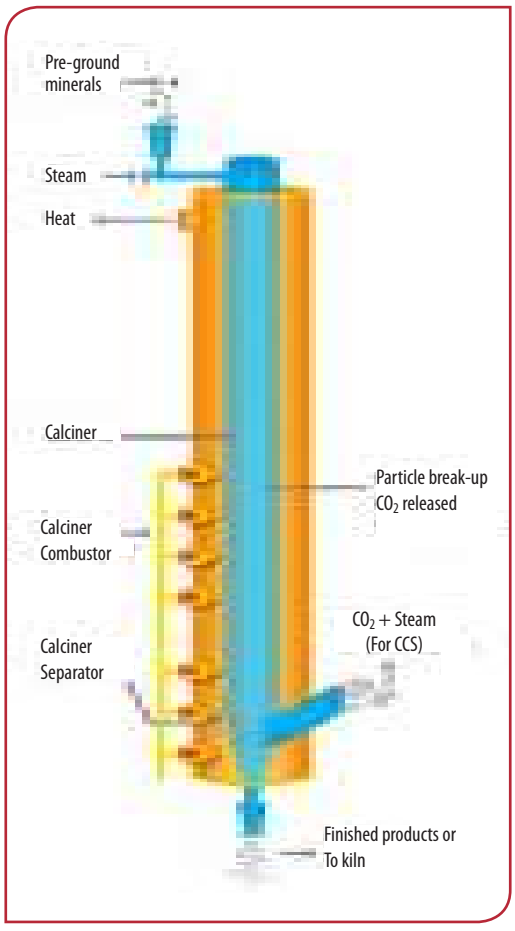
The LEILAC project will develop and test a suitably-sized pilot plant to validate the Calix technology and facilitate scale up. It will run at 8t/hr for limestone and 10t/hr for cement. The project started in January 2016 and is due to run until the end of 2020. The Preliminary Front End Engineering Design (Pre-FEED) stage ensured that the project was technically viable and it is currently in the Front End Engineering Design (FEED) phase. This will result in a Final Investment Decision in mid-2017. Following from that, there will be a detailed design and construction phase. The pilot plant should become operational in early 2019. The pilot will be built within the HeidelbergCement plant at Lixhe, Belgium to ensure the most realistic testing environment possible.

***GC:* What are the objectives of the LEILAC plant?**

DR: The pilot unit will run over two years, during which time it will undergo extensive testing in a standard operating environment over a continuous basis for several weeks at a time. The research on the process demands and performance, aims to demonstrate that the technology works sufficiently to begin scale-up planning in the cement sector or provide an immediate CO_2 capture option for the lime industry.

***GC:* Who are the main collaborators and what does each of the major players bring to the table?**

DR: The consortium is led by Calix, the Australian company behind the DSR technology itself, and comprises HeidelbergCement, Cemex, Tarmac and Lhoist as industrial partners that provide funding, guidance and technical input. We also have Amec Foster Wheeler on board as the consortium's engineering and procurement partner, as well as ECN and Imperial College London, which are undertaking key research



Right - Figure 1: Simplified schematic of Calix's Direct Separation Reactor (DSR). The mineral process (blue) and combustion (orange) streams are kept entirely separate, allowing for the production of high quality products and the removal of process CO_2.

into the main areas of risk for the project, plus analysis of the results. Process Systems Enterprise (PSE) is carrying out the modelling and techno-economic analysis of the technology, Quantis is looking at Life Cycle Analysis and the Carbon Trust is responsible for public engagement. It is supported by CEMBUREAU, ECRA, and EuLA which form the project's External Advisory Board. The pilot project is funded by the consortium partners (Euro9m) and the European Commission (Euro11m).

The technology

***GC:* How does the Calix technology work to remove and separate the CO_2?**

Adam Vincent, Project Manager (AV): The Calix DSR seeks to re-engineer the existing process flows of a traditional cement calciner, by indirectly heating the raw meal via a special steel reactor. This unique system enables pure CO_2 to be captured, with the combustion exhaust gases kept separate. This elegant solution requires no additional chemicals or processes for a pure CO_2 stream. In principle, the cement manufacturing process is not significantly altered.

There are a variety of ways to separate the gas from the calcined meal to produce a clean CO_2 stream. In LEILAC we are utilising an internal reversing axial separator, which has been proven to work effectively in our pilot plant in Australia. This approach has the additional benefit of increasing heat transfer between the CO_2 gas and incoming cement meal or limestone, thereby increasing efficiency.

***GC:* What led to development of the DSR?**

AV: The idea was co-invented by Connor Horely, sadly no longer with us, and Mark Sceats (Executive Director and Chief Scientist of Calix) for processing magnesite. Together they founded Calix. The process was successful, so Calix acquired a magnesite mine in South Australia and built the first commercial scale plant at Bacchus Marsh in Victoria. After some development they identified the magnesia (MgO) industry as a likely user. With external heating, the particle temperature is raised up to the calcination temperature gradually and uniformly. As a result, the magnesia produced by the system is highly reactive, with a very high surface area. The micron size particles were found to exhibit the same properties as nano-particles, and we call them 'nano-active.'

In the early days, Calix actually had a fairly strong focus on the use of magnesium oxides for building products. These types of alternative magnesium-based cements were a popular approach to the problem of CO_2 emissions from building materials at that time. It was thought that the products made would work well as a binder. However, we found the building products market to be very difficult to penetrate with new materials. This resulted in a rethink within the business and we subsequently turned our attention to other markets.

Left - Figure 2: Calix's Bacchus Marsh plant in Australia has used a Direct Separation Reactor (DSR) to produce niche 'extremely caustic MgO' since 2012, while trapping the plant's process CO_2 emissions.

"This may offer the ability to create new products at higher margins"

***GC:* Can you expand on Calix's experience in the magnesite calcining industry?**

AV: In 2005, the DSR idea was tested in a batch process. In 2009 a 250kg/hr pilot plant demonstrated that the process could work continuously and in 2012 a 5t/hr commercial reactor was built at Bacchus Marsh, Victoria, Australia. It is operated by Calix and has been online for the past four years.

The Bacchus Marsh plant generates extremely caustic MgO by lowering the temperature of the calcination process to avoid sintering. In fact its reactivity is up to 10 times higher than commercial caustic MgO, which has opened up new applications. Calix sells products to the waste water treatment, biogas enhancement and sewage sectors to prevent corrosion, as well as into aquaculture and agriculture. These are the markets developed from the Calix technology when applied to magnesite.

Later, it was demonstrated that the technology could be used to make lime from limestone in a very similar way. This led to the idea of using the DSR for cement production. Further limestone testing confirmed that the kinetics were sufficiently fast and that the DSR design could be used. However, cement and

lime plants are larger than magnesia plants and the temperatures are also higher. These differences and several other differences necessitated a larger pilot plant, the LEILAC plant.

As well as CO_2 savings, we anticipate that the DSR could lead to higher reactivity cement and lime products as seen in our magnesite experience. This may offer cement producers the ability to create new products at higher margins.

Right - Figure 3: Computer-generated rendering of the DSR to be used at the Lixhe plant.

***GC:* What happens to the CO_2?**

Mark Sceats (Executive Director and Chief Scientist): The CO_2 liberated from heating minerals is generally very pure, as most of the sulphur and other contaminants in the conventional process come from the combustion process. Thus the clean-up of the CO_2 gas stream before compression should not be as challenging as post-combustion capture.

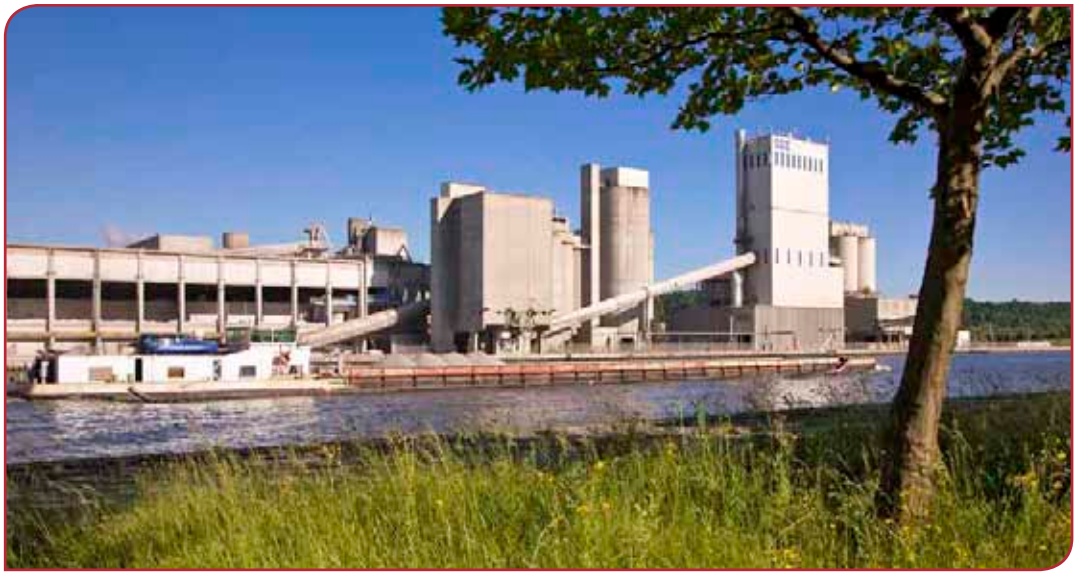
On a small scale the compressed CO_2 could be used for a wide range of carbon capture and use (CCU) technologies to generate chemicals, to carbonise waste minerals or for special cements in order to make low CO_2 building materials.

For other technologies, such as the growth of algae, there is no need for highly-concentrated CO_2. However, if the algae-farm could not be located next to the cement plant, the purified CO_2 can be liquefied and transported cost effectively to the algae farm. At the largest scales, carbon capture and storage would most likely be required to handle the large volumes of CO_2.

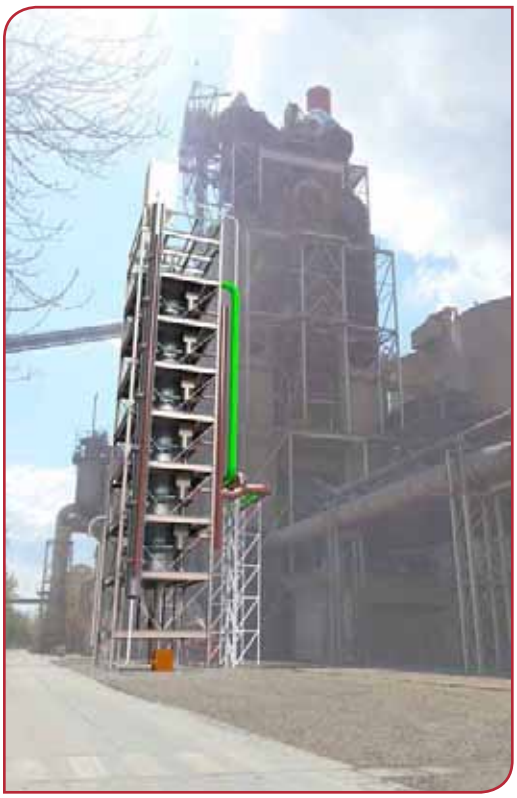
***GC:* The LEILAC literature says that there is almost no penalty other than compression, but what about transport and other factors?**

MS: We expect the CO_2 handling to be cost effective compared to other methods as the CO_2 will be relatively pure but, ultimately, it will depend on the volumes and fate of the CO_2. If it is to be liquefied, for example for shipping, the penalty will be relatively large. It could be compressed to 120bar for transportation by pipeline and injection over a reasonable distance, using commercially available compressors. Factors surrounding this will be investigated in the LEILAC techno-economic assessment and Roadmap, to be produced in 2020. It will detail all of the expected costs for the full-scale application of the technology, CO_2 compression and transport.

The LEILAC project will actually represent the highest temperature and volumes that the process is ever likely to have to handle. If everything goes to plan, LEILAC will provide assurance that almost any type of mineral could be processed



Right - Figure 4: View of the HeidelbergCement Lixhe plant in Belgium as it currently stands.



Left - Figure 5: DSR superimposed onto the Lixhe plant's precalciner. Will precalciners fade into history in the coming decades?

using a DSR. In fact, we are even looking into retrieving CO_2 from combustion itself. This is being investigated by coupling the calciner with a de-carboniser reactor under a separate EU project, ASCENT.

***GC:* The DSR has some elements similar to waste heat recovery (WHR) boilers. What do you see the overlap to be and what can be learned from that technology?**

AV: We have looked at other technologies like recovery heat exchangers for clues on fouling but the challenges with DSR are unique, given its configuration. Howver, there is a specific programme within LEILAC to look at WHR. For future integration we will use waste heat from the cement plant by feeding pre-heated meal. Waste heat from the DSR's CO_2 will also be recovered during the cleaning and compression steps. There are many opportunities to increase efficiencies and properly integrate the DSR with existing cement plant equipment.

At Lixhe

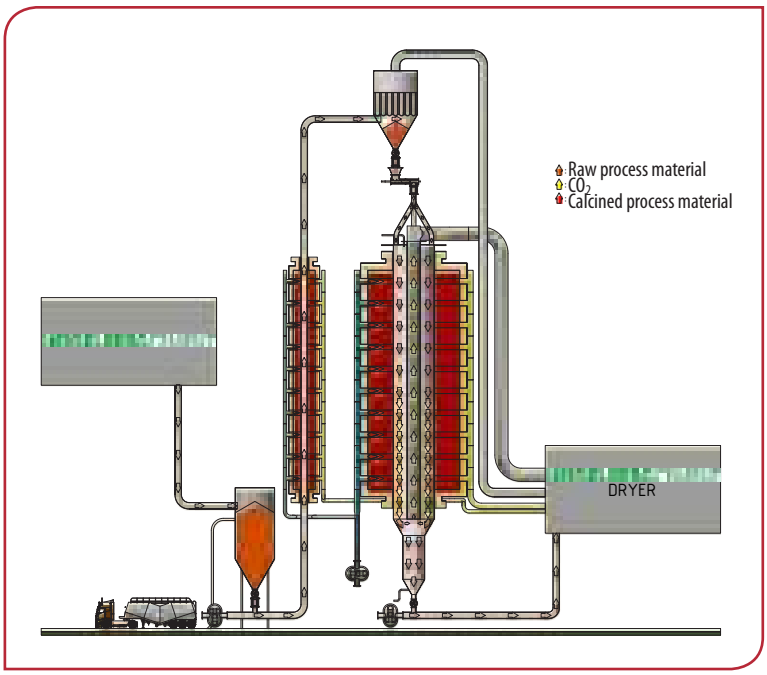
***GC:* Why was the Lixhe plant selected?**

DR: Lixhe was kindly selected by HeidelbergCement and is within a company and region that is supportive of innovation. The plant management is supportive of what we are doing, which is crucial for a project like this as it will represent a significant additional workload for the plant's staff during construction.

The Lixhe plant is close to the centre of HeidelbergCement's European operations and easily visited from other plants in the region. It is a 'typical' plant, as far as such a thing exists, with fairly typical raw meal. It is also close to the EU in Brussels, from which a lot of the funding comes.

AV: We set up Calix UK as our EU subsidiary precisely to be present in the EU, which is the most forward-thinking region in terms of CCS and CCU technology. It allows us to be part of projects like LEILAC.

***GC:* How will the technology be physically integrated into the plant?**



Below - Figure 6: Schematic of DSR integrated into the Lixhe plant.

DR: The raw cement meal will be a slip stream from the Lixhe plant. The calcined cement meal, the CO_2 stream and the combustion gas will be reinjected into the Lixhe plant. There is a provision for the plant to process other materials, such a pure limestone and other cement meals from our partners. The plan is to demonstrate 95% capture of the process emissions, which is ~60% of the total.

The funding for the Lixhe plant is limited, so the plant will not initially capture and compress the CO_2 stream, but will measure its purity for assessment of its potential utilisation.

***GC:* It seems strange that the CO_2 will not be captured? Will it be analysed?**

AV: The CO_2 will not be collected as the pilot will only be run intermittently for up to two years to test and prove the concept. As such the volumes collected will be relatively small and would vary depending on the nature of the test run. The CO_2 will be tested before it re-enters the main Lixhe cement plant, to prove its quality.

***GC:* What is the plan for evaluation of the technology at Lixhe?**

DR: The pilot is due to be constructed in early 2019, and will run until late 2020. It will undertake a number of tests that prove that the technology can be applied to the cement and lime sectors as expected and that the major scale-up risks have been, or can be, addressed.

The plant will run experimental campaigns for cement meal from the host plant at Lixhe and from other participating cement companies and ensure environmental compliance. There will also be trials for lime production. The project will monitor all the operating parameters of the plant.

The steel reactor tube will be assessed for performance, including corrosion, fouling and creep. Importantly, the project will also demonstrate the quality of the lime and clinker produced by the DSR.As part of LEILAC we have a task to examine the impact of DSR calcined cement meal against conventional meal. This work will be conducted by the industry partners and the research groups.

Right - Figure 7: Location of Lixhe, in the middle of HeidelbergCement's European operations.

***GC:* What do you expect to be the major technical barriers to using the technology in a cement plant?**

AV: There are two major technical barriers. Firstly, the temperature is higher. Magnesite is calcined at 750°C, whereas the temperatures required in the DSR for cement and lime production will be >900°C. This places additional demands on the steel used in the reactor. Secondly, cement and lime plants are larger than magnesite calcining plants. This will mean that we have to identify a commercially-viable route to scale up from 10t/hr to about 300t/hr, preferably with a retrofit capability. These issues have been at the forefront in developing the design for the Lixhe plant.

***GC:* How do you think the technology will handle alternative fuels?**

MS: The investigation of alternative fuels is part of the LEILAC programme. The findings will inform the 2020 techno-economic study and Roadmap for the deployment of the technology.

The next steps and commercialisation

***GC:* What happens post-LEILAC, assuming that the project achieves its aims?**

DR: At the conclusion of the project a Cement and Lime industry CCS Roadmap will be developed. This Roadmap will be based on the outcomes of the LEILAC pilot's construction and test, full-scale techno-economic study, Life Cycle Analysis, and retrofit report.

This roadmap will explore the timing and opportunities for the widespread roll out of this technology. This will be important in informing decision makers and industry of the viability of the widespread deployment of Direct Separation as a means of accelerating the decarbonisation efforts of the industry, based on verified data. Using the European targets for emissions reduction, this should also provide tangible information regarding potential costs for the industry, which has had limited economic deep decarbonisation options until this point.

***GC:* What about in terms of the technology?**

AV: For the lime sector, the Lixhe plant is already at the scale needed for commercial use. The first deployment focus is on obtaining an energy efficiency comparable with the best practice used in the industry. Apart from CO_2 emissions reduction, the drivers for the adoption of the technology may be: The use of fines that cannot be processed in conventional lime kilns; The added value of high surface area lime that may be produced; The elimination of impurities arising from combustion, and; Possible use of alternative fuels such as syngas and green electricity.

For cement, the next step could be to add a reactor of the existing size to a plant for generating the CO_2 for a commercial CCU-project. This may provide an early commercial application and will mature the long term experience of operating the reactor.

"Critical to the success of the DSR is the ability for it to integrate into existing cement and lime plants without major redesign..."

The following step for cement will be to build a demonstrator plant module containing perhaps five DSRs, equivalent to 50t/hr of cement meal. The first large scale demonstrator plant would then use five or more of these modules. At this stage, there are no technical impediments that would limit the potential for adoption in Europe. The ease of adoption will largely depend on the integration of DSRs into the conventional cement production process and a retrofit strategy.

***GC:* Do you envisage the technology will bear a net cost that offsets rising CO_2 prices or will it actually produce a revenue for the plant aside from CO_2 credit considerations?**

DR: Our aim is to demonstrate that the technology captures CO_2 without any substantial additional capital cost or operating costs, other than compression. It is possible that: The application to lime will produce a high surface area product that may sell at a premium; A higher surface area lime in cement meal may allow the development of new cement products for niche markets or; The technology can produce a range of meta-clays, such as metakaolin and very high surface area magnesia and semidolime, for cement additives. The benefits may come to bear in different ways depending on the location and the nature of the producer using the technology.

***GC:* This is an EU-funded project and as such is relevant to that region. Does this technology have applications outside of environmentally-conscious markets like the EU?**

DR: Yes, but we envisage that the drivers to adoption may differ in different regions. We hope that the technology will be adopted in regions with lower environmental requirements than Europe due to the ability for cement producers to provide niche, high-value products. Some areas have very strong emphasis on branding and niche Calix-based cement products could help producers to differentiate themselves.

It could also be that CO_2 capture could be the main driver in the EU ETS area at first and *then* the popularity of niche products will drive adoption of the technology in other regions.

***GC:* I can see analogies with alternative fuels. These are rarely used simply because they are 'green' but rather because they offer savings in fuel costs. Could this be how the technology is perceived outside of emissions trading areas?**

AV: Possibly, that is why the EU is attractive at the moment. It provides the highest incentive for adoption of this technology in terms of actually having a CO_2 price. It's low, but it is there, unlike in many other regions.

***GC:* Do you expect there to be 'attitude' barriers from other plant operators?**

DR: Critical to the success of the DSR technology is the ability for it to integrate into existing cement and lime plants without major redesign of process flow or operating philosophy. This should allow for a turnkey type of approach to work in many plants.

As such, when applied at full scale, it would be a straight replacement of a cement plant's calciner tower or a lime kiln. It should be a simple, cost effective and efficient way of capturing unavoidable process emissions and thereby provide options for operating in a CO_2-constrained world. We expect minimal challenges from attitudes at plant level due to the similarity of the technology with existing production methods.

One further exciting possibility is that we have looked at electrical sources for driving these types of calciners. This is of interest to the cement operators because instead of needing a fuel, you could run a cement plant on solar power, wind power, hydroelectric power, low energy biogas (via generators), and many other renewable sources.

***GC:* You mention a turnkey approach in your above answer. What about licensing the DSR out to the major cement plant manufacturers?**

AV: In terms of looking at how this will be rolled out, licensing is certainly a strong possibility. There may be differences in how we operate in the lime and cement sectors, as the DSR essentially replaces the entire lime kiln. It is different in the cement sector in that it only replaces part of the line. In both sectors there are lots of options and we are not committed to any one pathway at this point.

***GC:* We will certainly follow LEILAC's development with interest, gentlemen. Thank you all for your time.**

DR/AV/MS: You are welcome - Thank you!

Danlin Ou, Sheng Wu, Xiaomeng Liu & Yimin Liang, Zhejiang Bonyear Technology Co., Ltd., China;
Sibin Guo, Hua Qu, Liyang Tianshan Cement Co., Ltd., China; Brian Lines, Applied Manufacturing Technologies, USA

The application of model predictive control in cement kilns that use low quality alternative fuels

The treatment of municipal waste is one of the biggest environmental challenges facing China. One solution is co-processing in cement kilns. However, wastes are not sorted, leading to alternative fuels of low quality and varying consistency. This makes it difficult to keep the cement production process stable. To solve this problem, Zhejiang Bonyear Technology (BYT) has developed the Model Predictive Control (MPC) system, which was installed at Liyang Tianshan Cement (LTC). It has significantly increased the stability of the cement production process when using low quality and variable alternative fuels, with big improvements in selected key performance indicators (KPIs). This could have significant benefits for cement producers worldwide, especially in developing countries.

Liyang Tianshan Cement (LTC) is one of the most efficient and modern cement plants in China. With a clinker capacity of 2.0Mt/yr, the company operates a double-string five-stage preheater, precalciner, rotary kiln and grate cooler. The plant was built in 2004 and was updated to use municipal solid waste (MSW) in 2013. All of the plant's MSW comes from the nearby city of Liyang, which has a population of 0.8 million and generates about 400-600t/day of waste.

In order to process some of the waste from Liyang into materials that can be used by a cement plant, a system was installed by Sinoma Environment at the plant. As there is no MSW sorting by the municipality itself, the raw waste is separated into four parts. The first comprises combustible materials, which go to the precalciner. The second is sludge, which is added into the raw mill with the limestone feed. The third is leachate, which is treated by a waste water system. The fourth is metal, which is recycled.

Table 1 shows the characteristics of the combustible materials and the sludge derived from raw city refuse. The average calorific value (dry basis) of combustible materials is 5500kCal/kg and the average water content is about 38%. The quality of combustible materials is much worse than the RDF prepared in Europe. However, the real challenge is that its composition and calorific value are inconsistent.

Below right - Table 1: The properties of materials processed by LTC's MSW handling system.

Material	Mean calorific value (kCal/kg)	Mean water content (%)
Combustible material	5500	38
Sludge	2192	64

Below - Figure 1: Panorama of the Liyang Tianshan Cement plant in Liyang, Jiangsu Province.

Left - Figure 2: The combustible fraction from LTC's waste processing plant.

Figure 2 shows a sample of the combustible fraction. The poor quality combustible materials cause significant problems in the calciner and negatively affect the entire clinker production process. The operators at LTC constantly struggled to keep the process stable but, despite their extensive experience, the material is simply too difficult to handle. An intelligent control system was viewed as an efficient way to solve this problem.

Control strategy

Keeping the calciner stable is the key to the stability of the process. At the beginning of this project, it took the authors quite a while to analyse the whole calcination process at LTC. It was found that both the raw meal feed rate and combustible material feed rate were unstable and the raw meal flows separated to the two preheater strings were also uneven.

Traditionally, there are several standard controllers from BYT that apply Model Predictive Control to the cement production process. Additionally, two further controllers were designed for LTC. A brief description of the five controllers used is given here:

A. Feed Controller (FeedCtrl): There are two major purposes of this controller: To reduce the weight variability of the feed bin by adjusting the discharge valves of homogenising silo online and; To minimise the temperature difference of the two strings by adjusting the distribution gate of the raw meal feed.

B. RDF Controller (RDFCtrl): The purpose of this controller is to keep the feed rate of combustible materials stable when it is injected into the calciner. The transportation and dosing process of combustible materials are controlled by RDFCtrl to stabilise the feed rate step-by-step.

C. Calciner Controller (CalCtrl): The major purpose of this controller is to stabilise the outlet temperature of the calciner by adjusting the feed rate of coal to the calciner under the limitation of CO emission. In addition, the feed rate of the raw meal and combustible materials are designed as feed-forward controls. On top of this, a special algorithm called inverse difference is used to identify trends in the calciner exhaust temperature so the feed rate of coal can be adjusted in advance to counteract the disturbances.

D. Kiln Controller (KilnCtrl): This controller is more complex than others. Generally it can be considered in two parts.

1. The purpose of the first part is to keep the kiln outlet clinker temperature stable, which is the key for quality and production rate, and also to keep the kiln back-end temperature in the desired range. The major parameters are the feed rate of coal to the kiln head, the feed rate of raw meal and the set point of calciner temperature.

2. The purpose of the second part is to optimise the whole air system to make the burning process stable as well as to save energy, i.e.: to keep the O_2 concentration of the kiln inlet at a minimum level, maintain a stable kiln hood pressure and keep the temperature of the output clinker at the maximum level. The major parameters are the ID fan speed, exhaust fan speed and quench fan speeds.

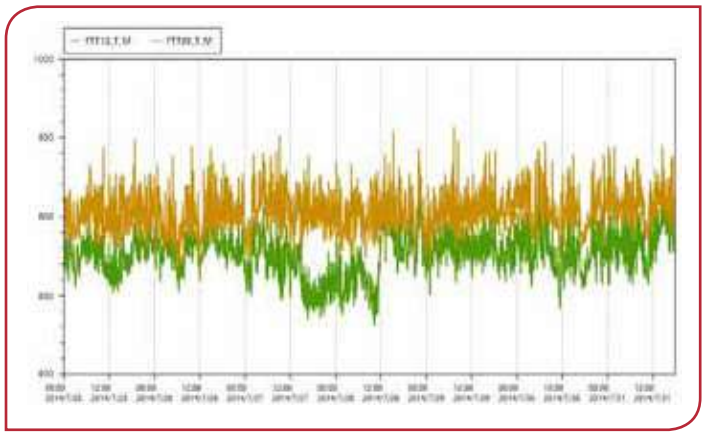
Left - Figure 3: Exterior view of the waste sorting plant.

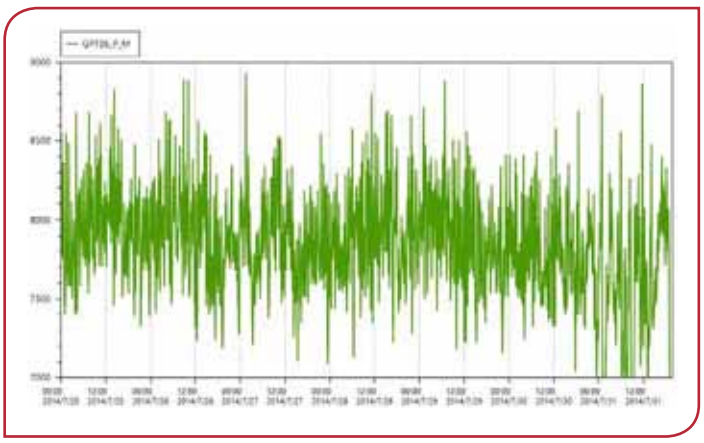
E. Grate Cooler Controller (GCCtrl): The purpose of this controller is to stabilise the heat exchange of the grate cooler. In the first stage of the grate cooler, the controller is designed to keep under-grate pressure (Room 1) stable. In the second and third stages of the grate cooler, the controller is designed to keep hydraulic pressure under a set maximum value. This means that more energy can be recovered from the clinker.

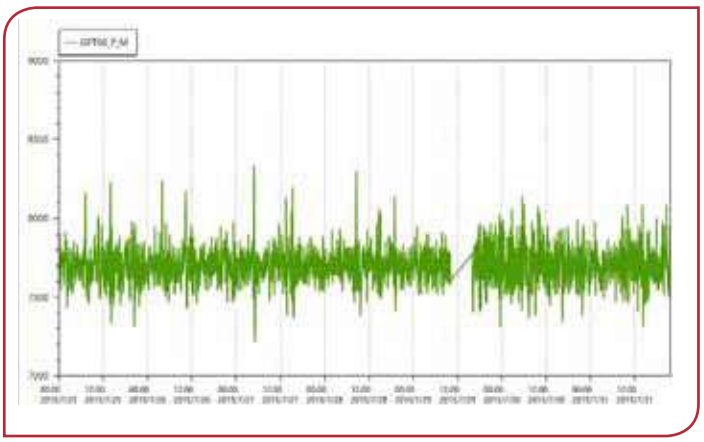
Results

Once the controllers were implemented, most parameters of the kiln process were much more stable than before. Figures 4 and 5 show the outlet temperatures of the two calciner outlets (A and B) in manual control and intelligent control (MPC) modes respectively. Figures 6 and 7 show the under-grate pressure (Room 1) in manual control and intelligent control (MPC) mode respectively.

We can see that the deviations of calciner outlet temperatures and under-grate pressure under MPC operation are much more stable than for manual operation. The standard deviations of calciner outlet







temperatures (A and B) were reduced by 34.2% and 43.9%, respectively. The standard deviation of under-grate pressure (Room 1) decreased by 62.4%.

The same trends can be seen in other key process variables, showing that the stability of the whole process has been significantly improved. As a result, the kiln can treat more combustible materials and energy consumption also fell.

Controller performance

The MPC system was put into service at the end of 2014 and the service time of most loops was more than 95% in 2015. Therefore, the comparison of some KPIs between manual operation in 2014 and MPC operation in 2015 gives a rough perspective of the controllers' performance (See Table 2).

Material	2014 (Manual)	2015 (MPC)
Clinker production (t/hr)	229.42	211.11
Coal consumption (kg/t of clinker)	107.13	100.46
Electrical consumption (kWh/t of clinker)	60.95	57.18
Combustible material used (t/day)	7.54	11.77
Sludge used (t/day)	9.58	11.87
Mean 28 day compressive strength (MPa)	57.1	57.7

The results show that when the MPC system was put into operation, the treatment mass of combustible materials and sludge increased by about 56.1% and 23.9% respectively, the coal consumption decreased about 6.7% and consumption of electricity decreased by 6.2%. However, as more combustible materials and sludge with high moisture content were co-processed, the humidity of exhaust gas increased significantly, which contributed to an increase in the volume of waste gas. As the ID fan was limited in capacity, the raw materials feeding rate fell by about 9.1%. From a general perspective, the economic benefits are still good, as both coal and electricity consumption decreased dramatically.

Conclusions

When the low quality alternative fuels were first co-processed by the cement plant at LTC, it was very hard to keep the clinker burning process consistent manually. An MPC system from BYT, including CalCtrl, KilnCtrl, GCCtrl, FeedCtrl and RDFCtrl modules, significantly increased the stability of key process parameters and brought significant economic benefits to the plant.

Above - Table 2: Comparisons of various KPIs in 2014 (manual control) and 2015 (MPC).

Top left - Figure 4: Outlet temperatures (A (orange) and B (green)) of the calciner under manual control.

Second top left - Figure 5: Outlet temperatures (A (orange) and B (green)) of the calciner in MPC mode.

Above left - Figure 6: Under-grate pressure under manual control.

Left - Figure 7: Under-grate pressure in MPC mode.

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Kirchdorfer Zement - The cement plant with the lowest emissions in the world

The title 'cement plant with the lowest emissions in the world' is not awarded every day. However, Kirchdorfer Zement spares no effort in the search for the best environmental protection. Here, it presents the development of emissions abatement systems at the plant, with a focus on the recent commissioning of a DeCONOx system from Scheuch GmbH.

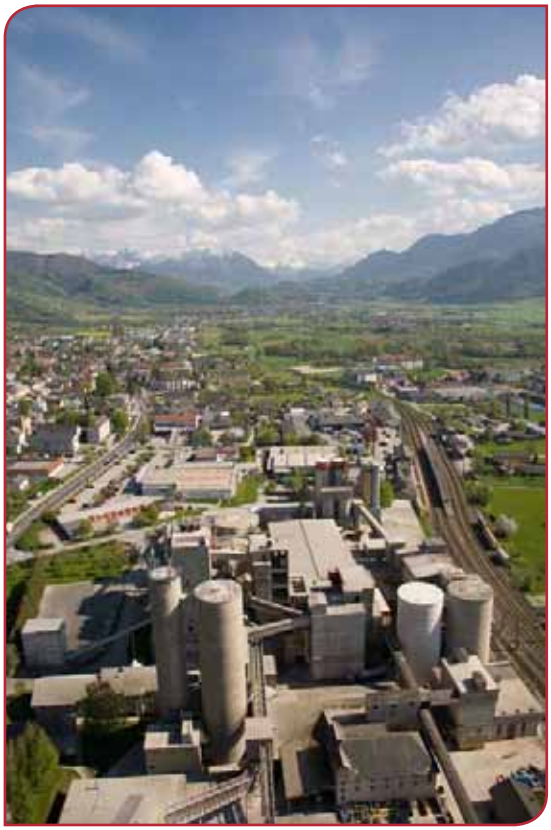
Cement has been produced in Kirchdorf Zement for 127 years. For many decades the management has taken numerous steps to reduce the plant's impact on the environment to a minimum. One of the reasons in the early days was its immediate proximity to the city centre of Kirchdorf an der Krems, which is just 600m away.

Over the years, this careful and considerate approach to the environment and its resources became second-nature. A summary of major milestones is shown overleaf. In 2010 the management and the owner announced a new vision for the Kirchdorfer Zementwerk, namely to become the most resource-efficient cement plant with the lowest emissions and highest safety standards in Europe.

DeCONOx system launch

Now, with the help of a sophisticated and award-winning DeCONOx installation from Scheuch GmbH, a globally-unique facility has been installed to further purify the plant's exhaust and enhance the use of waste heat. The system uses the energy from exhaust air to break down NO_x and volatile organic compounds. The residual energy is then recycled in the production process and de-coupled through heat recovery. Thus, waste heat of about 20GWh/yr can be fed into the district heating grid of EnergieAG Wärme Upper Austria to supply more than 1000 households in Kirchdorf and the surrounding area.

The facility was officially opened on 29 September 2016. At the event Upper Austria's Economic Secretary Dr Michael Strugl, said, "With this pioneering facility for air purification and heat recovery, the Kirchdorfer Zementwerk clearly reflects the new focus of Upper Austrian energy policy. With this new facility the Kirchdorfer Zementwerk implements innovative technology in order to protect resources and the environment. I can only congratulate the company on the realisation of a cement works with the lowest emissions in the world." Managing director Mag Erich Frommwald said, "Over the past 15 years we have already invested more than Euro23m in environmental protection. The DeCONOx facility is the highlight in a series of measures."

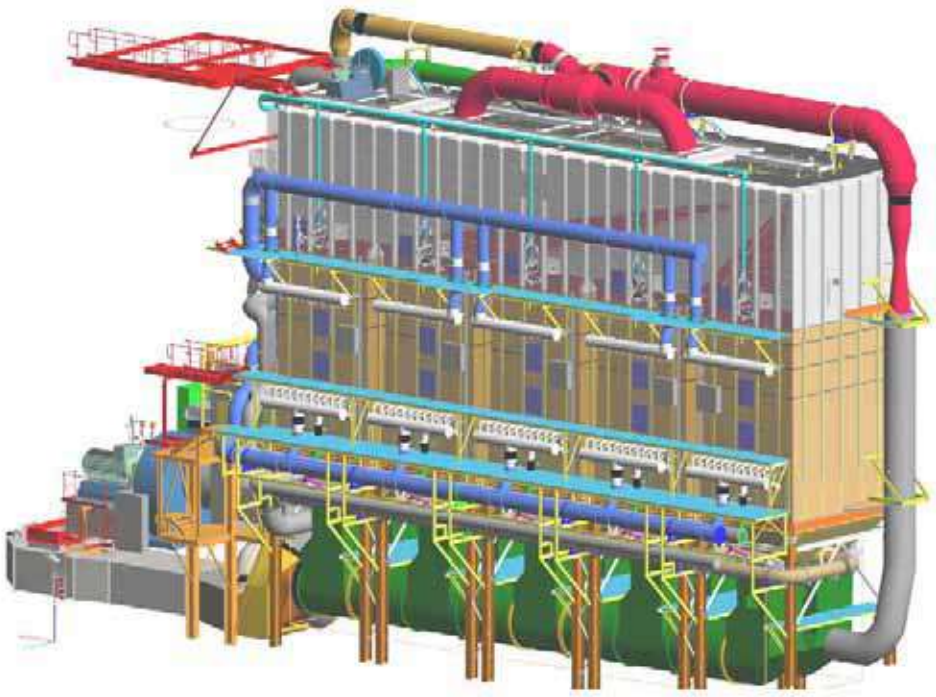


Right - Figure 1: The beautiful surroundings of the Kirchdorfer Zement plant in Upper Austria. The plant's management have long sought to minimise its effect on nearby settlements and the wider environment through a number of measures.

The DeCONOx system

'DeCONOx' stands for the reduction of (De) CO (carbon monoxide) and NO_x (nitrogen oxide). The process combines regenerative thermal oxidation (RTO) with low dust selective catalytic reduction (SCR), in a single system to fulfil two totally different tasks in exhaust gas purification.

The combination of RTO and SCR systems makes it possible to reduce organic carbon compounds and CO, while minimising odours. The installation of catalysts also enables a reduction in NO_x emissions. The DeCONOx system will run autothermally, meaning that the combustion process feeds itself. The fuels (CO, organic material) are present in the crude gas. This reduces the energy demand. The flue gas entering the system will have a CO concentration of 6500mg/Nm³.



Left - Figure 2: Five-tower DeCONOx facility.

Structure and function of the facility

The DeCONOx system consists of five towers. Two are pressurised with crude gas from prior to the reaction / combustion and two are pressurised with clean gas from after the reaction / combustion. The fifth tower is rinsed with clean gas in order to avoid peaks of crude gas concentrations (during switch over cycles) and thus reduce the half-hourly mean emission values.

Organic hydrocarbons and CO are converted in the combustion chamber at above 850°C. In order to guarantee complete oxidation, the combustion chamber is set to 860°C. During start-up (heat-up) and non-autothermal operation the temperature in the combustion chamber is regulated by burners or gas lances.

Kirchdorfer Zement's Milestones so far

1958: First electrical filter almost completely eliminates dust emissions.

1984: Installation of the first waste heat recovery (WHR) system for cooling of the clinker cooler exhaust. This has so far fed 250,000MWh of industrial waste heat into the Kirchdorf municipal heating system.

1998: Installation of the world's first pilot selective catalytic reduction (SCR) facility.

2006: Measures against noise pollution, including high-quality mufflers, reduce noise impact in and around the plant.

2007: Selective non-catalytic reduction (SNCR) system installed to reduce NO_x emissions.

2008-13: Installation of several waste gas purification pilot facilities, with a view to the future development of the new DeCONOx-technology.

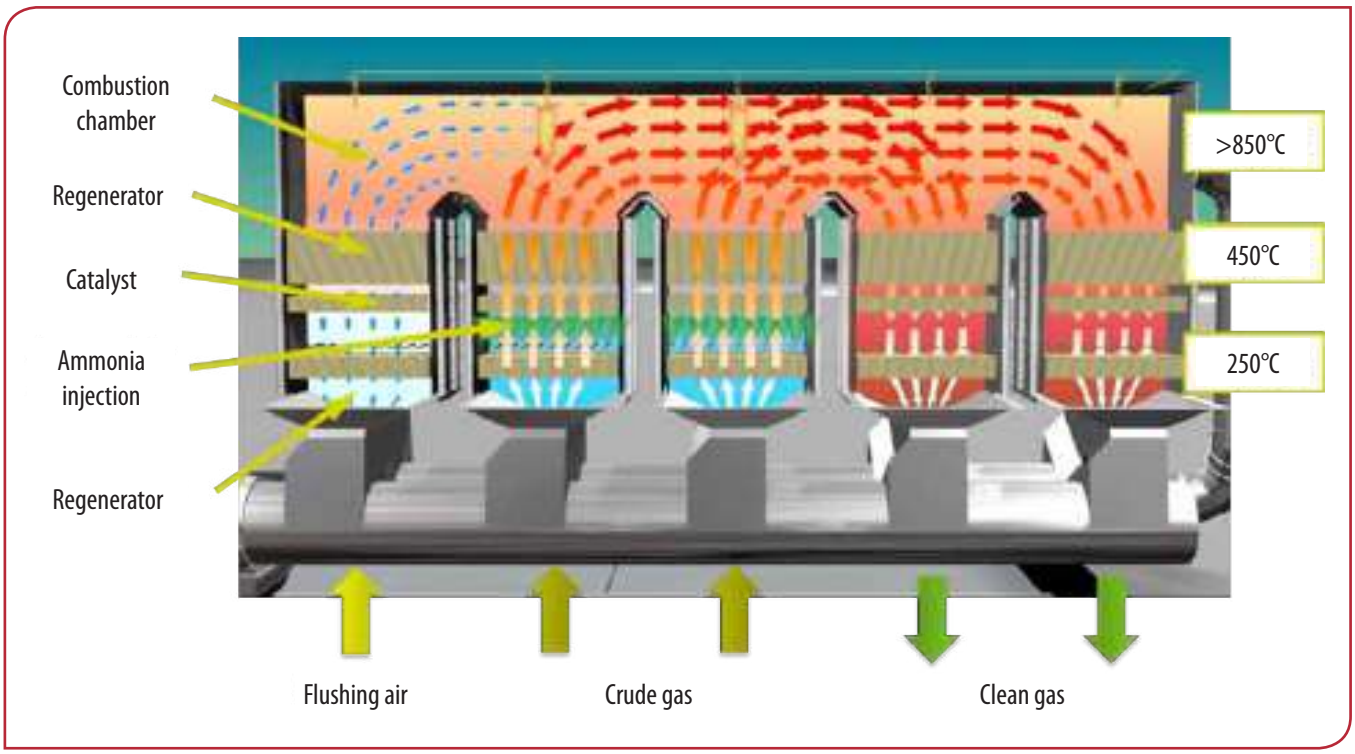
2010: Installation of a new kiln filter.

2011: Energy-efficient clinker cooler fitted.

2014: Implementation of an ISO 50001 energy management system.

2015: Erection of large-scale DeCONOx plant and WHR system.

2016 Opening of the DeCONOx-facility.



Above - Figure3: Schematic diagram of the gas routes based on a five-tower version of the DeCONOx system.

The special burners used only need natural gas during operation, not during standstill. With a combustion chamber temperature above 750°C the temperature can also be regulated with gas lances. These enable the temperature to be fine-tuned and do not need any burner air, thus reducing the energy demand even further. The clean gas leaving the DeCONOx is 25-35°C hotter than the crude gas.

Before start-up, the chamber is heated up with natural gas and fresh air. This takes 6-12hr. A maximum heat-up rate of 6°C/min should not be exceeded because of material stress. As soon as the temperature of the catalyst reaches 250°C and the temperature in the combustion chamber is beyond 850°C, the facility can be pressurised with flue gas. During standstill periods and maintenance work the plant must be rinsed with fresh air for about 30 minutes.

Regenerators serve to transfer the heat. During the cycles they are alternately heated up and cooled down by the flue gas. The catalysts are installed between the regenerators. The geometric set-up of the catalysts basically corresponds with the set-up of the regenerators. Thus, the catalysts work as regenerators and replace parts of the regenerators. The catalyst must not be damaged in the course of permanent switching procedures and the temperature changes

Right - Figure 4: Three out of five reaction towers during assembly on site.

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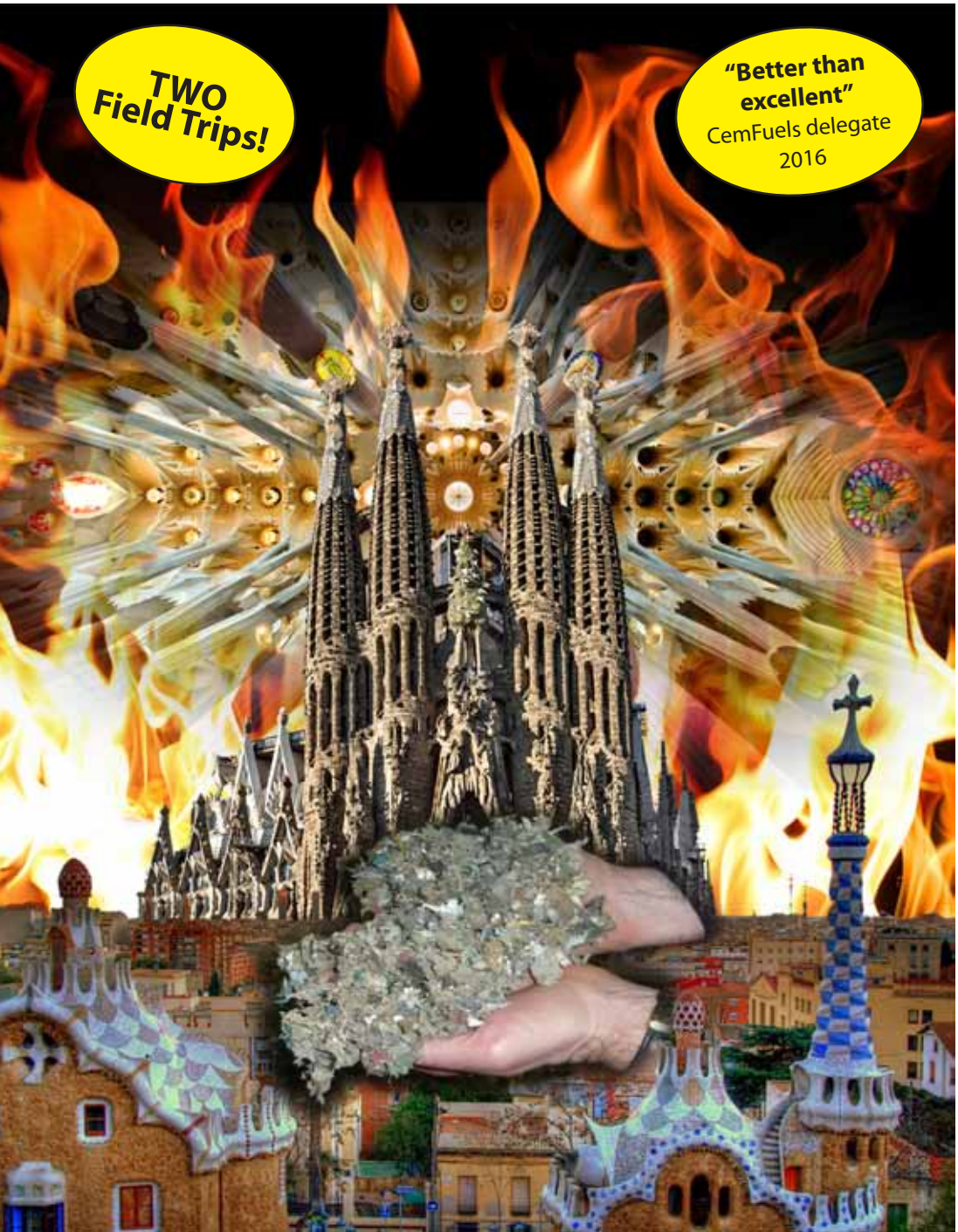

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Parameter	Warm side	Cold side
Thermal output (kW)	5300	-
Mass flux (kg/hr of water)	156,176	116,407
Inlet temperature (°C)	106	65
Outlet temperature (°C)	77	104

Right - Table 1: Heat recovery technical data.

Project data

Costs:	Euro7.3m
Steel used:	365t
Regenerator and catalyst weight:	215t
Hoisting of ammonia tank:	500t crane
Total installation time:	~25,000hr

involved. The switch over is carried out every 50–120 seconds, during which the gas absorbs heat with the upward flow and releases the heat with the downward flow. In the bottom regenerator the crude gas reaches the necessary catalyst inlet temperature of at least 240°C, depending on the SO_2/SO_3 content. The ammonia injection and the catalyst layer is then followed by a second regenerator layer that raises the flue gas to combustion chamber temperature.

"This new technology enables to operate temporarily without any fossil energy carriers and to save valuable raw material through the use of suitable recycling material such as waste sand or brick chippings. As a traditional enterprise, we feel obliged to act responsibly towards the next generations. We are proud that the facility went into operation without any problems and that it will set new standards in the cement production," concludes Erich Frommwald.

Right and below: Installation of parts of the DeCONOx system.

Tony Robinson, CST Instruments

CemTest - An innovation in cement testing

Just one poor quality batch of cement can have disastrous consequences for a major project. Quality testing is thus a crucial aspect of cement production. Current methodologies for testing the key characteristics of compressive and flexural strength are laborious, time consuming and expensive. Here, we describe how the CST CemTest instrument can speed up analysis, leading to savings and enhanced reputations for producers.

Current compressive and flexural strength test methodologies typically require a lab environment and specialist equipment to cast, cure and then crush sample prisms of cement over a 28 day period. If a test reveals that a cement batch is below standard, this will prevent the batch from being supplied to the end user, delaying projects and increasing costs. However, UK-based CST has improved upon this situation with a unique solution. It has developed the technologies and algorithms of an accelerated method to test cement and fresh mixed concrete. The CemTest system enables testers to determine the compressive strength of a mixture within minutes rather than the current 28 days.

Test description

CemTest is a simple accelerated method that utilises a small hand-held CemTest Instrument. It requires a small quantity of cement (<15g) and just 500ml of de-ionised water. It has drawn on over 30 years of experience from CST's team to arrive at a precise testing procedure that takes less than three minutes. It works by measuring the electrical conductivity characteristics of a cement and water solution during the early hydration period (first 90 seconds) using a purposely designed measuring probe.

This cost-effective, non-destructive and time-efficient solution doesn't require an environmentally-controlled area so it can be utilised both in the field and in the laboratory. It is possible to perform multiple tests on a single sample by varying any of the input parameters. This new level of flexibility and shortened timescales make CemTest an ideal tool for the research and development of new cement mixes, considerably speeding up the process of making changes to future batches.

Nine key parameters drawn from the product's data sheet - **1.** Cement type (rapid, normal, slow); **2.** Density of cement; **3.** Consistency of normal paste; **4.** Fineness of cement; **5.** Additive size; **6.** Additive type; **7.** Water/cement ratio; **8.** Curing time and; **9.** Curing temperature - are then entered into the CemTest instrument, along with the data from the analysis. The CemTest Instrument then uses the unique algorithm to calculate the ultimate strength of the cement for compressive strength and flexural strength (including for oil well cement).

The precise results provide the technicians an excellent measure of the strength of each batch of cement. The decision whether to accept or reject a batch of cement can now be immediate and evidence-based. Speeding up and informing these decisions saves money and time, reduces failure rates and ultimately protects the integrity of concrete structures.

The UK Accreditation Service (UKAS) and other independent laboratory tests have confirmed that CemTest provides accurate results for CEM I and CEM II cement ranges typically within +/- 5-7% of the BSI EN196-1 standards. The results will also be converted to ASTM standards using a conversion matrix being developed by the team.

Left: The CemTest Instrument by CST Instruments can provide accurate cement test results in a fraction of the time taken by traditional methods. CST focuses on solving challenges faced by the construction industry that are caused by poor quality cement and concrete , including major construction delays, environmental issues, financial penalties and health and safety problems. Its approach is to develop elegant solutions based on complex algorithms but with simple to use instruments that can support testing both in the field and in dedicated test centres. It is in use by Kaya Muhendislik (Turkey) and HeidelbergCement Georgia.

Ventilatorenfabrik Oelde GmbH

Wear protection for centrifugal fans – An economically sound decision

In the cement sector centrifugal fans are exposed to extremely harsh attack by abrasive media carried in the air flow. They must, furthermore, cope with challenging conditions during the production process. Venti Oelde has decades of experience in wear protection for centrifugal fans, constantly promoting research and development in this area. Together with a reputable German technical university, Venti Oelde has meticulously examined wear on industrial fans. Experience from many field studies has been incorporated into the development of measures to provide wear protection.

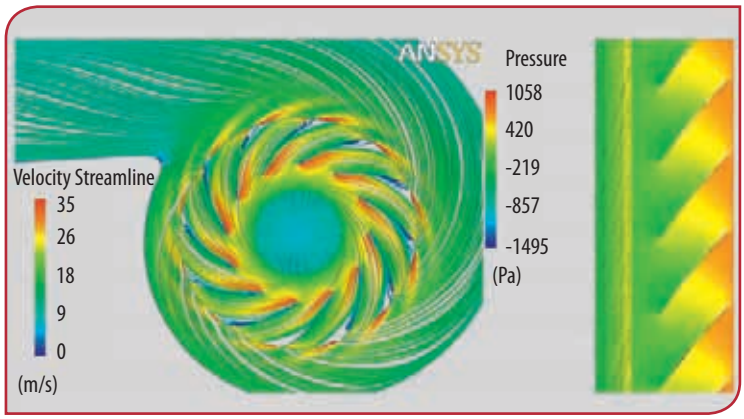
If the media being handled contains abrasive or corrosive substances, then protecting the fan against wear is highly recommended. Ultimately, this will increase the service life of the fan in a profitable manner. To determine the optimal wear protection and its positioning and design, the fan's load is digitally simulated using computational fluid dynamics (CFD). Taking into account the specific properties of the abrasive material, it is possible to determine both the areas on the fan impeller most subjected to wear and the optimum wear protection coating.

Intelligent mix of materials against dust

The mantra 'A lot helps a lot' can only be applied to wear protection with some reservations. The essential thing is to take the correct measures. Using harder hardfacing does not necessarily provide the desired result, especially as it is usually considerably more expensive and difficult to apply. Furthermore, wear protection materials, such as fused tungsten carbide, are becoming more and more difficult to obtain. Prices continue to climb globally.

Venti Oelde's aim is to select a wear protection system that is appropriate to each process. A parameter for the selection of the best wear protection is the composition of the dust in the air-stream that causes the wear. As well as quantity and hardness, the particle size distribution and particle geometry of the dust play important roles. For example, when the dust is very fine and abrasive a wear protection system where the carbides are evenly distributed and as close together as possible must be selected. This prevents excessive carbide erosion. The structure of a wear protection layer consists generally of hard carbide particles embedded into a binder matrix phase. Table 1 shows the wear protection materials used for a variety of application conditions.

Right - Figure 1: Impeller with wear on the centreplate.



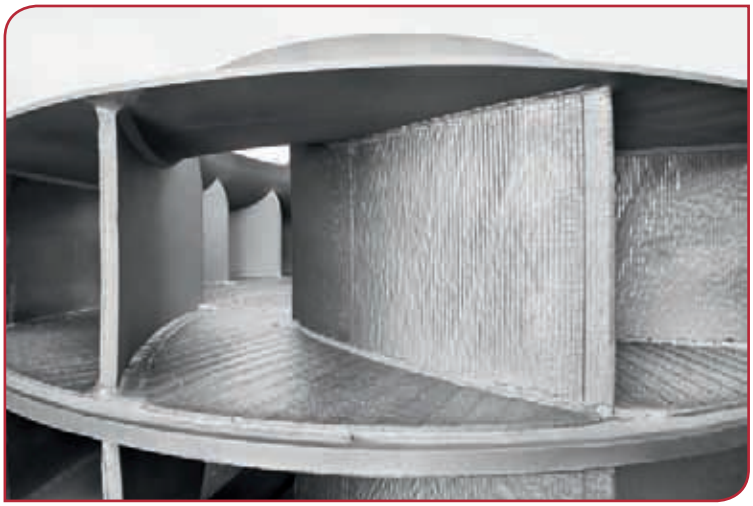
Right - Figure 2: Fan flow simulation.

VentiWear	Hard phase	Matrix	Operating temperature (°C)	Surface hardness (RT)	Special notes
100	Chromium carbides	Fe	250	59 HRc	-
150	Chromium and niobium carbides	Fe	250	61 HRc	-
170	Chromium carbides, Bor	Fe	250	62 HRc	-
200	Chromium carbides, Mo	Fe	500	62 HRc	Hot hardness 61 HRc at 450°C
210	Chomium carbides, Mo	Fe	350	59 HRc	Hot hardness 50 HRc at 350°C
300	Chromium carbides and borides	Fe	250	57 HRc	Few cracks
310	Chromium carbides	Fe	600	68 HRc	Hot hardness 65 HRc at 500°C
500	Fused tungsten carbides	NiBSi	500	50 HRc	Conditionally resistant to corrosion
600	Chromium carbides	Fe	250	55 HRc	Conditionally resistant to corrosion
800	Fused tungsten carbides, tungsten carbides	NiCrBSi	250*	55 HRc	Few cracks Conditionally resistant to corrosion
1000	Tungsten carbides	Co	250**	1350 HV1	Special design hot gas up to 450°C

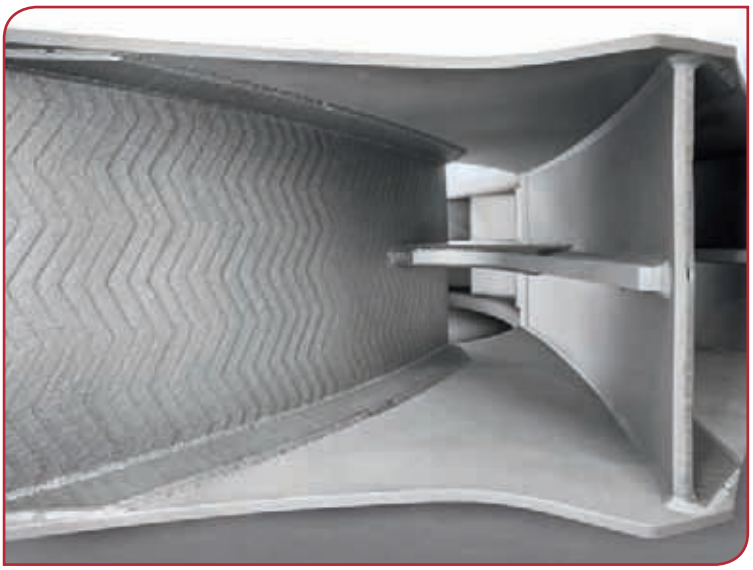
Left: Table 1.
* = Conditional on base material, as sintered at 1100°C
** = Conditional on the bonding.

Knowing where – proper positioning

Besides selecting the appropriate anti-wear material, its positioning and the implementation of measures to protect the centrifugal fan against wear are of equal importance. Empirical data combined with flow analysis gives an indication of the areas of an impeller which are likely to suffer wear. These areas can be given more significant protection against wear.



Left - Figure 3: Special wear protection on the critical areas of the impeller.



Left - Figure 4: Zig-zag geometry in wear protection on an impeller blade.

The right surface finish

The surface properties of the individual wear protection materials are also evaluated, while considering the flow pattern and properties of the particles (particularly their size), travelling through the fan and causing wear. This will have, for example, an effect on the geometry of the wear protection or on the technique used to apply the wear protection coating. In the case of fine dusts, in order to minimise erosion of the cracks in the wear-resistant layer – impossible to avoid in some materials used to protect against wear, due to their high hardness levels – the weld bead is laid contrary to the direction of flow. Otherwise a zigzag geometry is chosen. By selecting a wear protection system in conjunction with an appropriate technique for the application of the wear-resistant coating, a virtually crack-free surface can be created.

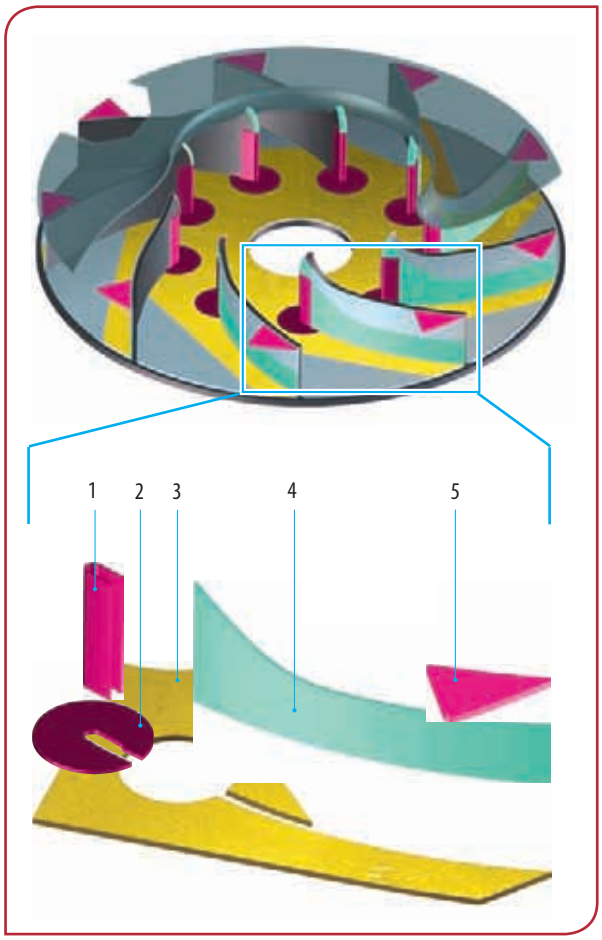
A hard shell – even retrospectively

When upgrading or refurbishing fans, measures can also be taken to protect fans against wear. Impellers and fans are dismantled by Venti Oelde on site and transported to Oelde in Germany. After cleaning the steel parts, an initial visual inspection is performed, as well as technical fault detection using the ultra sound method and dye penetrant testing. Parallel to fault detection, the fan may also be the subject of a flow simulation – customised to its operation – to determine how the fan may best be protected against wear.

Protection in a modular format

Venti Oelde also has a modular wear protection system. This includes six modules:

1. Wrap-around edge protection liners for blade inlet edges;
2. Wear plates on blade inlet edge;
3. Wear strips for the impeller centreplate;
4. Wear plates for the blades;
5. Wear plates for impeller shroud protection;
6. Protective caps and plates for the threaded connections, impeller to shaft.



Right - Figure 6: Wear protection measures on the impellers of centrifugal process fans.

1. Wrap-around edge protection liner.

2. Wear plate.

3. Wear strip.

4. Repair plate.

5. Wear plate for impeller shroud protection.

Grey surfaces will also be wear-protected if required.

The modular system makes it possible to use wear protective materials of varying quality in the different areas, depending on the load. The modular design of the wear-protection system means that the worn modules can be replaced quickly and easily.

Nigeria: Loesche reports on Unicem order

Loesche has released details on its order for the United Cement Company of Nigeria (Unicem) cement plant at Calabar in Cross River State, which was commissioned in September 2016. The order was for two vertical roller mills (VRM): one type LM 60.4 for grinding cement raw material and one LM 70.4+4 CS, the biggest Loesche VRM built for grinding cement clinker.

This mill was designed for a capacity of more than 370t/hr to a fineness of 4700 Blaine that required a drive system that could power it up to 8800kW. So the COPE system was designed for mill drive powers ranging from 4000 – 15,000kW. The COPE gearbox is also equipped with eight individual drive units, which are each designed for a capacity of 8800kW, allowing for redundancy in case of unit failure.

Other notable highlights of the installation that Loesche has highlighted include the equal size as standard drive units for VRMs that allow for the exchange of conventional gearboxes with the setup. The installation is also the first usage of an eight-drive unit in a VRM gearbox and the first time a multiple drive in a VRM can operate with or without a variable frequency drive.

Delivery of the order started in October 2015. First production of cement on the new production line began in September 2016. The new line increased the plant's cement production capacity to over 5.5Mt/yr from 2.5Mt/yr.

UK: Siwertell wins for Liverpool project

Siwertell, part of Cargotec, has won an International Bulk Journal (IBJ) Award. A joint submission with its customer Peel Ports took the prize in the Best Ship Loading/Unloading System category at the awards ceremony held in London on 21 November 2016.

"This latest win sends a clear message to anyone in the market for a dry bulk handling system that Siwertell is the first-choice for anyone whose priorities are capacity, safety, environmental issues and overall performance," said Emily Brækhus Cueva, Marketing Manager, Siwertell.

Ivory Coast: New order for Intercem placed by Sea Invest

In connection with the current order for the delivery of an 8000t/day cement grinding and packing plant for Cim Ivoire in Abidjan, Ivory Coast, Intercem has been granted with an additional order by Sea Invest for the raw material transport from the new ECO Hopper to the clinker silos and the additive storage.

This order includes the delivery of trough belt conveyors as well as all related components and the transfer tower on an EPC base – from the piling, the foundation works, the steel construction, the cladding of the building, the roofing of the belt bridges, the necessary filters and chutes to the electrical equipment, as well as installation and commissioning. Moreover, the scope of supply contains the measurement of the local conditions with a 3D scanning system as well as the mechanical, electrical and civil engineering.

Commissioning is planned for the fourth quarter of 2017 to ensure the raw material supply for Cim Ivoire. An extension by further trough belt conveyors is previewed in order to meet the challenging demand for raw material supplies of the country's cement industry in the future.

Iran: First Gebr. Pfeiffer MVR mill for Iran

Gebr Pfeiffer has released information about a newly-developed MVR 4250 R-4 raw mill that will be installed at Biarjaimand Cement Company in Iran. The raw mill, with an installed drive power of 3000kW, is designed to grind 280t/hr of cement raw material to a product fineness of ≤12% R 90µm. The contract was awarded in September 2016 and the order was placed through the Chinese general contractor Beijing Kaysun Trading, a subsidiary of CATIC based in Beijing. Gebr Pfeiffer staff will also supervise erection and commissioning. The delivery of the equipment is scheduled to start in the second half of 2017.

Austria: New Rocket Mill for ASA

ATEC has commissioned a Rocket Mill RM 2.50 for ASA at its waste treatment plant in Wiener Neustadt. The mill has a capacity of 7-40t/hr and is equipped with two grinding chambers, which can be independently loaded. Each one has a main drive of 315kW. Due to the grinding technology, it also has an additional drying effect of approximately 10%. The mill is designed to produce refuse-derived fuels (RDF) with an output size of 5-80mm from pre-sorted and shredded household and commercial waste. It was principally built at A TEC's plant in Eberstein.

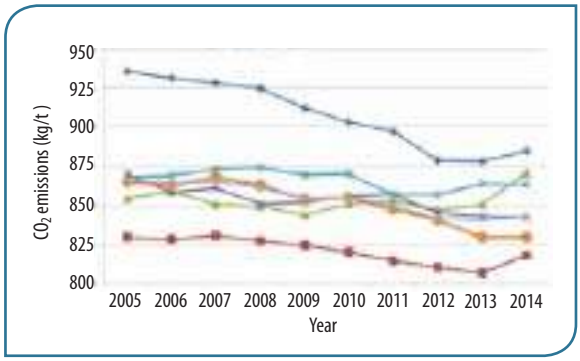
The EU cement sector continues to reduce its CO_2 emissions...

Koen Coppenholle Chief Executive of CEMBUREAU, the European Cement Association

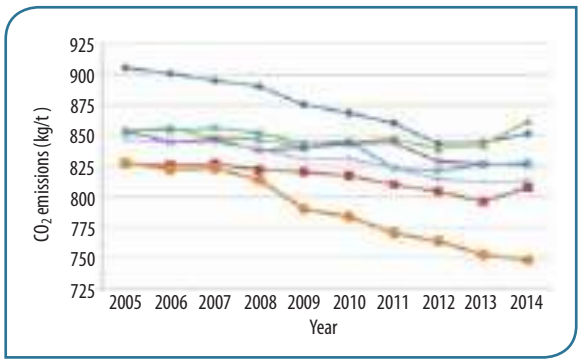
According to the latest data available, in 2014 the European cement industry continued to reduce its emissions per tonne of product. This data, published by the *Cement Sustainability Initiative*'s *Getting the Numbers Right* project, shows that, between 2005 and 2014, the EU28 cement industry:

- Reduced its gross CO_2 emissions per tonne of clinker by 4% (See Figure 1);
- Reduced its net CO_2 emissions per tonne of clinker by 10%; (See Figure 2);
- Reduced its gross CO_2 emissions per tonne of cementitious material by 5% (See Figure 3);
- Reduced its net CO_2 emissions per tonne of cementitious material by 10% (See Figure 4).

As this data shows, the European cement industry is still among the world's best performers and is on a continuous trend of improvement. It is important to note that while the data for the EU covers close to 100% of plants, this is not the case for other jurisdictions, where it is often only the best performing plants that contribute.



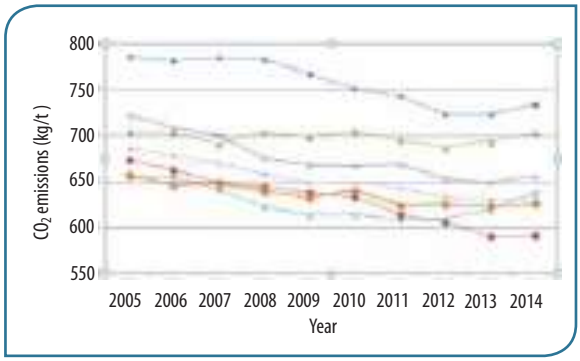
Above - Figure 1: Gross emissions for grey clinker, 2005 - 2014. **Source:** The CSI's Getting the Numbers Right programme.

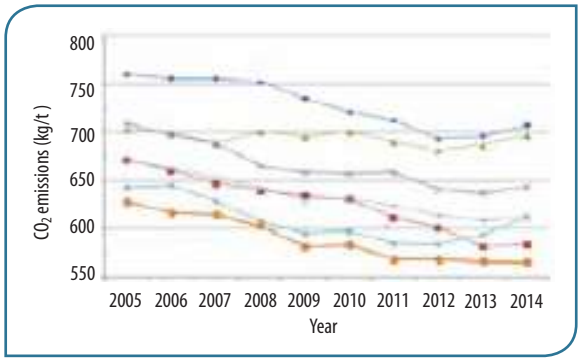


Above - Figure 2: Net emissions for grey clinker, 2005 - 2014. **Source:** The CSI's Getting the Numbers Right programme.

Below - Figure 3: Gross emissions for white and grey cementitous materials, 2005 - 2014. **Source:** The CSI's Getting the Numbers Right programme.

Below - Figure 4: Net emissions for white and grey cementitous materials, 2005 - 2014. **Source:** The CSI's Getting the Numbers Right programme.





Europe: Cembureau raises concerns over amendments to EU ETS

Cembureau, the European Cement Association, has raised concerns that amendments submitted by the European Parliament's Environment Committee, which foresee the introduction of a Border Adjustment Measure (BAM) with the loss of free allowances for the cement sector in Phase IV of European Union (EU) Emissions Trading Scheme (ETS), starting in 2020, will be detrimental to the local cement industry. The association is concerned that the changes unduly affect the cement industry, although lime, brick and tile industry have also been included.

The association said that a BAM against certain but not all sectors as 'discriminatory and legally flawed.' It raised the problems that the policy would bring for the competitiveness of the cement industry both globally and internally. It also blamed the influence of reports by non-government agencies upon policymakers.

Environmental campaign group Sandbag defended the changes as ones that could put a stop to the, 'cement sector's windfall profits from the ETS.' It argued that the proposed import inclusion carbon mechanism would expand the scope of the ETS to include imported materials for a number of sectors, meaning that products sold in the EU would face the same costs for carbon compliance, regardless of their origin.

"In a number of ways, this proposal marks a huge step forward in the evolution of the ETS. The proposed border adjustment measures are a good starting point for levelling the playing field for all cement producers," said Wilf Lytton, Industrial Carbon Researcher at Sandbag.

Switzerland: Olsen elected to CSI chair for 2017

Eric Olsen, chief executive officer of LafargeHolcim (right), has been elected as the new chairman of the Cement Sustainability Initiative (CSI) for 2017. The appointment was confirmed at the CSI's annual CEO Meeting in Madrid, Spain in late 2016.

"It is an honour for me to be chairing this important industry organisation in the coming year," said Olsen. "Sustainability in the construction sector is not the preserve of one organisation. I will focus on ensuring that the CSI continues to play an important role in building collaboration within our industry and encouraging joint action across the entire value chain. As one of the largest global sustainability programmes ever undertaken by a single industrial sector, we have a real opportunity to drive change. Our plans are ambitious and we are conscious that we will only achieve them by working together."

LafargeHolcim is one of the founding members of the CSI, which is part of the World Business Council for Sustainable Development (WBCSD). It was launched in 1999 with the aim of supporting the progress of the global cement sector toward sustainable development. The CSI unites 23 major cement producers with operations in more than 100 countries. Collectively these companies account for around 30% of the world's cement production and range in size from multinationals to local producers.

Netherlands: Keith promoting Freight Runner Conveyor

Keith Walking Floor is promoting its new Freight Runner Conveyor, a conveying system that can be installed inside a truck trailer, as part of its 'West Coast Tour' in the US and worldwide. It is intended to replace the manual process of palletised cargo handling that requires a forklift operator and an employee with a pallet jack. The system can move up to 30t and it can load and or unload a full trailer in two minutes. The system is available in a hydraulic and electric driven motor versions.

Germany: New VP at Hazemag

Erik Bach has been appointed the Vice President of the Minerals Processing division at Hazemag. His focus will be on the technology leadership for established products, the consistent completion of the product portfolio and the expansion of the company's markets. Bach, aged 43 years, has previously worked for FLSmidth.

Denmark: Schäfer becomes honorary consul

Klaus Schäfer, the managing director of Beumer's Danish subsidiary, has been appointed honorary consul of the Federal Republic of Germany for the Central Jutland region of Denmark. In addition to his day job for Beumer Group, his new duties include fostering closer ties between Germany and Denmark, with an emphasis on both trade and culture. Schäfer will assist with both administrative and ceremonial consular tasks. The role is voluntary.

Switzerland: Workers at LafargeHolcim highlight human rights' violations

Workers at LafargeHolcim held a 'global day of action' in advance of International Human Rights Day on 10 December 2016 to draw attention to the world's largest cement maker's alleged widespread violations of workers' rights, according to the IndustriAll Global Union federation. Workers in Europe, Africa, Asia and the Americas 'mobilised, took action and demanded' that LafargeHolcim respect workers' rights.

The union action intended to highlight alleged worker rights violations, including an increase in workplace fatalities in 2015, an increasing use of precarious employment, illegal replacement of striking workers in Canada, use of child labour and targeting of union members for dismissal in Uganda, unfair treatment of displaced families due to the development of a plant in Ambuja in India and a 'poor' response to workplace accidents in Indonesia.

Unions in the federation demand that LafargeHolcim use less precarious work, cooperate better with trade unions on health and safety and restructuring and enter into 'meaningful' negotiations with them about the future of labour relations and social dialogue.

"We expect that the world number one in the cement sector is not only number one in figures and cement sales, but also in labour standards and workers' rights," said general secretary of the European Federation of Building and Woodworkers (EFBWW) Sam Hägglund.

Turkey: Korfez wins order for shell lining system

Korfez Eng. has signed an order with a cement producer to supply a new shell lining system. The scope of the order is a complete replacement of a wear shell lining for a single-compartment mill with an effective grinding length of 4m and 14.5m, the mill discharge and complete new manhole covers in a modified configuration. The complete lining is of a wave profile type WAVE 35/50 in a highly wear-resistant steel casting with 27% chromium content. The complete contract scope will be completed and delivered within a month and a half.

UK: Tarmac opens rail facility at Aberthaw Cement Plant

Tarmac's Aberthaw Cement Plant has opened a rail facility to despatch bulk cement. The rail depot will mean that trains will be used to transport cement in Wales for the first time in over 20 years. The yard is expected to replace 2500 annual truck movements on local roads. Jane Hutt, the Welsh Assembly Member for Vale of Glamorgan, officially opened the facility.

"Reducing our road movements by 25% is a significant achievement and it puts us in an even better position to supply materials to our customers across Wales and the south west of England in a more sustainable way. The plant has been in operation for over 100 years and we employ 109 people, the majority of whom live within 10 miles of the site, so this development demonstrates our commitment to the Vale of Glamorgan," said Aberthaw Cement Plant manager, Chris Bradbury.

Russia: FAS discusses cement exchange trading

The Federal Antimonopoly Service (FAS) has brought together local cement producers to develop exchange trading with cement. Attendees agreed that trading should not be limited to Moscow and St Petersburg and a proposal was made to organise exchange trading supplying goods for export. They agreed to submit proposals to FAS, which will also ask industry experts and buyers for their comments towards shaping exchange trading.

"Exchange trading is an opportunity for new players to enter the market", said Deputy Head of the FAS Andrey Tsarikovskiy. He added that attracting new companies to the market would lead to increased competition in the sector.

Belarus: Belarusian Cement Company and Eurocement agree deliveries

The Belarusian Cement Company and Eurocement Group have signed a contract concerning deliveries of cement in 2017. In line with the agreement, the deliveries will satisfy the demand for Belarusian cement on the Russian market. The deliveries in 2017 will be at least as large as in 2016, according to the Belarusian Telegraph Agency. The deal was signed by Eurocement Group President Mikhail Skorokhod, Director General of Belarusian Cement Plant Igor Lozhechnikov and Director General of Krichevcementnoshifer Vladimir Korchevsky.

Belarusian Architecture and Construction Minister Anatoly Cherny said that the Russian market is the key target market for Belarusian cement producers. He added that, despite falling demand in Russia, the share of Belarusian cement on Russian Federation markets would grow larger.

Turkey: Çimsa Çimento and Batiçim place orders with Aumund

Aumund Fördertechnik has received orders from Çimsa Cimento and Baticim. Çimsa Çimento has now ordered about 60 machines for cement plants in Eskişehir and Niğde. Baticim has ordered 41 machines for its cement plant in Söke.

By the end of 2016 Aumund had supplied the Eskisehir plant with six central chain bucket elevators, with centre distances between 25 - 68m and capacities from 40 - 400t/hr. The package also comprised 10 belt bucket elevators with centre distances between 17 - 95m and capacities of 200-350t/hr. Also six Aumund 800mm pan conveyors with centre distances between 15-47m and capacities from 150 - 250t/hr were delivered. The Aumund SPB pan conveyor ordered for the Eskişehir plant has a centre distance of 42m and a capacity of 250t/hr. This particular model is equipped with three discharge stations. Finally, the plant ordered three trough chain conveyors.

For the Niğde plant Aumund has supplied three central chain bucket elevators, with centre distances of 25-37.5m and capacities of 50-400t/hr. The order also comprised six belt bucket elevators with centre distances of 31-91m and capacities of 250-350t/hr. To convey clinker a bucket apron conveyor with a centre distance of 40m and a capacity of 250t/hr will be used. The clinker dust will be transported by three trough chain conveyors.

Batisöke Söke Cimento will take delivery in mid-2017 of 14 central chain bucket elevators, with centre distances between 22 - 43m and capacities from 130 - 600t/hr. The order also comprises five belt bucket elevators with centre distances between 60 - 125m and capacities from 300 - 650t/hr, and 15 Aumund pan conveyors with widths ranging from 800 - 1400mm, centre distances between 49 - 146m and capacities from 300 - 600t/hr. Six sets of truck loading equipment will also be supplied.

Slovenia: Euro15m efficiency loan for Salonit Anhovo

The European Bank for Reconstruction and Development (EBRD) has awarded Salonit Anhovo (Salonit) a Euro15m loan to be used for energy and resource efficiency improvements and to restructure the company's balance sheet. The building materials producer has a substitution rate of 64% for alternative fuels at its Anhovo cement plant. The EBRD loan will be invested to increase this ratio further to improve the company's profitability and reduce CO_2 emissions. A precondition for increasing the ratio of alternative fuels is the installation of state-of-the-art equipment. The investment will also have a beneficial effect on operational costs, which are expected to decline thanks to the adjusted fuel ratios.

The Global Cement Directory 2017

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Mexico: Cemex to hit debt target

In December 2016 Cemex said that it had made good progress towards reducing its debts over the year. By 7 December 2016, it had announced divestments of close to US$2bn for 2016, had reduced its total debt plus perpetual securities by more than US$2bn and said that it was on target to reach its leverage ratio target of about 4.25 times by the start of 2017. Cemex also reported that it remains on track to reach its debt reduction target of US$3-3.5bn by the end of 2017.

"Despite challenging market conditions, working on the variables we can control has allowed us to be well on our way to significantly strengthen our capital structure and we expect to continue to be able to do so in the near future," said Fernando A Gonzalez, chief executive officer of Cemex.

Trinidad & Tobago: Cemex to take over Trinidad Cement

In contrast to its debt-reduction activities, Cemex has announced plans to take over Trinidad Cement by increasing its share in the cement producer through its subsidiary Sierra Trading. It will present an offer and take-over bid to Trinidad Cement's shareholders, which if successful, will increase its share of the company to 74.9% from the 39.5% that it holds at present. The value of the offer has been placed at US$89m. The offer is reliant on Sierra acquiring at least enough of Trinidad Cement's shares to give it control. The offer period is expected to close on 10 January 2017.

If the offer is successful, Trinidad Cement will continue operating as previously. Trinidad Cement's main operations are in Trinidad and Tobago, Jamaica and Barbados. It is the majority shareholder of Caribbean Cement Company.

US: Martinsburg sale completed

HeidelbergCement has completed the sale of its Martinsburg, West Virginia cement plant and eight related terminals to Cementos Argos. With the finalisation of the sale the group has now met all the obligations with regards to its acquisition of Italcementi.

"With the disposal of the US assets we fulfil the obligation of the Federal Trade Commission and improve the net financial position of HeidelbergCement after the acquisition of Italcementi," said Bernd Scheifele, chief executive officer of HeidelbergCement.

HeidelbergCement and Cementos Argos announced the sale in August 2016. The transaction purchase price was US$660m on a cash and debt-free basis. The FTC approved the agreement in November 2016.

US: Elementia completes Giant acquisition

Mexico's Elementia has completed its acquisition of Giant Cement for US$220m from Cementos Portland Valderrivas (CPV). The board of directors has given its final approval for the purchase of the remaining 55% stake of the US cement producer, giving it full control of the company. The transaction gives Elementia three cement plants, three limestone quarries, two aggregate quarries and six cement terminals, adding more than 2.8Mt/yr of cement production capacity.

"Today marks a major milestone for Elementia as we successfully enter the US cement market and take another solid step within our inorganic growth strategy. The work of our transition team is already underway to extract the tremendous value we see in Giant," said Fernando Ruiz Jacques, chief executive officer of Elementia.

Above: Section of the kiln at the Martinsburg cement plant in West Virginia, USA.

US: Hamblen is new PCA Chairman

The Portland Cement Association (PCA) has elected Allen Hamblen, president and chief executive officer of CalPortland Company, as chairman of the PCA board of directors, and Tom Beck, president of Continental Cement Company, was elected vice chairman. Hamblen takes over PCA board chairmanship from John Stull, chief executive officer of US Cement for LafargeHolcim US.

Prior to 2006, Hamblen was president and chief executive officer of Glacier Northwest and has worked with CalPortland and its predecessor for 31 years. He is a former chairman of the National Ready Mixed Concrete Association, a trustee of the Ready Mixed Concrete Research and Education Foundation and is a former president of the Washington Aggregates and Concrete Association.

Beck has served as senior vice president at Continental Cement from 2005 to 2013, and as vice president of sales and marketing from 1996 to 2005. He is also a former chairman of the American Concrete Paving Association.

US: PCA drops 2017 cement forecast

The Portland Cement Association (PCA) has lowered its forecast for cement consumption in 2016 to 2.7% from a previous estimate of 4%. It has also revised downwards its forecast for 2017 to 3.1% from 4.2%, attributing the declines to post-election political uncertainty, inflation and slower construction activity.

"President-elect Trump continues to shape his cabinet and policies, thus making it difficult to forecast potential outcomes at this point," said PCA Chief Economist Ed Sullivan. "The impact of uncertainty is expected to be compounded by increased inflationary expectations, which will impact long-term bonds and loans, such as mortgages – to the detriment of cement consumption."

In the meantime the PCA has presented three potential political scenarios in its forecast that could shape policy priorities. These scenarios take into account various levels of political support from the US Congress, as well as possible shifts in the President-elect's previously announced policy objectives that impact upon cement consumption.

Colombia: Maceo plant debacle continues

Cemex has received a subpoena from the US Securities and Exchange Commission (SEC) seeking information to determine whether there have been any violations of the US Foreign Corrupt Practices Act (FCPA) in relation to a new cement plant being built by Cemex Colombia at Maceo in Antioquia.

In late September 2016 Cemex fired several senior staff members in relation to the Maceo project and its subsidiary's chief executive resigned. This followed an internal audit and investigation into payments worth around US$20.5m made to a non-governmental third party in connection with the acquisition of the land, mining rights and benefits of the tax free zone for the project. Cemex referred the situation to the Colombian Attorney General at the same time. The group has also confirmed that it maintains an anti-bribery policy applicable to all of its employees and subsidiaries. Cemex Latam, the Latin American subsidiary of Cemex, intends to enter dialogue with the Regional Autonomous Corporation of Antioquia (Corantioquia) to revoke its environmental permit for Maceo cement plant project. Corantioquia has requested that the permit from Central de Mezclas, a subsidiary of CHL, be returned to the CI Calizas y Minerales, according to the El Colombiano newspaper. The government agency has removed the clearance on procedural grounds and over the mining rights in the area.

Above: Installation of a finish mill at McInnis Cement. **Source:** McInnis Cement website.

Canada: Hervé Mallet appointed head of McInnis Cement

McInnis Cement has appointed Hervé Mallet as its president and chief executive officer. Other new appointments include the assignment of Gaétan Vézina as Vice-President, Cement and Sustainable Development and Alexandre Rail as Vice-President, Operations – Port-Daniel–Gascons.

Previously Mallet was the Executive Vice-President – North America for Dynacast. He is a graduate of the University of Wolverhampton and Brunel University in the UK.

US: Ash Grove blamed over death

The Mine Safety and Health Administration (MSHA) has blamed the management of Ash Grove Cement's policies, procedures and controls for the death of a worker at its Midlothian cement plant in May 2016. Roderick Barnes, a maintenance worker aged 46 years, died from a fall from the top of a slurry tank. In its report on the incident the MSHA said that the cement producer failed to provide protection around openings through which workers could fall and that it failed to use fall prevention and protection devices. The MSHA has issued five citations for violations of the Mine Act in relation to the event.

Colombia: Competition body rejects Cemento Patriota brand request

The Superintendency of Industry and Commerce (SIC), Colombia's competition watchdog, has rejected a request made by Productora de Cementos to register its brand Cemento Patriota under Nice Classification. The initially approved submission was contested by Cementos Argos, according to La Republica newspaper. It argued that Cementos Patriota would infringe on its Cementos Uno A, Concretos Uno A and Agregados Uno A labels, because it reproduced the distinctive letter 'A' and number one of the accompanying graphic shared by all three brands. SIC ruled in favour of Cementos Argos, arguing that a side-by-side comparison shows visual similarities.

Venezuela: Unions seek collective contract

Union representatives from the Corporacion Socialista de Cemento have met with their counterparts from the aluminium industry to discuss how to obtain a collective contract for workers in the cement industry. The Cement Union Coalition (Coalicion de los Sindicatos Cementeros), comprising unions such as Sintracemex, Sintraboica, Sutracompeblo, Invecem and Sintracea, is seeking to sign a national unified agreement for cement workers to unify worker benefits, according to the Nueva Prensa newspaper. At present there are over 20 collective contracts in the cement sector with variations in wages and working conditions. The union has compiled a draft collective contract that will be revised before being passed to the government for negotiation.

Mexico: Cruz Azul to spend US$300m on plant upgrades

The Cruz Azul Cooperative plans to spend US$300m towards upgrades at its four cement plants. The investment will form part of a modernisation project over the next four years. The initiative will involve updating older production lines with environmental upgrades, expanding its production capacity for export and generating energy from wind power.

Brazil: Arabian Cement puts plant on ice

Arabian Cement has frozen plans to build a cement grinding plant in the north-west of Brazil. It said that there was no 'investment efficiency for the project' due to the poor Brazilian economy, according to Mubasher. The cement producer originally planned a joint venture in 2014 with Cementos Relampago Company, an affiliate of Cementos La Union, to build a 0.23Mt/yr plant for US$28.7m.

Argentina: Camargo Corrêa exploring sale of 40% stake in Loma Negra

Brazilian cement producer Camargo Corrêa is in talks to sell a 40% stake in Loma Negra. The company is exploring a potential sale with an unspecified number of bidders, according to Reuters and Brazil Journal. The proceeds of any successful sale will be used to reduce the debts of InterCement, the holding company that Camargo Corrêa uses to manage the assets that it purchased from Cimpor. Loma Nega is the largest cement producer in Argentina.

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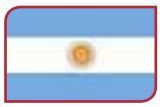
Peter Edwards, Global Cement Magazine

The cement industry in South America

South America has cement industries of different sizes and levels of development. While much cement is made by multinationals, national and regional players are increasing their influence both on the continent and further afield. Here we look at the cement industries of Argentina, Bolivia, Chile, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay and Venezuela. The Brazilian cement sector, which is around the same size as those of the other South American countries combined, will be covered in the March 2017 issue of *Global Cement Magazine*.

Argentina



Argentina has 14 integrated cement plants and a further four cement grinding plants. They share a combined capacity of 20.4Mt/yr, according to the *Global Cement Directory 2017*. This is enough to give Argentina South America's second-largest cement industry after that of Brazil.

Producer breakdown

The dominant cement producer in Argentina is Loma Negra, the local subsidiary of Brazilian cement giant InterCement. It operates 8.2Mt/yr of integrated capacity across seven plants, as well as 0.6Mt/yr of grinding capacity at a plant in Ramallo. Its 8.8Mt/yr represents over 43% of national capacity.

The second-largest producer is LafargeHolcim, which operates the former Holcim subsidiary Holcim Argentina. It has 4.1Mt/yr of integrated cement capacity at three sites, plus 1.7Mt/yr of grinding capacity at a further two. With 5.8Mt/yr, LafargeHolcim represents 28% of Argentina's total capacity.

The third largest producer by installed capacity in Argentina is Cementos Avellaneda, a joint-venture between the Spanish Group Cementos Molins and Brazil's Votorantim. It operates 4.9Mt/yr of cement capacity across two integrated plants and one grinding plant.

In June 2016, Cementos Avellaneda announced a US$189m upgrade at its San Jacinto grinding plant. The capacity will increase to 1Mt/yr from 0.3Mt/yr, taking Cementos Avellaneda's total to 5.6Mt/yr. The upgrade will be completed by the start of 2019.

The fourth, and smallest, player in the Argentinian cement market is Petroquimica Comodoro Rivadavia (PCR), which operates two integrated cement plants and has a total capacity of 0.9Mt/yr.

Recent production trends

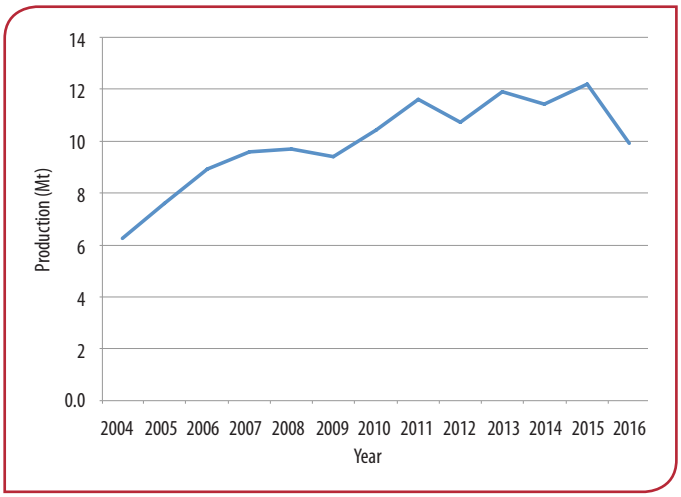
Data from the Asociación de Fabricantes de Cemento Portland (AFCP) shows that Argentina's cement industry is currently operating at a fairly low capacity utilisation rate. Figure 1 shows that cement production rose consistently year-on-year from 2005 (6.3Mt) to 2011 (11.6Mt), rising by 84% in just six years. Since 2011, cement production has plateaued, with 2016 showing significant contraction compared to 2015. While the AFCP's latest data is for November 2016, taking the December 2015 value as an approximation for December 2016, we arrive at 9.9Mt of cement made in 2016, a decrease of 2.3Mt or 18.5% year-on-year compared to 2015. This gives a capacity utilisation rate of just 48% for 2016.

Country	Active capacity (Mt/yr)			Number of active plants		
	Integrated	Grinding	Total	Integrated	Grinding	Total
Argentina	17.7	2.7	**20.4**	14	4	**18**
Bolivia	5.6	0.2	**5.8**	6	2	**8**
Chile	7.1	3.9	**11**	5	10	**15**
Colombia	16.8	2.1	**18.9**	14	4	**18**
Ecuador	3.9	0.9	**4.8**	5	1	**6**
French Guiana	0.0	0.1	**0.1**	0	1	**1**
Guyana	0.5	0.0	**0.5**	1	0	**1**
Paraguay	0.7	0.4	**1.1**	1	1	**2**
Peru	11.4	0.0	**11.4**	7	0	**7**
Suriname	0.0	0.1	**0.1**	0	1	**1**
Uruguay	1.1	0.0	**1.1**	3	1	**4**
Venezuela	15.3	0.0	**15.3**	11		**11**
TOTAL	**80.1**	**10.4**	**90.5**	**67**	**25**	**92**

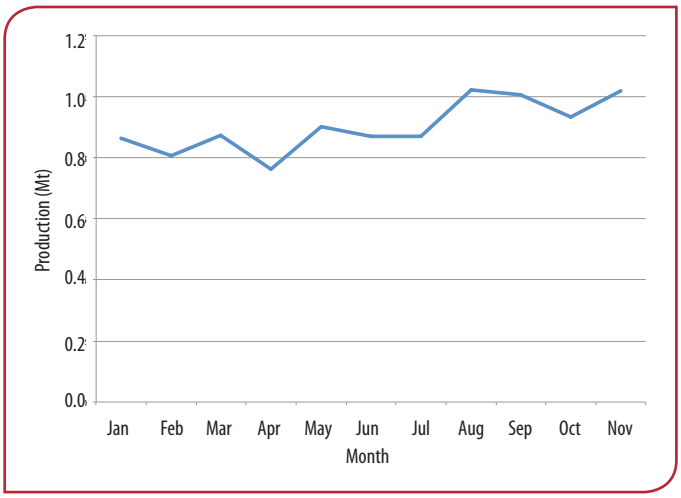
Right - Table 1: South America cement capacity and plant totals. **Source:** *Global Cement Directory 2017.*

Recent news

December 2016: Camargo Corrêa announced that it had entered into talks to sell a 40% stake in Loma Negra. The company was exploring a potential sale with an unspecified number of bidders, according



Left - Figure 1: Argentinian cement production, 2004 - 2016. 2016 value is an estimate based on real January - November 2016 data, plus December value from 2015. **Source:** AFCP.



Left - Figure 2: Argentinian cement production in 2016. **Source:** AFCP.

to Reuters and Brazil Journal. The proceeds of any successful sale will be used to reduce the debts of InterCement, the holding company that operates Loma Negra.

August 2016: The Loma Negra plant at Caramarca is currently undergoing work to upgrade its baghouse at a cost of US$17.5m. Work began in September 2016 and will take 12 months.

Bolivia

Bolivia has four integrated cement plants and two grinding plants that share a total capacity of 5.8Mt/yr. The industry is dominated by local producers, with some interests also held by Brazilian players. The plants are typically small, with no single plant larger than 1.0Mt/yr.

Producer breakdown

The largest cement producer in Bolivia is Sociedad Boliviana de Cemento (SOBOCE), which has three integrated plants and one grinding plant. It has a total production capacity of 1.1Mt/yr. The second-largest producer in Bolivia is Fabrica Nacional De Cemento (FANCESA), which operates an integrated 1.0Mt/yr plant in Sucre state. The company has been in operation since 1948.

Other producers active in the market are Cooperativa Boliviana de Cemento, Industrias y Servicios (COBOCE) and Empresa Minera Industria, which operate integrated plants of 0.3Mt/yr and 0.1Mt/yr respectively. Itacamba Cemento, a Votorantim subsidiary, also operates a grinding plant close to the Brazilian border and a 0.9Mt/yr integrated plant that came online in Yacuses in late 2016.

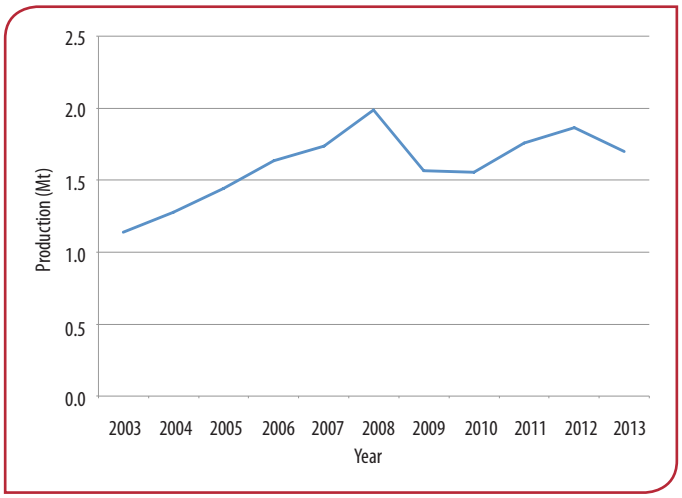
The Bolivian cement sector is set to expand further in the near future, with the addition of three further integrated plants. As of May 2016 Empresa Publica Productiva Cementos de Bolivia (ECEBOL) reported that its 1.3Mt/yr, US$306m cement plant project in Jeruyo, Caracollo was 35% complete. A Spanish-German consortium formed by Imasa, thyssenkrupp Industrial Solutions and Valoriza has been working on the plant since May 2015. Testing is scheduled to start in late 2017 followed by final delivery of the plant in September 2018.

In November 2016 it was announced that the Bolivian government plans to build a 1.3Mt/yr cement plant at Cutara in the Potosí department with an investment of US$306m. The government will spend US$245m on plant infrastructure and US$61m on road, electricity, water and natural gas connections.

The third plant is another 1.3Mt/yr cement plant being built in Oruro for US$244m. It is being constructed by Sacyr Industrial, which has a wide range of interests in the construction, oil and gas and water desalination sectors. The project was announced in April 2014 and Sacyr has not since released further updates. If all of these projects come online, the Bolivian cement sector will increase in size to 10.6Mt/yr from 6.7Mt/yr within the next 12 months.

Recent production trends

The Instituto Nacional de Estadística de Bolivia (INE) estimates that Bolivia consumed around 2.7Mt of cement in the first nine months of 2016. By estimating that each quarter saw equal consumption, we arrive at an estimated consumption of around 3.5Mt in 2016 as a whole. This indicates a capacity utilisation ratio of around 52% for the year, which calls into question the need for an additional 3.9Mt/yr of capacity. The USGS estimates that the country produced just 1.7Mt of cement in 2013 (the most recent year for which



Right - Figure 3: Bolivian cement production, 2003 - 2013.
Source: USGS.

data was available). This figure was broadly static in the preceding five years but increased in the five years prior to 2008, as shown by Figure 3.

Recent news

January 2016: SOBOCE awarded a contract to Denmark's FLSmidth for an OK 36-4 cement grinding system to be installed at its Viacha plant in January 2016. It was installed in September 2016 and is the first vertical roller mill for cement grinding in Bolivia. It produces high strength cement with 5000 Blaine and operates at >4000m above sea level.

August 2016: Menzel Elektromotoren delivered two motors for a cement mill and a classifier to the SOBOCE plant in August 2016. Particular technical attention had to be paid to the motors' durability and ruggedness to withstand the special operating conditions. During the planning phase, the drive engineers and the customer decided on a change of voltage levels, construction of a foundation plate and the installation of a vibration monitoring system for integration into the control as requested by the customer.

Chile

Chile has five integrated cement plants that share a total capacity of 7.1Mt/yr, plus 10 grinding plants that operate a further 3.9Mt/yr of capacity. This gives it a total capacity of 11.2Mt/yr.

Producer breakdown

The largest producer in the Chilean cement market is Cementos Bío Bío, (3.5Mt/yr) which operates three integrated plants (3.2Mt/yr) and one grinding facility (0.3Mt/yr). It has operated locally since its founding in 1957 and has 31% of the Chilean market by capacity. The producer reported a slight improvement in its profit in 2015, which rose by 4% year-on-year to US$30m.

The second-largest cement producer in Chile is LafargeHolcim, with 3.4Mt/yr of capacity via its 54.3% stake in Cementos Polpaico, which operates one 2.3Mt/yr integrated plant and two grinding plants of 0.8Mt/yr and 0.3Mt/yr respectively. LafargeHolcim is in discussions to sell its stake in the company, which would see it exit the Chilean market entirely. The purchaser is Inversiones Caburga and the deal is expected to be completed in the first half of 2017.

Cementos Melón (2.1Mt/yr) is the third-largest producer in Chile, with one 1.5Mt/yr integrated plant and 0.6Mt/yr of grinding capacity that is split evenly across two sites.

The remaining producers operate grinding plants only. Cementos BSA is the third-largest producer of cement in Chile. It operates three captive grinding plants for its ready-mix operations and has a total capacity of 1.2Mt/yr, enough for 10.7% of the market by this measure. Meanwhile Hormigones Transex and Cementos La Union each operate a single grinding facility, with capacities of 0.4Mt/yr and 0.2Mt/yr respectively.

Colombia

Chile has the third-largest cement sector in South America after Brazil and Argentina. It has 14 integrated plants (16.8Mt/yr) and four grinding facilities (2.1Mt/yr), giving it a total capacity of 18.9Mt/yr.

Producer breakdown

The largest Colombian cement producer is the rapidly-growing Cementos Argos, which also has interests in the US, French Guiana, Haiti, Honduras, Panama, the Dominican Republic and Suriname. It most recently completed the acquisition of a cement plant in Martinsburg, West Virginia, US, from HeidelbergCement for US$600m.

Within Colombia, Cementos Argos operates nine plants that share a total capacity of 9.9Mt/yr, enough to give it 52% of the national market. The bulk of its installations are integrated facilities, with just one 0.2Mt/yr grinding plant in its portfolio. It is in the process of expanding the capacity of its Rioclara plant from 1.4Mt/yr to 2.4Mt/yr.

Despite this ongoing work, Cementos Argos had a tough time of it at home in 2016. It reported that its sales revenue in Colombia fell by 8.3% to US$629m for the first nine months of 2016 from US$686m in the same period in 2015. Its earnings before interest, taxation, depreciation and amortisation (EBITDA) fell by 12.9% to US$171m and its cement sales

Left: Cementos Argos is a significant player in the Colombian and wider South and North American marekts. **Source:** Cementos Argos' website.

volumes fell by 17.9% to 3.78Mt. It blamed this on a fall in demand for bulk cement in the country caused by a delay in infrastructure projects. "The US, Honduras and Panama continue to drive the company's results and offer great opportunities for growth, offsetting the slowdown in demand we faced in the Colombian market," said Juan Esteban Calle, CEO of Cementos Argos.

Cementos Argos had earlier reported that its net consolidated income rose by 83% year-on-year to US$556m in 2015 compared to US$305m in 2014. Its revenue rose by 40% to US$7.91bn from US$5.67bn. The rise in profit was attributed to an increase in market profitability and operational effectiveness.

Cemex is the second-largest producer by installed capacity in Colombia, with 4.0Mt/yr of capacity spread across two integrated (3.0Mt/yr) and two grinding facilities (1.0Mt/yr). It is in the process of building two further integrated plants in the country, of 1.0Mt/yr each. When these are completed Cemex's capacity will rise to 6.0Mt/yr. However, its project at Maceo has been dogged by delays and controversy. Cemex dismissed its Vice President for Planning and the General Attorney for its Latin American and Colombian units following an investigation into payments related to the project. It had found that around US$20m had been paid to a non-government individual for land and mining rights and benefits related to a tax-free area where the Maceo cement plant is being constructed, according to a regulatory filing released by the Colombian financial regulator. The company has since received a subpoena from the US Securities and Exchange Commission seeking information to determine whether there have been any violations of the US Foreign Corrupt Practices Act (FCPA).

Other producers that operate in the Colombian market include LafargeHolcim, which has one 1.2Mt/yr integrated plant. It has announced that it would build a 0.5Mt/yr grinding plant in November 2016. It is expected that this will come online in the first quarter of 2018. A 1.0Mt/yr grinding plant is operated by Ultracem and Procemcol opened its 0.2Mt/yr integrated plant in September 2016.

Cementos Molins is also in the process of building a 1.3Mt/yr plant in Colombia. It is due to come online in 2019. If the four new integrated lines and one grinding plant mentioned above come online, Colombia's total cement capacity will rise by 4.5Mt/yr to 32.6Mt/yr.

In June 2016 the Colombian cement sector was optimistic with respect to the rest of that year and 2017 due to proposed government spending under its 4G roads programme and the growth of the housing sector. However, there have been delays with the planned projects, meaning that cement demand may rise more slowly than producers anticipate.

Recent news

August 2016: Cementos San Marcos, part of Cementos Argos, ordered a vertical roller mill to grind coal from Loesche in August 2016. The order follows a previous purchase of an LM 35.2+2 mill to grind cement. The new coal mill will replace an existing smaller mill and reuse its foundation. The classifier and ducts will also be part of the contract.

August 2016: Also in August 2016, Cementos Argos announced that it would close its oil well cement production plant at San Gil in Santander. The closure follows falling demand for this type of cement caused by falling global oil prices. The National Construction Material Industry Workers' trade union Sutimac has requested that the cement producer transfer its 75 employees at the San Gil plant to other parts of the business. The union hopes that Cementos Argos will transfer workers to its plants in Cartagena, Tolu and Antioquia.

Ecuador

The Ecuadorian cement sector has a total of five integrated plants and one grinding plant that share a total capacity of 4.8Mt/yr. Although the largest producer is Lafarge-Holcim's Holcim Ecuador, with a total capacity of 2.3Mt/yr (48%), the other five plant owners are all based in South America. The second-largest player is Peru's UNACEM, which operates a 1.4Mt/yr integrated plant, followed by Union Cementara Nacional, which has a capacity of 0.8Mt/yr across two integrated sites. It announced that it will add a third, 0.6Mt/yr integrated plant in 2014, although no further information has since been made available.

Other players in the market include Hormicreto, which operates a 0.3Mt/yr integrated plant in Cuenca. It has recently been undergoing upgrades to improve its production process. It is in the process of commissioning a new G-Jet Hot Gas Generator for alternative liquid fuels firing, from FCT Combustion. FCT has also supplied two K-Jet Calciner Burners at the riser. Meanwhile Gebr. Pfeiffer Inc has been contracted to supply a complete grinding unit to replace the plant's aging ball mills.

ARGENTINA

1. Cementos Avellaneda, San Jacinto, 2.1Mt/yr
2. Cementos Avellaneda, Olavarria, 2.4Mt/yr
3. Holcim Argentina (LafargeHolcim), Capdeville , 0.7Mt/yr
4. Holcim Argentina (LafargeHolcim), Puesto Viejo, 1.0Mt/yr
5. Loma Negra (InterCement), Barker, 1.6Mt/yr
6. Loma Negra (InterCement), Olavarria, 1.7Mt/yr
7. Loma Negra (InterCement), Olavarria, 1.6Mt/yr
8. Loma Negra (InterCement), San Juan, 0.2Mt/yr
9. Loma Negra (InterCement), Zapala, 0.4Mt/yr
10. PCR, Comodoro, 0.4Mt/yr
11. Loma Negra (InterCement), Catamarca, 1.8Mt/yr
12. PCR, Pico Truncado, 0.5Mt/yr
13. Loma Negra (InterCement), Sierras Bayas, 1.0Mt/yr
14. Holcim Argentina (LafargeHolcim), Malagüeño, 2.4Mt/yr

BOLIVIA

15. COBOCE, Irpa Irpa, 0.3Mt/yr
16. Empresa Minera Industrial, Oruro, 0.1Mt
17. FANCESA, Cal Orcko, Sucre, 1.0Mt/yr
18. SOBOCE, Emisa, 0.2Mt/yr
19. SOBOCE, El Puente, 0.2Mt/yr
20. SOBOCE, Viacha, 0.9Mt/yr
21. Itacamba Cemento (Votorantim), Yacuses, 0.9Mt/yr
22. ECEBOL, Jeruyo, 1.3Mt/yr (Due late 2017)
23. Sacyr Industrial, Ouru, 1.3Mt/yr (Due 2017)
24. Government Project, Cutara, 1.3Mt/yr (Announced Nov 2016)

CHILE

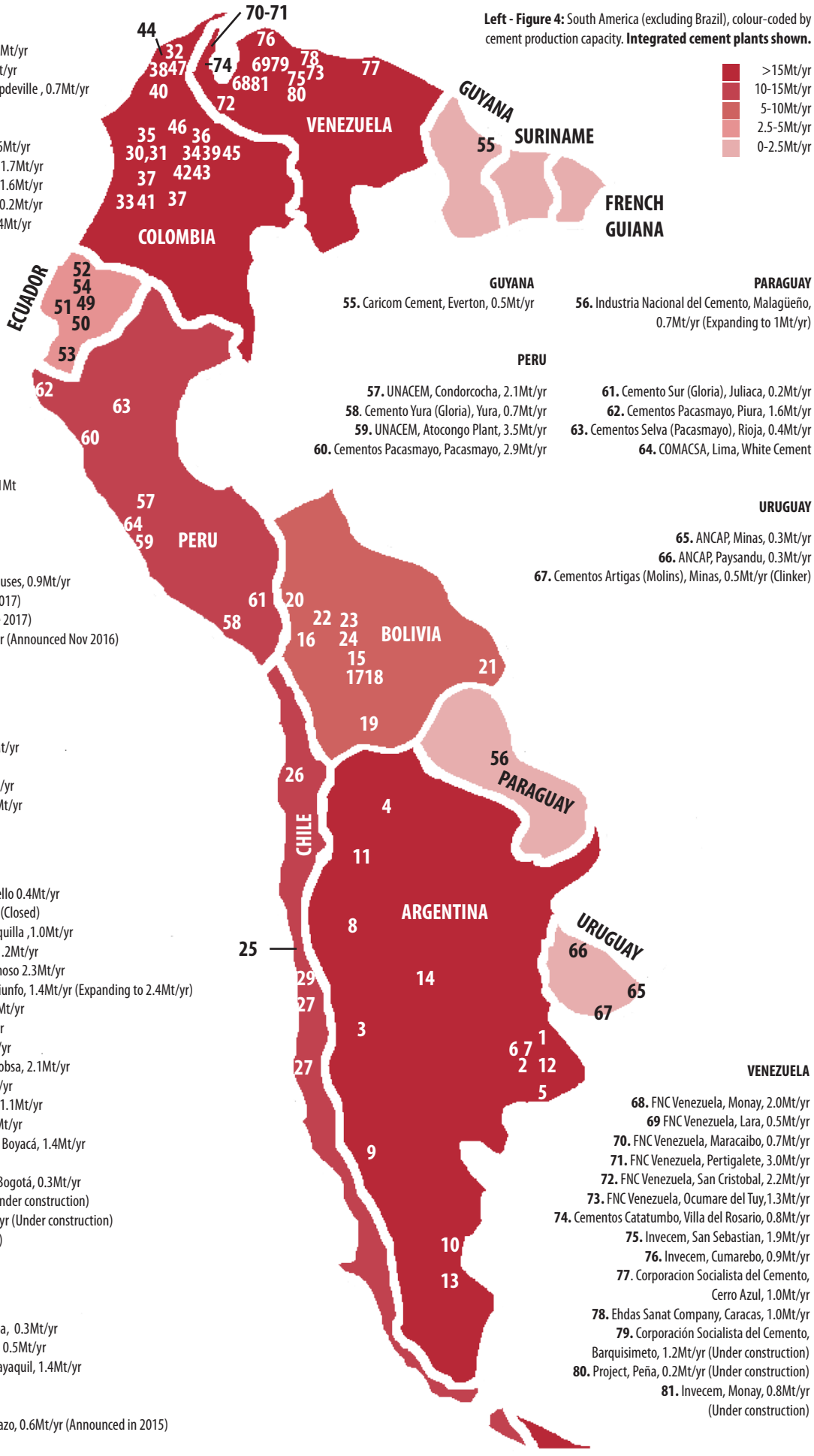
25. Cemento Melón, La Calera, 1.5Mt/yr
26. Cementos Bío Bío, Antofagasta, 0.7Mt/yr
27. Cementos Bío Bío, Curico, 1.7Mt/yr
28. Cementos Bío Bío, Talcahuano, 0.8Mt/yr
29. Cemento Polpaico, Cerro Blanco, 2.3Mt/yr

COLOMBIA

30. Cementos de Cairo (Argos), Monjtebello 0.4Mt/yr
31. Cementos de Caldas, Neira, 0.3Mt/yr (Closed)
32. Cementos del Caribe (Argos), Barranquilla ,1.0Mt/yr
33. Cementos del Valle (Argos), Yumbo, 1.2Mt/yr
34. Cementos Paz del Rio (Argos), Sogamoso 2.3Mt/yr
35. Cementos Rioclaro (Argos), Puerto Triunfo, 1.4Mt/yr (Expanding to 2.4Mt/yr)
36. Cemex Colombia, Bucaramanga, 0.2Mt/yr
37. Cemex Colombia, Caracolito, 2.8Mt/yr
38. Colclinker (Argos), Cartagena, 1.4Mt/yr
39. Holcim Colombia (LafargeHolcim), Nobsa, 2.1Mt/yr
40. Tolcemento (Argos), Toluviejo, 0.9Mt/yr
41. Cementos San Marcos (Argos), Valle, 1.1Mt/yr
42. Cementos Tequendama, Suesca, 0.3Mt/yr
43. Cementos Argos, Sogamoso, Bogotá, Boyacá, 1.4Mt/yr
44. Cementos de Oriente, Malambo
45. Productora de Cemento, Sogamoso, Bogotá, 0.3Mt/yr
46. Cemex Colombia, Maceo,1.0Mt/yr (Under construction)
47. Cemex Colombia, Magdelena,1.0Mt/yr (Under construction)
48. Cementos Molins, 1.2Mt/yr (By 2019)

ECUADOR

49. Union Cementera Nacional, Riobamba, 0.3Mt/yr
50. Union Cementera Nacional, Azogues, 0.5Mt/yr
51. Holcim Ecuador (LafargeHolcim), Guayaquil, 1.4Mt/yr
52. UNACEM, Imbabura, 1.4Mt/yr
53. Hormicreto, Cuenca, 0.3Mt/yr
54. Union Cementera Nacional, Chimborazo, 0.6Mt/yr (Announced in 2015)



Left - Figure 4: South America (excluding Brazil), colour-coded by cement production capacity. **Integrated cement plants shown.**

GUYANA

55. Caricom Cement, Everton, 0.5Mt/yr

PARAGUAY

56. Industria Nacional del Cemento, Malagüeño, 0.7Mt/yr (Expanding to 1Mt/yr)

PERU

57. UNACEM, Condorcocha, 2.1Mt/yr
58. Cemento Yura (Gloria), Yura, 0.7Mt/yr
59. UNACEM, Atocongo Plant, 3.5Mt/yr
60. Cementos Pacasmayo, Pacasmayo, 2.9Mt/yr
61. Cemento Sur (Gloria), Juliaca, 0.2Mt/yr
62. Cementos Pacasmayo, Piura, 1.6Mt/yr
63. Cementos Selva (Pacasmayo), Rioja, 0.4Mt/yr
64. COMACSA, Lima, White Cement

URUGUAY

65. ANCAP, Minas, 0.3Mt/yr
66. ANCAP, Paysandu, 0.3Mt/yr
67. Cementos Artigas (Molins), Minas, 0.5Mt/yr (Clinker)

VENEZUELA

68. FNC Venezuela, Monay, 2.0Mt/yr
69 FNC Venezuela, Lara, 0.5Mt/yr
70. FNC Venezuela, Maracaibo, 0.7Mt/yr
71. FNC Venezuela, Pertigalete, 3.0Mt/yr
72. FNC Venezuela, San Cristobal, 2.2Mt/yr
73. FNC Venezuela, Ocumare del Tuy,1.3Mt/yr
74. Cementos Catatumbo, Villa del Rosario, 0.8Mt/yr
75. Invecem, San Sebastian, 1.9Mt/yr
76. Invecem, Cumarebo, 0.9Mt/yr
77. Corporacion Socialista del Cemento, Cerro Azul, 1.0Mt/yr
78. Ehdas Sanat Company, Caracas, 1.0Mt/yr
79. Corporación Socialista del Cemento, Barquisimeto, 1.2Mt/yr (Under construction)
80. Project, Peña, 0.2Mt/yr (Under construction)
81. Invecem, Monay, 0.8Mt/yr (Under construction)

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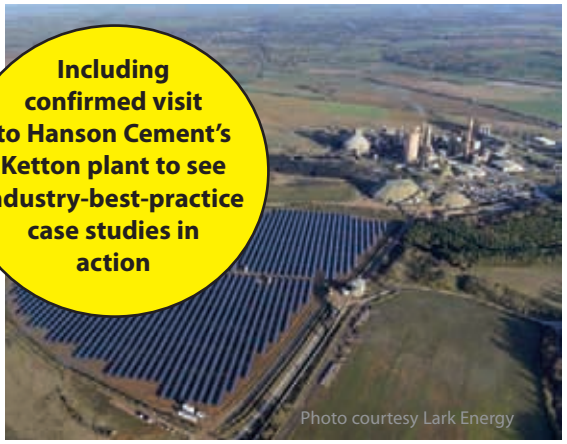

Photo courtesy Lark Energy

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- Find new suppliers
- Meet old friends
- Do business!

Outline conference programme

First day

Day theme: Process efficiency in a competitive market

Session 1: Global trends in cement supply and demand

Session 2: Process optimisation in the cement industry

18.00 Social evening

Second day

Day theme: Maximising production in a sold-out market

Session 3: Trouble-shooting case-studies from the global cement industry

Session 4: Maximising cement production

Session 5: De-bottlenecking for production maximisation

18.00 Farewell party

Third day

Field trip to Hanson Cement's Ketton cement plant

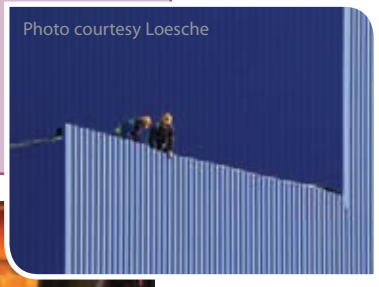
Photo courtesy Loesche


Photo courtesy Stephen Elliott, Hope Construction Materials

Who should attend?

- Cement plant maintenance managers
- Cement plant general managers
- Cement company technicians
- Industry optimisation experts
- Academics & researchers
- Equipment suppliers
- Service providers

Exhibition and sponsorship enquiries
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ARGENTINA

1. Cementos Avellaneda, San Luis, 0.3Mt/yr (1Mt/yr by 2019)
2. Juan Minetti (LafargeHolcim), Campana, 1.2Mt/yr
3. Loma Negra (InterCement), Ramallo, 0.6Mt/yr
4. Holcim Argentina (LafargeHolcim), Yocsina Plant, 0.5Mt/yr

BOLIVIA

5. SOBOCE, Warnes, 0.2Mt/yr
6. Itacamba (Votorantim), Quijarro

CHILE

7. Cemento Melón, Ventanas, 0.3Mt/yr
8. Cemento Melón, Puerto Montt, 0.3Mt/yr
9. Cemento Polpaico, (54.3% LafargeHolcim), Concepción, 0.8Mt/yr
10. Cemento Polpaico, (54.3% LafargeHolcim), Mejillones, 0.3Mt/yr
11. Cementos Bío Bío, San Antonio Plant, 0.3Mt/yr
12. Cementos BSA, El Bosque, 0.3Mt/yr
13. Cementos BSA, Mejillones, 0.6Mt/yr
14. Cementos BSA, Concepción, 0.6Mt/yr
15. Cementos La Union Chile, San Juan, 0.2Mt/yr
16. Hormigones Transex, Puente Alto Plant, 0.4Mt/yr

COLOMBIA

17. Cementos Argos, Sabanagrande, 0.2Mt/yr
18. Cemex Latam, Clemencia, 0.5Mt/yr
19. Cemex Latam, Santa Rosa, 0.9Mt/yr
20. Ultracem, Barranquilla, 1.0Mt/yr
21. Holcim Colombia, Buenaventura, 0.5Mt/yr (Coming 2018)

ECUADOR

22. Holcim Ecuador (LafargeHolcim), Latacunga, 0.9Mt/yr

FRENCH GUIANA

23. Ciments Guyanais, Cayenne, 0.1Mt/yr

PARAGUAY

25. Yguazú Cementos (InterCement/Concremix), Villa Hayes, 0.4Mt/yr
26. Industria Nacional del Cemento, Villeta, 0.6Mt/yr

PERU

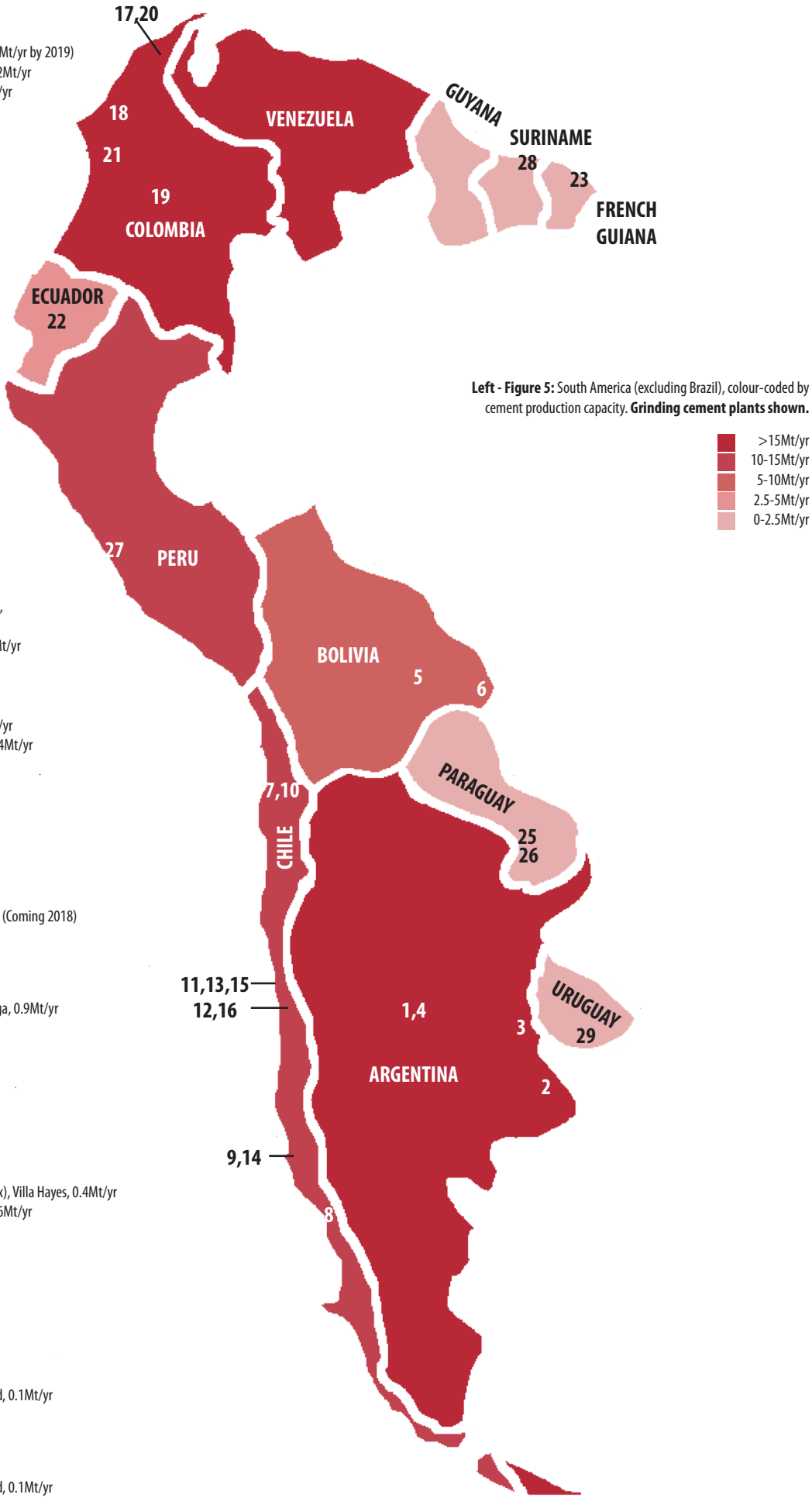
27. Cemex, Ventanilla, Plan

SURINAME

28. Vensur (Cementos Argos/Kersten), Dijkveld, 0.1Mt/yr

URUGUAY

29. Vensur (Cementos Argos/Kersten), Dijkveld, 0.1Mt/yr



Left - Figure 5: South America (excluding Brazil), colour-coded by cement production capacity. **Grinding cement plants shown.**

17th global gypsum Krakow, Poland

CONFERENCE, EXHIBITION & AWARDS 2017

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- New applications
- Beyond commodity board
- Energy efficiency
- Sustainability

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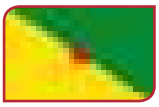
French Guiana



Technically an overseas Department of France, French Guiana has a single 0.1Mt/yr cement grinding plant, which is operated by Ciments Guyanais, a subsidiary of Colombia's Cementos Argos. The plant in Cayenne was previously operated as a joint venture between Lafarge and Holcim. The agreement to sell the plant to Cementos Argos came just two days after the announcement of the Lafarge-Holcim merger.

Guyana

Like its French counterpart, Guyana has a very small cement sector, with one integrated plant that can make 0.5Mt/yr of cement. It was opened by Caricom Cement in late 2014. At the time, Caricom said that the main purpose of the plant was to 'make cement affordable for all Guyanese.' The plant is capable of producing around twice the nation's cement demand, meaning that the plant exports some of what is produced.

Paraguay

The cement industry of Paraguay is also small compared to others in the region. It has 1.1Mt/yr of capacity from one integrated plant (0.7Mt/yr) and one grinding plant (0.4Mt/yr).

The integrated plant is operated by Industria Nacional del Cemento (INC). It has spent 2016 alternating between production campaigns and upgrade projects. It first shut down in February and March 2016 for a 30 day period as part of a project to upgrade the burner for fuels other than fuel oil. The plant was also shut for a further 90 days in the middle of the year for a second phase of the same project, which is due to be completed in January 2017.

INC is also building a cement grinding plant at Villeta. The new mill is being built by Sinoma for a cost of US$11.5m. It had been scheduled for delivery in August 2016 and will have a cement production capacity of 0.6Mt/yr when fully commissioned.

The grinding plant that currently operates is run by Yguazú Cementos, a joint venture between Brazil's InterCement and Concremix.

Peru

Peru has seven integrated grey cement plants that share a total capacity of 11.4Mt/yr. There is also a white cement plant operated by Compañía Minera Agregados Calcáreos SA (COMACSA). There are currently no grinding plants in the country, although Cemex recently announced that it will build a 1.0Mt/yr mill. The country is currently without representation from major multinational cement makers.

The largest player currently operating in the Peruvian cement market is domestically-owned UNACEM. It has two integrated cement plants that share a total capacity of 5.6Mt/yr. This represents around 49% of domestic capacity.

UNACEM reported that its profit fell by over 50% to US$40m in 2015 from US$83m in 2014. The Peruvian cement producer blamed lower output, rising costs and foreign exchange losses. Sales rose by 3.4% to US$429m in 2015. However, cement production fell by 2.7% to 5.57Mt. Clinker output across all of

Right: The SOBOCE plant in Viacha, Bolivia. The plant is one of the highest above sea level in the world, operating at 3907m! **Source:** German Cernadas, entrant to the *Global Cement Photography Competition.*

its interests fell by 7.3% to 5.72Mt. The company attributed this to delays in infrastructure projects such as Line No. 2 of the Lima Metro and a decline in homebuilding. Exports dropped by 5.2% to 0.97Mt.

Unacem said that its domestic market share slipped to 49.6% in 2015 from 49.9% the previous year. Peru's cement production fell by 2.5% to 10.4Mt in 2015, according to the cement producers' association Asocem. National exports increased to 0.36Mt from 0.31Mt.

Cementos Pacasmayo, which is also locally owned, follows UNACEM closely in second place. Its operates two plants under its own name, while a third, acquired in 1998, operates under the Cementos Selva brand. These three combine to give 4.9Mt/yr or 43% of domestic capacity. The Cementos Selva plant uses four 0.1Mt/yr vertical shaft kilns. Cementos Pacasmayo's net income rose by 12.1% year-on-year to US$60.4m in 2015 from US$53.8m in 2014. Its revenue fell slightly to US$351m from US$354m. Its cement production volumes fell slightly by 0.7% to 2.3Mt from 2.35Mt.

The cement producer attributed its profit growth to cost savings despite a 'challenging' operating environment. It managed to hold its cement production volumes at a stable level due to the ramping up of its Piura cement plant in the fourth quarter of 2015 despite falling volumes at its Pacasmayo and Rioja cement plants.

The third-largest producer is Grupo Gloria, via Cementos Yura (0.7Mt/yr) and Cementos Sur (0.2Mt/yr), which is a subsidiary of Cementos Yura. Cementos Yura's income has risen by 10% year-on-year to US$141m in the first half of 2016 from US$127m in the same period of 2015. Its net income rose by 21% to US$29m from US$24m.

Yura's sales volumes grew by 11% to 608,923t of cement in the second quarter of 2016 mainly due to a rise in regional demand. Clinker sales volumes remained stable. Yura increased its market share to 22.4% in the quarter from 20.4% in the same period in 2015.

Recent news

August 2016: Cementos del Sur signed a contract to buy all of Brazil's Votorantim's shares in Cementos Otorongo for US$4m and those of Votorantim's subsidiary Corporación Noroeste. Cementos Otorongo is planning to build a cement plant in southern Peru for US$125m. The planned plant will have a production capacity of 0.7Mt/yr.

Suriname

Suriname has a single cement grinding plant operated by Vensur, a joint venture between Colombia's Cementos Argos and Suriname's Kersten. The plant has a capacity of 0.1Mt/yr and has been in operation since 1965.

Uruguay

There are three integrated cement plants operating in Uruguay that share a combined capacity of 1.1Mt/yr. The largest producer is the Administración Nacional de Combustibles, Alcohol y Portland (ANCAP), which operates two 0.3Mt/yr integrated plants. The only other producer is Cementos Artigas, a Cementos Molins subsidiary. It operates a 0.5Mt/yr clinker production line at Minas, but grinds the clinker in a separate mill at Montevideo.

Recent news

November 2016: FANCAP, the workers' union of ANCAP, criticised imports of cement produced by Turkey's Çimsa by Cementos Charrua in November 2016. It complained that imports were being dumped in the country at lower than the local price of production, negatively impacting the local industry. Cement is allegedly imported from Turkey and then it is repackaged in bags with the Uruguayan brand for resale. FANCAP has asked the government to reassess tariffs for cement imports. It says that these imports are affecting operations at both ANCAP and Cementos Artigas.

Venezuela

The Venezuelan cement sector is unlike any of the others in this review, as it is predominantly owned by the government. This is due to a nationalisation policy started by former President Hugo Chavez in 2008. Prior to this, Cemex and Holcim had extensive operations in the country.

Corporatión Socialista del Cemento operates a total of 10 cement plants out of 11, either directly or via FNC Venezuela, Invecem and Ehdas Sanat. It has a total capacity of 14.5Mt/yr out of Venezuela's 15.3Mt/yr capacity. This is sufficient to give it 93% of the national supply. Today the only non-government cement operator is Cementos Catacumbo, which operates a single 0.8Mt/yr plant.

A further three government plants are at various stages of construction. When they come online, they will contribute an additional 2.2Mt/yr of cement capacity to Venezuela, giving it a total of 17.5Mt/yr.

Philippines: DMCI to build huge new capacity

DMCI Holdings is planning to spend US$180m to build a 1.7Mt/yr cement plant on Semirara Island in the Visayan Islands. The plant will also include a 0.4Mt/yr grinding mill and a captive power plant.

DMCI is also planning to build three cement grinding plants in Batangas, Iloilo and Zamboanga, for a cost of US$188m, to give it access to markets throughout the country. The plants will be completed by 2020, according to Victor Limlingan, the managing director of DMCI. Limlingan added that DMCI hopes to benefit from increased government infrastructure spending.

South Korea: Hyundai Cement sale to generate US$515m

The sale of Hyundai Cement is predicted to generate up to US$515m. Sources quoted by the Maeil Business Newspaper said that the auction in December 2016 would receive attention from cement producers and private equity funds.

Hyundai Cement is the seventh largest cement producer locally, with about 7% of the market. Larger producers, such as Ssangyong Cement Industrial, Tongyang Cement & Energy and Lafarge Halla Cement, all have production units in coastal regions and would benefit from purchasing Hyundai Cement, which has assets located in the country's interior.

Philippines: Ministry issues show cause orders to cement projects in Philippines

The Department of Environment and Natural Resources has issued show cause orders against two cement projects. Orders were issued to the Mindanao Portland Cement Corporation and the Pozzolan and Associate Minerals Cement Plant, as well as to nine other mining companies. Environment Secretary Gina Lopez said that these companies should explain within seven days why fines should not be issued and environmental compliance certificates cancelled. The initiative is part of a review of environmental certificates issued by previous administrations.

India: No cash? No cement!

Demonetisation of high value Indian rupee currency notes reduced cement demand by 45-50% in November 2016. Demand for cement fell across all regions, with the central region including Uttar Pradesh and Madhya Pradesh suffering the least. The decline has hit the industry when it had expected an increase in demand from infrastructure development following the monsoon season.

A slowdown in real estate activity has particularly affected the cement industry as the majority of cement in the country is used by the realty sector. RP Gupta, chairman and managing director of Shiva Cement, said that contractors are finding it difficult to make cash payments for buying raw materials such as sand, bricks and stones as well as paying wages. Cement companies are reportedly trying to help dealers install bank or credit card payment machines to reduce cash-based transactions.

Pakistan: DG Khan Cement to build new plant

DG Khan Cement plans to build a new 9000t/day cement plant at Hub in Balochistan. It has contracted Izhar Construction to conduct all civil work on the project. The plant is being built to benefit from demand generated from infrastructure built via the China-Pakistan Economic Corridor.

Pakistan: Authorities look forward to tax contributions from cement bonanza

Tax bodies are expecting to see a jump in revenue in the 2016 – 2017 financial year from cement producers as Chinese-funded infrastructure starts to be built. The Large Taxpayers Unit (LTU) in Karachi, the largest revenue-collecting arm, estimates that it will tax producers US$114m in the 2016 – 2017 financial year. A study by the LTU said that growth would arise from increases in sales tax and federal excise duty following the start of projects worth US$46bn from the China-Pakistan Economic Corridor.

Cement sales have risen by 8.3% year-on-year to 8.98Mt in the first quarter of the local financial year. This follows a 17% rise in domestic sales to 33Mt in the 2015 – 2016 financial year.

India: LafargeHolcim receives environmental clearance to enlarge Nongtrai limestone mine

LafargeHolcim has received environment clearance to raise the production capacity of its Nongtrai limestone mine in Meghalaya to 5Mt/yr from 2Mt/yr for US$28m. The mine is operated by Lafarge Umiam Mining, a subsidiary of Lafarge Surma Cement, according to the Press Trust of India. Limestone from the mine is transported across the border to Lafarge Surma Cement's plant in Bangladesh. The increased limestone is expected to increase the production capacity at the plant to 5.5Mt/yr from 2.2Mt/yr.

The mine expansion project is subject to final outcomes of cases pending before Supreme Court, High Court and National Green Tribunal. LafargeHolcim's subsidiaries have also been asked to obtain clearance from the National Board of Wildlife and the State Pollution Control Board.

Nepal: Locals seek compensation at Hongshi-Shivam project

Residents of Jyamire are seeking 'fair' compensation from a quarry that Hongshi-Shivam Cement is building. Villagers have prevented Chinese technicians from the Nepal-China joint venture from working near the village, claiming that the company has ignored their complaints. Around 32 households will be displaced by the mining project. The villagers are seeking compensation in excess of the rate set by the government.

Hongshi-Shivam Cement is building a cement factory at Sardi in Nawalparasi district. It has acquired a permit from the Department of Mines and Geology to extract limestone at Jyamire in Palpa. China's Hongshi Holding Group has invested US$330m and its local partner has contributed around US$140m towards the project. The plant will have a production capacity of 6000t/day when operational. It is expected to open later in 2017.

India: Dalmia plans large Odisha investment

Dalmia Bharat Group plans to spend US$293m towards increasing its production capacity in Odisha. The cement producer has joined the 'Make in Odisha Conclave.' It has a production capacity of 5.5Mt/yr from two plants in the state. Mahendra Singhi, Group chief executive officer of Dalmia Bharat Group, said that Odisha's gross domestic product (GDP) is expected to grow by 12% by 2020. He added that the state government's commitment to industrial development is backed by industry-friendly policies that are already showing positive results.

Australia: Adelaide Brighton signs new gas deal

Adelaide Brighton Cement has signed a sales agreement with Beach Energy to supply processed gas for one year from its Mooba processing plant. Supply of the gas is expected to start on 1 January 2017 and it will replace the previous deal that the companies had for raw gas.

Thailand: Siam Cement appoints new VP

Siam Cement has appointed Cholanat Yanaranop as its Executive Vice President. He will also retain his role as President of Siam Cement Group Chemicals. The promotion took effect on 1 January 2017.

India: Aumund India wins orders in conjunction with FLSmidth projects

Aumund India has been awarded orders for 17 bucket elevators, eight silo discharge systems and one pan conveyor in connection with orders FLSmidth has received from Tamilnadu Cement, Akij Cement and Shah Cement.

Aumund India will deliver one type BW-ZL bucket elevator, one type BWG belt bucket elevator and three type BWG-GK belt bucket elevators instead of the conventional Aumund type BWZ bucket elevator for the Akij Cement project. For the Tamilnadu Cement project FLSmidth had specific design criteria and wanted a certain safety factor for the chain. So Aumund India provided an optimised solution, which met these specific criteria. It will deliver two type BW-ZL bucket elevators, eight type BWG bucket elevators, eight type SDI silo discharge systems and one type KZB deep drawn pan conveyor. For the Shah Cement project Aumund India will deliver two type BWZ bucket elevators.

Vietnam: Exports fall in 2016

The Vietnam Building Material Association has predicted that revenue from cement exports is set to fall by 7% year-on-year to US$556m in 2016 from around 15Mt of cement and clinker. In the first 11 months of the year the country's export volumes fell by 5.9% to 14Mt/yr. The decline has been blamed on competition from foreign companies including those in China, India, Pakistan and Thailand. The association also blamed the high cost of exports.

India: CCI manager and three others killed in car crash

Manoj Kumar Sinha, a deputy general manager of the Cement Corporation of India has died in a car crash. Sinha and three other persons were killed in an accident on the Yamuna Expressway.

Pakistan: Fecto to bid for Hattar cement plant

Fecto Cement plans to bid for the Hattar cement plant owned by Dewan Cement. Abdul Samad, Fecto Cement's company secretary, said that the company would evaluate the information to be provided by the financial advisor of Dewan Cement for carrying out due diligence in relation to the prospective acquisition of the plant. He added that the sale would be subject to finalisation of commercial terms, completion of due diligence, execution of definitive agreement and receipt of regulatory approvals.

Sri Lanka: Holcim Lanka rebrands as Insee Cement

Holcim Lanka has been rebranded as Insee Cement following its acquisition by Thailand's Siam City Cement. The company will continue to use its Sanstha and Mahaweli Marine brands of cement but it will also introduce Insee Pro, Insee Pro Plus and Insee Extra brands.

China: Shandong Shanshui starts debt clear-up

Shandong Shanshui Cement has entered into a debt investment framework agreement. Cinda Shandong will acquire the defaulted bonds issued by Shandong Shanshui. It will also loan Shandong Shanshui up to US$1.15bn. Deputy chairman Mi Jingtian told the Xinhua News Agency that his company had 'paid in full' all outstanding interest and had regained a 'normal working relationship' with commercial banks. In December 2016 Shandong Shanshui said that it had settled with China Merchants Bank in a dispute over US$81m of loans. Shanshui Cement has faced financial problems since a shareholder battle for control of the company took place in late 2015.

Bangladesh: Lafarge to buy Holcim Bangladesh

Lafarge Surma Cement, a joint venture between LafargeHolcim and Cementos Molins, intends to buy a 100% stake in Holcim Bangladesh from LafargeHolcim for US$117m. The transaction is subject to approval by the shareholders of Lafarge Surma as well as other regulatory and customary approvals in Bangladesh. Following the acquisition Lafarge Surma Cement will operate one integrated cement plant and three grinding plants in the country. It will also offer a range of products including Supercrete, Holcim Strong Structure, Holcim Red and Holcim Gold.

Laos: Siam Cement plant to launch in early 2017

Siam Cement Group (SGG) plans to start commercial operations at a 1.8Mt/yr cement plant it is building in the first quarter of 2017. Construction of the plant is nearly complete. SCG's president and chief executive Roongrote Rangsiyopash said that half of the output from the plant will be used locally and the rest would be exported to the north-east of Thailand. He added that Laos consumes about 0.4Mt/yr and that SCG expects demand to grow by 6-7% in 2017 due to state funded infrastructure projects.

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If your business involves synthetic gypsum, you must attend the 2nd Global SynGyp Conference and Exhibition in 2017!

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Syngyp users
Cement producers
Academics
Technology companies
Plant managers
Market analysts
Shippers & traders
Others involved in syngyp

Topics covered:

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FGD regulatory trends
Global, regional and national trends in synthetic gypsum
Global syngyp markets, shipping and trade
Syngyp supply/demand trends
Natural vs synthetic gypsum
Equipment options for syngyp production
Lime versus limestone for FGD production
Scrubber types and influence on FGD
Scrubber process control
Scrubber operation options
Effects of fuels on FGD quality
FGD quality control
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Crystal morphology control factors
Syngyp storage and handling
FGD properties and components
Impurities and contaminants
Whence mercury?
Dewatering/drying options
Syngyp use in cement industry

... and more!

Namibia: Ohorongo Cement inaugurates plant upgrade

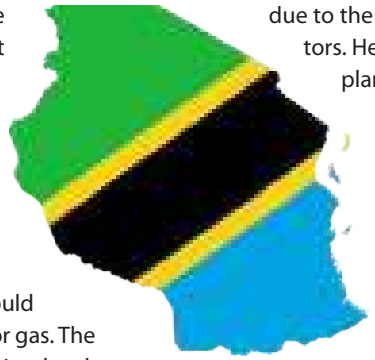
Ohorongo Cement has inaugurated upgrades to its cement plant in Otavi, including the installation of a composite cement unit and a third packaging line. The US$10.6m expansion is expected to increase the plant's production capacity to 1Mt/yr. Deputy Minister of Mines and Energy Kornelia Shilunga presided at the event.

The composite cement unit will enable the plant to produce various types of cement. The new packaging line will increase the plant's packaging rate to 6800bags/hr from 4400bags/hr. Ohorongo Cement has also installed a 2t big bag filling station for special projects, aimed at optimising logistics.

The Namibian Standards Institute also certified Ohorongo Cement's products at the inauguration for fulfilling the requirements of the Namibian Standard NAMS/EN 197-1:2014. The scope of certification covers five types of cement manufactured by Ohorongo Cement: CEM II A-LL 42.5N, CEM II B-LL 32.5N, CEM II B-V 42.5N, CEM I 42.5R and CEM I 52.5N. The new certification should allow Ohorongo Cement to enter markets in Zambia and Botswana without additional certification or inspections.

Tanzania: Minister confirms Dangote deal is still in place as four other players want in

The Tanzanian Minister for Industries, Trade and Investments Charles Mwijage has confirmed that the government's investment arrangement with Dangote Cement that was granted by former President Jakaya Kikwete's administration are still in place. He said that the government would do nothing to compromise Dangote Cement's investment in the country and described its entry as a 'game changer' by reducing the price of cement. The comments were made in response to media speculation regarding a production shutdown at Dangote's Mtwara plant.



Mwijage said that Dangote Cement could cut its production costs by using local coal or gas. The Tanzania Petroleum Development Corporation has been in negotiations since October 2016 to supply gas to the cement producer. He also added that another cement producer, Engro, is considering building a cement plant and that the government is willing to offer it the same incentives as those given to Dangote Cement.

Meanwhile, Dangote Cement has clarified that a temporary production shutdown at its Mtwara plant has been made due to technical problems. Country chief executive officer Harpreet Duggal made the announcement in response to claims that the stoppage was due to high production costs in the country, according to the Tanzania Daily News newspaper. The plant resumed production within a few days.

Duggal described operating costs in Tanzania as 'high' due to the producer's dependence on diesel generators. He also cited high transport costs due to the plant's distance from its key markets.

In other news, four other cement projects have been mooted in Tanzania. Lake Cement plans to invest US$150m towards building a new 1.4Mt/yr cement plant in Bagamoyo. Construction will start in the middle of 2017 and commissioning is planned for mid-2018.

EAM, Mamba and Sungura are planning to invest in the cement industry, according to Industry, Trade and Investment Minister Charles Mwijage. He said that the companies had all requested to enter the industry at the Dar es Salaam International Trade Fair in December 2016. EAM wants to build a 3Mt/yr plant in the Tanga region on condition that the government lets it export cement internationally. It has also requested other conditions that are being considered by the government. Mamba and Sungura are also in discussion with the government regarding their projects.

Ghana: President opens CIMAF plant

President John Dramani Mahama has inaugurated a 1Mt/yr cement plant in Tema on behalf of Ciments de l'Afrique (CIMAF), a subsidiary of Morocco's Addoha Group. The project had an investment of Euro60m according to the Ghana News Agency. Construction started in 2014.

Egypt: Three new cement licences granted

The Industrial Development Authority (IDA) has tendered three licences to build new cement plants to El Sewedy Cement, South Valley Cement and Cement Egypt. The total capacity covered by the licences is 6Mt/yr. The new capacity is intended to support local infrastructure projects, including the construction of a proposed new capital city. *See P62 for more on South Valley Cement.*

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Photo credit: Stephen Elliot, Hope Construction Materials, Derbyshire, UK.

Kenya/Uganda: CBMI lands two LafargeHolcim contracts

CBMI Construction has signed two contracts with LafargeHolcim in Kampala for cement grinding plant projects in Uganda and Kenya. Bamburi Cement, LafargeHolcim's subsidiary in Kenya, has ordered a 1Mt/yr grinding plant from CBMI. The plant will be located in Nairobi. Hima Cement, a joint venture that LafargeHolcim is part of in Uganda, has ordered a 0.8Mt/yr grinding plant. It will be located in Tororo in the east of the country.

The scope of the projects covers clinker feeding to cement packing and shipping. These contracts will come into force after being signed, receiving of guarantees and CBMI receiving advance payments. Contract periods are 17.5 months after the contracts come into force to complete industrial tests and 19 months to commissioning.

Attendees at the signing ceremony included the CEO of Bamburi Cement Bruno Pescheux, the CEO of Hima Cement Daniel Pettersson and the Regional Manager of CBMI Li Ming.

Bahrain: Arab Petroleum buys 30% stake in Falcon Cement

The Arab Petroleum Investments Corporation (APICORP), a development bank jointly owned by Organisation of Arab Petroleum Exporting Countries (OPEC) member states, has purchased 30% stake in Falcon Cement. The deal was completed with the GFH Financial Group.

"We are delighted to acquire a 30% stake in FCC, Bahrain's largest cement producer. We believe this is a high growth sector for Bahrain and the investment assists us in diversifying our investment portfolio. The investment is also a strong signal of APICORP's commitment to driving economic growth throughout the region," said Raed Al Rayes, Deputy CE and General Manager of APICORP.

Falcon Cement runs the country's sole integrated cement plant. It has a production capacity of 1000t/day and is currently being upgraded to produce 2400t/day. Another regional firm, Integrated Capital PJSC, part of the Abu Dhabi Financial Group, bought a 10% stake in Falcon Cement in 2016.

Cameroon: Medcem plant inaugurated

Medcem Cameroon, a subsidiary of Turkey's Eren Holdings, inaugurated its cement grinding plant in Douala in December 2016. The plant originally started selling cement in October 2015 before it left the market. It has since resumed selling cement. The plant has an investment of US$21m and has a production capacity of 0.6Mt/yr. It is the fourth cement plant in the country bringing the national production capacity to 4.3Mt/yr.

Egypt: South Valley Cement to consider cost of second line

South Valley Cement is considering the cost of building a second production line. This follows an increase in the cost of equipment from foreign suppliers due to the devalution of the Egyptian Pound. The company's management met in December 2016 to discuss the new 1.5Mt/yr line and how to pay for it. The line is due to be built at the producer's plant in Beni Suef's industrial zone, increasing the company's overall production capacity to 3Mt/yr. It will take three years to build. South Valley Cement won a cement licence from the Industrial Development Authority in December 2016.

Jordan: Fuheis plan awaits approval

Lafarge Jordan's proposal to replace its Fuheis cement plant with a US$2.8bn urban development is waiting for local government approval. The company signed a memorandum of understanding with the Fuheis Municipality but is still awaiting the municipal council's approval to go ahead with the plan to turn its site into an urban hub, the company's chief executive officer, Amr Reda said in a press conference reported upon by the Jordan Times. He added that, despite the plant not being operational since 2013, it is still facing legal challenges on environmental grounds and that it is paying around US$7m/yr in compensation for environmental issues.

Algeria: GICA makes first batch of oil well cement

Groupe Industriel des Ciments d'Algérie (GICA), a government-owned cement producer, has launched the certification process of its oil well cement ahead of plans to produce the product itself. A sample batch of 300t was produced in November 2016, according to the Algeria Press Service. Rabah Guessoum, the chief executive officer of GICA, said that the cement will be produced at the company's Setif plant and sold to Sonatrach group and foreign oil companies. A national demand of around 300,000t/yr is anticipated.

Oman: Raysut resignation

Salem Bin Alawi Mohammed Baabood has resigned as group chief executive officer of Raysut Cement Company with effect from 8 December 2016 due to personal reasons. Mohammed Bin Ahmed Aideed has been assigned to assume the functions and duties of the group chief executive officer of Raysut Cement until a successor is appointed.

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 64**. In this issue subscribers receive more information from other countries that are not shown here.

Pakistan: Amidst rising coal prices on the international market, cement manufacturers have put planned price increases on hold. They hope that the government will consider reductions in duties on import of coal. International coal prices have also retracted to US$83/t after touching a high of US$100/t in November 2016, convincing the industry not to pass-on a coal price hike to the customers.

The spokesman of the All Pakistan Cement Manufacturers Association (APCMA) urged the government to support the industry by cutting import taxes, while at the same time expressing satisfaction at the continued growth in domestic cement despatches.

India: Cement price increases are likely in southern and western markets over the next year. During 2016 cement prices rose by 2.7%, with the northern region witnessing the maximum increase of 20%. At the start of 2017, the price of cement was US$4.41-4.92/bag (50kg) across the country.

In south India, the price of a cement bag declined by US$0.44/bag between October 2016 and November 2016 and is now around US$4.41/bag.

In the western markets, after the price increased by US$0.22/bag in October 2016 to US$3.90/bag, it slipped to US$3.54/bag in November 2016. Prices held in the northern and eastern markets over the same period.

Over the next 12 months, pricing could be affected by the trajectory of power and fuel costs for cement producers. Up until June 2016, cement producers benefited from lower petcoke and diesel prices. Many cement manufacturers substituted coal with petcoke, with prices of the latter falling in the global market. However, with petcoke prices doubling since March 2016, most of the cost advantages have been erased.

Any further pick-up in crude oil prices could further increase raw material and transportation costs, which could put pressure on existing prices.

Cement companies are facing margin pressure because of the rising price of imported coal and petcoke and sluggish demand due to the government's ongoing demonetisation policy. The prices of the two fuels are unlikely to come down in six months.

The demonetisation policy has hit cement demand and ICRA Ratings says that volume growth has been adversely impacted in all regions.

Turkey: A wide-ranging report by the Turkish Competition Authority (TCA) has recently been published as part of investigations into the competitiveness of the country's cement sector. According to Lexology Newsfeed, the report does not seek to establish whether any particular competition law violations have been made by any particular party or group of parties.

Nevertheless, it reports that, while the demand for cement (and hence expected prices) are seasonal, decreases in demand do not appear to correlate to decreases in price. Indeed, prices rose even when demand did not. The report finds that price increases post 2013 are clearly above inflation and that there is a high degree of similarity in price trends for certain (but not all) bulk cement products. Price movements for different bagged cement products were also found to be very close to each other.

Prices are for cement in metric tonnes, unless stated otherwise. Where a source has given a range, the published price is the minimum value.

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ASWP = Any safe world port.

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How 20 years have flown by - here's looking towards 2037!

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

So, '*Global Cement*' is 20 years old. The fore-runner of this magazine - *Asian Cement and Construction Materials Magazine* - was first published in January 1997. The magazine was later amalgamated with other titles to become *GCL: Global Cement and Lime Magazine* and finally became simply *Global Cement Magazine* in October 2006. The original magazine was created in an attic on a computer with a then-huge memory of 1Gb. Each issue took up 500Mb of space, and so had to be separately archived each month, to make room for the next month's issue. We used huge SyQuest disk drives to send data to the printer. We scanned in real photographs using a scanner that cost around Euro/$/£3000 - something you could buy now for less than £300. When that first issue was published, I was a young man of 29, with a full head of hair, and was yet to meet my wife.

Looking through that first issue (pictured right) is like flying through time. In that first issue - January 1997 - only three advertisers had an email address on their ad - and only two had a web site (H.W. Carlsen and Dome Technology). All the ads had a telephone and fax number on them - and many still had Telex numbers as well. (If you are too young to have heard of 'telex,' you can look it up on the internet). The fact that you could start a business relationship with someone on the basis of calling them up on the telephone now seems quaint, but that is the way they used to do it.

Many of the companies that appear in that magazine are still with us - Heko, KHD, Köppern, Loesche, Magotteaux, Siemens, Venti Oelde - and some are not, or at least not with the same names: they have been subsumed into other companies and renamed - although the people remain the same. The technology back then would be familiar to anyone working at a cement plant today - things have not moved quickly. Some of the themes that appeared in the news in that first issue are oddly familiar - 'North Korea isolated, desperate for trade;' 'Woes befall ACC;' 'Hopes rise in Japan.' One headline, 'Foreign firms eye Asian market,' foretells the feeding frenzy that took place once the Asian Crisis took hold (only six months after that first issue of *Asian Cement Magazine*), when cement factories and companies became desperately cheap for western multinationals that were - back then - flush with cash (or credit, at least). China was still buying equipment - even cement plants - from western companies.

Absent from the magazine is any mention of global warming or greenhouse gases. There is no mention of alternative fuels. The Euro was some years in the future (in terms of notes and coins). Some people, not many, had mobile phones (the size and weight of a brick).

Now almost everyone has a smart phone (a powerful internet-connected hand-sized computer/camera that can also make telephone calls). The internet is ubiquitous and is changing or undermining almost all established processes and industries (think news, taxis, dating, TV, estate agency, crime, activism, knowledge, gambling, shopping, education, work, democracy, etc, etc). Fortunately for all of us, cement cannot be made on or distributed via the internet (yet).

This issue of Global Cement Magazine reflects today's pre-occupations - with alternative fuels, reducing the clinker factor, emissions trading, environmental performance and increased cost-efficiency (that, at least, will never change - the bean-counters will always ultimately be in charge). China is in the ascendant - selling cement and equipment to the rest of the world. Now I'm 49 with no hair, but with two daughters who are mostly grown up and thinking about leaving home (them, not me).

What will *Global Cement* be writing about in January 2037? My guess is that any doubts about anthropogenic global warming will have been laid to rest -one way or another. The cement industry may be in the front line of assaults on CO_2-producing industries and the focus will still be on reducing the clinker factor - using slag, fly-ash, activated ultra-fine limestone, rice husk ash and anything else that the industry can get its hand on that works. By 2037 everyone will be using AF - *everyone*.

I think though that when people look back on 2017 from 2037, they will say that we were sleepwalking into trouble. The chances of China having a massive financial crash are already high - and increasing. When the Chinese Crash happens, it will not be a happy sight. The US owes around US$20trn and that's set to go up a lot under Mr Trump. Can it increase forever? It cannot. Finally, the same people that made billions betting against subprime mortgages are now betting that the Euro will fail. The Euro Crash will make Brexit look like a tea party.

In 2037, when I'll be 69 (hopefully still fit and a doting grandfather), *Global Cement Magazine* will be 40 years old. From being one of the youngest people at our cement conferences, I will be one of the oldest. Still, in 20 years time, an age of 69 will be considered youthful. I look forward to coming to work on my anti-gravity hover board. *Here's to another 20 years!*

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