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This issue's front cover...

KIMA Echtzeitsysteme GmbH:
For 20 years KIMA Echtzeitsysteme has worked in the field of high performance closed loop controls, innovative sensor systems and databases for processing industries. With SmartFill KIMA 'E' sets new global standards regarding the precision and reliability of measuring the fill level of ball mills. More than 700 of these 'electronic ears' have been sold worldwide. Based on the great results KIMA has developed its predictive expert system MillMaster. MillMaster comes along with different technology modules (e.g. for ball mills, vertical roller mills, roller presses etc.) and is based on KIMA's experience with the optimisation of grinding processes. Read more about grinding optimisation on Page 14 of this issue of *Global Cement Magazine*.

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global cement MAGAZINE

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Global Cement Conferences: Global CemFuels, Global Slag, Global CemTrans, Global EnviroCem, Global Boards, Global Well Cem, Global CemProcess.

Dear readers,

Welcome to the April 2017 issue of *Global Cement Magazine,* the world's most widely-read cement magazine, which will be distributed to all delegates at the 1st *Global CemProcess Conference & Exhibition* on cement plant process optimisation, which takes place in London, UK on 24-25 April 2017.

To tie in with the themes of this event, this issue looks at a host of lower-capex ways to make the most out of your equipment. Starting on Page 8, authors from INFORM look at how better management of 'close-to-core' activities like yard control and distribution can help save both plants and customers time (and therefore money). Optimisation of ball mills is discussed by KIMA's Dirk Schmidt from Page 10 and authors from LafargeHolcim's Midlothian plant in Texas discuss how in-house CDF modelling can add a new dimension to plant optimisation (Page 18). Elsewhere, Siemens' Paul Addison looks at the savings that the Hanson Ribblesdale plant has made in the UK following a fan upgrade (Page 22).

Also to tie in with the *Global CemProcess Conference,* we report from the Hanson Ketton cement plant in Rutland, UK, which will be visited by delegates of the conference. In production for nearly 90 years, the plant has seen several incarnations over the years and now operates a 1.3Mt/yr Polysius kiln line that was installed in 1986. Despite this relatively old kiln, the plant has continued to invest heavily to increase its efficiency, including recent changes to the vertical roller mill for raw meal, new bagging equipment, emissions abatement installations and a 12MW solar plant, which can supply up to a third of the cement plant's electrical requirements during the summer months. Turn to Page 46 to read our detailed interview with plant manager Stewart Jones.

As well as our *CemProcess*-related content, readers will be able to find articles on chains (Page 30), SNCR (Page 24) and mill and kiln drives (Page 20), as well as in-depth reports on the Iranian (Page 64) and Central African (Page 73) cement markets, both of which have huge potential for rapid growth in the future.

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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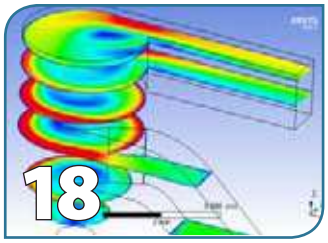
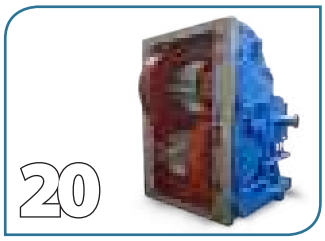
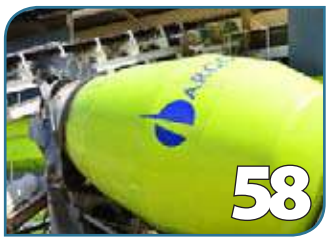
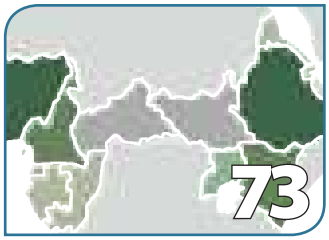




Global Cement articles

European cement





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www.CemProcess.com

Interpack 2017
4-10 May 2017, Düsseldorf, Germany
www.interpack.com

Arab International Conference & Exhibition on White Cement & Related Building Materials
8-9 May 2017, Ammam, Jordan
www.aucbm.org

SOLIDS Dortmund 2017 (Schüttgut)
10-11 May 2017, Dortmund, Germany
www.easyfairs.com

12th Global Slag Conference & Exhibition
18-19 May 2017, Düsseldorf, Germany
www.GlobalSlag.com

IEEE-IAS/PCA Cement Conference
21-25 May 2017, Calgary, Canada
www.cementconference.org

1st Global CemTrans Conference & Exhibition
6-7 June 2017, Antwerp, Belgium
www.Cem-Trans.com

12th Global Insulation Conference & Exhibition
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POWTECH 2017
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Thomas Bergmans & Dirk Schlemper, INFORM GmbH

Faster loading pit stops

Pit stops in modern motorsport are carried out in less time than it takes to read this sentence. Blink... and you miss it. High-tech tools, optimised processes and the latest advances in IT have been the main drivers behind this progress. Data and algorithms can also help cement producers to speed up their loading processes.

The race car pulls in, stops in a precise position, gets jacked up immediately, its tyres are changed, the jacks are dropped and the car races away. Precisely timed pit stops are vital to turn race strategy into success. Time lost to unscheduled stops is hard to catch up. What used to be a time-consuming exercise in the past has come down to a two-second, perfectly choreographed performance of man and machine.

Racing garages today look more like a control room than a mechanic's work area. On each bench, there are more computer monitors than oil smeared wrenches. Real-time data insights allow engineers to track and analyse car performance while it is out on the circuit, helping the team to predict what will happen next.

In the daily race of cement distribution, loading processes are still a far cry from the mind-blowing pit stops we see in motorsport. A look at cement plants around the world reveals that long lines of idling trucks in front of the entrance gate or loading bays are still a common sight. Although cement handling and loading equipment can be highly innovative today and operations can be fully automated, turnaround times seem to have benefitted little from these advances.

The good, the bad and the ugly

Core competencies give companies a value-adding position in the market place. For cement producers these are typically product development, manufacturing processes and quality control.

Close-to-core competencies like onsite yard management (gate, loading, weighbridges and related tasks) often receive less attention. These processes tend to be less efficient and are often performed in the same manner as they were 20 years ago. Once the gates to the outside world of distribution are opened, process standards hardly exist and/or services are outsourced to third parties. However, yard and distribution can contribute significant value to one's position in the market place, for example, by driving customer satisfaction and lowering logistics costs. Depending on the region, logistics costs equate to 15-25% of a cement producer's sales revenue.

Pulling out of the race

Queueing is neither a pleasant sight nor an efficient way to do business. Many hauliers are independent contractors who depend on quick turnarounds at the plant to keep their businesses profitable and costs low for the cement producer. Many customers depend on

Right - Figure 1: Digital torque can help to speed up loading processes.

Left - Figure 2: Queueing is not an efficient way to do business.

reliable delivery times to keep their operations running. In case of delays, some may start to turn their trucks around and send them to competitor plants nearby. For a cement producer with an annual output of 4Mt/yr, a 5% loss of orders due to excess waiting times can add up to a US$1m/yr lower turnover.

Fatal crashes

Terrible accidents have happened throughout the history of motorsport, both on the race tracks and in the pit lanes. Trucks within a cement plant are also a health and safety risk. According to the Cement Sustainability Initiative (CSI), driving related incidents are the single largest cause of fatalities among its members. Over 200 employees, contractors and third parties lost their lives in a two years' period (CSI report from 2012). Over 60% occurred off-site, about 40% on-site. Drivers walking around moving trucks, for whatever reason, are potentially at risk. Controlling traffic and reducing the number of trucks within the plant is a major step towards a safer working environment.

Premium service

In many racing series, each team runs two cars with two drivers. In the heat of the action, the driver with the best chances to win the race or championship will usually get preferred treatment when it comes to entering the pits.

In cement distribution, all customers should be treated fairly, but that doesn't mean they must all be treated equally. Why should a Class A customer line-up behind a one-off buyer picking up a small order? Business practice often requires that some clients receive preferred service. Premium customers, one's own truck fleet, contract hauliers, ex-works deliveries or even specific product promotions, the list of possible beneficiaries is long as is the list of reasons why they should be allowed to jump the queue.

Spectators

Noise, the smell of petrol and burning rubber are part of the excitement for motorsport fans. People who live close to cement plants and quarries are less excited to watch the daily race of cement distribution. Heavy traffic around the plant is often a major concern for nearby communities. Finding a way to clear the air and roads around a plant will help to clear neighbourhood disputes.

Digital race control

Time slot management, truck appointment systems and scheduling software. These are three different terms to describe the same concept: software that is used to allocate time slots to cement buyers and inbound suppliers. It helps to avoid hauliers arriving randomly at the plant, adding speed and consistency to on-site handling processes.

Software can also be used to calculate an optimised loading schedule based on the order book information, business rules and site constraints. Business rules that may apply are:

- Customer/contract profitability;
- Preferred haulier list;
- Premium service to specific customers;
- Timeline of orders;
- Minimising product changes at loading points;
- Maximising loading capacity utilisation;
- Targets for product volumes or specific regions.

Site constraints may include:

- Product availability at a specific loading point;
- Capacity of the loading point per product group;
- Loading point availability;
- Interdependencies of loading points;
- Product volume quotas;
- Equipment compatibility between the truck and the loading point.

Real-time updates

The schedule builds a solid foundation for the next day(s) or shift(s). However, plans usually have a limited shelf life. Daily challenges like ad-hoc orders, cancellations or delays, truck or machine breakdowns and other unforeseen eventualities can disrupt the schedule and will affect the efficiency of the operation if no counter-measures are taken.

The latest software tools review and adjust all planning decisions constantly, right up to the moment before execution. GPS data from the trucks and live information from the gates and loading stations are fed back into the software. Its real-time optimisation feature checks which order(s) can be moved forward and updates the entire schedule accordingly. Similar to flight information at airports, display panels within the parking or gate check-in area update truck drivers on schedule progress, hence reducing the need for drivers to constantly check with plant staff.

The right set-up

Time slot management turns cement loading and inbound deliveries into an efficient and smooth process. It significantly reduces delays and turnaround times. However, like in motorsport, there's always a way to set new records. Some software suppliers integrate time slot management into their outbound transport planning and optimisation tools.

Powered by algorithms, these tools analyse a virtually endless number of scheduling decisions in real-time and identify those that are ideal for minimising costs and maximising service quality, based on the defined business criteria. The software allows operators to make incredibly complex, time-critical decisions with ease. What's more, the decisions made take into account a larger range of variables than the human mind can, resulting in better overall decision quality. This, in turn, leads to increases in efficiency across the entire supply chain. This optimisation approach is based on a seven step strategy (Figure 3):

1. Pre-race data import: The current order book is taken from the enterprise resource planning (ERP) system. Geographical data is used to calculate travel distances and trip durations. Fleet data provides information on each available truck's characteristics and capacities.

2. Starting grid: The software calculates an optimised cement delivery schedule and fleet configuration for the following shift(s) or day(s), incorporating the service levels selected by the dispatcher. Dispatchers can also compare several scenarios for the same data set by changing the scaling factors.

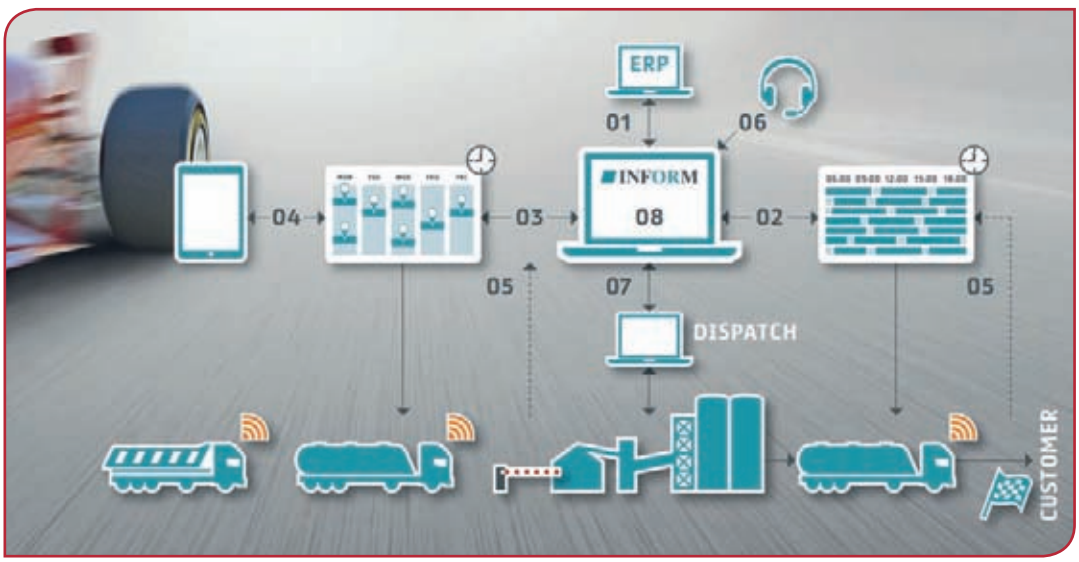
3. Faster pit stops: The software allocates time slots to hauliers, adding speed and consistency to loading stations.

4. Haulier access: Hauliers, suppliers and ex-works customers will receive an e-mail or text notification on available time slots and haulage orders. A web portal grants access for all transactions.

5. Real-time updates: Vehicle breakdowns and traffic holdups are a nightmare for any driver or dispatcher. The software automatically updates the transport plan every 30 to 120 seconds.

6. Race control: The software gives dispatchers full control over their On-Time In-Full (OTIF) performance. They are also able to offer suitable delivery slots at the point of order taking.

7. Dispatch automation: The software sends information on upcoming 'pit stops' and receives feedback on current progress from gates, loading stations and weighbridges.



Right - Figure 3: Transport planning in the fast lane.

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Intercem Group

Express delivery: Intercem supplies to Burkina Faso

Intercem Group's latest project shows that express delivery can be a reality. Intercem performed an express delivery of a replacement transformer for Cimfaso Cement in Burkina Faso. The complete time elapsed was just 10 days from the first phone call until the plant restarted production.

The main transformer of the Cimfaso Cement plant was purchased from a local supplier during construction work in 2014. On 16 February 2017 it was damaged due to a problem in the local power grid and production had to be stopped completely. Cimfaso asked Intercem for urgent help because high production downtime costs were expected and the plant was at risk of losing market share.

After an intensive market investigation Intercem found an appropriate transformer to replace the damaged one. An offer was submitted and the transformer in question was inspected together with a representative of the customer that same day. An order was placed and the transformer was tested, certified, disassembled and packed for air freight by cargo aircraft to Burkina Faso. The transport from the supplier in Potsdam, Germany to the airport in Leipzig, Germany was made by truck. The loading of the transformer from the truck into the aircraft was a quite complex procedure because of the height and weight of the machine. Transport within Burkina Faso was organised by Cimfaso Cement.

One of Intercem's engineers accompanied the complete transport and supervised the reassembly in the Cimfaso plant. This included mechanical assembly, electrical connection, the provision of assistance during the authorisation by the local power supplier, the function test, the commissioning and the restart of production at the plant. Moreover the Intercem Group was responsible for customs clearance, obtaining visas and all kinds of further necessary organisation. Everything was completed in just 10 days!

The Intercem team, the sub-suppliers as well as the local labour force at the Cimfaso plant worked hand-in-hand and mastered this challenging project as one team. This project can be proudly considered as a prime example of a good partnership between Cimfaso Cement and Intercem Group.

Timeline of the project at a glance

16 February: Search for appropriate replacement transformer; Offer to Cimfaso; Inspection and test of the transformer together with a representative of the customer.

17 February: Order from Cimfaso.

21 February: Disassembly of the transformer; Appropriate packaging for airfreight; Transport in Germany by truck.

22-23 February: Loading into the aircraft.

23 February: Transport by aircraft; Customs clearance; Visa; Loading from aircraft onto the truck; Transport by truck in Burkina Faso.

24-25 February: Mechanical assembly; Electrical connection; Authorisation by the local power supplier; Function test: Commissioning of the transformer in the plant.

25 February (Evening): Production re-start after 10 days!

Right: Air transit was only part of a rapid turnaround for Intercem and Cimfaso in a 10 day transformer replacement project.

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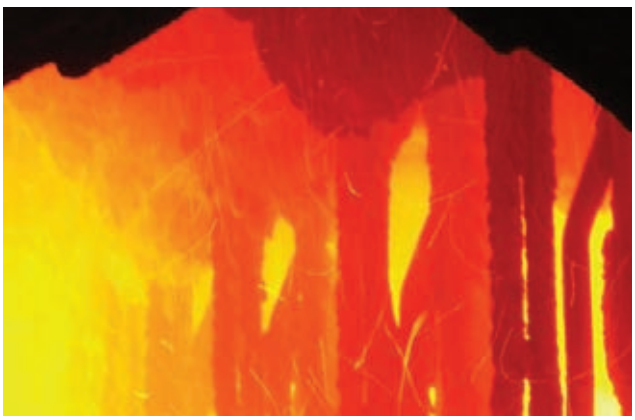

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Dirk Schmidt, KIMA Echtzeitsysteme

Ball mill optimisation using smart fill-level control

Expert systems have been proven to optimise the operation of ball mills all over the world. For decades, high-level control systems have guided cement producers towards more efficient and consistent operation. Such systems do not make human operators unnecessary but instead offer the control team in the central control room more time for other work. While these 'auto pilots' control mills and kilns, there is more time for manual adjustments and more precise operations in other areas of the plant. However, each 'auto-pilot system' is only as good as the information that guides it. In this article, we look at how Kima Echtzeitsysteme's SmartFill™ fill level management system can be used to optimise the grinding process of one and two chamber cement ball mills.

A sophisticated and well developed expert system should be easy to use and able to be maintained by the plant personnel. The times when remote experts need to frequently visit the plant for adjustments should be history.

A modern high-level control system allows plant operators to create and modify individual plant control loops via simple graphical tools and logic blocks. By this I do not mean set-point corrections but adding *new* instrumentation into the control loop and changing logical combinations. This includes new parameters like new fuel types in the combustion or the change from manual input parameters to continuous measurement signals.

The modular and open control software SmartControl™ developed by KIMA Echtzeitsysteme considers such demands. It has found success in single and two-chamber ball mills (including central discharge) for raw meal, slag, coal and, of course, cement. The system can also control roller presses that are installed before the mill and separators. It is sold under the name MillMaster.

MillMaster comes with a multitude of function blocks that are assembled to a control group in a special programme called 'Control Designer.' The intuitive user interface offers clear visualisation, is flexible and easy to learn. It was designed to offer process engineers that have no programming skills the opportunity to generate the control logic and adapt/manipulate it by themselves without the need of external support.

Right - Figure 1: An On Mill Unit (OMU) SmartFill (circled) on a two chamber mill. Level sensors for chamber 1 and chamber 2 are installed directly on the mill tube.

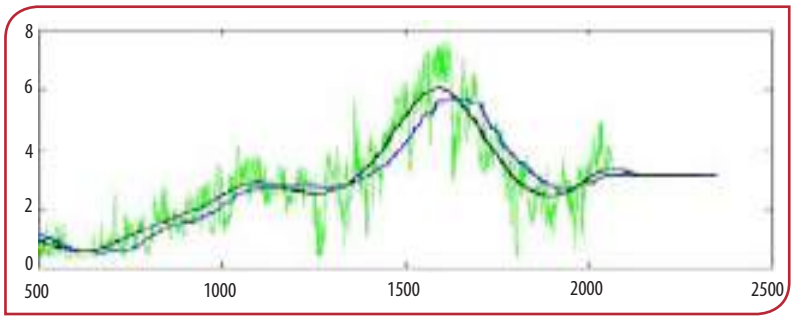
Pre-defined functions and structures are simply created via 'drag-and-drop' from a large catalogue of functions, helping operators to focus on the essentials. A huge library of existing structures gives, for most applications, complete solutions that can be further adapted by limit value and set point adjustments.

To smooth rapidly-varying process instrumentation signals for control purposes such 'digital filters' compare to traditional ones in that they do not have a delay time. The green line in Figure 3 shows a highly-fluctuating measurement signal as is usual in the industry. A classical filter would smooth the signal but would always have a delay time. This can be a 'killer' in situations where, for example, in-situ measurements and process leading values are used in control loops.

Besides highly-sophisticated digital filters, the MillMaster system contains predictive models that can predict trends into the future (See Figure 4). So called 'soft-sensors' can be generated, which use multi-dimensional input vectors. This groups together significant process data to determine the outcome of longer timeframe processes, minutes or even hours in advance. This model prediction is a very useful tool for complex phenomena in non-linear processes. It should be noted that the control methodology is distinct from model predictive control (MPC) but instead uses MPC to calculate future trends in the control loop as soft sensor information. This leads to both the sensor's signal and control loop being much more stable when unpredictable situations arise.

Control loop and strategy

Each controller is only as good as its instrument for the targeted value and each grinding process is only efficient at an optimum mill capacity. The classical strategies for controlling a ball mill all influence the efficiency of the grinding process indirectly.



Above left - Figure 2: MillMaster - Screenshot from the Control Designer with logic functions that can be easily combined to 'rules' by dragging and dropping.

Above - Figure 3: Digital filters developed by Kima 'E' as real time information without any delay time.

Measurement
Classical filter
KIMA digital filter

Imagine the following set of parameters: Fresh material = constant; Reject material = constant; Total feed = constant. Such information gives the operator an impression that the process is very constant, but this is not the case. All of these parameters tend to oscillate significantly. This can be measured using a precise fill-level measurement.

For this reason KIMA decided to develop a fill-level measurement called SmartFill™, which is based on structure-borne sound. Highly reproducible and stable signals give the separate fill levels of chambers 1 and 2 separately, offering high-level control systems a new source of fundamental information. Consequently the leading cement producing companies in the world have implemented or recommended the use of SmartFill's 'electronic ears' in their in-house expert systems.

KIMA uses the optimal filling of the mill as the main control parameter. This allows the grinding process to become very stable, which allows unexpected disturbances to be accommodated more easily. The main variable parameter is the hardness of the material to be ground, which influences the time it must be held within the mill. Figure 5 makes it clear that all delay times within the production circuit are more or less constant (T_1-T_5). Only the time the material spends in the ball mill itself (T_{mill}) is not known and definitely varies with the grindability. It is thus logical that the fresh feed into the mill should be adjusted accordingly and be used to keep the level inside the mill constant.

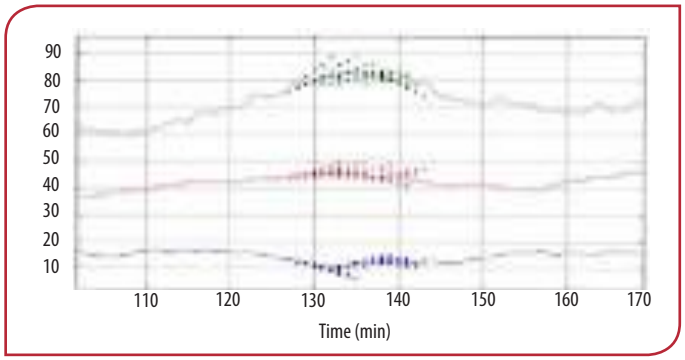
Sophisticated controllers need reliable sensors

Compared to classical proportional integral derivative (PID) controllers the fuzzy components in expert systems like KIMA E's MillMaster and SmartFill systems can compensate for signal drift that occurs as a result of wear in various parts of the process. Other technologies are all installed away from the original source of interest, i.e.: the mill body. Microphones as well as vibration sensors that measure the variation of sound or vibrations in the bearing foundations are all indirect and failure-sensitive sources of raw information. A microphone that 'listens' can be very sensitive to other mills, motors or gearboxes nearby, meaning that the vibrations of motors, wearing sprockets from drives or similar can disturb vibration analysis. It is no secret that these types of system must be re-calibrated, very often on a monthly basis.

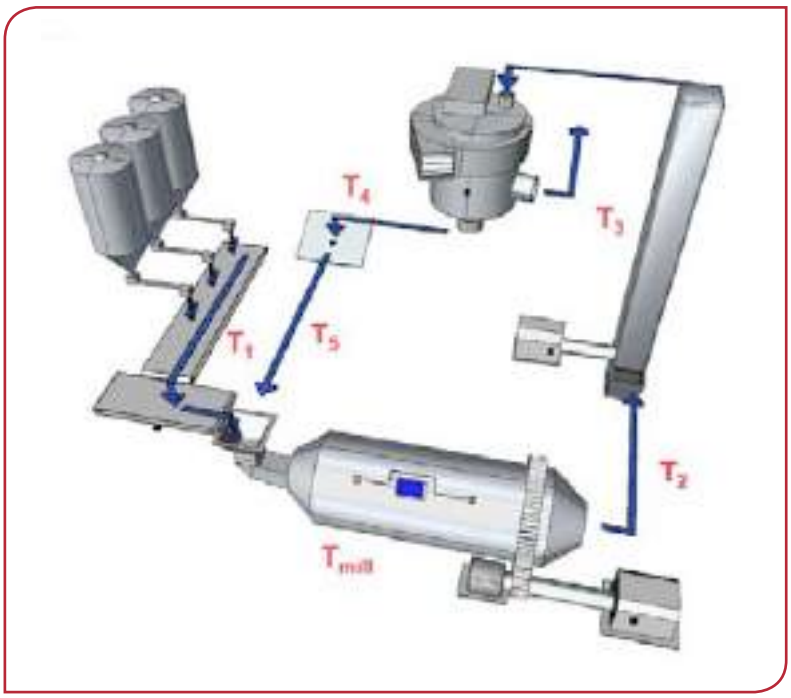
With a constant fill level inside of the one or two mill chambers the optimum production volume is reached. Keeping these levels constant also secures a more constant product quality due to the particle size distribution becoming narrower. Another logical effect is the reduced wear of liners and balls which was reported by HeidelbergCement, Dyckerhoff (Buzzi Unicem), LafargeHolcim and other producers. It is not surprising that, when it comes to certain guarantees, OEMs of grinding plants consider using SmartFill in their projects. To secure constant product quality and constantly high production for their customers in greenfield or modernisation projects, the measurement system with the sensor box mounted directly on the mill body is considered right from the first specification.

Implementation and adaptation to the plant automation

Regardless of which distributed control system (DCS) is used, the MillMaster reads and writes its data via an open platform communication (OPC) connection to the plant controller. The very few set point corrections and limit value adjustments can be easily implemented in the supervisory control and data acquisition (SCADA) system and visualisation displays of the plant. This makes the switch from manual or standard PID control operation to the 'auto pilot' very easy.



Left - Figure 4: Predictors support the connected fuzzy controller downstream to take the right action. Three variables are shown.



Above - Figure 5: All time delays are constant except for the time that the material stays in the mill (T_{mill}). A reliable measurement is therefore of great importance.

Above right - Figure 6: A SmartFill On Mill Unit (OMU) with cable trays to the structure-borne sound sensors for chamber 1 and 2 as well as the optional thermocouple measuring the gas/material temperature within the diaphragm.

In manual operation, mill input (fresh feed) should be adjusted by a 'fresh manual' value that is entered in the SCADA system. When MillMaster is running, its calculated 'fresh feed set value' controls the fresh feed.

This and other set values can be fully-automated and adjusted while the KIMA E's MillMaster is in operation. The system usually runs for 95-100% of operational hours. Operators learn very fast that driving the mill in the auto-mode gives them time to concentrate on other issues around the plant. The process engineers are very thankful that they can change not only parameters but also adapt new instrumentation easily into the control strategy on their own.

Proven results

In 2007 the Lafarge Davenport plant (now Continental Cement) in the USA, reported the various benefits of the MillMaster plus SmartFill package.

Below - Figure 7: The Continental Cement plant at Davenport reports fundamental benefits of using MillMaster.

Jonathon Sprague, Instrumentation Supervisor reported, "The Davenport Lafarge plant is very satisfied with our Smartfill and MillMaster systems. Kima 'E' is very knowledgeable and has been excellent to work with throughout. Since operating and controlling our grinding mills with the MillMaster and SmartFill systems from KIMA we have been able to optimise our grinding process in terms of better information to make process decisions. For example, there had been a plan to add additional block-off plates in the diaphragm, because it was believed that chamber 1 was under-loaded and chamber 2 was full. The day that we commissioned the SmartFill device, we found that chamber 1 was actually full and that Chamber 2 was only 60% loaded. We later took out all of the existing blanks in the diaphragm to allow better flow into chamber 2 and have the level up to 85-95%."

"It is now easier to see the effects of process changes because the mill loading is kept constant. We were able to reduce grinding aid usage while increasing production. More stable operation also results in more consistent lab results as well as less wear on liners and balls. We have mostly eliminated the loose liner bolts that we had previously had to deal with routinely. This is probably attributed to less direct impact on the liners, because of stable mill loading. The plant also saw a reduction in power consumption per tonne of cement and increased production."

"The commissioning and the optimisation of the MillMaster system was taken care of by KIMA engineers via a VPN connection, freeing up manpower that was previously devoted to optimisation of Lafarge's LUCIE control system," concludes Sprague.

A more recent order is from the Opterra cement plant of Karsdorf, Germany (now owned by Schwenck Zement). Another former Lafarge plant, it has ordered six MillMaster plus SmartFill packages to optimise its ball mills in a single mill building. KIMA hopes to report the results at a later date.

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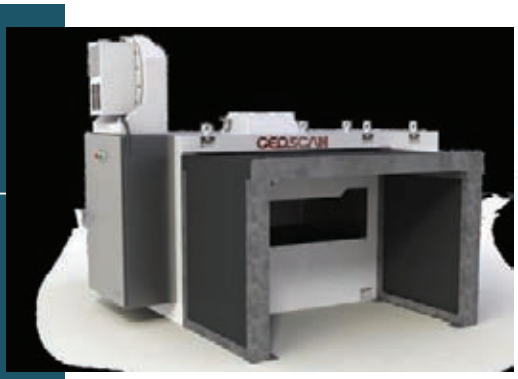

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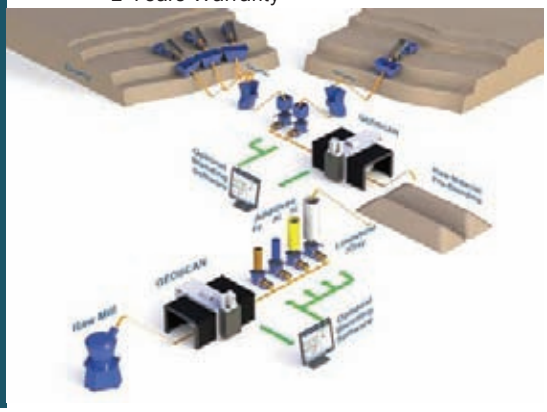

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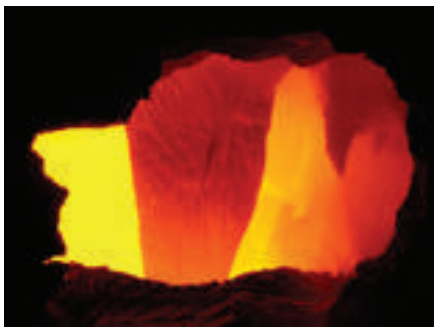

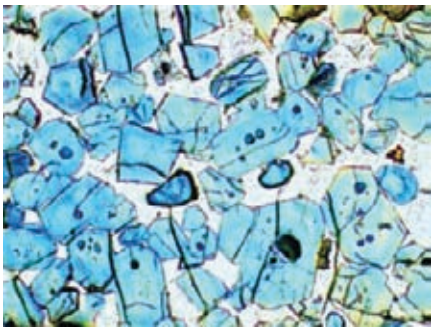

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Thomas Lamare & Michel Moser, Holcim (US) Inc., a member of LafargeHolcim

In-house CFD modelling: Adding value to a cement plant's bottom line

Computational Fluid Dynamics (CFD) modelling and simulation have been used for decades. However, high cost, complexity and the low performance of computers had limited its use to high-tech companies such as those in the aeronautic, space, automotive or electronics industries. With the significant increase in computing power and reduction of equipment cost in the 2000s, the use of CFD has gained potential and is now accessible to new types of users, from students in universities to engineers at low-tech companies.

LafargeHolcim's Midlothian plant in Texas started using CFD in 2006 by contracting studies with external companies.[1] Since 2012, however, the plant has used CFD in-house to optimise its two kiln lines. More than a dozen studies have been conducted so far, offering a deep understanding of the plant's equipment performance and its potential for improvement. Additionally, these in-house studies have reduced outsourcing costs.

Hardware and software configuration

Following an evaluation of the different solutions on the market, the company purchased a license from ANSYS[2] for Fluent software and Workbench platform and the plant installed a dedicated workstation.

The computer was originally equipped with a 23" screen, a multi-core Intel Xeon CPU with 32GB of RAM running on a 64 bits OS, an NVIDIA Quadro 4000 GPU with 2GB of RAM and a 1TB hard drive. This powerful configuration is meant to reduce computing time and ensure that the analysis can be run within a reasonable time frame.

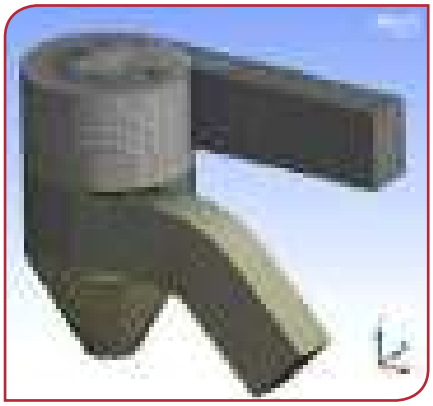
As an example, flow simulations in equipment such as cyclones can take anywhere from a few minutes to hours to complete, while more complex simulations involving particles, heat transfer or chemical reactions can require days. The workstation is also connected to the local network so that employees can remotely run analysis and simulations in the background while performing other tasks.

The Midlothian plant trained key personnel including the production manager, process engineers and a project manager. Engineers were considered the primary users of the software due to required understanding of fluid dynamics and the physics of the cement process. The user first needs to build the 3D model (similar to CAD), then a mesh grid, and eventually set the simulation conditions and parameters. The software computes all calculations in the background and provides a solution file that is analysed in a post-processing application.

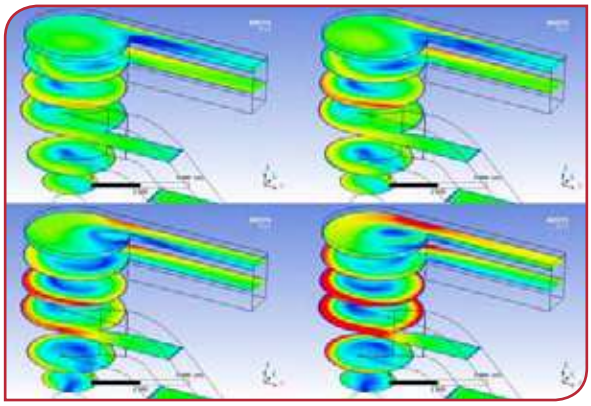
For complex cases, the plant can always rely on the help from ANSYS technical support, otherwise libraries and the internet provide a lot of information on how to independently optimise and analyse a case study.

Typical simulation: Dust settling chamber

In 2016 the plant investigated the cooler settling chamber installed on Kiln No. 2, which started operations in 2000. The equipment showed low separation efficiency and high dust carry-over to the tertiary-air duct. In addition, dust build-up in the chamber cone and walls led to regular plugging of the chamber, which required manual cleaning and upset conditions in the kiln, sometimes leading to a kiln stop.



Right - Figure 1: Dust settling chamber hexagonal mesh.



Far right - Figure 2: Gas velocity comparison.

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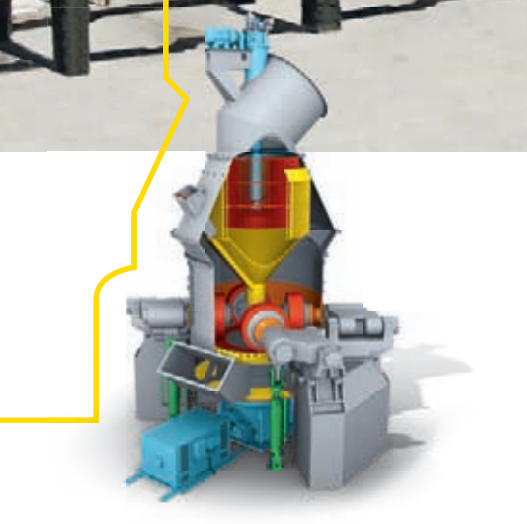

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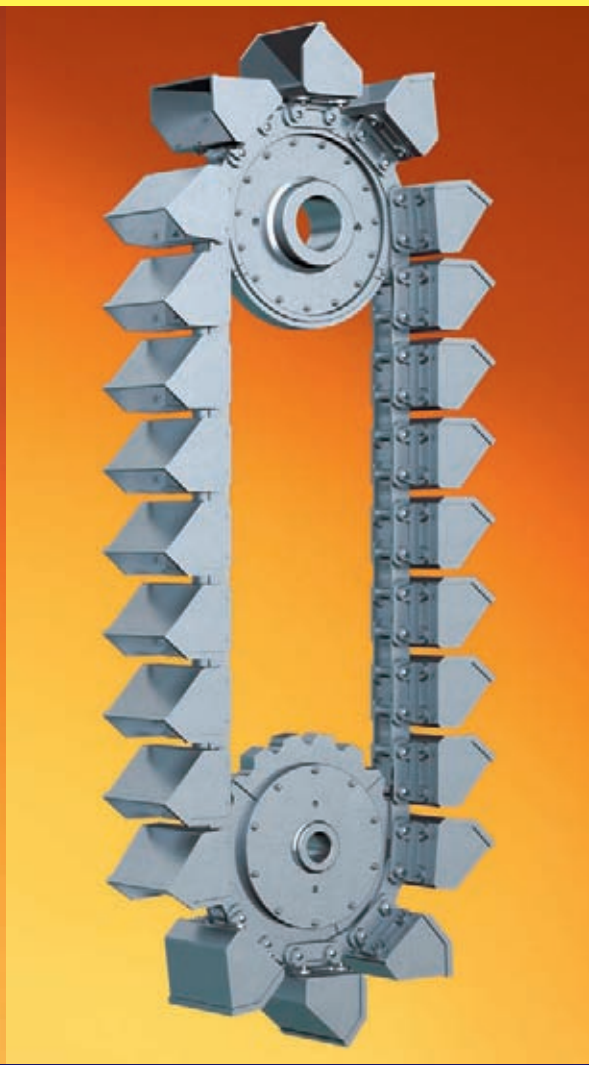

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The objective of the study was to modify the chamber inlet geometry to avoid build-up, thereby improving the separation efficiency and flow of dust.

First, the existing settling chamber was modelled using blueprints and site measurements. The simulation results were compared to the actual operating conditions to confirm the quality of the model in terms of pressure drop and separation efficiency.

Second, the approved base case was used to generate eight alternative models with different inlet geometries. All models were simulated and their performance compared.

The geometry modification that showed the best impact to increase the separation efficiency was selected and underwent sensitivity analysis to optimise the inlet duct dimensions (See Figure 2). The overall goal was to improve the separation efficiency while limiting the increase of pressure drop. The final solution was presented to the plant's management team and approved for implementation.

Process data confirmed the success of the modification. The chamber shows much lower build-up in the cone, resulting in less cleaning, improved safety, less kiln upset conditions and less downtime. As expected, the pressure drop across the chamber increased slightly but remained within the predicted range, i.e. a <1mbar increase.

Other applications

The team conducted several other studies, including:

- Conditioning tower and spray arrangement (Figure 3);
- Raw mill cyclone optimisation (Figure 4);
- Raw mill pressure drop optimisation;
- Cooler dedusting chamber separation efficiency;
- Cooler air heat-exchanger dust erosion;
- Ball mill charge and liner geometry (Figure 5);
- Ductwork pressure drop optimisation;
- Flow distribution in RTO and SCR system.

In-house vs. sub-contracted

While the plant had subcontracted CFD analysis with external companies in the past, the return on investment was always in question. In most cases, the consultant's lack of expertise regarding the plant's equipment and specificities often led to biased modelling and simulations that generated solutions that were neither technically feasible nor cost effective. Another major disadvantage is the high cost of such studies and their low flexibility. Each new change of parameter added to the final cost and the subcontractor might not have been able to extend resources.

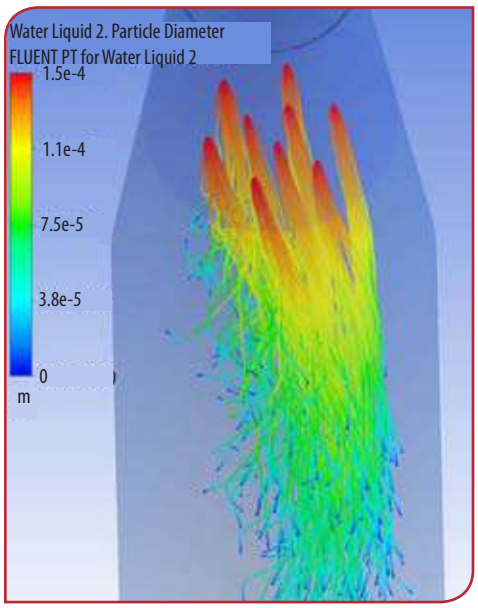
In comparison, conducting CFD analysis in-house offers full control and transparency over the model geometry, the simulation conditions and the analysis of the results. Once a model is developed, it is easy to add components or change conditions at no cost. Overall, the buy-in and consideration from plant personnel increases, as CFD becomes a standard tool in the plant's toolbox for process optimisation.

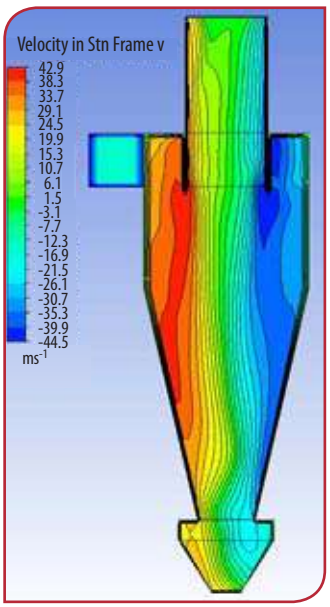
In most cases the CFD models developed for a specific plant can be reused and easily adapted to other cases, thereby saving time. This is especially true for standard cement plant equipment such as cyclones, conditioning towers and cement mills.

Conclusion and next steps

The Midlothian plant demonstrated the advantages of using in-house CFD modelling to analyse and optimise the cement process at a reduced cost compared to outsourcing. The plant team started supporting other facilities in the company and is now using CFD as a standard tool for process optimisation and project design.

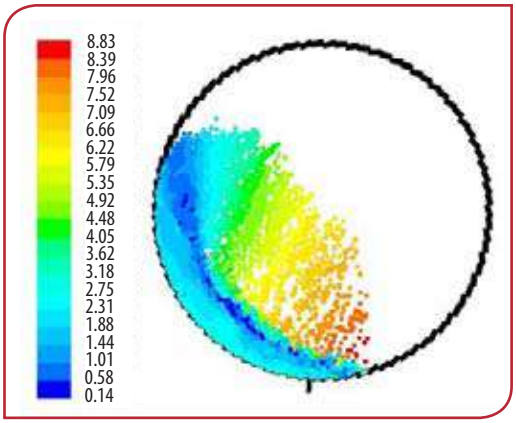
In the future, the multi-physics capability of the ANSYS suite could offer unlimited potential to optimise all aspects of the plant. In combination with Finite Element and Vibration Analysis, one could develop solutions to reduce wear, mitigate vibrations and avoid failures of key equipment.





Above - Figure 3: Conditioning tower spray evaluation.

Above left - Figure 4: Cyclone tangential velocity.



Left - Figure 5: Ball charge movement and velocity (ms^{-1}).

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1. *'NO_x Reduction through a combination of Reburn and SNCR,'* ZKG International No 5-2008.
2. www.ansys.com

Lukas Steiner, Wikov Industry

An ingenious solution for driving tube mills with girth gears

Wikov, a gearbox engineering and manufacturing company, has a field-proven product for driving tube mills with large girth gears, a space-saving Side Drive gearbox. While there are several such side drive gearbox solutions on the market, the features of Wikov's Side Drive give end users increased reliability, reduced maintenance and service costs. These aspects of process optimisation result in improved positions for cement producers in the highly competitive modern market place.

Above: Wikov Side Drive.

Below: Common oil contamination on conventional side drive solutions that lead to fatal damage of bearings and scoring of gear teeth.

The Side Drive gearbox saw the light of day for the first time in 2006 and it has undergone a lot of development based on a real-life experience from years of 24/7 operation.

The objective of the development of the Side Drive gearbox by Wikov was a product that would be compatible with the majority of existing plants using single pinion solutions for mills or kilns. The point was to make the product feasible for cement plants without the need for large construction modifications that lead to increased capital costs. At the same time reliability and low maintenance requirements were the primary drivers for an efficient, modern product.

The Side Drive is now proven and cost-competitive with conventional solutions, while providing reliable operation at low maintenance and service costs. This has a positive impact on the Total Cost of Ownership, a far more useful measure than jsut the initial investment figure.

The convenience of the Side Drive lies in the patented separated lubrication system, which is a unique technical solution - a self-aligning pinion and rigid gearbox casing. In the field, these mechanical groups are proven to be decisive for trouble-free operation.

The separated lubrication system is key to ensure extended lifetime of the gearbox by eliminating gearbox contamination by cement dust and impurities coming from the girth gear. Despite the fact that the rim is thoroughly sealed during installation, field experience shows that this sealing is far from perfect and it wears very quickly.

Conventional side drive gearboxes that are open in the direction of the rim get contaminated by cement dust. This results in rapid wear of the gears and bearings, contamination of the lubrication oil and clogging of filters and the entire lubrication system. The gearbox tends to fail prematurely.

The Side Drive by Wikov has a closed and sealed design so that contact with the girth gear is limited to outlet pinions only. Sealing in the area of pinion shafts at outlets is implemented using non-wearing labyrinth seals and scraper rings. The advantage of the system is the significant increase in gearbox reliability, especially of bearings that are extremely sensitive to cleanliness and lubricating oil quality. In order to achive purity of the lubricating oil that fully conforms to the operation of the bearings in the original design, one would have to include in the lubrication system a full-flow filter, filtering at about three microns. This is not realistic for practical applications and therefore one has to ensure that the lubricating circuit of the bearings and the transmissions is as insulated as possible from the external environment of the casing. The time between repairs or replacement of bearings in the new gearbox can be doubled by using this system.

The gearbox lubricating system was designed so that the separated spaces have independent oil supplies from two separated lubricating units. This contributes to keeping the gears and bearings free of contamination from the girth gear. The oil from the girth gear space is drained to a tank of the girth gear's lubricating system and the oil from the separated inner space of the gearbox is drained to the second lubricating unit. Each circuit can use a different oil grade: the gearbox using VG 320 and the girth gear using VG 460, for example. The separated lubrication system allows cement plants to use high-quality synthetic oil without wasting money, which would be the case with a conventional side drive gearboxes where contamination of the oil would cause degradation almost immediately. In the case of the Side Drive by Wikov, synthetic oil may increase gearbox efficiency and reduce energy costs, while maintaining its properties.

Piping for the girth gear lubricating circuit, which is prone to contamination by cement dust, may require cleaning from time to time. Therefore complete

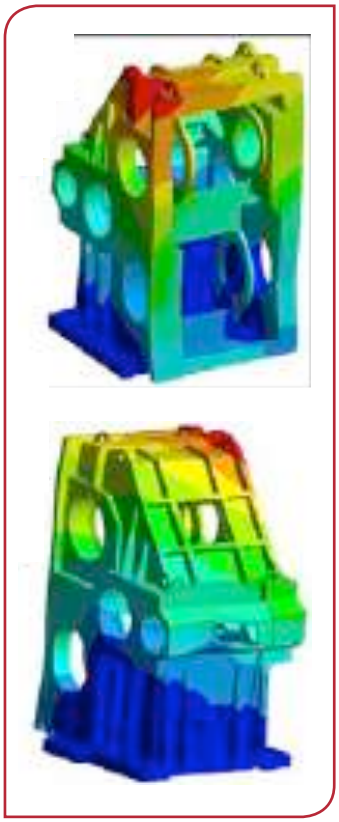
distribution of the lubricant for the gearbox and the girth gear is realised from the outside of the gearbox. The gearbox casing has openings for lubricating pipes with spraying nozzles that lubricates gear stages and a girth gear. These lubricating pipes can be dismounted and cleaned easily during operation breaks. This service takes 2-3 hours. It does not require any special equipment or tools because the gearbox does not have to be dismounted, as is the case with conventional solutions.

Finally, yet importantly, the partition system significantly increases the rigidity of the gearbox casing. In the case of a conventional side drive gearbox, the side adjacent to the rim is open and therefore not reinforced, whereas with the innovative gearbox the partition system closes the gearbox from this side as well and significantly increases rigidity of the whole casing.

The optimally rigid gearbox casing is a result of research of dynamic behaviour of the Side Drive, which included various analyses such as structural analysis of the gearbox casing and modal analysis using finite element methods (FEM), to determine the natural mode shapes and frequencies of an object or structure during free vibration and other vibration conditions. The calculations were compared to real-life operation and results implemented into an optimised design for the gearing in order to secure maximum meshing of gearing under load and thus improve reliability and service life of the gearbox.

A self-aligning pinion is a prerequisite of a smooth operation because the mill, the girth gear and the base are subject to elastic deformations, have deviations due to manufacture and suffer from wear. An assembly of self-aligning pinion is used in applications where an ideal meshing of gears is needed, where a pair of pinions is meshing with one gear or where the variable misalignment of a pinion and a gear is expected. This is the case in side drive gearboxes for cement mills and kilns. The advantage of the Wikov system is that a tilting pinion allows it to align optimally with the meshing gear independently, on both shaft and gear deformations. The principle lies in a relative movement between two pairs of spherical rings and the spherical shape of a pinion's gear teeth. The spherical rings ensure axial stability. The value of misalignment and radial movement that the self-aligning shaft can bear depends on the actual design. Generally it is possible to accommodate misalignments up to 0.5°. The maximum misalignment may affect the lifetime of the equipment. Therefore final design of the self-aligning shaft should be optimised for each case individually.

The Side Drive design and dimensions enable easy drop-in replacement for other side drive solutions in the market, for power of 2.8-6.0MW. Existing oil systems can be used. However, the major added value remains reduced maintenance costs, increased efficiency and gearbox lifetime.



Above: Static and modal FEM analysis to ensure optimally rigid gearbox casing.

Below: The ADOÇİM AŞ Tokat Cement plant.

Case-study: ADOÇİM's Tokat plant

ADOÇİM AŞ's Tokat integrated cement plant in Turkey had two Wikov Side Drive gearboxes installed as part of a mill unit by a third party OEM in 2007. A third identical mill unit, also with a Wikov Side Drive gearbox, was erected in 2011. ADOÇİM also has a fourth grinding plant in the Marmara region in Tekirdağ, also with a Side Drive. The company thus operates a total of four Wikow Side Drive gearboxes.

"The price to performance ratio was the most important criteria during comparisons," explained Mehmet Erdem Fidangül, Methods and Planning Manager. "The Side Drive solution also required a minimum area, which is another significant selection criteria, as well as the compatibility to our mill configuration. The projects were new and we did not replace any older drives."

"We had seen improvements in maintenance times and effectiveness during our 10 years of experience of cooperation with Wikov Service specialists. Our best practice is regular six months maintenance tasks based on strictly-controlled maintenance master plans. Any findings are acted upon immediately."

Paul Addison, Siemens plc

Total Engineered Solution from Siemens brings green benefits to Hanson Cement

A kiln fan upgrade incorporating Siemens' totally engineered control and drive solutions has enabled Hanson Cement to considerably improve flexibility as well as reduce CO_2 emissions and energy costs at its Ribblesdale cement plant at Clitheroe, Lancashire, UK, taking advantage of the industry's changing demands. Return on investment, calculated to be 18 months, has also been a significant factor. The upgrade generated savings of more than 3.111GWh/yr, with the kiln fan now running at 1426kW/hr, as opposed to 1820kW/hr previously. This equates to greater than Euro278,000 year-on-year savings and a massive annual reduction of 1867t of CO_2 emissions.

The equipment prior to the upgrade included a 1.82MW ID kiln fan, drive motor and gearbox working against a damper to produce the correct air flow, controlling pressure within the kiln. Hanson was looking to save energy and improve maintenance periods with increased flexibility.

The Siemens CS IDS turnkey solution comprised connection from the 6.6kV switchboard, the supply and installation of a 1.6MW Perfect Harmony variable speed drive located within an electrical equipment module (EEM) and the supply and installation of a directly connected 1LA4 6.6kV AC induction motor, which replaced an inefficient motor gearbox arrangement. The improved drive train ensured the fan speed was appropriate to process requirements. The EEM was, in effect, a mobile switchroom, allowing maximum project flexibility. Siemens commissioned the entire system, including all site work and project management.

Hanson's engineering manager at Ribblesdale, David Holgate, said, "We wanted to make this kiln more efficient in its energy use as well as more reliable with improved flexibility for a changing market. Siemens optimised the drive system to run at 97% capability. Previously it had run at around 45%. This has given us more efficiency and significant in-house energy savings. After a few initial issues, the upgrade has certainly made the kiln much more efficient long-term and has further reduced our CO_2 footprint."

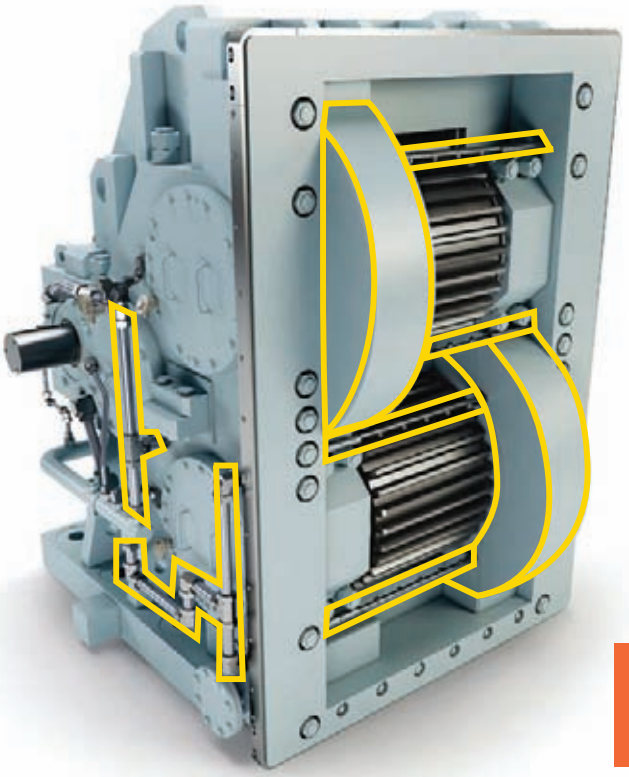
Total Engineered Solution

The Siemens Total Engineered Solution centres on a concept of an integrated drive system (IDS), which ensures that all products within the drive train are as integrated as possible, supported by Siemens both in specification and throughout their lifecycle. By optimising the drive system to the highest degree of performance, and by acquiring data through monitoring that system, the best operational performance can be achieved, whatever the application.

Gary Palmer, the Siemens application engineer responsible for the project, said, "This new system helps Hanson increase energy savings and CO_2 savings and improve Hanson's flexibility for an ever-changing market, even during times of lower demand. By optimising the fan speed and process performance we've helped Hanson achieve greater productivity. There should also be a significantly reduced cost of ownership over the lifecycle of this system."

The benefits of the system at Ribblesdale also included: Increased airflow at lower speeds; Improved flexibility; Improved run-up and run-down times; Reduced manpower and line attendance; Increased pre-emptive maintenance information and; Standardisation. The installation has already reduced Hanson's carbon emissions by in excess of 10,000t since its installation in 2012, equating to around Euro1.4m of savings.

Right: Siemens engineers carrying out an inspection prior to conversion to an integrated drive systems (IDS) solution.



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SNCR: Aqueous ammonia or urea?

Selective non-catalytic reduction (SNCR) systems have been on the market for more than 20 years, during which time NO_x emissions have been constantly decreased due to improving equipment. It is common knowledge that such systems can use either aqueous ammonia (NH_4OH) or urea ($(NH_2)_2CO$) as the reducing agent. However, this has left many with the impression that both reagents work equally and at the same efficiency, despite there being considerable technical and economic differences between them.

SNCR technology works on the basis that NO_x reacts with nitrogen-containing reducing agents to form molecular nitrogen (N_2) and water vapour (H_2O). The two most commonly used are aqueous ammonia (NH_4OH) and urea solution ($(NH_2)_2CO$). Both reduce NO_x emissions by forming NH_2 radicals that react with NO. In the case of using urea, ammonia is formed first as an intermediate.

Common NO_x reducing agents:

1. Urea ($(NH_2)_2CO$): For SNCR applications, urea (a solid compound) is dissolved in water, typically to a 32-45% solution. When the solution enters the cement plant gas stream the water evaporates due to the low pressure. NH_2 radicals then form, which react with the NO to produce N_2 and H_2O. It is the formation of the radicals that make urea systems slower than ammonia-based systems.

As it contains a CO group, the use of urea can contribute to the CO concentration in the plant. The formation of CO (and hence CO_2) depends on the process conditions as well as the oxygen levels in the flue gas.

From a practical standpoint, urea is commonly supplied as granulate to be dosed and dissolved at the plant. This avoids unnecessarily transporting water by truck.

Some suppliers of SNCR systems sell urea or urea-solutions in addition to injection equipment. This can mean that there is then a commercial incentive for them to supply SNCR systems engineered and designed for the use of urea, even if the NO_x removal efficiency is lower.

2. Aqueous ammonia (NH_4OH): Ammonia solutions are commercially available ready-mixed at below 25% (by weight) of ammonia. The reaction inside kiln gas happens immediately due to the fact that ammonia is a gas dissolved in water. The droplets 'explode' in flue gas like a fizzy drink and the ammonia molecules are immediately ready for reaction with NO.

Several tests in different cement plants (with preheaters or precalciner) have shown that aqueous ammonia is, on average, 2.0-2.8 times more efficient than a 40% urea solution.[1] This means that it is possible to not only reduce the consumption of reducing agent but also the bounded water consumption, reducing build-ups in the calciner.

3. Anhydrous Ammonia (NH_3): Ammonia was used for many years in the cement industry as it is the most reactive reducing agent that can be injected into the flue gas flow for NO_x emission reduction. However, in Europe safety standards have been increased and it is not longer possible to transport it on the road in bulk containers. Only small containers may be transported by road to avoid higher safety risks. From a technical standpoint, anhydrous ammonia is a very attractive option and highly efficient.

Temperature effects and ammonia 'slip'

The reaction temperature is essential for effective use of SNCR. When the reaction takes place at the wrong temperature the efficiency drops significantly and competing chemical reactions will lead to undesirable products and effects.

Low temperature: If the temperature is too low, the reagent may not be fully used up, allowing ammonia to 'slip' into the flue gas. Indeed, spraying urea into gas at temperatures below 800°C will generate higher NH_3 slip emissions than if one used ammonia itself. The reducing agent always needs to be selected for the specific application.

Right: Urea is a solid, which makes it easier to transport and use in SNCR applications than ammonia. However, it is less effective.

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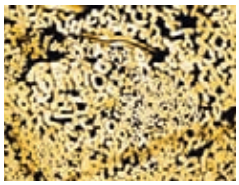

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Hazardous?	No	Yes
Safety equipment needed?	No	Yes
Physical state	Liquid (Heating equipment needed)	Solution (Liquid)
Side products	N_2O gas / Extra CO	None known
NO_x removal efficiency	1.0	2.0-2.8
CAS No.	57-13-6	1336-21-6

Right - Table1: Comparison of 40% urea and 25% ammonia solutions. * = Gas temperatures and reactivity valid for cement process.

Another cause of ammonia slip is when too much reducing agent is injected at points in the process where NO_x is not present in sufficient quantities. It is therefore very important to install the injection nozzles at the most effective areas of the process due to the varying NO_x distribution over the duct cross section. This can be a process of fine-tuning, and reducing ammonia slip can be very difficult.

High temperature: If the temperature heads above 1000°C ammonia decomposes and is no longer available to reduce NO. It will react with oxygen (O_2) to *create* NO, the opposite of the desired result.

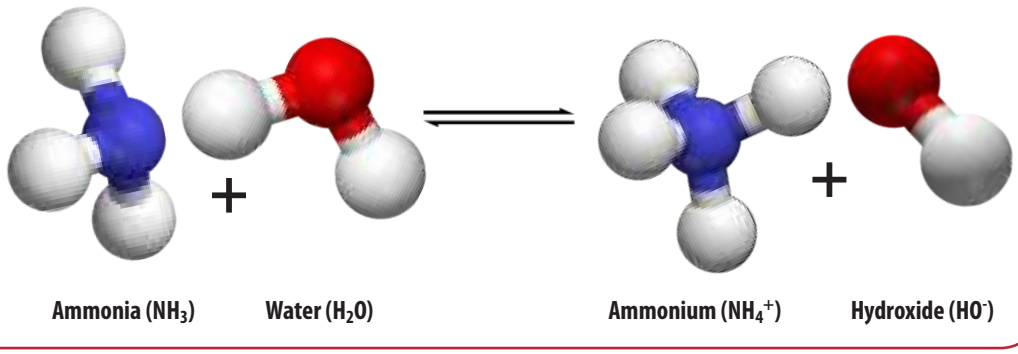
Clinker effects

At all times it must be remembered that the effective temperature window for SNCR is different in the cement sector than in other industries. This is because the clinker dust has a catalytic effect on NO reduction,[2] leading the reaction to take place at lower temperatures than in clean gas combustion applications like boilers.

In precalciner kilns this effect can be noted by comparing injection into the burn-out zone and other locations. In the burnout zone NO_x levels can be reduced by about 50%. However, when the kiln gas coverage is in the right location it can reach 75%. A suitable position is often after the calciner's gooseneck or mixing chamber, where the gas concentration is more homogeneous and a more even gas-profile is present.

Right: An ammonia-water dosing cabinet for safe ammonia distribution to SNCR lances.

The European Industrial Emission Directive IED 2010/75/EU, valid from January 2019 will reduce the permissible NO_x emissions for EU cement plants to 200mg/Nm³@10%O_2. This is not a problem for an SNCR system, but the ammonia slip emission of 30mg/Nm³ may be the limiting factor for some plants.



Right: When ammonia (NH_3) is dissolved in water (H_2O), the two molecules rapidly and reversibly exchange a hydrogen ion (H^+) to form the ammonium cation (NH_4^+) and hydroxide anion (HO^-). The solution goes by a number of names, including 'aqueous ammonia,' 'ammonia solution,' 'ammonium hydroxide' and 'ammonia water.'

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Right: Mobile test equipment to inject ammonia water.

Equipment comparison

SNCR equipment is typically constructed in a special quality of stainless-steel. Pumps and injection lances, as well as the reagent metering and dosing skids, are nearly identical for both systems. Despite the fact that ammonia systems need gas-warning sensors, sprinklers and a gas-pendulum system to return NH_3 fumes from the tank back to the truck, the installation costs for each are very similar. Urea system operating costs, however, are higher than those for ammonia systems.

The most significant difference between the design of equipment used for urea and aqueous ammonia is the design of storage tanks for the reducing agent. Aqueous ammonia tanks are designed either as double-shell tanks, with extraction from the top of the tank or as single-shell tanks inside a concrete basin that can contain the tank's volume. For either urea or ammonia, glass reinforced plastic tanks are a cost-effective alternative to 304L or 316L tanks.

The safety standards for such systems are high and are described well in EN or US-standards. Engineering and technical documentation for the system must come from qualified and certified suppliers. The test procedures are quite extensive and include material tests, pressure tests, welding tests and X-ray tests.

SNCR atomisation nozzles

Proper injection-nozzle design is important. The reducing agent flow is atomised by compressed air. The nozzle design has to fit well into the flow of the plant ducting to avoid large nozzles tips, which produce large droplets. The evaporation-time of different droplet sizes were studied in SNCR applications.[3] This showed that a droplet size of 300µm needs 3.2 times as long to evaporate than a droplet of 50µm. Care has to be taken to design the required flow and to distribute it to the right number of installed SNCR lances.

In case the reagent flow has to cover a relatively wide range, it is better to install more nozzles and activate them as required by the NO_x controller. Each SNCR lance should be flow controlled to allow an optimisation of reagent coverage according to the real-time flue gas dispersion. Due to the different ideal reaction gas temperature for urea and ammonia the placement of SNCR lances needs to be well understood and calculated.

Conclusion

Highly effective SNCR systems are characterised by:

- Kiln gas temperature measurements at injection points (at different fuel mixes);
- Selection of suitable reducing agents;
- Multipoint injection and flexible nozzle activation / deactivation;
- High and uniform coverage of reaction agent with kiln gas to avoid NH_3 spots or layers;
- NO_x measurement;
- NH_3 slip measurement.

The most efficient reduction agent used for SNCR is an ammonia solution, as the typical gas temperature in a precalciner kiln is 830-930°C. For preheater kilns, urea can have advantages, for example if the gas temperature is higher at the riser duct before the first cyclone stage. The choice of suitable reduction agent is also often determined by economy, safety and handling considerations. The selection of the most effective reducing agent for SNCR installations mostly depends on the point at which it can be injected. The main considerations are the kiln gas temperature and retention time at the selected injection points.

Savings in the amount of agent that needs to be injected (and hence operating expenditure) can be made by using ammonia.

Further technical investigations into other reducing agents and injection improvements by using a different aggregate phase are being conducted by the research and development team at M.A.L. Umwelttechnik. The company welcomes the industry's input.

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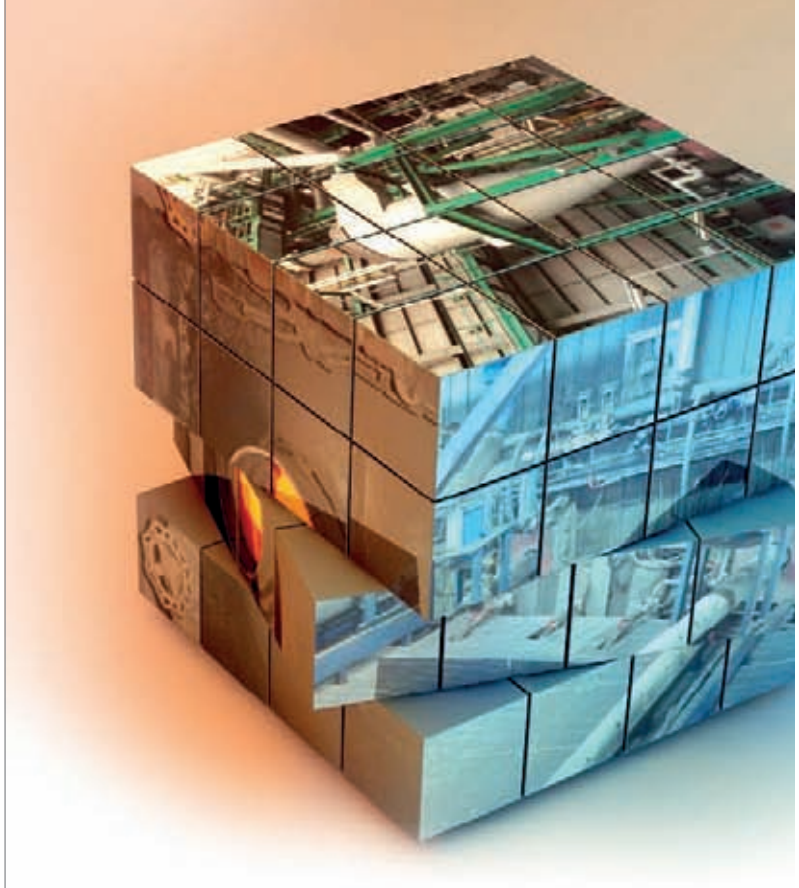

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A review of major chain producers

Chains play an integral part to the smooth operation of cement plants, as well as many other bulk handling industries. Here, *Global Cement Magazine* provides an overview of a selection of chains and related products suppliers to the cement industry, with recent case-studies from Sedis.

Chain & Conveyor

Chain & Conveyor is one of the newer chains producers active in the cement industry. It was established in Cheshire, UK and now has 25 years of experience. The company claims to be the largest chain supplier in the UK and holds at least 18,200m of chain at all times. Chain & Conveyor produces standard chains, bespoke chains, sprockets, slat chains, attachments and spares for the cement and recycling industries, among others. Its chains come in imperial, metric DIN FV, metric DIN M, carrier type and drive chain variations. Chain & Conveyor has been ISO 9001 accredited since 2000.

CICSA

CICSA was launched in 1941 in Lombardia, Italy. It serves the bulk handling and marine sectors, among others, in more than 50 countries around the world.

CISCA claims to be 'the sole chain manufacturer producing the complete range of steel chains, including round link chains, roller chains and forged link steel chains, along with the corresponding fittings, such as wheels, sprockets, shafts, couplings, shackles and various types of brackets.' Its products are deep case hardened to minimise wear and achieve maximum chain life under the most severe service. CICSA produces chains up to 42mm diameter and is ISO 9001-2008 certified.

Below - Figure 1: CICSA's toothed and pocket wheel.

GEFA

GEFA produces continuous chain conveyor systems and spare parts from its base in Konstanz, Baden-Württemberg, Germany.

Its spare parts include forked chain links (drop forged and case hardened), chain bolts and locking rings, drive chain wheels, tooth segments and deflector rollers, high-strength manganese steel wearing rails, shearing bolt wheels, shearing crowns, shearing hubs, racks and roller chains. It supplies the cement, chemical, waste incineration and timber industries, among others. In addition to continuous chain conveyors, GEFA also produces screw conveyors, bucket belt conveyors, disk sieves and spare parts.

HEKO Ketten GmbH

HEKO was established in 1917 in Wickede, North Rhine-Westphalia, Germany and is celebrating its Centenary in 2017. In 2004, the company acquired a second production plant, which doubled its production capacity. It also opened a new export office in Beijing, China in 2005.

HEKO produces round steel chains, bucket and scraper attachments, chain wheels, buckets and shafts, complete return and tensioning units for bucket elevators, as well as chain conveyors and heat resistant ring kiln chains for rotary kilns. Its products are used by the cement, sugar, mining and quarrying industries, among others. HEKO uses case hardening and heat treatments to enhance its products, all of which are tested thoroughly. The company is ISO 9001-2000 certified.

John King Chains

John King Chains has manufactured cement industry chains for over half a century. It originally constructed mechanical handling equipment, which allowed the company a unique insight into the special demands of the cement industry and of material transport. John King Chains is well placed to offer the majority of chains encountered, commencing in the quarry with heavy duty plate feeder chains, stockpiling and reclaiming of raw materials including limestone, shale, coal and gypsum, as well as hot clinker transport, elevators, ancillary equipment in precipitator dust handling, packaging and alternative fuel conveying.

The company made its mark manufacturing cast link chain produced from iron and steels, later specialising in manganese or Hadfield steel, which is typically found in clinker drag conveyors where it is well suited to the harsh environment. The company has particular strengths in mill duty elevator chain designs, drawn from its long experience, notably in single strand centrifugal discharge elevators and in its Crusader welded steel drag link, which has been well received in both retrofit and new applications.

As part of the company's ongoing investment, 2015 saw the installation of a new 5KW Fibre laser. This is considered to be the best equipment of its type available on the market. With the additional

SEDIS

France's SEDIS can trace its history back to 1895 when it produced chains as Chains Peugeot, making it the oldest chains company discussed here. In 1946, the merging of Chains Peugeot with two other production facilities formed SEDIS. It currently produces from the Troyes plant in Aube and the Verrières plant in Essonne, both in France.

SEDIS produces leaf chains, roller chains, conveyor chains, agricultural chains, sprockets and wheels. It has been ISO 9001-certified since 1989. The company's products are supplied to many of the bulk handling industries, including the cement sector. SEDIS' research and development department focuses on producing innovative products that require minimal lubrication and maintenance.

Morocco: Bucket elevator for pyrrhotite

In 2015 a Moroccan cement industry customer requested a quotation to replace its pyrrhotite bucket elevator chain. It informed SEDIS that it was not happy with the existing chain, as it was only lasting six to eight months before replacement was necessary.

SEDIS' engineer went on-site to analyse the existing chain. Looking at the state of wear of the bush, it was obvious that it was highly loaded and was the weak point of the chain.

SEDIS therefore quoted three different options. The first one was the same design as the existing chain (re-made by SEDIS), and the two other options were designed to improve the bush resistance against wear. The customer chose one of the two improved versions. The chain was installed in March 2015 and there is no sign of wear after two years! This has given complete satisfaction to the customer.

Morocco: Inclined conveyor for pyrrhotite

The main issue on this inclined conveyor for pyrrhotite is the dusty environment where the chain works. These very tough conditions, in addition to the paste formed by grease and filth, meant that the wheels of the chain could not turn correctly. Consequently, the lifetime of the chain was very limited due to a high friction coefficient.

To help the customer to increase the life time of this installation, SEDIS recommended different improvements:

- SEDIS first offered a solution to maintain the grease between the pin and the bush only, therefore limiting the quantity of lubricant on the other parts of the chain;
- SEDIS found a way to allow the evacuation of impurities;
- SEDIS ameliorated the concept of the rollers so that they can turn more easily, even in tough conditions;
- SEDIS recommended an adapted oil.

Confident that the solutions offered would solve its problems, the customer placed the order with SEDIS. Its engineers came on site to assist and advise the customer during assembly of the new chain on the conveyor.

France: Kiln exit apron

The main issue for the customer was simple maintenance operations on the chain of its installation, at the link between the two matched chains which form the apron.

SEDIS proposed a new concept to be tested on a portion of the chain, in order to assemble a connecting spacer to the chain and to remove the axles between the two chains.

The customer was very happy with the concept and has extended it to the entire application (125m of chain) to be able to intervene easily anywhere on the apron.

Left: Elements of the inclined conveyor chain being installed at a Moroccan cement plant.

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acquisition of a welding robot, principally for forged fork link chain flight fixing, John King Chains is committed to best manufacturing. Recognition that it is fulfilling this objective was confirmed in a BSI ISO9000 quality audit where its internal systems were found to be to 'a first class standard.'

Ketten Branscheid

Ketten Branscheid was founded in 1938 in Ennepetal, North Rhine-Westphalia, Germany. In 2007, it bought forging business Köllmann & Vorländer to ensure vertically-integrated, flexible production. Its products are supplied to bulk handling industries, including the cement sector.

Ketten Branscheid produces forge linked chains, sprockets, wear rails, slat chains, link chains, forged chains, block link chains, trough conveyor chains, full stud conveyor chains, plug-in chains, round steel chain systems, chain shackles, special chains and parts. Its products are tested in an on-site laboratory and it complies with ISO 9001-2008 standards.

KettenWulf

KettenWulf was established in 1925 in the Sauerland, North Rhine-Westphalia, Germany. The company has continuously cooperated with equipment manufacturers and end users to optimise chain designs for the cement and bulk material handling industries.

Below: SEDIS' hollow shaft chain.

KettenWulf's products include apron conveyors, hinged conveyors, pan conveyors, drag chain conveyors, scraper reclaimers and bucket elevators. Most of its business is in customised product solutions. The KettenWulf Centre of Competence in Kückelheim, North Rhine-Westphalia ensures that its products meet international standards. KettenWulf is also ISO 9001-2008 certified.

Kettenfabrik Unna

Kettenfabrik Unna has been on the market for more than 95 years. Its main focus is on round link chains of various sizes and styles, including its well-known KU 4 and KU 5 product lines.

Nearly 10 years ago Kettenfabrik Unna started to make drop forged link chains, which it now makes in sizes from 102mm pitch up to 315mm pitch. Chains can be produced as single or double strand chains. All common materials can be used, like 20 $MnCr_5$ as a case hardening steel or 42 $CrMo_4$ as a heat treatable steel, to mention the most common ones. Furthermore, higher alloyed steels and stainless steels can be used, depending on operating conditions. All necessary accessories, like chain wheels with and without teeth, attachments, fixing material etc. are part of the programme. Chain wheels are inductively hardened, giving an optimised hardness profile, guaranteeing extended life time.

Renold

Renold was launched in 1864 as James Slater, which later became Hans Renold Co, and much later after a series of mergers and acquisitions, simply Renold. Its head office is located in Manchester, UK, but the company has operations in almost 20 countries. In 2008, Renold acquired a controlling interest in India's chain manufacturing company L G Balakrishnan and in 2007 it bought China's Hangzhou Shanshui Chain Company to establish a manufacturing base in a low cost economy.

Renold produces chains, gearboxes and couplings for the power transmission, lifting, conveying and processing sectors. For the cement industry, it manufactures bucket elevator chains, sealed joint chains, apron conveyors, hard face drag chains and super capacity elevator chains, among others. Renold is ISO 9001 certified.

Thiele

Thiele was established in 1935 in Iserlohn, North Rhine-Westphalia, Germany. The company has expanded over the years via a series of takeovers, including chains producers Schlieper and Nordland. Today, it serves 72 countries and claims to have produced the longest and the heaviest anchor chains in the world, at 915m and 100t respectively.

Thiele produces 5000 varieties of round steel chains and forged parts. For the cement industry, its products include plate link chains, bucket elevators, forged link chains, round link chains and sprocket wheels. Thiele has been ISO 9001 certified since 1994. The company is also ISO 14001 certified for its environmental management system, while it is working towards ISO 50001 certification for its energy management system.

Webster Industries Inc

Webster Industries Inc was established in 1876 in Chicago, Illinois, US, although today it operates from Tiffin, Ohio, US. Its customers include the cement, grain, forest and other bulk handling industries. In 2014, Webster announced a three-year, US$8.3m expansion project that saw an extra 38,000ft^2 of factory space, 65 new jobs and a US$4.5m investment into new machinery.

Webster produces a range of chain products, including cast chains, steel bushed roller (SBR) chains, combination chains, steel belt conveyors, PORTALLOY® mill chains, PORTALLOY® drag chains, top plate chains, sprockets, elevator buckets and vibrating conveyors. The company is ISO 9001-1998 certified. It claims that it was 'the first engineered class chain manufacturer to become certified to the ISO 9001 quality standard.'

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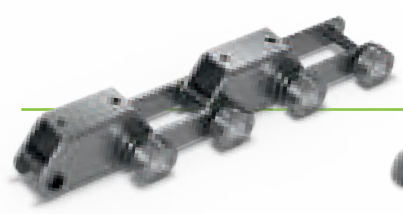

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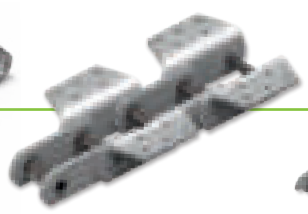
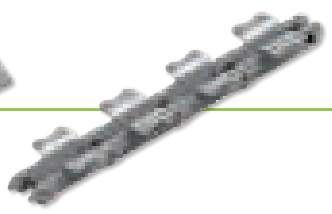


Chains for bucket elevator

Central chain for high performance bucket elevator



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Germany: Haver & Boecker to launch Quattro System Monitoring product at Interpack

Haver & Boecker plans to launch its Quattro System Monitoring product at the Interpack 2017 exhibition, taking place at Düsseldorf in May 2017. The mineral processing and packaging technology company will also feature its newly-developed Roto-Packer RVT packing system and Elementra inline packer. Its subsidiary Newtech Bag Palletizing will also be present at the event with its Terram 1000 palletiser.

The Quattro System Monitoring is a 'smart system' that allows real-time production and maintenance information on packing machines to be viewed on a variety of devices either locally or remotely via a secure connection. The company says that the system, 'allows machines to be operated more profitably and processes to be laid out and planned more intelligently.' The product can also be retrofitted to existing machines.

Haver & Boecker will also be running a parallel event at its headquarters in Oelde in May 2017 to invite customers to live machine demonstrations.

Above: The Quattro System Monitoring system, 'allows machines to be operated more profitably and processes to be laid out and planned more intelligently.'

Egypt: Hoffmeier delivers ball mill

Hoffmeier Industrieanlagen has delivered a ball mill to Misr Beni Suef Cement. The mill has a diameter of 6m, a length of 17.3m and it weighs 190t. The installation of the mill will start in April 2017 and is to be commissioned by the end of the year. Hoffmeier will also support the customer with its installation knowledge during the assembly phase. The German engineering company produces industrial heavy machinery including tube mills and rotary kilns.

Above: From frozen Germany to the Egyptian desert. Hoffmeier has delivered a ball mill to Misr Beni Suef Cement in Egypt.

South Korea: Work at SsangYong Donghae

SsangYong Cement has awarded a contract to Claudius Peters Projects for the supply of a grate cooler modification. The existing cooler will be upgraded with a 7600t/day ETA 5th generation clinker cooler system with a fixed inlet, High Efficiency module (HEM) and a moving floor ETA technology.

Also at the plant, Voith has installed drives for a 12.8km SB500 belt conveyor. The installed power is now 2 x 1.2MW at the head and 1 x 1.2MW at the tail of the conveyor. The existing drives from the longer conveyor were used to double the number of drive trains on the plant's shorter 2km SB200 conveyor. The new configuration of the SB200 drive system consists of 4 x 600kW installed power at the head equipped with new gearboxes. A Voith TurboBelt DriveControl system was also installed to reduce the start-up time of the longer conveyor by half from over 10 minutes to five.

Myanmar: Order for Loesche

South Korea's Yojin Construction & Engineering has placed an order for two cement mills from Loesche for installation in Myanmar. The order for a cement and slag mill is Loesche's first in the country. The mills will be used at a grinding plant owned by Yojin Myanmar Engineering in Thilawa. They will each produce 75t/hr of cement with a fineness of 3300 Blaine. Operation is scheduled for mid-2017. Yojin has an ambition to produce 1Mt/yr of cement at the site.

US: E Instruments to release E8500

E Instruments plans to release its E8500 Cooled NO_x portable emissions analyser in the spring of 2017. The product is intended to increase the accuracy of its NO gas sensor at higher temperatures than normal, particularly above 40°C. The E8500 Cooled NO_x keeps the NO sensor cooled with an internal cooling system.

The analyser measures, displays and records the NO sensor temperature to make it easier to comply with US Environment Protection Agency (EPA) conditional test methods such as CTM-030. The E8500 Cooled NO_x also comes with a Sample Conditioning Unit that cools and dries the stack gas at the probe handle to minimise the time that the gas has in contact with the condensate.

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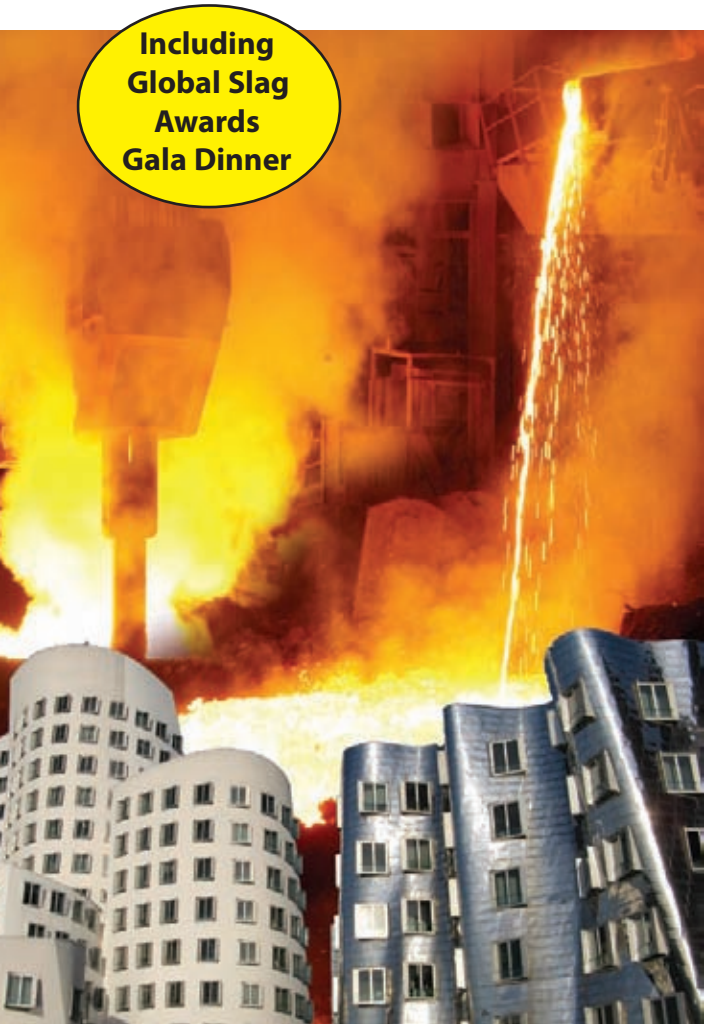

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European Emissions Trading System: Integrating industrial, trade and climate policies

Bruno Vanderborght Lesscoo GmbH

The *Global Cement Weekly* column of 22 February 2017 entitled *'European Union (very) slowly tightens the screws on its Emissions Trading Scheme,'*[1] bears witness to the misconception that we must choose between protecting the cement industry OR the climate. Quite the opposite is true: the objective is the cohesion between economic prosperity, meeting cement market demand AND lowering CO_2 emissions.

It is undisputed that, if climate protection is aspired to, there needs to be an adequate regulatory incentive that supports, perhaps even strengthens, industry's profitability when companies act to lower their CO_2 emission. Some companies have tried selling low CO_2-cement at a price premium, marketing their lower embedded carbon. In a commodity market of a grey powder where low prices are a decisive purchasing point, this obviously doesn't fly.

The only sustainable business incentive is to pass on the full cost of CO_2 not only in production but also in consumption of products. This would effectively result in higher cement sales prices for high-CO_2 cement and lower prices but higher margins for low-CO_2 cement, without losing competitiveness to producers that do not face regulatory CO_2 constraints. Hence, a win-win-win situation for low carbon cement producers, consumers and the environment. This is after all the purpose of the sectoral ETS mechanism with inclusion of importers and no free allowance allocation.

The studies undertaken by Boston Consulting Group (BCG) for Cembureau simulated the potential gross margin for the domestic cement industry in case of different leakage prevention mechanisms. While this may sound shocking for some, there is nothing wrong with aiming at maximisation of gross margin. Quite the opposite, gross margin maximisation is absolutely necessary for the cohesion between economic prosperity and climate protection and the effectiveness of an ETS.

The BCG studies led to the conclusion that in case of a tightening CO_2 allowance cap and under certain market conditions the importers' inclusion mechanism can yield the best margin for the industry. Since however, as the Global Cement Weekly column mentions, the EU only very slowly tightens the screws on the supply of emission allowances, there will be sufficient free allocation for industry and there remains little need to lower emissions and thus little need for an importers' inclusion mechanism.

Cembureau called into doubt the representativeness of the technology penetration reported by the Cement Sustainability Initiative's Getting the Numbers Right database. It is a well-established fact that the penetration of modern preheater precalciner kilns in most emerging countries is higher than in Europe, because the industry is younger outside of Europe and hence most installations have been built with more recent, more energy-efficient technology. Besides the CSI database, cement CO_2 inventories exist for about 10 emerging countries. They all confirm the same.

Beyond the comparison with other regions however, an emissions trading system that after 12 years still enables one fifth of production being made using the most energy-intensive technologies objectively misses its purpose.

Despite consuming up to 50% more energy than the Best Available Technology, such installations can survive thanks to free allocation and the revenues from waste-derived fuels. The industry legitimately highlights the environmental benefits of using waste as a fuel. However, it is questionable whether keeping energy-intensive installations alive thanks to cheap energy from waste is consistent with this environmental narrative.

The proposed changes to the EU ETS will not improve its effectiveness for the cement industry. Quite the opposite, it will make it even less effective because the introduction of a dynamic allocation based on a clinker benchmark completely nullifies the need for the industry to lower the clinker content in cement.

Cembureau indeed has the right to protect the industry it represents, but is probably short sighted and ill informed when it does so to the detriment of society's necessity to mitigate climate change. The rejection of the importers' inclusion mechanism is a missed opportunity for the European Union to make the ETS effective and for the cement industry to maintain its competitiveness in a carbon constrained world.

Eric Olsen, CEO of LafargeHolcim, the largest global cement company, and chairman of the Cement Sustainability Initiative, has called for a meaningful and increasing carbon price that can be passed through the whole product value chain and for trade policy to be included in the ETS.[2]

Lakshmi Mittal, Chairman of ArcelorMittal, the largest global steel company, has also called for a border adjustment measure and inclusion of consumption in climate policies.[3] High quality research by leading economists exists on this topic.[4] Now that the reform of the EU ETS enters the trilogue negotiation between European Council, Commission and Parliament, these industry leaders should step forward with a concrete and workable solution to combine industrial, trade and climate policies by 2020.

1. http://www.globalcement.com/news/item/5836-european-union-very-slowly-tightens-the-screws-on-its-emissions-trading-scheme.
2. WEF, Davos: https://www.youtube.com/watch?v=O_mhqcNR0uA.
3. Financial Times: https://www.ft.com/content/8341b644-ef95-11e6-ba01-119a44939bb6
4. Climate Strategies, UK: http://climatestrategies.org/?s=consumption.

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Switzerland: LafargeHolcim's sales tumble as earnings grow

LafargeHolcim's net sales took a tumble of 8.7% to Euro26.9bn in 2016 from Euro29.5bn in 2015, although on a like-for-like basis it says they declined by just 1.7%. However, its adjusted operating earning before interest, taxation, depreciation and amortisation (EBITDA) rose by 1.3% to Euro5.83bn from Euro5.75bn, with a higher improvement rate on a like-for-like basis. The building materials company didn't explain why its sales had fallen in 2016. Instead it focused on its efforts on cutting costs, building benefits from synergies, working on pricing and growing its earnings.

"Our strong execution was visible across our five regions, which all grew earnings for the quarter and for the year. This performance underlines the strength of our diversified portfolio, which has a good balance of mature and developing markets. I am also pleased with the positive trajectory of markets such as the US, Nigeria, India and key countries in Europe, which we have singled out as important drivers for growth in 2017 and beyond," said chief executive officer Eric Olsen.

The group's sales volumes of cement fell by 8.8% to 233Mt from 256Mt, with decreases in all regions. It reported that production overcapacity hit cement volumes and prices in Indonesia, Brazil continued to face challenging operating conditions with its ongoing recession and both Nigeria and Egypt faced difficult markets in the period. Of particular note were that its sales volumes fell in North America due to an economic downturn in Western Canada and a strong fourth quarter in 2015 to measure against. Operating EBITDA rose on a constant basis in Europe and North America only.

France: Vicat saved by US sales in 2016

Vicat's sales fell slightly to Euro2.45bn in the year, although they rose by 4.1% at constant scope and exchange rates. Its earnings before interest, taxation, depreciation and amortisation (EBITDA) rose by 3.2% to Euro458m from Euro444m. Sales volumes of cement rose by 10.5% to 21.9Mt from 19.8Mt.

By region, sales volumes rose in France by 6% in domestic and export markets, boosted particularly by export sales, with sales revenue also up. Elsewhere in Europe sales fell but volumes rose after a difficult first half of the year. Sales volumes in the US rose by 4% driven by 'strong momentum' in the Southeast region, making up for a decline in California caused by a strong previous year and poor weather. In the group's Asian region its sales revenue fell mainly due to currency variations in Turkey and Kazakhstan. Finally, in its African and Middle East region, sales revenue in Egypt rose by 3.5%, despite a devaluation of the local currency, driven by a 'sharp' increase in volumes. Two coal grinders that entered into service in late 2015 also helped to grow its EBITDA.

Portugal: Semapa sales fall slightly

Semapa's sales revenue from its cement business fell by 1.35% year-on-year to Euro471m in 2016. Its earnings before interest, taxation, depreciation and amortisation (EBITDA) fell by 0.3% to Euro85.1m. It attributed the slight fall in revenue to a fall in turnover in Portugal and Tunisia, although it noted that it rose in Brazil.

Its sales volumes of Ordinary Portland Cement rose by 5% to 4.99Mt from 4.73Mt but its clinker sales fell by 13% to 0.42Mt from 0.48Mt. Despite the poor state of the construction market in Brazil, the cement producer's local firm, Supremo Cimentos, managed to increase its sales. Its Adrianópolis plant increased its production in the year following its opening in mid-2015.

Poland: Kujawy to get A TEC bypass

LafargeHolcim has awarded a contract to A TEC to upgrade the chlorine bypass system at its Kujawy cement plant. A TEC will upgrade its existing Reduchlor bypass system to increase the rate to 10% from 5%. The upgrade will retain the system's existing bypass filter and filter fan. The project will be commissioned in the spring of 2017.

Ireland: Limerick fuels plan under fire

Residents of Limerick protested on 10 and 11 March 2017 against Irish Cement's plans to burn waste solvents and used tyres at its plant in Mungret. In response, Irish Cement stated that it is the only cement plant left in the country that uses solely fossil fuels and that it needs to use waste fuels to reduce costs if it is to keep the 84 jobs at the plant.

UK: New mill mooted for Padeswood

Hanson (HeidelbergCement) is considering spending around Euro23m on building a new clinker mill and other improvements at its Padeswood cement plant. At present the site use four mills that are only able to grind about 40% of the kiln's output.

A second phase of the upgrade project, dependent on production levels being increased, will be to rebuild a railway link to the plant.

Germany: Schwenk to buy Karsdorf

Schwenk Zement has been confirmed as the buyer of Opterra Zement's Karsdorf cement plant. The transaction remains subject to the German competition body and this is expected to take up to six months. Employees are reportedly 'concerned' about the acquisition because Schwenk Zement operates its Bernburg plant in the same state, Saxony-Anhalt. The deal also includes a cement grinding plant.

Ireland: CRH reports on positive 2016

CRH's sales revenue rose by 4% year-on-year to Euro27.1bn in 2016 from Euro23.6bn in 2015. Its earnings before interest, taxation, depreciation and amortisation (EBITDA) rose by 41% to Euro3.13bn from Euro2.22bn. The group attributed the growth in sales and profits to positive sales in the Americas and Europe and benefits from its first year of full ownership of some assets purchased from LafargeHolcim in 2015.

"2016 was a year of significant profit growth for CRH, with margins and returns ahead of last year in every division. We benefited from positive momentum in the Americas and also in Europe, particularly in the Northern and Eastern regions where we operate," said chief executive Alfred Manifold.

By region, the group's Europe Heavyside division reported boosts in sales revenue and operating profits. However, its cement operations grew sales volumes in several countries where it faced price pressure and production overcapacity including Ireland, Spain and France. In Germany the group noted that sales volumes grew in its first full year of full ownership due to growth in residential building but that prices remained under pressure. Weak activity in Poland also affected pricing and reduced sales and operating profits.

Outside of Europe, the Americas Materials division also grew its sales and profits. Demand in North American cement markets increased as declines in Western Canada were offset by increases in Quebec and the US. In Brazil it reported that cement consumption fell by 12% in the southeast region and competition remained high. Finally, the group's new Asia division said that cement demand grew in 2016 due to the private sector and government infrastructure spending. Its operating profit was also boosted by higher prices and lower input cost, including a lowered price of imported clinker. In China the group said that prices fell due to a poor construction market and production overcapacity.

Spain: Molins profit up by a quarter

Cementos Molins profit rose by 25.6% year-on-year to Euro63.9m in 2016 from Euro50.8m in 2015. However, its sales revenue fell by 12% to Euro561m from Euro638m and its cement and clinker sales volumes fell slightly to 13.7Mt. The cement producer blamed the result on poor sales in Argentina, Uruguay and Tunisia.

UK: Breedon results boosted by Hope acquisition in 2016

Breedon Group's sales revenue and profits have been expanded by its acquisition of Hope Construction Materials in 2016. Its revenue rose by 43% year-on-year to Euro523m in 2016 from Euro367m in 2015. Its profit before tax rose by 50% to Euro53.9m from Euro36m. The group also attributed its success to its aggregate business.

"2016 was arguably the most eventful year in the group's history. We completed our largest acquisition to date, invested a record amount in our business, began supplying our biggest ever contract and delivered an excellent financial performance – all against the background of an uncertain economic environment and challenging trading conditions in many of our markets," said executive chairman Peter Tom.

The building materials company added cement production to its portfolio when it purchased Hope in mid-2016. It added a cement plant, five new quarries, a network of concrete plants and eight rail-linked distribution depots. In November 2016 it bought Sherburn Minerals, including two terminals in northeast England and eastern Scotland, that are used to import cement and ground granulated blast-furnace slag (GGBS).

Denmark: Aalborg Portland orders two calciners from A TEC

Aalborg Portland, Denmark's only cement producer, has awarded A TEC a contract to upgrade its Cement Kiln 87 in Aalborg. It has ordered two calciners for its 4500t/day semi-dry kiln system that was commissioned in 1988. The calciners will be designed and delivered during the kiln's annual stop in February and March 2017. Commissioning is planned for the spring of 2017. The upgrades are intended to increase production of Ordinary Portland Cement on the line.

A TEC intends to adapt the flow pattern of the calciner system in a way to improve the operational behaviour of the system. The design will be configured for the usage of 100% solid alternative fuels with low emissions. Additionally, the number of kiln stops due to fall-through cyclone blockages should be reduced. A TEC will conduct the engineering, supply the equipment and will be responsible for erection and documentation.

The new calciner system will be equipped with the A TEC Post Combustion Chamber (PCC) for the optimised mixture of fuels and combustion air in the end section of the calciner. The PCC was specially developed for the achievement of complete combustion of alternative fuels at high substitution rates.

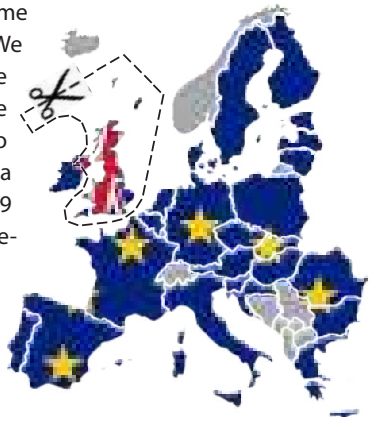
Above: Preheater, with long kilns in the foreground. The Aalborg site has seven kilns in total.

UK: MPA outlines Brexit priorities

In March 2017 the Mineral Products Association (MPA) outlined key points that the UK government should consider ahead of its triggering of Article 50 as it moves towards leaving the European Union (EU).

Following consultation with its members, the association wants the government to focus on six areas including: investment; growth; access to markets; access to labour and skills; maintaining equivalent regulations and standards; and rebalancing regulation after Brexit.

"More needs to be done, both politically and economically, to give the clarity needed by businesses to sustain investment confidence beyond the triggering of Article 50. The economy has remained resilient in the short term, but the issue always was, and remains, what will happen post-Brexit in the medium and longer term? Given that the public political conversation in the UK has not yet involved the other 27 EU member states, we are currently no wiser as to the likely outcome of negotiations. We must therefore contemplate the possibility that no deal may mean a clean break in 2019 and trading arrangements under WTO rules," said MPA chief executive officer Nigel Jackson.



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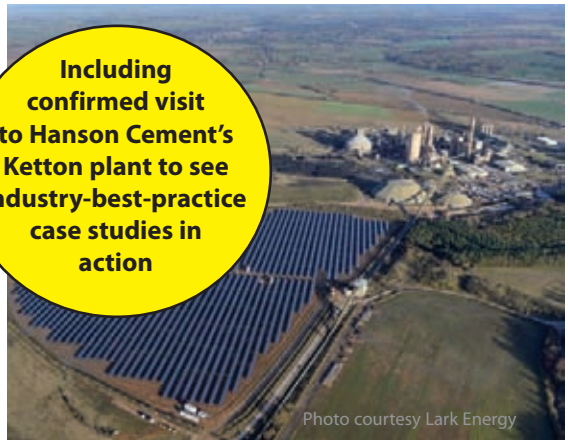

Including confirmed visit to Hanson Cement's Ketton plant to see industry-best-practice case studies in action

Photo courtesy Lark Energy

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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

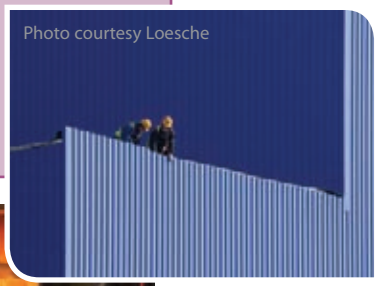

Photo courtesy Loesche

Photo courtesy Stephen Elliott, Hope Construction Materials

Who should attend?

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Interview by Peter Edwards, Global Cement Magazine

Investing for the future at Hanson's Ketton plant

The Hanson Ketton cement plant in Rutland, UK is the company's main supplier of cement into the busy London and South East region of the UK. The plant was constructed in 1928 and began production in 1929. It has since undergone a series of expansions and upgrades, most recently with the installation of a Polysius kiln (No. 8) in 1986. Despite having to mothball its Kiln 7 in 2008 due to market conditions, the company continues to invest heavily in the plant, with major environmental, efficiency and quarry projects ongoing and planned for the coming years.

***GC:* Can you describe the history of production at the Ketton Works?**

Stewart Jones, Plant Manager (SJ): The plant began production in July 1929 as the Ketton Portland Cement Company. Initially it had one small wet kiln, operating at around 0.05Mt/yr in 1930, the first full year of production. In 1933 Kiln 2 was installed and Kiln 3, installed in 1939, brought total production to around 0.23Mt/yr in the early 1940s. A further three wet kilns were added in 1954 (Kiln 4), 1962 (Kiln 5) and 1967 (Kiln 6), bringing production to around 0.65Mt/yr in the early 1970s.

However, it became clear by that time that the plant needed to invest in new technology or suffer the same fate as the many other UK plants that had already closed down. In 1973 plans were drawn up to install a large, modern FLSmidth dry process kiln, with preheater and planetary cooler. The early 1970s was a turbulent time economically, but Kiln 7 (0.5Mt/yr) finally came online in 1977. It helped to increase production to over 1Mt/yr in the mid 1980s, when a further significant investment came in the form of Kiln 8. It is a 1.3Mt/yr capacity Polysius line with precalciner and a grate cooler.

After 1986 the six wet kilns were all decommissioned and have since been removed from the site. Kiln 7 was mothballed in 2008 as the effects of the global economic crisis took hold. Kiln 8 is the only line in operation at the moment.

The plant has had various owners over the years, including Rio Tinto, RTZ Corporation, Scancem and, since 2002, HeidelbergCement. It carried Castle Cement branding between 1986 and 2009 but was changed to Hanson following the acquisition of the aggregates and concrete group by HeidelbergCement in 2007 and the subsequent consolidation of its cement business into Hanson UK.

***GC:* Please outline the production process used by Kiln 8.**

SJ: The quarry is pretty unique here in that the mixture of limestone, clay, silica and iron-containing

Right: View over the Ketton cement plant in Rutland, UK. Kiln 8 is to the right, with the mothballed Kiln 7 to the left.

Left: View over the plant's extensive quarry with plant in the background and solar farm (ringed) in the centre.

minerals is perfect for cement manufacturing. It is a shallow but very wide-ranging quarry, around 5km from end-to-end. Quite significant parts of it have now been returned to rural use, as per our restoration plan, and our solar power plant, which I will come onto later.

We extract around 1.8Mt/yr of material from it in total, which represents the vast bulk of raw materials that we need. The only things that we bring in are iron sludge, sourced as an alternative raw material from Anglian Water, and gypsum, which is brought in from British Gypsum's Fauld mine, around 120km to the north west. We also use Cemset, which is made from recycled gypsum wallboard.

In the quarry we use a combination of track vehicles and dumper trucks to bring materials to the primary crusher, which is around half way between the furthest reaches of the quarry and the plant. It is a Krupp Hapra 3034/8 impact crusher that, when fitted with its 8 shafts and 72 hammers, weighs 96t. It has a 2700kW motor, operates at around 1700t/hr and reduces the material from as large as 2m to <45mm in a single pass. This then goes down a 1.1km belt conveyor to the covered mix beds, of which there are two. There is a 43,000t, 88m-diameter bed for 'lime clay,' a mixture of lower grade limestone and clay, plus silica and iron containing minerals. There is also a 10,000t, 53m-diameter bed for high quality (98-99% $CaCO_3$) limestone. Each area of the quarry has undergone a detailed geological survey and there is a cross belt analyser on the conveyor, so we know the chemical composition of the material and can control it accordingly.

Raw material homogenisation continues in storage with a rotary conveyor and boom stacker using a continuous chevron stacking method. The material

Plant profile: Hanson Ketton Works

Location:	Ketton, Rutland, England, UK
Part of:	Hanson Cement (HeidelbergCement)
Production began:	1929
Kiln 7 (FLSmidth):	1977 - 2008
Kiln 7 clinker capacity:	0.5Mt/yr
Kiln 8 (Polysius) started:	1986
Kiln 8 clinker capacity:	0.9Mt/yr
Kiln 8 cement capacity:	1.3Mt/yr

Other Hanson plants:

1. Padeswood, Flintshire, Wales
2. Ribblesdale, Lancashire, England

Left: Summary plant information and location. The county of Rutland is highlighted.

Above: Kiln 8 is the only kiln active at the Ketton Works at present. Kiln 7 was mothballed in 2008 due to the global economic downturn.

Kiln 8 Pyro-processing system

Kiln	**Polysius Dopol type 2442**
Dimensions:	Ø = 4.2m, L = 68m
Speed:	0-4 rpm
Incline:	3°
Kiln drive:	448kW
Fuel efficiency:	3.80GJ/t
Burner:	Greco Flexi-flame
Burner fuel feeds:	Coal @ 0-10t/hr
	Cemfuel @ 0-7t/hr
	MBM @ 0-7t/hr
	Profuel @ 0-4t/hr
Preheater	**Polysius suspension preheater with AS precalciner**
Stages	4
Pressure drop	~55mbar
Fuel feeds:	Coal @ 0-10t/hr
	Profuel @ 0-10t/hr
	MBM @ 0-7t/hr
ID Fan	
Power:	2100kW
Max speed:	900rpm
Volume:	594,000m^3/hr @ 380°C
Cooler	**Repol grate cooler**
Dimensions:	3m x 30.3m
Fans:	10
Output temperature:	Ambient + 80°C

is taken via reclaimers (450t/hr for lime-clay, 250t/hr for limestone) to two 200t Besta buffer silos, which feed the raw mill as required. The proportions are controlled by an on-site analyst, who alters the feed rates depending on the blend required.

The raw mill is a Polysius RM46/23/85 vertical roller mill (4.6m table diameter), which provides 260t/hr of raw meal at 8% residue on 90microns. This goes to a 25,000t storage silo, prior to entering the preheater. We are quite 'blessed' in that we have such a large raw blend storage capacity. It allows for around 10 days of operation without needing to run the raw mill. When we had our annual maintenance in January 2017, we did a lot of work on the raw mill and we were able to bring it back online *after* the kiln came back online.

The pyroprocessing system comprises a two-string four stage Polysius Dopol type 2442 suspension pre-heater kiln with AS Precalciner, which has a combined centre stage. The kiln is 68m-long and 4.2m in diameter. It is inclined at 3° and has a clinker capacity of 2750t/day (0.9Mt/yr). This works out at a cement capacity of around 1.3Mt/yr.

The plant has a chlorine bypass that was installed by A TEC in 2006. It has a kiln gas capacity of approximately 8%.

The cooler is a Polysius Repol grate cooler of 3m x 30.3m. It was upgraded with a CemProTec Static Inlet in 2008. There are 10 cooling fans and the clinker leaves at typically 80°C above ambient temperature.

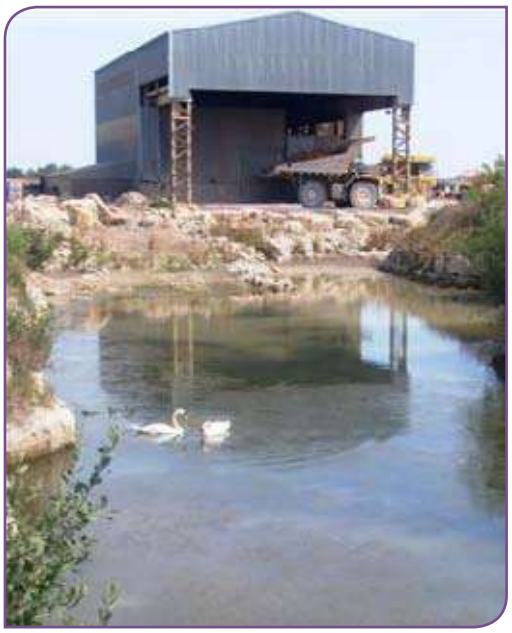
There is the capacity for 110,000t of clinker storage in a single silo. We extract it from underneath the silo from multiple points via a series of conveyors to the cement mill building, which houses two Polysius ball mills. Each of these can operate at up to 100-120t/hr.

***GC:* What changes have been made to the process in recent years?**

SJ: There has been significant investment in the plant in the past few years, which is a great position to be in as the plant manager.

Quite a large part of the investment has been due to compliance with particulate emissions restrictions. We have just invested Euro2.1m on a new baghouse for the cement mills. That project involved taking the roof off the cement mill building, taking out the ESP and installing the baghouse on top. The equipment was from Intensiv Filter and the project was carried out by Fairport Engineering.

In the recent shutdown, we upgraded the vertical raw mill in a Euro1m project. All of the internal



Far left: One of the plant's 100t trucks unloads limestone into the 700t receiving hopper.

components were replaced, including the table and rollers. Prior to that project we were grinding raw meal at 240t/hr. Now we can reach 265t/hr, so we are seeing good payback. The shutdown also saw the replacement of all the coal mill internal components and extensive re-bricking of the kiln.

We have also just invested Euro590,000 on a new Ventomatic packing machine that can fill 4200 bags per hour. It has replaced an earlier Ventomatic that could only pack up to 3500 bags per hour. We also have installed a new palletiser from Ventomatic under the same project. Both of these will increase our capacity for packed products, which our commercial colleagues assure us is a good position to be in going forward. We also commissioned an Arodo Arovac plastic packing system in late 2011.

The plant is also very proud of its 12MW solar farm, which was installed between 2013 and 2015 on 20 hectares of land between the works and the adjoining quarry. It was built by and is now owned and managed by Lark Energy but it is tied into our electrical supply contract. On average it supplies 3MW per day. In the summer we can see figures as high as 6MW and in the winter we might see 1MW. We use around 16MW of electrical energy in total so it is an appreciable proportion of what we need. If for any reason we cannot use the electricity, it goes to the grid. However, this is rare, even during the winter shutdown.

***GC:* Are there any upcoming projects in the near future?**

SJ: In 2017 we will invest Euro10m project to replace the electrostatic precipitator (ESP) on Kiln 8

Left: The plant's large Polysius vertical roller mill for raw meal grinding.

Cement mills

The plant's two Polysius closed circuit cement mills are 4.4m in diameter by 16.25m in length. They each have a 4600kW drive, two chambers and rotate at 15.5rpm. They typically output 100t/hr of cement each at an energy cost of 38kWh/t.

The first chamber of each is 4.54m long with step lining and internal water cooling. The second chamber of each is 10.68m long, with classifying lining and internal water cooling. Each is fitted with a Slegten flow control diaphragm and a 215kW, 170,000Am^3/h Solyvent separator fan.

Clinker and gypsum are fed in via Schenck weigh belts with circulating load control. Limestone can be added to produce CEM II (maximum 20% limestone) and there is a ferrous sulphate system to control hexavalent chromium. Cement is transported away from the mills via a 125t/hr Polysius Poldens pneumatic system.

Left: One of the plant's two Polysius cement ball mills.

Right: Clinker is currently fed into the plant's 100,000t clinker silo from Kiln 8 via the conveyor shown to the left of the image. The conveyor overhead was previously used to transport clinker from Kiln 7 and is still occasionally used to transport clinker brought in from Hanson's other sites.

However, the largest project that we have in the longer term is to manage some pretty extensive changes to our quarry. We have applied to divert the road that runs between Ketton and Normanton slightly northwards and redirect it over a new bridge over a narrow part of the quarry. That will allow us to go south of the road and access further reserves that we already have planning permission for. We are also looking in future to submit a larger planning application to quarry land to the north and north east of the existing quarry areas, which will secure us many more decades of reserves. In some areas we already own the mineral reserves but with a new baghouse. The project will be undertaken by FLSmidth. In the longer term we will be replacing the cooler ESP with a baghouse in 2018-2019. This will 'future proof' the plant to allow for an increase in capacity from 2750t/day to 3000t/day. We will achieve this by upgrading the ID fan, which, in turn, will be facilitated by a number of other modifications to the plant. Other smaller projects include a Euro710,000 project for road surface improvements and a Euro830,000 project to replace some of the plant's air compressors.

Right: A new FLSmidth Ventomatic bagging machine was commissioned in February 2017.

Below: Schematic showing locations of plant site, solar farm quarry, main roads and rail.

Main roads
Local road
Rail link to East Coast Mainline
Conveyor

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Right: A new palletising system from Ventomatic was commissioned in February 2017.

Far right: An Arodo Arovac system for packing plastic bags was commissioned in 2011.

not the surface, in some areas we own both and some areas we own neither! It will be a big project. A potential longer term solution may be an access road to the north from the plant. This would potentially mean that, instead of our trucks going through the village and narrow roads, they could stay on larger roads and access the main road network more easily.

"With regards to Brexit, we are just getting on with it. There is plenty of infrastructure happening and we have a positive outlook."

Fuels and the environment

***GC:* What types of fuels are used at the plant?**

SJ: Our main fuel today is secondary recycled fuel (SRF), comprising waste paper and plastic. We source it from a company called Mid UK through a long term contract. It supplies around 45% of our thermal energy requirements. We also use Cemfuel, which is a branded recycled fuel made from waste solvents. It is supplied by a company called Tradebe UK. It is sourced from a pretty wide area from all manner of chemical processes and comprises about 17% of our fuel consumption. We also use meat and bone meal (MBM) at about 6% of our thermal energy consumption. Combining those three takes us to 68% alternative fuels. The remaining fuel is coal, sourced from the UK. It comes in mostly by rail.

Pulverised coal is provided to the main burner after grinding in a Polysius RM25/12/40 vertical roller mill. Cemfuel is also fed to the main burner, which burns around 45% of all fuels. To the calciner we feed SRF and MBM pneumatically. In 2016 we had to operate without the bypass for three months, following a problem with the main stack. However, everything has been up and running again for a while now and we expect an overall substitution rate of around 65% in 2017.

***GC:* How has the use of alternative fuels changed over the years since the plant began using them?**

SJ: Cemfuel, the fuel made from waste solvents, is actually the fuel that we have used for the longest, since we obtained a permit for it in 1994. The plant used tyres for some years from 1996, but these are no longer used. MBM was introduced in the mid 1990s due to the BSE crisis and the SRF (paper, plastics) has risen steadily from around 25% when we first introduced it in the late 1990s.

We have been able to ramp up the amount of SRF we use by securing a long-term contract with a quality fuel provider. This is where most of the overall increase in alternative fuels has come from. In the past we used to receive baled waste on site and process it but now we receive the fuel directly from the supplier for immediate use in the kiln.

***GC:* How might the fuels change in the future?**

SJ: We are always on the look out for improvements to our fuel mix. Some ideas going forward include burning SRF on the main burner. However, to do that we would need to reduce the size of the particles.

***GC:* Is the plant at a technical ceiling with respect to the amount of alternative fuels it can handle?**

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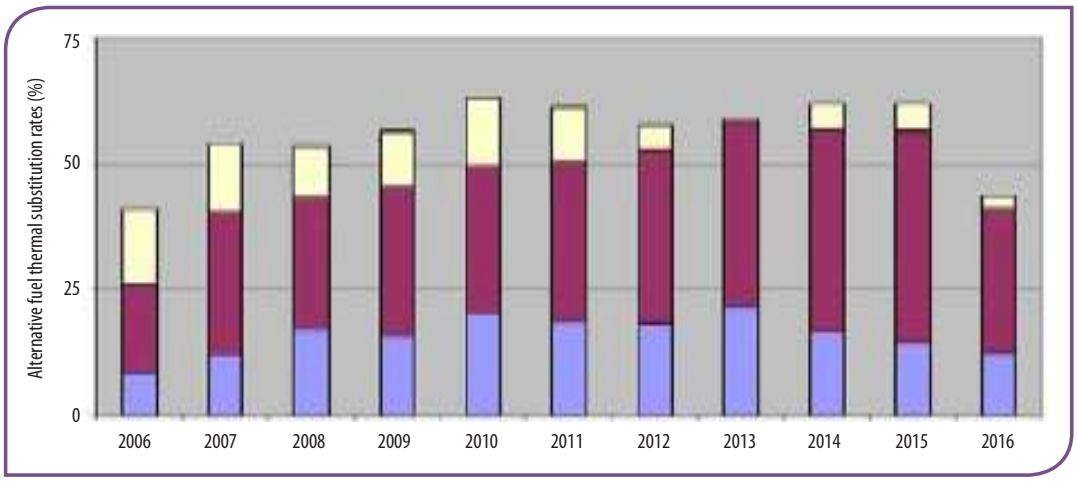


Right: Alternative fuels mix at the Ketton plant between 2006 and 2016. Profuel levels in 2016 were lower due to operating for three months without the bypass, following problems with the main stack.

Meat and bone meal
Cemfuel (waste solvents)
Profuel (paper and plastics)

SJ: We are approaching ceilings on two fronts. Firstly we cannot increase the level of SRF, because of introducing too much chloride from the plastic that it contains. On top of that the residence time in the calciner is just 2.2 seconds, well below a modern residence time of 5 seconds or more. This limits the size of the particles that can burn, which somewhat reduces the types of fuels we can use.

GC: **What are the public perceptions of the plant's use of alternative fuels?**

SJ: We have a good relationship with our neighbours in the surrounding villages. This is due to our open door policy and regular reporting and meetings. We did not face significant opposition when we first started to use alternative fuels because environmental awareness was not as high then as it is today. At our meetings with local stakeholders today they are pleased to hear that we are burning such large quantities of alternative fuels. We have a strong track record.

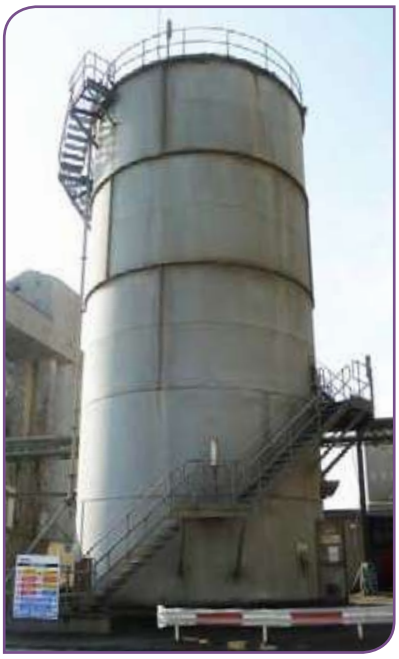
GC: **What environmental control systems are used?**

SJ: Aside from the dust filtration systems that I described earlier, we use lime to control HCl and, to some extent SO_2. We put in aqueous ammonia to control NO_x as required but, due to the high level of control we have over our fuels and raw materials, we don't have to use it very often. Dioxins are taken care of by our Lurgi gas tower with Lechler gas conditioning system. I would also like to mention that our bypass dust, instead of going to landfill, is now licenced for use as a fertiliser.

Markets and future

GC: **Where are the plant's markets and how are they served?**

Right: Unloading point for Cemfuel (waste solvents).



Far right: MBM silo.

Right: Unloading Profuel (plastic and paper).

SJ: We predominantly ship to the south and south east of England. Around a quarter of our total production last year was delivered to our rail depot at Kings Cross in London by train, from where it was distributed to ready-mixed and precast concrete plants in and around the capital by truck. The rest is sent out by road, from the plant, with around 50% of the total output in bulk tankers and a further 25% in 25kg bags. Typically our road distribution is to East Anglia (Norfolk, Suffolk and Cambridgeshire) and other counties to the north and east of London.

GC: **How has the plant (and Hanson) coped with the economic downturn?**

GC: While the Ketton plant noted a downturn in demand, we had to mothball Kiln 7 of course, it was not as badly affected as the other Hanson plants at Padeswood and Ribblesdale. That is because we supply a lot to London, where the downturn was not as marked. We have the ability to grind clinker, which can be brought in from our Padeswood plant.

GC: **What are your expectations for the future of UK cement demand, especially given Brexit?**

SJ: With regards to Brexit, we are just getting on with it. It has not stopped investment for us and the UK population isn't going anywhere. The UK will continue to need cement. The government has stated that we need to build 250,000 houses a year for the next five years to meet demand, about twice the current position, and is looking at policies to help achieve this, which will be fantastic for the cement and wider construction sector. A recent survey of the main construction companies showed that, since the Brexit vote, they have outperformed the general stockmarket, so things are good for the sector overall.

As well as the need for housing, there is also the HS2 rail project, Hinkley Point nuclear power plant (to which Hanson is the key materials supply), the new cross-London sewer extension, as well as the A14 extension and the A303 tunnel under Stonehenge. There is plenty of infrastructure happening and we have a positive outlook.

GC: **What one thing would you change about the plant, regulations, political situation, etc, if you could to best benefit the plant?**

SJ: I would build Kiln 9 to secure the long-term future of the site. As the economy improves, we could grow into, let's say a 4000t/day (1.3Mt/yr) capacity kiln. Then, after we have secured planning permission for the quarry, we could really get motoring. That's the dream!

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

SJ: You are most welcome.

Left: Hanson distributes around half of its cement in bulk silo tankers.

Global Cement staff

Solids Dortmund 2017 - Preview

On 10 - 11 May 2017, the trade shows Solids Dortmund (Schüttgut) and Recycling-Technik will again take place in Dortmund, Germany. Over two show days, suppliers and customers from near and far will meet together under one roof. easyFairs (the event's organiser) expects 15% more exhibitors than at the previous shows, a growth trend that is also reflected in a rapidly increasing visitor attendance. With lectures, guided tours and an expert congress to complement the exhibition, visitors searching for new products and solutions will find a wide range on offer at the event.

On 10-11 May 2017 two top trade shows will take place in Dortmund: the eighth edition of Solids Dortmund alongside the fourth edition of Recycling-Technik. Solids Dortmund has established itself as the leading trade show in Germany for granules, powders and solids technologies. The show explores all aspects of the equipment and process technologies required for the production, material acceptance, handling and processing of bulk solids, as well as the mechanical or pneumatic conveying thereof within the plant. It also covers the filling, packaging, storage and transportation of those goods to their final destinations.

Solids Dortmund covers the entire process engineering value chain and showcases technologies for the processing, handling, storage and transport of bulk granules, powders and solid goods. Exhibitors look forward to meeting trade visitors from a broad mix of industries, especially in the fields of mechanical and plant engineering, chemicals and pharmaceuticals, and minerals, soils and mining, as well as areas like the food and feed industry and logistics. The international country pavilions, for example the Benelux and Italian pavilions, are particularly popular among the attendees.

SOLIDS
DORTMUND 2017
10 – 11 May 2017
Messe Westfalenhallen

Additionally, the parallel event Recycling-Technik is a business and innovation platform for recycling, environmental technology and urban mining. Exhibitors representing all major areas of recyclable and residual waste technologies will present machinery and plant components for reclamation and environmentally-sound disposal. With 240 providers, there will be 15% more exhibitors showing their products and solutions than at the last edition in November 2015.

Right: As in previous editions, Solids Dortmund and Recycling-Technik will take place at the Messe Westfalenhallen in Dortmund, Germany.

Left: One of the two events' four halls.

The growing diversity is also supported by the show programme, with its two daily guided tours of the exhibition, 100 lectures on five open stages and the third German Fire and Explosion Protection Congress in cooperation with IND EX® e.V.

Rising profiles

"Both Solids Dortmund and Recycling-Technik have enjoyed rising importance in the minds of both exhibitors and visitors," emphasises Daniel Eisele, Group Event Director and exhibition manager for the show organiser, Easyfairs Deutschland GmbH.

"This trade show is simply a must for suppliers of solids technologies. It has become the leading event for the solids industry."

Left: Guided tours show off the best of the shows.

"This can be seen not only quantitatively in the fast-growing exhibitor and visitor numbers but also in terms of quality, as our surveys show. With 450 registrations, we have already the same number of exhibitors as last time, long before the show will take place. This is where the entire bulk goods community comes together."

Stefan Meyer, Managing Director of REMA TIP TOP West GmbH, adds, "This trade show is simply a must for suppliers of solids technologies. It has become the leading event for the solids industry."

RECYCLING-TECHNIK
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Visit *Global Cement*

Global Cement will be exhibiting in Hall 7 on Stand X:17-7 behind the Recycling-Technik CompetenceCenter WFZ-Ruhr. We look forward to your visit!

Left: Visitors can get up close and personal with equipment from a full range of more than 450 suppliers.

US: Multinationals rule themselves out of Trump wall bids... but not LafargeHolcim

German cement multinational HeidelbergCement has announced that it will not bid for the contract to build US President Donald Trump's planned 3000km border wall with Mexico, according to a statement of 16 March 2017.

"We are in principle a materials supplier and not a construction company, that is why we do not take part in such tenders," said CEO Bernd Scheifele at a news conference after HeidelbergCement published its 2016 financial results.

Mexico-based Cemex, which has faced strong pressure at home not to bid, has also decided not to do so. The Mexican government has been a staunch opponent of Trump's proposed project. Cemex, previously seen as one of the main potential beneficiaries of the project due to having major cement production assets on both sides of the border, could still benefit from Trump's much trumpeted infrastructure spending boost, should it come to fruition, along with other cement producers based in the US.

According to a Cemex company statement, it sees cement demand growing by 4-6% in the US in 2017, based on public works such as the 2015 Fixing America's Surface Transportation Act, Trump's infrastructure plan and the wall.

These two declarations are in stark contrast to LafargeHolcim's position. In March 2017, CEO Eric Olsen said that it would seek to be involved, in remarks published in a range of media outlets. It is the largest cement multinational in the US and the world. French politicians have since cautioned LafargeHolcim about the consequences of supplying cement to the project.

French Presidential candidate Emmanuel Macron said that companies such as LafargeHolcim must consider the 'ethical aftermath' of their business deals, after Olsen's remarks.

"Being a private company, whose headquarters are mainly in Switzerland, does not free it from having an ethical conscience and asking questions before participating in certain projects," Macron told Agence-France Presse. LafargeHolcim is already under attack in France for Lafarge's handling of its Syrian operations during the spread of ISIS (See Page 72).

The US Customs and Border Protection agency previously said that it would accept proposals during March 2017 for the design of the wall, the first step in picking vendors. President Trump wants Congress to spend US$1.5bn for the border wall with Mexico in the current fiscal year and a further US$2.6bn in the 2018 fiscal year.

US: Orcem slag plant denied

Orcem Americas, a subsidiary of Ireland's Ecocem, has been refused planning permission to build a slag cement plant in Vallejo, California. The cement producer was hoping to build a US$50m grinding plant but it faced opposition from local residents on environmental grounds, according to the Irish Times. The issues for the planners were an anticipated increase in the number of trucks on local roads and putative pollution from the plant. Orcem Americas can now appeal the decision to Vallejo's City Council if it chooses.

Colombia: LafargeHolcim is Ready2Grind

Gebr. Pfeiffer has sold a Ready2Grind modular grinding system with a MVR 2500 C-4 mill to LafargeHolcim Colombia. The order consists of a Ready2Grind with a finished product storage area and a packing plant supplied by Claudius Peters. No value for the sale has been disclosed.

Canada: Lafarge strikes water deal

The Greater Vancouver Water District (GVWD) has struck a deal with Lafarge Canada to sell drinking water treatment residuals to the Richmond cement plant for use in cement production. The contract is for a three-year agreement up to a total cost of just under US$1m, according to Postmedia News. The deal follows a 12-month industrial trial that started in 2016.

The residuals will be used as a substitute for shale in the production process. Around 10,000t/yr of residuals will be used to replace 2100t/yr of red shale and conglomerate that are currently supplied from a quarry at Sumas Mountain, Abbotsford. The use of residuals doesn't affect the plant's Air Quality Permit following stack tests. As part of the agreement Lafarge will need to build additional storage capacity at its plant.

Mexico: Elementia posts better results in 2016

Elementia's cement division's sales revenue in Mexico rose by 30% year-on-year to US$155m in 2016 from US$119m in 2015. Its earnings before interest, taxation, depreciation and amortisation (EBITDA) grew by 39% to US$65.9m from US$47.3m. It attributed the result to increased prices and a higher capacity utilisation rate.

The cement producer noted that its 1.5Mt/yr upgrade to its Tula cement plant is scheduled for completion in the third quarter of 2017. The company also competed its acquisition of a 55% stake in US company Giant Cement in the fourth quarter of 2016.

Brazil: Magnesita revenue up

Magnesita's revenue from its Industrial Refractory Solutions division rose by 3.3% year-on-year to US$144m in 2016 from US$140m in 2015. Its sales volumes grew by 10.2% to 147,000t from 133,000t.

Mexico: Fives completes Moctezuma project

Fives has supplied a Fives FCB Horomill for the new production line at Cementos Moctezuma's Apazapan plant in Veracruz. The cement producer signed the acceptance certificate in mid-February 2017. The FCB Horomill 3800, supplied to fit the raw meal-grinding workshop, is part of the new plant that was inaugurated by Cementos Moctezuma in January 2017.

Colombia: Argos sales fall in 2016

Cementos Argos' sales volumes of cement fell by 5.5% year-on-year to 3.44Mt in 2016 from 3.64Mt in 2015. Despite increasing its presence in the US with the acquisition of the Martinsburg, West Virginia cement plant, its sales volumes in Colombia fell by 19% in 2016, more than the market, due to its 'higher exposure' to the infrastructure and industrial segments and increasing volumes of imports. Despite this, its sales revenue rose by 7.7% to US$2.95bn from US$2.74bn and its earnings before interest, taxation, depreciation and amortisation (EBITDA) rose by 8.7% to US$572m from US$526m.

"We are very satisfied with the results of the US regional division as they ratify the visionary decision, taken 11 years ago by the company, to enter with our value proposition into the largest economy and the most demanding market. Our diversification strategy allows us to balance different market cycles, drives our results and supports value generation for our shareholders," said Juan Esteban Calle, chief executive officer of Cementos Argos.

The US became the cement producer's biggest market in 2016, contributing about half of its revenue. By region, cement sales volumes grew in the US by 18.5% to 3.97Mt from 3.36Mt. Sales volumes in its Caribbean and Central American region rose by 4.7% to 4.95Mt from 4.73Mt. It added that it had decided to postpone the expansion of its Sogamoso cement plant in Colombia. Instead it plans to increase its production capacity by 1Mt/yr at its Rioclaro and Cartagena plants in 2017 and 2018.

US: Summit reports 49% rise in revenue for 2016

Summit Materials cement business' sales revenue rose by 49% year-on-year to US$250m in 2016 from US$168m in 2015. Its sales volumes of cement grew by 37% to 2.36Mt from 1.72Mt. Its adjusted earnings before interest, taxation, depreciation and amortisation (EBITDA) grew by 51% to US$113m from US$74.8m. It attributed the improvement to higher prices, cost reductions, production efficiencies and increased sales volumes due to the acquisition of the Davenport cement assets in July 2015

"Our cement business represents a clear catalyst for growth heading into 2017," said Tom Hill, chief executive officer of Summit Materials. "Limited domestic production capacity and continued growth in US demand have combined to create opportunities for sustained growth in industry pricing. During the fourth quarter, our cement segment generated organic price and volume growth of 6.8% and nearly 1%, respectively. Looking ahead to the remainder of 2017, we anticipate continued adjusted EBITDA growth in our cement business, as supported by sustained growth in organic cement prices and sales volumes along the Mississippi River corridor."

US: Board changes at Vulcan

Vulcan Materials has elected David P Steiner to its board of directors. Steiner will serve on Vulcan's Safety, Health and Environmental Affairs Committee and the Governance Committee. Steiner most recently served as chief executive officer of Waste Management from 2004 to 2016, a North American waste management services company that covers collection, transfer, recycling and resource recovery services, as well as landfill disposal. He currently serves on the board of directors of FedEx Corporation.

Vulcan also announced that Elaine L Chao has stepped down from the Board after being confirmed by the US Senate to serve as US Secretary of Transportation. Secretary Chao joined Vulcan's Board in February 2015.

US: Fire at LafargeHolcim's Hagerstown plant

A fire took place at LafargeHolcim's Hagerstown cement plant in Maryland on 20 February 2017. An overloaded conveyor belt was the source of the blaze near the centre of the site that broke out in the evening, according to the Herald-Mail newspaper. High temperatures prevented fire fighters from tacking the fire immediately and it burned for over an hour.

Mexico: Cemex keeps 9.5% of GCC after all

Cemex has retained a 9.5% stake in Grupo Cementos de Chihuahua (GCC) following a sale of some of its shares in the Mexican cement producer. Cemex said that the underwriters did not exercise their over-allotment option to acquire shares in GCC. Originally Cemex said in late 2016 that it intended to sell its full 23% minority stake in GCC.

China: Planners admit overcapacity

The National Development and Reform Commission (NDRC) is considering aiming for a 10% cut in cement production. The Chinese state planning body announced on 6 March 2017 that it is pushing to cut production capacity in a number of industries including coal, steel and cement, according to the Nikkei Asian Review. Some sources place Chinese cement production capacity at up to 3.5Bnt/yr and 30% of this is believed to be surplus. The commission intends to cut production capacity through market control and legislation. The change in policy from the NDRC coincides with the third consecutive year that China's annual target for real economic growth has been lowered.

Vietnam: Siam Cement buys into Vietnam Construction Materials

Thailand's Siam Cement Group (SCG) has purchased a 100% stake in Vietnam Construction Materials for US$155m. The enterprise value of the transaction is valued at US$440m, including net debt and additional efficiency improvement investment to the acquired assets, according to the Bangkok Post. Vietnam Construction Materials has a cement production capacity of 3.1Mt/yr, including one integrated plant at Tuyen Hoa in Quang Bing Province. The acquisition raises SCG's cement production capacity in the Association of Southeast Asian Nations (ASEAN) region outside of Thailand to 10.5Mt/yr. It follows other purchases by SCG of Vietnamese building materials companies, including the white cement producer Buu Long.

Above: Flag of the Association of South East Asian Nations (ASEAN).

Pakistan: Lilla plant to double capacity

Flying Cement plans to double the production capacity of its Lilla cement plant in Mangowal, Punjab. It has struck an agreement with an undisclosed Chinese contractor to upgrade the plant's clinker capacity to 4000t/day from 2000t/day. No value for the deal has been released. The plant has a cement production capacity of 0.63Mt/yr. It was originally supplied by Japan's IHI.

Philippines: Holcim Philippines sales grow despite competition

Holcim Philippines posted higher sales despite increased competition in 2016. Its revenue grew by 7.5% to US$801m due to both higher volumes and prices. Operating earnings before interest, tax, depreciation and amortisation (EBITDA) increased by 14% to US$215m.

The company's net income reached US$135m, which benefited from a one-time gain of US$52m from the revaluation of Holcim Philippines' investment in an affiliate. Without the one-off item in 2015, profits were higher by 24% in 2016.

Holcim Philippines Chief Operating Officer Sapna Sood said, "Ensuring stable supply is critical in these times of high building activity. Last year, we demonstrated our commitment to keep the market supplied by raising our production capacity and leaning on our strong regional network. As a result, we showed our customers that we are a reliable partner, which helped us compete, even with the entry of new players."

Philippines: CEMAP asks for fair investigation

The Cement Manufacturers Association of the Philippines (CEMAP) has asked that the local industry be treated fairly in an investigation by the Philippine Competition Commission (PCC). In a press statement, Ernesto M Ordoñez, President of CEMAP said that his association had not been notified or given a copy of a compliant filed by a legal firm, according to the Manila Bulletin. He added that the association's lawyers had previously tried to find out more about the complaint in late January 2017 but had not had a reply.

"Fairness requires that both sides are heard. Not only were we not given a chance to be heard, more than a month after our letter to PCC asking for what the complaint is about so we could give our side, we still have no reply from PCC. We found out about the nature of the complaint through the newspapers. This is one-sided and unfair, especially considering the track records of the subjects of the complaint," said Ordoñez.

The PCC announced in early March 2017 that it was preparing to investigate the cement industry for alleged violations of competitive practice following a legal statement by Victorio Dimagiba, a former trade undersecretary, in August 2016 accusing CEMAP, LafargeHolcim Philippines and Republic Cement and Building Materials of engaging in anti-competitive agreements.

India: First sales decline since 2001 on the cards

A report by HDFC Securities suggests that the Indian cement industry will witness its first decline in cement sales volumes since 2001 due to demonetisation. The research by Ankur Kulshrestha and Sarfaraz Singh says that cement volumes fell by 13% year-on-year in January 2017 following a 9% decline in December 2016. They added that cement demand, although weak, is recovering from the shock, with the south of the country least affected.

"Our channel checks across the country show cement demand, though still weak, is recovering from the effect of this move. Though states undergoing political processes (Uttar Pradesh and Punjab) are an exception to this recovery as of now, there is a possibility demand may pick up once the government formation is complete," said Kulshrestha and Singh. They added that energy prices contributed much of a surge of cement industry profitability in the last financial year or so.

Kyrgyzstan: EEU undermines inefficient plants

Cement produced in Kyrgyzstan has become 'uncompetitive' since the country joined the Eurasian Economic Union (EEU). The State Committee for Industry, Energy and Mining has blamed this on high volumes of imports from Kazakhstan. Kyrgyzstan has five cement plants.

Above: Flag of the Eurasian Economic Union (EEU).

Pakistan: Lucky Cement gets additional WHR unit

Lucky Cement has inaugurated a waste heat recovery (WHR) unit in Pezu, Khyber-Pakhtunkhwa, its fifth across all of its operations. The unit generates 10MW from two 2400t/day cement production lines. It was installed by China's Sinoma.

The inauguration ceremony was attended by Muhammad Ali Tabba, CEO of Lucky Cement, as well as other members of the company's senior management. "As one of the leading cement manufacturers in Pakistan, we have the responsibility to reduce energy consumption and improve the environment. With the launch of our fifth WHR plant, we aim to do just that," said Tabba.

Pakistan: New Bestway plant in Farroqia

Bestway Cement plans to set-up a 6000t/day integrated cement plant at its Farroqia site in Khyber-Pakhtunkhwa province. It has signed an agreement with China's Sinoma International Engineering Company to build the plant. No cost for the project nor a scheduled timescale has been released.

Philippines: Eagle plans IPO

Eagle Cement is planning an initial public offering (IPO) of US$183m to partly pay for a US$249m cement plant it wants to build in Cebu. The plant will have a cement production capacity of 2Mt/yr when complete, according to the Philippines Star newspaper. The project will also include building a distribution centre and marine terminals in Southern Luzon, Visayas and Mindanao regions. Additional financing will be sourced through debt funding and internal sources. Construction is scheduled to start in the fourth quarter of 2017 and the project is anticipated to be finished in the first quarter of 2010.

India: ACC sells Shiva stake to JSW

ACC has sold its 12.1% stake in Shiva Cement to JSW Cement for US$5.8m. Following the sale, JSW Cement now holds the entire promoter holding in Shiva Cement, according to the Mint newspaper. In January 2017 JSW Cement announced that it was making an open offer to buy out Shiva Cement. Shiva Cement operates a 0.2Mt/yr cement plant in Odisha.

Brunei: New cement import policy

The Energy and Industry Department at the Prime Minister's Office has released information on its new policy for importing cement and the connected application process, following the abolition of the previous method on 1 January 2017.

Officials say that the changes are intended to open up the cement market in the country, increase competition, offer more market choice and reduce the price of cement, among other aims. Cement importers are required to register, their companies need to be at least 70% locally owned and applications will last two years. Personal allowances for citizens bringing cement across the border will be limited to two bags per vehicle.

Myanmar: Extra EIA for Mawlamyine

Mawlamyine Cement, a joint venture between Siam Cement Group and Pacific Link Industries, has been ordered to conduct an additional environmental impact assessment at its Kyaikmayaw cement plant in Mon State. The government has requested that a third party conduct the study at the site. Issues with coal use, transportation of finished products via river and emissions have been raised by the Environmental Conservation Department. The cement producer has also been asked to include residents in the assessment to ensure transparency of the process.

Peter Edwards, Global Cement Magazine

The cement sector of Iran

The Islamic Republic of Iran is located in the west of Asia and shares borders with Iraq, Turkey, Armenia, Azerbaijan, Turkmenistan, Afghanistan and Pakistan. It covers a total of 1.65 million km^2, has 82.8 million inhabitants and has the eighth-largest cement sector in the world, according to active capacity listed in the *Global Cement Directory 2017*. It was previously as high as fourth-largest in 2014/2015, and is aiming to improve its ranking in the near future.

Iran has been an Islamic Republic since the 1979 Islamic Revolution. Its transition to an Islamic republic led to the severing of ties with former ally the United States, a prolonged war with neighbouring Iraq in the 1980s and US, EU and UN sanctions.

Tensions with the international community were particularly high during the Presidency of the hardliner Mahmud Ahmadinejad between 2005 and 2013, although the subsequent election of the more moderate Hassan Ruhani in 2013 has led to a thawing of relations. The Iran Nuclear Deal Framework, an agreement reached between Iran, the US, the UK, Russia, France, China, Germany and the EU in 2015, which outlined a reduction in sanctions in return for curtailment of Iran's nuclear programme, led to the lifting of the UN sanctions in 2016.

This has led to significant optimism that relations between Iran and major world powers can be normalised, although the new US President Trump recently described the deal as one of 'history's dumbest.' Iran was included on Trump's controversial 'travel ban' list. At the end of January 2017 Iran said that it would retaliate in kind against the ban, (before the ban was temporarily lifted), leading some to predict that US-Iranian relations could deteriorate once more under the new US administration.

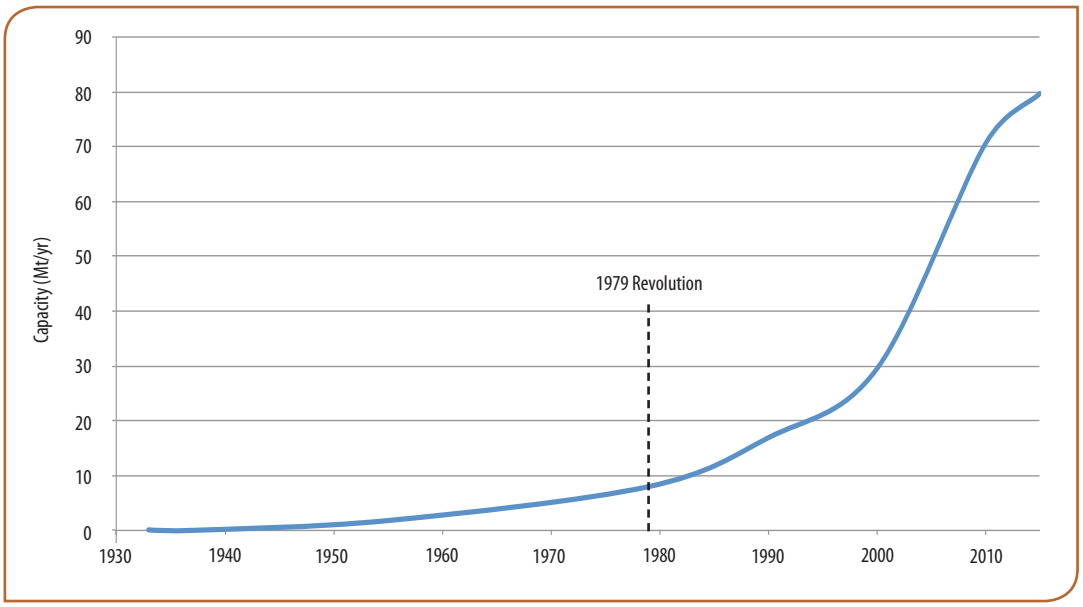
Economy

The Iranian economy is currently dominated by the state, with large numbers of directly- and indirectly-state-owned companies in a range of sectors. It relies heavily on oil and gas sales, despite sanctions. The country is second in the world in terms of natural gas reserves and fourth in terms of proven crude oil reserves.

In 2016 around half (48.6%) of the labour force were involved in the service sector, with 35.1% in industry and 16.3% in agriculture. Unemployment was estimated at 10.7% in July 2016, broadly unchanged year-on-year from the same month of 2015.

Iran's GDP was US$394bn in 2015 according to the World Bank, although it had been as high as US$592bn in 2011. This 33% decline is largely due to the prolonged decline in global oil prices. In 2016 GDP had been expected to rise once more due to the lifting of some sanctions.

Right: The skyline of Tehran, the Iranian capital. Iran has a unique geographical location. As well as its seven land borders, it has access to the Persian Gulf, an extension of the Indian Ocean via the Gulf of Oman.



Left - Figure 1: Cement capacity in Iran, 1933 - 2015.[1] According to Khosro Jamei, Managing Director of Fars & Khuzestan Cement's Khash Cement subsidiary, "It has been widely stated by major officials that Iran may increase capacity up to 120Mt/yr in the near future. Post sanction conditions and increases in domestic demand will help to achieve this."

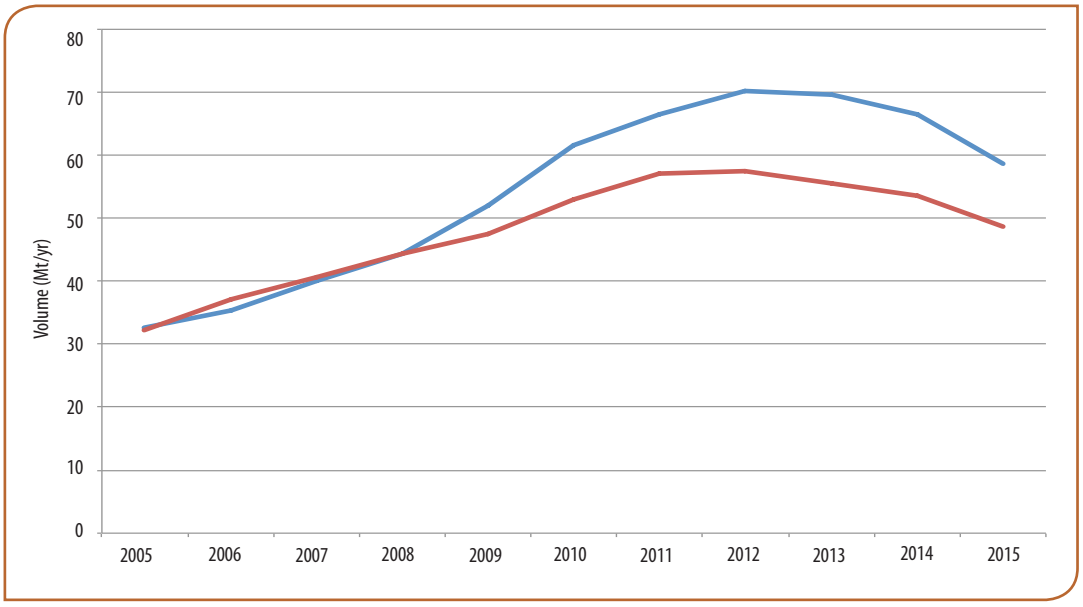
Cement industry - Introduction

The Iranian cement sector traces its origins back to 1933, when the first plant, of just 100t/day, was built to the south of Tehran by Denmark's FLSmidth. Subsequent capacity was added in 1937, taking the total capacity to 9000t/yr, before more significant expansion in the 1950s and 1960s (See Figure 1).[1]

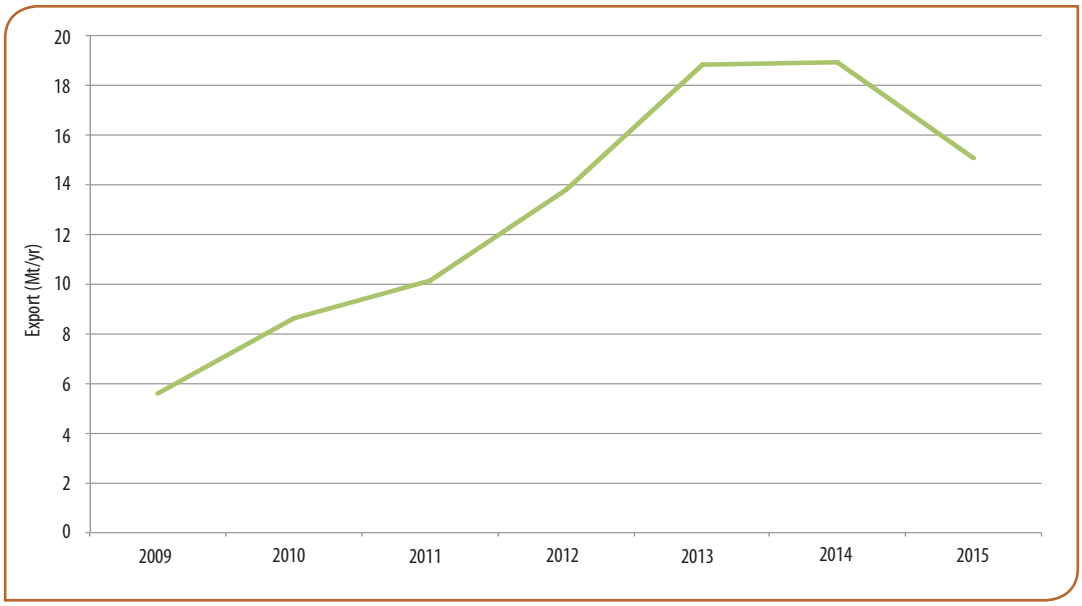
By the end of the 1970s cement capacity had hit 8Mt/yr and capacity really took off after the revolution, despite war and sanctions. Capacity rose to 16.9Mt/yr in the decade to 1990 and nearly doubled again in the next decade to 29.5Mt/yr by 2000. Expansion then became even more rapid in the 10 years to 2010, when 41.1Mt/yr of additional capacity came online. Additions have since slowed, in part due to overcapacity. Capacity hit nearly 80Mt/yr in 2015. Table 1 shows the additions to Iranian cement capacity between 2005 and 2016, the most intense period of cement capacity addition.

Year	New projects		Expansions	
	Number	Capacity (Mt)	Number	Capacity (Mt)
2005	3	2.49	3	0.66
2006	5	4.52	4	1.41
2007	5	4.22	2	0.79
2008	9	8.11	4	2.01
2009	4	5.45	0	0.00
2010	7	8.15	1	0.15
2011	4	4.57	1	0.55
2012	2	1.99	0	0.00
2013	1	0.99	1	0.30
2015	1	0.60	0	0.00
2016	1	0.15	0	0.00
TOTAL	**42**	**41.2**	**16**	**5.87**

Left - Table 1: Cement capacity added in Iran, 2005 - 2015.[1]



Left - Figure 2: Cement production and consumption in Iran, 2005 - 2015.[1]



Right - Figure 3: Iranian cement exports, 2009-2015.[1]

The most recent data from the Ministry of Industries, Mining and Trade, released in January 2017, shows that Iran's cement production fell by 1.4% year-on-year to 42.7Mt in the first nine months of the Iranian calendar year that started on 21 March 2016.[2]

Cement industry - Exports

In the not-too-distant past, Iran was a major global exporter of cement, but quantities have been reduced significantly due to sanctions. During the sanctions era, as Iranian cement demand has fallen relative to capacity, the country has become affected by overcapacity. This is helped by government policies that keep cement prices low, around US$35/t. This has driven a strong uptick in exports, as shown in Figure 2. Exports more than tripled between 2009 (5.6Mt) and 2014 (18.9Mt), before falling in 2015 by around a fifth to ~15Mt.[1] By far the most popular destination was Iraq (7.2Mt, 48% of exports), followed by Afghanistan (1.3Mt, 9%), Kuwait (1.2Mt, 8%) and Qatar (1.2Mt, 8%).

In May 2016 Iran reported on cement exports for its 2015-2016 financial year, which ended on 20 March 2016. According to Abdolreza Sheikhan, secretary of Iran's Cement Industry Employers Association, exports fell by 20% year-on-year to 18.5Mt. In comments to the Islamic Republic News Agency, Sheikhan blamed the fall in exports on security problems in the region, including in Iran's main export market of Iraq. Iraq had earlier increased its tariffs on imports of cement and Azerbaijan had increased its cement production capacity, reducing its reliance on Iranian cement exports.

Shahryar Geravandi, the manager of Saman Cement at Kermanshah in western Iran, warned in June 2016 that Iraq's high import tariffs on cement has put the Iranian cement industry in 'crisis.' He added that finding new markets for the surplus cement would be hampered by high transport costs.

In June 2016, it was also reported that Iraq would remove the ban on import of Iranian cement, according to Abdolreza Sheikhan. In comments reported by the Fars News Agency, Sheikhan said that Iranian and Iraqi officials had held several meetings on the issue. He added that Iraq had banned cement imports due to security problems in the country and the falling oil price. Iraq's cement demand is currently met by its own domestic production but it previously took 60% of Iran's cement exports.

Khosro Jamei, Managing Director of Fars & Khuzestan Cement's Khash Cement subsidiary in south east Iran reports that, post-sanctions, exports are ripe to take off due to reliable and cheap fossil fuels from neighbouring Arab countries and short distances to large and rapidly-growing economies in Africa as well as to the north and east of Iran.

"In addition to having access to the vast and overwhelming markets of Afghanistan and Pakistan, we should, at this moment, focus on Oman, as well

Right: Saman Cement's Polysius kiln and pre-heater tower in western Iran. The producer is one of Iran's many 'one plant' producers. **Source:** Saman Cement website.

Iranian cement capacity

The Iranian cement industry has 79 integrated cement plants.[i] Of these, 10 are under construction or planned, leaving 69 that are currently producing cement. These share 85.0Mt/yr of capacity.

Figure 4: Iranian cement plants in 2017. **Source:** Iranian Cement Association.[i]

1. Abadeh Cement, Abadeh, 0.4Mt/yr
2. Benvid, 0.2Mt/yr (White)
3. CIDCO, Kerman, 1.2Mt/yr
4. CIDCO, Neka, 2.3Mt/yr
5. CIDCO, Shomal, 1.4Mt/yr (of which 0.1Mt/yr white)
6. Tejarat Mahriz Cement, Yazd, 1.1Mt/yr
7. Ghadir Investment, Dashtestan, 1.2Mt/yr
8. Darab Cement, Darab, 1.3Mt/yr
9. Estahban Cement, Estahban, 0.3Mt/yr
10. Fars and Khuzestan Cement, Abyek, 4.8Mt/yr
11. Fars and Khuzestan Cement, Behbahan, 0.7Mt/yr
12. Fars and Khuzestan Cement, Bojnourd, 1.8Mt/yr
13. Fars and Khuzestan Cement, Doroud, 1.2Mt/yr
14. Fars and Khuzestan Cement, Fars, 0.7Mt/yr
15. CIDCO, Firuzkuh, 1.1Mt/yr
16. Tamin Cement, Ghaen, 0.8Mt/yr
17. Fars and Khuzestan Cement, Gharb, 1.2Mt/yr
18. Fars and Khuzestan Cement, Khash, 0.8Mt/yr
19. Fars and Khuzestan Cement, Khazar, 1.3Mt/yr
20. Fars and Khuzestan Cement, Khuzestan, 2.5Mt/yr
21. Fars and Khuzestan Cement, Neyriz, 0.2Mt/yr (White)
22. Tamin Cement, Urmia, 2.0Mt/yr
23. Espandar Cement, Ardabil, 1.1Mt/yr
24. Espandar Cement, Ekbatan, 0.1Mt/yr (White)
25. Isfahan Cement, Isfahan, 1.1Mt/yr
26. Karoon Cement, Karoon, 0.9Mt/yr
27. Fars and Khuzestan Cement, Saveh, 2.5Mt/yr (of which 0.3Mt/yr white)
28. Omid Investment, Hormozgan, 1.9Mt/yr
29. Ghadir Investment, Kordestan, 1.0Mt/yr
30. Ghadir Investment, Sepahan, 3.1Mt/yr
31. Ghadir Investment, Shargh, 2.0Mt/yr (of which 0.3Mt/yr white)
32. Tamin Cement, Shahroud, 1.9Mt/yr
33. Tehran Cement, Hegmatan Plant, 2.1Mt/yr
34. Tehran Cement, Ilam Plant, 1.7Mt/yr
35. Tehran Cement & Tehran Unit 7, 3.2Mt/yr
36. Tamin Cement, Soufian, 2.2Mt/yr
37. Urmia White Cement, Urmia, 0.2Mt/yr (White)
38. Ardestan Cement, Ardestan, 1.1Mt/yr
39. Omran Anarak Cement, Deijan City, 1.0Mt/yr
40. Espandar Company (Faraz Firouzkuh), Tehran, 1.0Mt/yr
41. Espandar Cement, Kashan, 0.6Mt/yr
42. Kohgiluyeh Cement, Yasoj, 0.7Mt/yr
43. Larestan Cement, Fars, 0.1Mt/yr (White)
44. Shahrekord (Bonyad Maskan), Chahar Mahal, 1.0Mt/yr
45. Tamin Cement, Zanjan, 0.6Mt/yr
46. Bagheraz Cement, Bagheraz, 1.0Mt/yr (Not operational)
47. Momtazan Kerman Cement, Kerman, 1.0Mt/yr
48. Azar-Abedagan, Khoy, 1.2Mt/yr
49. Dehloran Cement, Dehloran, 1.2Mt/yr (Not operational)
50. Fars & Khuzestan Cement, Firouzabad, 0.9Mt/yr
51. Gharb Asia Cement, Torbat Jaam, 1.3Mt/yr (Not operational)
52. Gilan Sabz Cement, Deylaman, 1.2Mt/yr
53. Jovein Cement, Mashhad, 1.5Mt/yr
54. Khorramadabad Cement, Khorramadabad, 1.2Mt/yr (Not operational)
55. Lar Sabzevar Cement, 1.0Mt/yr
56. Ghadir Investment, Mondashti, 1.2Mt/yr (Under construction)
57. Nahavand Cement, Nahavand, 1.0Mt/yr
58. Naeen Cement, Naeen, 1.4Mt/yr
59. Omran Arya Cement, Andimeshk, 1.3Mt/yr (Not operational)
60. Peyvand Golestan Cement, 1.0Mt/yr
61. Qeshm Cement, Qeshm Island, 0.4Mt/yr
62. Sarooj Isfahan Cement, 0.7Mt/yr
63. Bookan Cement, Bookan, 1.1Mt/yr
64. Saman Cement, Kermanshah, 2.2Mt/yr
65. Sepo Cement, 1.2Mt/yr (Not operational)
66. Zaveh Torbat Cement, Torbat Heydariyeh, 1.2Mt/yr
67. Zabol Cement, Zabol-Sistan, 1.0Mt/yr
68. Lamerd Cement, Lamerd, 1.0Mt/yr
69. Khamseh Cement, Khamseh, 1.1Mt/yr
70. Semangan Cement, Semangan, 1.1Mt/yr (Not operational)
71. Majd Khaf Cement, Majd Khaf, Razavi, 1.0Mt/yr
72. Tischabahar Cement, Tischabahar, (Not operational)
73. Bagheran Cement, Semnan (Not operational)
74. Zarin Rafsanjan Cement, Kerman, 0.2Mt/yr
75. CIDCO, Sarooj-Bushehr, 2.0Mt/yr
76. Maku Cement, 0.3Mt/yr (White)
77. KiaSar Cement, 0.6Mt/yr
78. Margoon Cement, 1.1Mt/yr
79. Sepehr Cement, 1.3Mt/yr

Recent news highlights[3]

Complicated transport arrangements

In March 2016 Fars & Khuzestan Cement revealed plans in which Pakistan will help Iran export cement to East Asian countries. Morteza Lotfi, head of Fars & Khuzestan, has said that Iran will supply cement to Pakistan and in return Pakistan will export the same amount of cement to its neighbouring countries under Iran's name, according to Islamic Republic of Iran Broadcasting (IRIB).

Lotfi said that Pakistan has the infrastructure to export cement to its neighbours but it doesn't produce enough cement to meet its domestic consumption. Therefore the two countries agreed on a cement swap. He added that Iran's annual capacity for producing cement is about 80Mt/yr. Pakistan produces about 40Mt/yr. According to the agreement, Iran will also launch a clinker grinding unit in Pakistan.

Twenty-four countries, including Iraq, Azerbaijan, Turkmenistan, Afghanistan, Russia, Kazakhstan, Kuwait, Pakistan, Qatar, Turkey, the United Arab Emirates, Georgia, Oman, India and China are among the main buyers of Iran's cement. Iran exported 19Mt of cement and clinker in 2014.

Fars & Khuzestan Cement goes green

Eight Fars & Khuzestan Cement plants were awarded the Nature Friendly Company award for 2016. Reasons for winning the award included: Following and implementing nature-friendly protocols; Installing online exhaust monitoring and anaerobic waste water treatment systems; Providing more green space; Focusing on energy management, and; Production of clean energy.

As part of this, Khash Cement is investing in a 10MW solar plant and Fars Nov Cement is aiming at installing a waste heat recovery system to increase process efficiency.

First Gebr. Pfeiffer MVR mill for Iran

Gebr Pfeiffer has released information about an MVR 4250 R-4 raw mill that will be installed at Biarjaimand Cement Company. 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.

Jovein Cement wins award

In January 2016 Jovein Cement won an award for the most environmentally conscious cement manufacturer in Iran.

Reasons for winning the award included: the cement producer's efforts to extend the lifetime of its kiln refractory bricks by optimising the rate of production and thereby the energy consumption of natural gas; the recycling of refractory materials; investing in installing an online pollution analyser on the plant's main exhaust; using electrostatic precipitator technology to reduce the amount of cement dust and other general pollution released to the neighbouring community.

Future plans by Jovein Cement include the installation of a waste heat recovery system to recycle up to 30% of the heat generated by the plant. As an ancillary benefit the plant will also be able to heat water used at the site.

as east African and east Asian countries. To help Iranian cement export win back the markets like in the good old days, the government is backing up cement plants big time, whether it is allocating fuel or giving subsidies for transport. The government is trying to be there for the cement plants."

Cement industry - Summary of producers

The Iranian cement industry has 79 integrated cement plants.[i] Of these, 10 are under construction or planned, leaving 69 that are currently producing cement. These share 85.0Mt/yr of capacity. Of this, around 1.8Mt/yr (2.1%) is white cement capacity.

The recent explosion in Iranian cement capacity translates into a fairly modern cement production infrastructure, with around 65% of the country's cement kilns commissioned since 2000.[1]

The vast majority of cement plants in Iran are domestically-owned, as is typical in the region. However, unlike in some other countries, foreign investment has been further limited in the past due to US, EU and UN sanctions. A substantial proportion of the cement sector is ultimately controlled by the government. No major multinational producers or regional players are present in the market.

An additional >10.4Mt/yr of cement capacity is listed as non-operational, due to being either mothballed, closed, under construction or at the planning stage.

Left: Khash Cement plant, a subsidiary of Fars & Khuzestan Cement.

Cement industry - Producer profiles

The largest Iranian cement producers are:

Fars & Khuzestan Cement: Founded in 1950 as Fars Cement Company, Fars & Khusestan Cement is the largest producer of cement operating in the Iranian market. It has grown substantially from a capacity of just 200t/day in 1955, when production began. In 2017 the company has 18 subsidiaries and, together with its partner Ta'min Cement Investment Company, which has a further five cement plants, it operates nearly 32% of Iranian cement production capacity.

CIDCO: Cement Investment and Development Company (CIDCO) controls the cement sector assets held by Bank Melli Iran Investment. It has 8.0Mt/yr of capacity across five integrated plants.

Ghadir Investment: Founded in 1992, Ghadir Investment is a publicly-listed company engaged in a variety of industrial projects, including oil and gas, financial activities and cement production. Its cement operations began in 2005, at the peak of Iranian cement plant construction. Today it is the third-largest producer of cement in Iran, operating a total of 7.3Mt/yr via five cement subsidiaries. This is enough to give the company around 8.5% of the national market. It is also building a further 1.2Mt/yr of capacity at Mondashti.

Tehran Cement: Founded in 1954, Tehran Cement produced its first cement, from a 300t/day (0.1Mt/yr) kiln, in 1957. It launched numerous other lines over the next 30 years, bringing capacity to 3.1Mt/yr by 1987. In 2007 it replaced three of its older lines with a single line of 3400t/day(1.1Mt/yr), bringing its capacity to 4Mt/yr. Further capacity has since come online, bringing capacity up to 6.1Mt/yr. This gives it around 7% of Iranian capacity.

Economic and industry forecast

The economy of Iran is forecast by the International Monetary Fund to have grown by 6.6% in the year to 20 March 2017, following the lifting of sanctions.[4] As of January 2017 the World Bank forecast that growth will increase to 5.2% in 2017, followed by 4.8% and 4.5% in 2018 and 2019.[5] However, uncertainty returned to the fore in November 2016 following the election of Donald Trump as the 45th President of the United States. As of late February 2017, the

"It has been widely stated by major officials that Iran may increase capacity up to 120Mt/yr in the near future..."

IMF warned that deteriorating 'relations with the US could deter investment and trade with Iran and short-circuit the anticipated recovery.'

The Financial Times further reports that the Iranian President Hassan Rouhani is under pressure from more conservative political groups who claim that the deal has done little to help 'ordinary' Iranians.[4] With elections set for May 2017, a lot may therefore depend on whether Rouhani gets a second term as President.

However, the potential for growth in Iran, in the event that political conditions remain calm, are staggering. The opportunities will not be lost on its cement producers. Project Iran has identified US$200bn of infrastructure projects that could be on the cards, including US$154bn on building renovation in Tehran alone.[6] This represents 'Dubai-like' levels of spending and will be driven in part by the new Iranian Building Code that specifies higher standards than previously, especially with relation to technology, energy, efficiency and the use of modern technologies. There are an estimated US$43bn of water infrastructure projects and tourism is expected to experience a renaissance, with associated construction and renovation of hotels, restaurants, shopping malls and other facilities.

International firms, including those that manufacture cement plant equipment and accessories, are in line to benefit, with an extra US$4bn of machinery expected to be imported in 2017 compared to 2016. Indeed, Germany's Gebr. Pfeiffer recently announced that it will supply an MVR vertical roller mill to Biarjaimand Cement, the first time such a mill has been supplied to the country. Iran's cement makers will hope that this type of investment is a sign of things to come.

Indeed, According to Khosro Jamei of Fars & Khuzestan Cement's Khash Cement subsidiary, "It has been widely stated by major officials that Iran may increase capacity up to 120Mt/yr in the near future. Post sanction conditions and increases domestic demand will help to achieve this."

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

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Notes

i. Many thanks to Adam Emaminejad of Khash Cement (Fars & Khuzestan Cement) for his kind input, corrections and comments.

ii. Company profiles taken from respective websites.

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Saudi Arabia: Sales slump by 35%

Cement-making companies in Saudi Arabia witnessed a near 35% decrease in sales in February 2017, according to Mubasher. The cement companies sold 4.1Mt of cement in February 2017, down from 5.4Mt for the year-ago period. The companies' production also decreased by 26% in February 2017 to 4.0Mt, compared to 5.5Mt in the same month of 2016.

The country's cement inventory increased to 1.07Mt in February 2017, up by 18.2% year-on-year from 906,000t. Yanbu Cement topped cement sales in February 2017, as it registered sales of 474,000t, with a drop of 21.26% year-on-year from 602,000t.

Saudi Arabia: Najran mothballs line

Najran Cement has temporarily shut down its second production line due to poor market conditions and high inventory. The line has a clinker production capacity of 3000t/day. The cement producer intends to announce any financial impact arising from the shutdown in its financial report for the first quarter of 2017.

Kenya: Bamburi profit rises in 2016

Bamburi Cement's profit rose slightly to US$57.4m in 2016 from US$57.2m in 2015. Its operating profit rose by 8% to US$76.7m from US$70.9m. However, its turnover fell by 3% to US$371m from US$382m. It blamed the fall in turnover on high competition, particularly in the individual homebuilding market.

Bamburi Cement also reported a fall in sales volumes of cement, although this was offset by infrastructure and contractor markets in Kenya, Uganda and Rwanda. The cement producer added that the cement grinding plants it is building in Kenya and with its subsidiary Hima Cement in Uganda are on schedule to be completed by the middle of 2018.

Egypt: FLSmidth awarded El Sewedy project

FLSmidth has been awarded an order from El Sewedy Cement Company to build a cement production line at Ain Soukhna in Suez Governorate. The order is scheduled for completion in the fourth quarter of 2018.

The full scope of the order includes an OK 39-4 vertical mill for raw grinding, EV 250x300 Hammer Impact Crusher, stacker and reclaimer systems for storage, QCX quality control system, ECS/ControlCenter control system, Rotax-2 rotary kiln with low NO_x ILC calciner, Jetflex burner and an FLSmidth Cross-Bar cooler. The OK mill and Rotax-2 kiln will be the first of these models to be installed in Egypt. Additional equipment in the order includes planetary gear units from FLSmidth MAAG Gear, electrostatic precipitators and fabric filters from FLSmidth Airtech, a control system and plant automation from FLSmidth Automation and weighing and metering systems from FLSmidth Pfister.

"This order reflects the strong relations we have had with one of the biggest industry groups in Egypt for almost a decade. Working closely with El Sewedy Cement Company, we assist them in improving productivity and operational excellence," said Group Executive Vice President, Cement Division, Per Mejnert Kristensen.

South Africa: PPC questions CO_2 scheme

It has been estimated that PPC would be liable for an estimated US$7m in carbon taxes, should South Africa's proposed carbon tax bill be enacted. However, Darryl Castle, the chief executive of PPC, said the company was looking at a number of initiatives to reduce the forecast amount, including the replacement of coal with carbon-neutral energy sources and further reduction of its overall clinker factor.

Castle added that the carbon tax regime did not apply to imports into South Africa and had not been meaningfully implemented elsewhere. He noted that a similar scheme was scrapped in Australia because of the impact on the industry. "PPC is ready for the implementation of the carbon tax regime in January 2018. However, we will continue to engage with the government on this matter," he said in a presentation at the Merrill Lynch investor conference in Sun City.

Elsewhere, PPC has said that adverse weather negatively affected cement and concrete sales in South Africa in January and February 2017. Rainfall in excess of 200mm was experienced in many parts of South Africa over the two months.

Above: PPC says it will 'engage with' the government regarding its draft carbon tax.

Ethiopia: Chinese deal signed

Representatives of the Ethiopian and Chinese cement industries have signed a memorandum of understanding at the 2017 Ethio-China Cement Forum. Industry Minister Alemu Sime said that the forum was 'vital' to bring Chinese skills and experience into the local industry, according to the Ethiopian Herald newspaper. Representatives from the Chinese Cement Association, the Ethiopian Cement Association and local cement producers were in attendance.

Nigeria: Dangote earnings fall by 2%

Dangote Cement's earnings before interest, taxation, depreciation and amortisation (EBITDA) fell by 2% year-on-year to US$817m in 2016 from US$834m in 2015. However, its sales revenue rose by 25.1% to US$1.95bn from US$1.56bn and its sales volumes of cement rose by 25% to 23.6Mt from 18.9Mt. The cement producer reported a particular increase in sales volumes, revenue and earnings outside of Nigeria and it said that its export sales have turned Nigeria into a net exporter.

"We exported nearly 0.4Mt into neighbouring countries and in doing so, we achieved a great milestone by transforming Nigeria into a net exporter of cement. This is a remarkable achievement given that, only five years ago, Nigeria was one of the world's largest importers, buying 5.1Mt of foreign cement at huge expense to our balance of payments. We will increase our exports substantially in 2017," said chief executive officer Onne van der Weijde. He added that despite some local and temporary disruptions in Ethiopia and Tanzania, the cement producer strengthened its market share in every country in which it operates. Operations are also due to start in the Republic of Congo and Sierra Leone in 2017.

By region, Nigeria's economy entered into a recession in 2016. Dangote Cement increased its domestic sales volumes by 11.1% to 14.8Mt from 13.3Mt, although it said that its fourth quarter was hit by a price increase in September 2016. Despite the poor economic situation in the country, it said that overall cement sales grew by 5.7% in 2016. Outside of Nigeria it increased its cement volumes by 54% to 8.64Mt from 5.61Mt, aided by the opening of a plant in Tanzania.

Syria: LafargeHolcim acknowledges conduct was 'unacceptable'

LafargeHolcim has accepted that its conduct at a cement plant in Syria in 2013 and 2014 was 'unacceptable.' An internal investigation by the group into Lafarge's behaviour has reported that staff committed 'significant errors in judgment.' The probe, supervised of the Finance and Audit Committee of the Board, found that the Lafarge subsidiary appears to have provided funds to third parties to work out arrangements with a number of armed groups, including sanctioned parties, in order to maintain operations and ensure safe passage of employees and supplies to and from the plant. The investigation could not establish with certainty the ultimate recipients of funds beyond those third parties engaged. However, LafargeHolcim says that it believes its staff acted in a manner they believed was in the best interests of the company and its employees.

Qatar: QNCC to commission new mills

Qatar National Cement Company (QNCC) plans to commission two cement mills for its Plant 5 during the first half of 2017 to increase its production capacity to 5500t/day. Construction work on the kiln will then be completed in the second half of the year. The company intends to increase its production capacity of washed sand and calcium carbonate to capture an anticipated rise in market demand. It also intends to sell its Plant 1 to Umm Bab following an agreement in mid-2016.

The cement producer's revenue fell by 2.6% year-on-year to US$313m in 2016 from US$321m in 2015. Its cement sales volumes fell slightly to 3.7Mt during the period. Its net profit rose by 2.3% to US$130m from US$127m.

Tanzania: Export based plant to be built

China's Sinoma will build a US$1bn cement plant in the coastal city of Tanga for Hengya Cement. It will focus on exports, wth 70% of cement heading to Somalia, Kenya, Mozambique, Sudan, the Democratic Republic of Congo and Uganda. Construction at the site is expected to start in May 2017.

Tunisia: Government to sell Carthage stake

Finance Minister Lamia Zribi has said that the Tunisian government has decided to sell its share in Carthage Cement. It owns an around 41% of the cement producer. Zribi said that the decision was due to financial problems at the company, as well as issues with production and exports. Carthage Cement's chief executive Ibrahim Sanaa has blamed a rise in production costs on a poor construction market and production overcapacity.

Above: Inside a linear storage building at Carthage Cement.

Algeria: Surplus on the horizon

Serge Dubois, the head of communications at LafargeHolcim Algeria, says that Algeria faces a cement production overcapacity of 10Mt/yr by 2019. He said that the country will overproduce 1Mt in 2017 and that it imported 3.5Mt in 2016. LafargeHolcim intends to diversify its product range to cope with this anticipated production glut, with a focus on roads, airports and industrial users.

Peter Edwards, Global Cement Magazine

The cement industries of central Africa

Africa has been the scene of rapid cement sector development in the past few years. Here, we look at a central belt of countries, stretching from Nigeria in the west to Ethiopia in the East, that also takes in Cameroon, the Central African Republic, the Republic of Congo, Djibouti, Equatorial Guinea, Eritrea, Gabon, Kenya, South Sudan and Uganda.

Cameroon

The modern Republic of Cameroon comprises the former French Cameroon, which gained independence from France in 1960, and British Cameroon, which merged with the former French territory in 1961. The country has moderate oil reserves and is a significant exporter of agricultural products.

The country's political situation is dominated by the long-standing President Paul Biya, who has ruled the country since 1982 and has twice changed the constitution to extend his presidency.

Biya's stance has become increasingly authoritarian of late. In March 2017 he ordered that the state-controlled internet be shut down in English speaking areas after protests over the domination of French in public life. The country has a history of oppressing anglophone political interests, with the separatist Southern Cameroons National Council declared illegal in 2001. As Biya is 84, questions over how competing political groups will conduct themselves upon his death are increasingly pertinent.

Cement industry

Cameroon has two active integrated cement plants that share 2.1Mt/yr of capacity, as well as 3.1Mt/yr of grinding capacity from a further three grinding plants (See Figure 1 and Table 1). A further 1Mt/yr of integrated capacity was due to have come online at Mira Cement's plant in Douala in 2016, although this has not been confirmed. Most of Cameroon's capacity has been added in the past few years and the country now restricts imports.

Cimencam: In terms of capacity the market leader is Les Cimenteries du Cameroun (Cimencam), 54.73% owned by LafargeHolcim Maroc Afrique, itself a joint venture of LafargeHolcim and the Morocco-based Société Nationale d'Investissement. With 2.6Mt/yr across one integrated plant and one grinding plant, it commands 50% of national capacity. It is also the oldest producer in the country, operating since 1963. In the future, Cimencam is set to add a further 0.5Mt/yr grinding plant at Yaoundé. Construction is being carried out by China's CBMI, with commissioning scheduled for the summer of 2018.

Dangote Cameroon: Nigerian cement producer Dangote Cement has operated a 1.5Mt/yr cement plant in Douala since August 2015. The plant was constructed by China's Sinoma and, at the time, was described as the first part of an eventual two stage, 3Mt/yr project by CEO Aliko Dangote.

Despite this relatively new presence, Dangote was criticised in February 2017 for allegedly undercutting its domestic rivals by illegally importing cement from neighbouring Nigeria. According to the Business in Cameroon journal, this has led to a 40% price disparity for cement between cheaper cement in the north and more expensive cement in the south of Cameroon.

Mira: Mira Cement is reportedly undergoing the final stages of constructing a 1Mt/yr integrated cement plant in Douala, which is being built by the Shandong Design and Research Institute of China. According to its website, the plant was expected to be commissioned by the close of 2016, although news of this has not yet been announced.

Medcem: Turkey's Eren Holdings has operated a 0.6Mt/yr cement grinding plant in Douala via Medcem Cameroon since 2015, although production was halted briefly before official commissioning in December 2016. The plant is now up and running.

CIMAF: Ciments d'Afrique (CIMAF), part of Morocco's Addoha Group, has operated its 0.5Mt/yr integrated cement plant since late 2015. At the time that the project was inaugurated, it was suggested that the plant would increase to 1Mt/yr 'in the near future,' although no update has since been provided.

Central African Republic

Like French Cameroon, the Central African Republic (CAR) gained independence from France in 1960. The CAR has since suffered from almost constant political unrest, several military dictatorships and periods of widespread lawlessness, which remains the case in many regions outside of the capital Bangui.

Cement industry

The CAR has no cement production infrastructure, although Indian firm Jaguar Overseas was involved in the construction of a 0.4Mt/yr cement plant at Bangui between 2013 and early 2014. Construction was nearly finished but around 100 Indian labourers had to be evacuated on security grounds. Two plant workers had earlier been killed. Jaguar Overseas was able to return to the site in June 2016 to assess damage caused to the plant and a report is expected.

Congo

Not to be confused with its larger former Belgian neighbour (DRC), the Republic of the Congo is a former French colony that gained independence in 1960. It has since seen a variety of Marxist and democratic governments, with relative stability since 2003. It is a moderate oil producer, with oil and related activities contributing the vast bulk of national income, although revenues are gradually being diversified.

Cement industry

SONOCC: Société Nouvelle de Ciment du Congo (SONOCC) currently operates an integrated cement plant in Madingou, Bouenza. It is the oldest cement producer in the country and underwent an expansion from 0.12Mt/yr to 0.3Mt/yr in 2014.

Dangote Cement: The Republic of Congo will join Dangote Cement's many international markets when the company's 1.5Mt/yr Mfila plant is commissioned. The plant was originally due for commissioning in December 2016 but recent reports from the company now allude to start-up later in 2017.

Djibouti

Djibouti is a small east African country in the Horn of Africa that borders Eritrea, Ethiopia, Somaliland (Somalia) and the Gulf of Aden. It was formed in 1977 after the French Territory of the Afars and Issas gained independence. A single party regime gave way to multi-party elections in 2001. The country is strategically located at the meeting point of the Red Sea and the Gulf of Aden, acting as an important transhipment hub for international trade between Africa, the Middle East, East Africa and further afield.

Cement industry

Cimenterie d'Ali Sabieh: The first cement producer by a matter of a few weeks, Cimenterie d'Ali Sabieh was established in 2012 and began producing cement at Ali Sabieh in February 2013. It can produce 0.24Mt/yr of OPC from its grinding plant in the capital Djibouti using imported clinker.

Nael Cement Products: Nael Cement is part of UAE-based company Nael General Contracting Establishment. It began producing cement from its 0.22Mt/yr grinding plant in March 2013, as well as a range of pre-cast concrete products such as floor tiles.

Equatorial Guinea

Equatorial Guinea comprises a small area of mainland Africa and a series of islands, including Bioko, the location of the capital Malabo. It gained independence from Spain in 1968 and operates as a one party state. The President has almost complete control.

Equatorial Guinea has seen its GDP rise dramatically following the discovery of oil reserves. GDP/capita rose from US$1970 in 2000 to a peak of US$28,937 in 2012, although it has since fallen back sharply due to the subdued oil price.

Cement industry

Equatorial Guinea does not have any cement production facilities, although Denmark's FLSmidth was awarded a contract to build a 3000t/day (1Mt/yr) integrated greenfield cement plant for Grup Abayak AKOGA Cemento in May 2013. The contract included supply of plant engineering and all main equipment, including jaw crusher, cone crusher, ATOX® raw mill, OK cement mill, pyroprocessing line with cross bar cooler, dosing systems, filters, packing plant and automation control system. It was expected to be complete by the close of 2016, although no announcement on the project's progress has since been made.

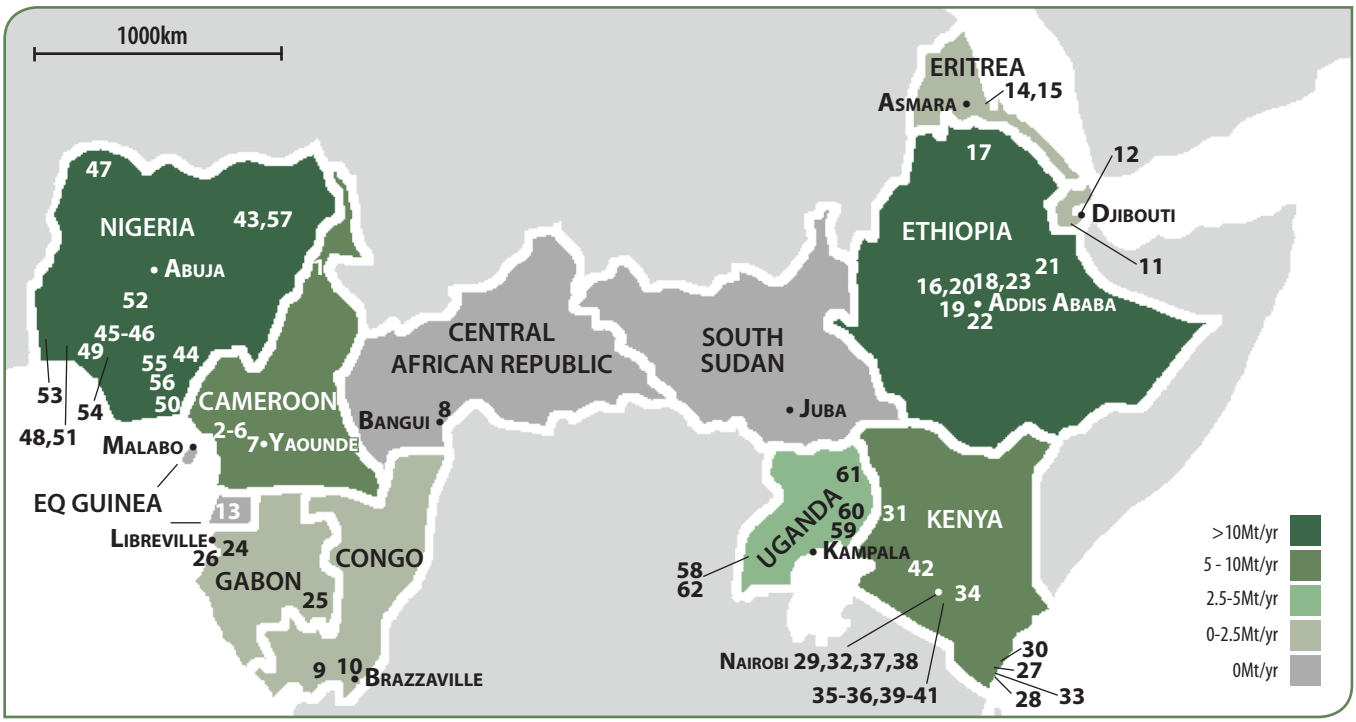
Eritrea

Independent from Ethiopia since 1993, Eritrea is a one party state and has never held elections. The country's economy is dominated by subsistence agriculture, which is hindered by unreliable rains and a lack of reform. The situation is exacerbated by the departure of many young people due the country's compulsory national service. Although it officially lasts 18 months, it is often indefinite and has been described by Amnesty International as 'forced labour.'

Cement industry

Gedem Cement: Eritrea's largest cement plant is operated by Gedem Cement. It can produce 0.3Mt/yr of Portland cement, sulphate-resistant cement and pozzolanic cement, both for the domestic market and for exports to the Middle East. It is of a Chinese design and has operated since August 2011.

Massawa Cement: Massawa Cement operates a 45,000t/yr cement plant in Massawa. It has been in production since the early 1990s.



Above - Figure 5: Map of central Africa, with locations of cement plants. Plants numbered according to Table 1. Countries are colour-coded by installed cement production capacity.

Ethiopia

The only African territory not to be colonised by European powers, Ethiopia's monarchy was overthrown by a military junta in 1974. After taking over, the military set up a socialist state. During the 1970s and 1980s inaction and neglect by the government amplified the severity of the 1983-1985 famine that claimed 400,000 lives. In 1991 a diverse opposition group overthrew the socialist system. It drew up a constitution in 1994 and held free elections in 1995 for the first time. Ethiopia's GDP has since grown rapidly, although it remains in the bottom 20% within Africa in GDP/capita terms.

Cement industry

Ethiopia's cement sector is second in size only to Nigeria in the countries in this review, with five active integrated plants, one active grinding plant and two integrated plants that are either under construction or undergoing commissioning. The country has a capacity of 10.76Mt/yr, much of which is very recent.

Messebo Cement: Messebo Cement has operated an FLSmidth plant in Mekelle, near Messebo, since 2001. Originally able to make 2.2Mt/yr, it was expanded to 3.2Mt/yr by a Chinese company in 2011.

Derba Midroc: Located 70km from Addis Ababa, Derba Midroc Cement, operated by Midroc Ethiopia was commissioned in January 2012. The integrated plant can produce 2.5Mt/yr of cement.

Mugher Cement: State-owned Mugher Cement operates a 1.4Mt/yr capacity integrated cement plant in Mugher, Oromia. It has a total capacity of 1.4Mt/yr from three lines that were installed in 1984, 1990 and 2011.

Mugher Cement also leases the Addis Ababa plant to Avorniga, an Israeli company that imports cement via Djibouti. The site was previously an integrated site, but the kilns are no longer used.

Dangote Cement: As part of its pan-African expansion, Nigeria's Dangote Cement has operated a 2.5Mt/yr cement plant at Mugher, Oromia since the middle of 2015.

In February 2017 Dangote announced that it would construct a 120 million bag/yr bagging plant and a third silo at the plant. The bagging plant will be completed by July 2017 and the silo will be built by the third quarter of the year. In the longer term, Dangote plans to double the plant's capacity to 5Mt/yr.

National Cement: National Cement began to make cement at the renovated former Dire Dawa Cement plant in 2012. It can produce 1Mt/yr of cement.

Habesha Cement: 51% owned by South Africa's PPC, Habesha Cement is due to launch its 1.4Mt/yr capacity integrated plant at West Shoa, Oromia, in the second quarter of 2017. As of November 2016, the overall project progress was reported as above 80%, with civil construction 94% complete, mechanical erection at 66% and 95% of equipment delivered.

Ethio Cement: The Ethio Cement project was also launched in 2009 with the aim of constructing a 1.4Mt/yr cement plant, but appears to have made little progress since.

	No	Company	Location	Type	Status	Mt/yr
Cameroon	1	Cimencam	Figuil	I	A	1.6
	2	Cimencam	Douala	G	A	1.0
	3	CIMAF	Douala	I	A	0.5 (1.0)
	4	Mira Cement	Douala	I	U/C (2017)	1.0
	5	Medcem Cement	Douala	G	A	0.6
	6	Dangote Cement	Douala	G	A	1.5
	7	Cimencam	Yaoundé	G	U/C (2018)	0.5
					CAMEROON ACTIVE TOTAL	5.2
CAR	8	Jaguar Overseas	Bangui	U	U/C & D	0.4
Congo	9	SONOCC	Madingou	I	A	0.3
	10	Dangote Cement	Mfila	I	U/C (2017)	1.5
					CONGO (REP) ACTIVE TOTAL	0.3
Djibouti	11	Cim d'Ali Sabieh	Ali Sabieh	G	A	0.24
	12	Nael Cement	Djibouti	G	A	0.22
					DJIBOUTI ACTIVE TOTAL	0.46
E G'nea	13	Grup Abayak AKOGA Cemento	Mainland	I	U/C	1.0
Eritrea	14	Gedem Cement	Massawa	I	A	0.3
	15	Massawa Cement	Massawa	I	A	0.045
					ERITREA ACTIVE TOTAL	0.345
Ethiopia	16	Mugher Cement	Mugher	I	A	1.4
	17	Messebo Cement	Mekelle	I	A	3.2
	18	Derba Midroc	Chancho	I	A	2.5
	19	Habesha Cement	West Shoa	I	U/C (2017)	1.4
	20	Dangote Cement	Mugher	I	A	2.5 (5.0)
	21	National Cement	Dire Dawa	I	A	1.0
	22	Avorniga	Addis Ababa	G	A	0.16
	23	Ethio Cement	Chancho	I	U/C	1.4
					ETHIOPIA ACTIVE TOTAL	10.76
Gabon	24	CimGabon	N'Toum	I	A	0.3
	25	CimGabon	Franceville	G	A	0.24
	26	CimGabon	Libreville	G	A	0.4
					GABON ACTIVE TOTAL	0.94

	No	Company	Location	Type	Status	Mt/yr
Kenya	27	ARM Cement	Kaloleni	I	A	0.7
	28	Bamburi Cement	Mombassa	I	A	1.1
	29	EAPCC	Nairobi	I	A	1.3
	30	Mombasa Cement	Vipingo Ridge	I	A	1.0
	31	Cemtech (Sanghi)	Sebit	I	U/C (2018)	1.2
	32	Dangote Cement	Nairobi	I	P (2021)	1.5
	33	Dangote Cement	Mombasa	I	P (2021)	1.5
	34	ARM Cement	Kitui	I	P or U/C	2.5
	35	Mombasa Cement	Athi River	G	A	0.6
	36	Bamburi Cement	Athi River	G	A	1.5
	37	Bamburi Cement	Nairobi	G	P	1.0
	38	National Cement	Nairobi	G	A	0.2
	39	ARM Cement	Athi River	G	A	1.0 (1.5)
	40	Savannah Cement	Athi River	G	A	1.2 (2.4)
	41	Karsan Ramji & Sons	Athi River	G	A	0.22
	42	Karsan Ramji & Sons	Nakuru	G	U/C	0.22
					KENYA ACTIVE TOTAL	8.82
Nigeria	43	Ashaka Cement	Ashaka	I	A	0.9 (3.9)
	44	Dangote Cement	Benue	I	M	4.0
	45	Edo Cement (BUA)	Okpella New	I	A	3.0 (3.5)
	46	Edo Cement (BUA)	Okpella Old	I	A	0.5
	47	Sokoto Cement (BUA)	Kalambania	I	A	0.5 (1.5)
	48	Lafarge Africa	Ewekoro	I	A	1.1
	49	Lafarge Africa	Samagu	I	A	0.9
	50	UNICEM	Calabar	I	A	5.0 (7.5)
	51	Lafarge Africa	Ewekoro	I	A	2.5
	52	Dangote Cement	Obajana	I	A	13.3
	53	Dangote Cement	Ibese	I	A	12.0
	54	CCNN (BUA)	Sagamu	I	A	5.5
	55	Ibeto Cement	Enugu	I	U/C	2.2
	56	Ibeto Cement	Effium	I	U/C	5.0
	57	Ashaka Cement	Gombe	I	A	0.9 (3.0)
					NIGERIA ACTIVE TOTAL	46.1
Uganda	58	Hima Cement	Kasese	I	A	0.9
	59	Tororo Cement	Tororo	I	A	1.8 (3.0)
	60	National Cement	M'Bale	I	U/C	1.0
	61	Moroto Ateker	Karamoja	I	U/C	1.0
	62	Hima Cement	Nyakesi	G	U/C	1.0
					UGANDA ACTIVE TOTAL	2.7
					Active Integrated Total for all Countries	66.5
					Active Grinding Total for all Countries	9.1
					ACTIVE TOTAL FOR ALL COUNTRIES	75.6

Table 1: Cement industry of Central African countries. **Source:** *Global Cement Directory 2017.*

Notes:
Mt/yr column refers to capacity
(Future capacities of expanding facilities shown in brackets)

I = Integrated
A = Active
D = Damaged
G = Grinding
M = Mothballed
P = Planned

U/C = Under construction
(With start date where known)

Gabon

A former French colony following independence in 1960, Gabon has become one of the region's more stable countries. For more than 40 years it was ruled by President Bongo until his death in 2009. Bongo's son assumed power following an election. The country has a high GDP for west Africa but distribution is very uneven. A reliance on mineral wealth, particularly manganese, and oil exports provided significant growth in the early part of the 21st Century, but sustained low commodity prices and reducing oil reserves threaten Gabon's status quo.

Cement industry

The cement industry of Gabon is totally dominated by CimGabon, a part of Morocco's Ciments d'Afrique (CIMAF). It took over the operation of the former HeidelbergCement assets at N'Toum (0.3Mt/yr wet integrated) and Franceville (0.4Mt/yr grinding) in 2014 and added a second 0.24Mt/yr grinding mill from Fives FCB at Libreville in June 2016.

Kenya

Modern Kenya traces its history to independence from Britain in 1963. For the first 15 years, power was held by Jomo Kenyatta under a de-facto one party state until his death in 1978, when power passed to Daniel Moi. Under international pressure, one party rule ended in 1991, although Moi retained power in two election cycles to 2007. The 2007 election was marred by accusations of electoral fraud and ethnic violence. Kenyatta's son Uhuru Kenyatta, won the 2013 election, which was also affected by violence.

Cement industry

Kenya has the third-largest cement sector by installed capacity of the countries listed here after Nigeria and Ethiopia. It has four active integrated plants that share 4.7Mt/yr of capacity, plus five active grinding plants that add a further 4.12Mt/yr.

ARM Cement: Based in Athi River, ARM Cement operates one integrated (0.7Mt/yr) cement and one grinding (1.0Mt/yr) cement plant in Kenya, as well as others in Tanzania via its Tanga Cement subsidiary. The company was founded in 1974 and has been a major force in the Kenyan cement sector.

At present, ARM is constructing a second 2.5Mt/yr integrated plant at Kitui, a project that has had a difficult birth since it was first announced in 2013. In February 2017 it also announced that it was set to increase its Athi River grinding plant's capacity by 50% to 1.5Mt/yr. The new grinding capacity will use clinker from Tanga Cement in Tanzania.

Bamburi Cement: Established in 1951 Bamburi Cement has been part of Cementia, Blue Circle, Lafarge (since 1989) and now LafargeHolcim, which retains a 58.6% interest. It operates a 1.1Mt/yr integrated plant in Mombasa, and a 1.5Mt/yr grinding plant in Athi River, near Nairobi. In February 2017 it ordered a 1.0Mt/yr grinding plant from Chinese manufacturer CBMI. The new plant will be located in Nairobi.

EAPCC: East Africa Portland Cement Company (EAPCC) began as a cement importer and clinker grinding company in the 1930s, importing clinker from the UK and India. It commissioned its first kiln in 1957, giving the company the capability to make 0.15Mt/yr. A second kiln was added in 1974, doubling capacity to 0.3Mt/yr and mill upgrades took capacity to 0.6Mt/yr by the late 1990s. In 1997 the plant commissioned a dry process line, with the capacity unchanged due to grinding restrictions. In the 2000s further grinding capacity moved capacity up to 1.3Mt/yr.

Mombasa Cement: Established in 2007, Mombasa Cement operates a 1.0Mt/yr integrated cement plant at Vipingo Ridge and a 0.6Mt/yr grinding plant in Athi River. In January 2017 Mombasa Cement announced that it would build a 36MW wind farm by its plant in Vipingo. Power from the unit will be used for the company's cement plant and sold to Kenya Power, according to the Daily Nation newspaper. The project will consist of 12 3MW turbines and it is estimated to cost US$2.5m.

Cemtech Kenya: Part of India-based Sanghi Group, Cemtech has been attempting to set up a 1.2Mt/yr integrated cement plant in Pokot since 2010. After six years, the construction phase finally began in January 2016. A date for completion is not known, but *Global Cement* estimates that construction is unlikely to be complete before 2018 at the very earliest.

Dangote Cement: In its 2016 Annual Report Dangote Cement states that it plans to establish two 1.5Mt/yr integrated cement plants in Kenya, one near Mombasa and one near Nairobi, in the period to 2021.

National Cement: Part of Devki Group, National Cement was established in 2008. It operates a 0.2Mt/yr grinding plant in Nairobi, with plans to expand the plant in the near term.

Savannah Cement: Savannah Cement has operated a 1.2Mt/yr clinker grinding plant in Athi River since July 2012. In November 2016 it released details of a planned upgrade to 2.4Mt/yr via the addition of a new vertical roller mill. The project is expected to be complete by March 2018 and will be commissioned during the second quarter of that year.

Karsan Ramji & Sons: Mining firm Karsan Ramji & Sons made the move into cement production with the commissioning of its 0.22Mt/yr Athi River grinding plant in June 2015. The company is now constructing a second 0.22Mt/yr grinding plant at Nakuru.

Nigeria

Nigeria gained independence from the UK in 1960 but endured mainly military rule for the next 38 years until a peaceful transfer to civil government in 1998.

The country has Africa's largest economy, in which oil revenues are the major income. Falling oil

prices in the past few years have led to a downturn in the country, however, which has been exacerbated by devaluation of the Niara currency and long-standing problems with corruption and security due to the Islamic group Boko Haram that affect the north of the country.

Cement industry

Nigeria's cement sector, with 46.1Mt/yr of active capacity, is the second-largest in Africa after that of Egypt (79Mt/yr). There are a total of 12 active integrated plants, plus two that are under construction and one that is mothballed.

Dangote Cement: Nigeria's cement production capacity is dominated by Dangote Cement, which has three integrated cement plants that share an incredible 29.3Mt/yr. Its 4Mt/yr Benue Cement plant, very large by normal standards, is dwarfed by both its Ibese and Obajana facilities, which have capacities of 12.0Mt/yr and 13.3Mt/yr respectively. The Benue plant was acquired during a privatisation drive, although Dangote's Annual Report for 2016 says that the plant was mothballed for much of 2016 due to higher efficiencies at its other two plants and the fact that these 'benefit from pioneer tax status.' Obajana opened as a 5Mt/yr facility in 2008 and Obese began production in February 2012 as a 6Mt/yr plant.

Despite these incredibly large plants, Dangote reports that it produced 15.1Mt of cement in 2016, indicative of a 52% capacity utilisation rate, or a rate of 60% once the mothballed Benue capacity is removed from the calculation. The company's earnings before interest, taxation, depreciation and amortisation (EBITDA) fell by 2% year-on-year to US$817m in 2016 from US$834m in 2015. However, its sales revenue rose by 25.1% to US$1.95bn from US$1.56bn and its sales volumes of cement rose by 25% to 23.6Mt from 18.9Mt.

The year was notable for the country, as well as Dangote, as Nigeria became a net exporter of cement. "We exported nearly 0.4Mt into neighbouring countries and in doing so, we achieved a great milestone by transforming Nigeria into a net exporter of cement," said CEO Onne van der Weijde. "This is a remarkable achievement, given that only five years ago, Nigeria was one of the world's largest importers, buying 5.1Mt of foreign cement at huge expense to our balance of payments."

Dangote Cement also operates cement capacity in Senegal, Ethiopia, Zambia, Congo and Cameroon and has aims to produce cement in Mali, Liberia, Ivory Coast, Ghana, Nepal and Zimbabwe by the early 2020s.

Lafarge Holcim: Part of LafargeHolcim, Lafarge Africa operates cement plants in Nigeria and South Africa. In Nigeria it operates three integrated plants under the Lafarge Africa banner, two of which are directly adjacent to one another. The three share a total capacity of 4.5Mt/yr. Lafarge Africa also operates two 0.9Mt/yr plants via its Ashaka Cement unit.

Lafarge Africa's current 6.3Mt/yr capacity will be bolstered in future with the construction of a further 3.0Mt/yr line at the Ashaka plant and a further 2.1Mt/yr of capacity at its Gombe (Ashaka Cement) plant. This will increase Lafarge Africa's capacity to 11.4Mt/yr.

Complicating the picture further, LafargeHolcim also has a 50% stake in UNICEM, which operates a 5.0Mt/yr capacity integrated cement plant in Calabar, Cross River State. The plant has two 2.5Mt/yr production lines, the most recent of which was commissioned at the end of 2016. A third 2.5Mt/yr is expected to follow.

At present, the combined capacity of Lafarge Africa, Ashaka Cement and UNICEM is 11.3Mt/yr, rising to 18.9Mt/yr when the above projects are completed.

BUA Group: BUA Group directly owns Edo Cement which operates two cement plants in Okpella, Edo State. The older of the two has a capacity of 0.5Mt/yr, while its modern cousin has 3.0Mt/yr of capacity. It is in the process of expanding to 3.5Mt/yr. BUA Group also indirectly owns Sokoto Cement (0.5Mt/yr), which is part of its Cement Company of Northern Nigeria (CCNN) subsidiary.

Ibeto Cement: A cement importer since 2001, Ibeto Cement is in the process of renovating the former Nigercem plant in Effium, Ebonyi State. It is constructing a modern 5.0Mt/yr line on the site, which last produced cement in the 1990s.

In October 2015, Ibeto Cement reported that it had contracted China's Sinoma to build a US$386m, 2.2Mt/yr integrated cement plant in Enugu state. It appears that the plant remains under construction.

South Sudan

Having gained its independence from Sudan on 9 July 2011, South Sudan continues to be blighted by political instability, the presence of armed militias and many aspects of the difficult relationship with Sudan that saw it secede in the first place. In January 2012 it limited its own oil production following disputes with its northern neighbour. It is now in the grip of a humanitarian crisis following internal conflicts that ended in the promise of a government of unity in 2015. However, as of early 2017 this has not been realised.

Cement industry

South Sudan has no cement production facilities and imports cement. In 2013 Dangote Cement stated that a 1.5Mt/yr capacity South Sudanese cement plant would come online by the close of 2016 but this has

not been built to date. It now seeks to export cement to South Sudan from its new Ethiopian unit.

Uganda

Independent from the UK since 1962, Uganda's modern history is indelibly marked by the reigns of dictators Idi Amin (1971 -1979) and Milton Obote (1980-1985). Relative stability has been achieved since 1986, although multi-party politics were outlawed until 2005.

The economy of Uganda has historically been based in its mineral wealth and agriculture, thanks to a combination of rich soils and reliable rainfall. It recently struck oil, which is expected to add to revenues in the coming years.

Cement industry

Uganda's cement sector is relatively small, with two operational integrated plants that share 2.7Mt/yr of capacity. A further 3.0Mt/yr of capacity is expected to come online shortly in the form of two further integrated plants and one grinding plant.

Tororo Cement: The oldest and largest cement producer in Uganda, Tororo Cement was founded in 1952 under the auspices of Uganda Cement Industries. In 1995 the company was privatised and renamed Tororo Cement. This period brought significant investment as the 1950s wet kiln was scrapped and replaced with a dry line of twice the capacity (1.8Mt/yr).

In July 2015 it was announced that the plant would undergo further expansion to 3Mt/yr through the addition of a new mill and other handling facilities, although a new kiln was not mentioned. This suggests that the existing plant set-up is severely cement limited. No announcement has since been made regarding progress of the expansion project.

Hima Cement: Hima Cement is a 71.01% subsidiary of LafargeHolcim via Bamburi Cement. It operates a 0.9Mt/yr cement plant in Kasese. Like Tororo Cement, it was part of Uganda Cement Industries prior to privatisation in 1994.

Production increased under new owners Hima Cement from just 20,000t/yr to 0.25Mt/yr before Lafarge (and its subsidiary Bamburi Cement) bought the company in 1999. In 2010 the plant underwent a significant overhaul to a single 0.9Mt/yr dry process cement kiln.

The company continues to expand, having broken ground on its US$40m, 1.0Mt/yr grinding plant in January 2017. The plant is being supplied by China's CBMI Construction.

National Cement: In April 2015 Kenya's National Cement announced that it would construct a US$200m, 1.0Mt/yr integrated cement plant at Mbale, its first plant outside of Kenya. The progress of the project is currently unclear, as no further updates have been provided.

Moroto Ateker Cement: In October 2016 it was announced that the Ugandan government intends to build a cement plant in Karamoja in partnership with Moroto Ateker Cement. It has contracted India's Saboo Technologies to build the cement plant in the Moroto Industrial Park.

The same plant was earlier mooted as 'Moroto Cement,' according to a self-contradictory Wikipedia entry. That project was reported to have a capacity of 1.0Mt/yr and was due to have been completed in 2013.

Summary and Future

The cement sectors of these 12 countries currently share 76.1Mt/yr of cement production capacity for a population of 401.9 million. In lieu of reliable per-capita consumption data, this gives a headline capacity per capita of 174kg, far below per-capita consumption of developed markets (typically >300kg/capita). In its 2016 Annual Report, Dangote Cement calculates that its pan-African footprint had average per-capita consumption of 112kg in 2016.

There is clearly significant room for growth in many of these markets. Indeed a total of 13.8Mt/yr of plant expansion projects and 21.1Mt/yr of greenfield capacity (34.9Mt/yr in total) is expected to come online in the next five years. In some countries the fundamental demand will continue to be tempered by political, economic and infrastructure hurdles, although the market offers great potential for experienced regional players.

Below - Table 2: Summary of cement industries of the Central African countries in this report. Populations from World Bank Data Indicators.

Country	Active Integrated (Mt/yr)	Active Grinding (Mt/yr)	Active Capacity (Mt/yr)	Population in 2013 (millions)	Cap/Pop (kg/capita/yr)
Cameroon	2.1	3.1	5.2	22.3	233
CAR	0.0	0.0	0.0	4.6	0
Congo (Rep)	0.3	0.0	0.3	4.4	68
Djibouti	0.0	0.46	0.46	0.87	529
Equatorial Guinea	0.0	0.0	0.0	0.76	0
Eritrea	0.345	0.0	0.345	6.3	54
Ethiopia	10.6	0.16	10.76	94.1	114
Gabon	0.3	0.64	0.94	1.67	562
Kenya	4.1	4.72	8.82	44.4	198
Nigeria	46.1	0.0	46.1	173.6	267
South Sudan	0.0	0.0	0.0	11.3	0
Uganda	2.7	0.0	2.7	37.6	71.8
TOTAL / MEAN	66.545	9.08	75.625	401.9	174

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 the latest prices, you should subscribe - **See page 40**. In this issue subscribers receive further information from several other countries not shown here.

India: According to Motilal Oswal, all India average cement prices increased by 1% month-on-month to US$4.43/bag (50kg) in February 2017, on the back of price increases in the north and east of the country. It reports that the north India average cement price is at a three-month high, with demand gradually improving. Supply disruptions at the Shree Cement plants in Bihar led to a spike in the east India average cement price. Meanwhile it reported that prices in the west of India remain subdued, with decade-low prices in Gujarat. In the south, prices are stable in Hyderabad and Chennai, though there is some price pressure evident in Vizag and Kozhikode.

Meanwhile, the Builders' Association of India (BAI) is calling on the Indian government to constitute a cement regulatory authority to break what it calls the 'cartel' in the cement industry and thereby bring down its price closer to the production cost.

In comments to The Hindu newspaper, the BAI's national president, Avinash M Patel said, "At present the cost of cement is around US$6.13/bag, while its original cost, including profit, could be as little as US$2.29/bag. The prices have been jacked up by at least three times. With cement being a major raw material for builders, the high price of cement has affected the growth of the industry."

Patel added that, if the government came up with cement regulatory authority on the lines of Real Estate Regulatory Authority, the price of cement would 'dive down steeply.'

Malaysia: Cahya Mata Sarawak Berhad (CMSB) group managing director Datuk Richard Curtis, has denied claims that the CMSB will increase prices. "Whenever there is pressure on the financial markets, rumours of price hikes surface for all materials. I am happy to record that CMS Cement has absolutely no plans to increase prices," he said.

Brazil: According to allegations, cement used to redevelop the Maracana Stadium in Rio de Janeiro before the 2014 FIFA World Cup was bought at *three times* the market price.

Egypt: Prices of Portland cement as at 21 March 2017. Arabian Cement Al Mosalah = US$40.33/t; Arabian Cement Al Nasr = US$40.00/t; Cemex Al Muhandis = US$42.62/t; Cemex Al Fahd = US$38.25/t; Building Materials Industries Co = US$39.23/t; ASEC Asic Cement = US$40.44/t; ASEC Horus Cement = US$39.89/t; Elnahda Cement = US$39.07/t; Wadi El Nile Cement = US$39.62/t; Lafarge = US$40.16/t; Medcom Aswan Cement = US$38.53/t; Arish Cement = US$39.24/t; Sinai Cement = US$39.07/t; National Cement = US$39.78/t; Suez Cement = US$40.33/t; Torah Portland Cement = US$38.25-40.60/t; Helwan Cement = US$40.60/t; Shora Cement = US$38.53/t; Misr Beni Suef Cement = US$39.78/t; South Valley Cement = US$39.34/t; Misr Cement Qena = US$38.53/t.

White cement prices as at 21 March 2017: Sinai White Cement = US$87.43-89.62/t; El Menya Cement - Royal = US$86.87-88.25/t; Menya Helwan Cement = US$87.16/t.

Blended cement prices as at 21 March 2017. Sinai Cement = US$37.43/t; National Cement Altawfir cement = US$37.16/t; National Cement Alwaha cement = US$38.41/t.

Sulphate-resistant cement prices as at 21 March 2017. Cemex Al Mukawem = US$43.17/t; ASEC Cement Asic Sea Water = US$41.80/t; Lafarge Kaher Albehar = US$42.79/t; Suez Cement Alsuez Sea Water = US$42.24/t; El Sewedy Cement = US$41.80/t.

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

FOB {+ the named port of origin} = Free On Board: The delivery of goods on board the vessel at the named port of origin (loading), at seller's expense. Buyer is responsible for the main carriage/freight, cargo insurance and other costs and risks.

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

ASWP = Any safe world port.

Conversions to US$ from local currencies are as at the time of original publication.

Postcapitalism? Better to make up your own mind...

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

I've recently read a book called '*Postcapitalism*,' by Paul Mason, which was subtitled 'A guide to our future.' The blurb on the front, written by Irvine Welsh, stated that it was 'The most important book about our economy and society to be published in my lifetime.' Having completed the book, I'm disinclined to believe the veracity of Mr Welsh's statement. However, the book did have some interesting points to make, which might impact on everyone involved in the global cement and building materials industry.

Paul Mason includes a great deal of history in his book, including large tracts of analysis on the evolution of Marxist thinking. He also gives a long introduction to the concept of Kondratiev Cycles (also called supercycles, great surges, long waves, K-waves or the long economic cycle), which are, according to Wikipedia[1], 'cycle-like phenomena in the modern world economy, ranging from forty to sixty years, and consisting of alternating intervals between high sectoral growth and intervals of relatively slow growth.'

The start of the latest Kondratiev Cycles are:

- The Industrial Revolution: 1771
- The Age of Steam and Railways: 1829
- The Age of Steel and Heavy Engineering: 1875
- The Age of Oil, Electricity, the Automobile and Mass Production: 1908
- The Age of Information/Telecommunications: 1971.

In *Postcapitalism*, Paul Mason suggests that we are at the start of a new Kondratiev Cycle, which will see the demise of capitalism, the dominant economic mode of our time. He suggests that we are entering into a new age of plenty, when there will be a tendency for the price of goods to drop to zero, due to increased automation and roboticisation. Once the cost of labour is taken out of the price equation for the cost of goods, then - with self repairing and self-replicating machines - the cost of goods will drop towards zero. Personally I think that this is rubbish. All goods have a variety of input costs, not all of which can be reduced to zero, and if goods did have zero price, then why would anyone want to produce them? Russia tried this with the collectivisation of its farms after 1928, when farmers were forbidden to profit from their own toil.[2] As a result, yields crashed and millions starved. It's only when profit can be gained that people will be bothered to get off their backsides and go out and do some work. It's human nature.

However, the number of jobs is decreasing in some countries and real wages are failing to keep in step with inflation, meaning that wages are falling in real terms. Paul Mason points out that Globalisation has created winners and losers, with the losers being those whose jobs have been outsourced to other countries, and the winners being those who are in charge of the outsourcing. The 'global elite' continue to do very well in this unequal world.

Postcapitalism comes alive when Paul Mason starts to get away from Marxist theory and instead starts to look at real-world impacts that are likely to radically alter today's economic systems. Firstly he suggests that global warming may completely re-shape the world, through changing where is considered habitable. Low-lying coastlines that might be prone to hurricanes or typhoons in a stormier world might have to become off-limits. Increasing desertification, or simply increasing temperatures, might make increasing parts of the world uninhabitable. The waves of refugees from these areas will threaten economic models around the world.

Secondly, he points out that populations around the world are ageing and that essentially we have not been saving up enough to look after our older people. Mason suggests that around 60% of the world's economies are already insolvent when you take future unfunded pension and social care liabilities into account.

His suggestion is that the world's dominant economic system will change, possibly slowly, possibly sharply, over to 'postcapitalism.' This system will have the following characteristics:

- High levels of material prosperity and wellbeing;
- A stabilised and much reduced finance sector;
- A low carbon and sustainable way of living;
- Widespread peer-to-peer projects, networking and collaborative and open-source working;
- Suppression of monopolies;
- Elimination of the global elites;
- Payment of a basic income to everyone;
- Near-ubiquity of robots and automation.

Mr Mason does not say what we are meant to do with all the time that we are going to have on our hands, once goods are free or nearly free, so that we don't have to go out to work to earn the money to buy them. (Forgive me for saying, but it sounds too good to be true). Perhaps, as a pass-time, you would like to start building castles in the air, like Paul Mason does in his book '*Postcapitalism*'.

1 https://en.wikipedia.org/wiki/Kondratiev_wave

2 https://en.wikipedia.org/wiki/Collectivization_in_the_Soviet_Union

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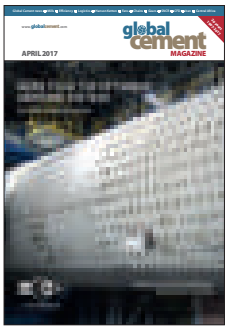

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