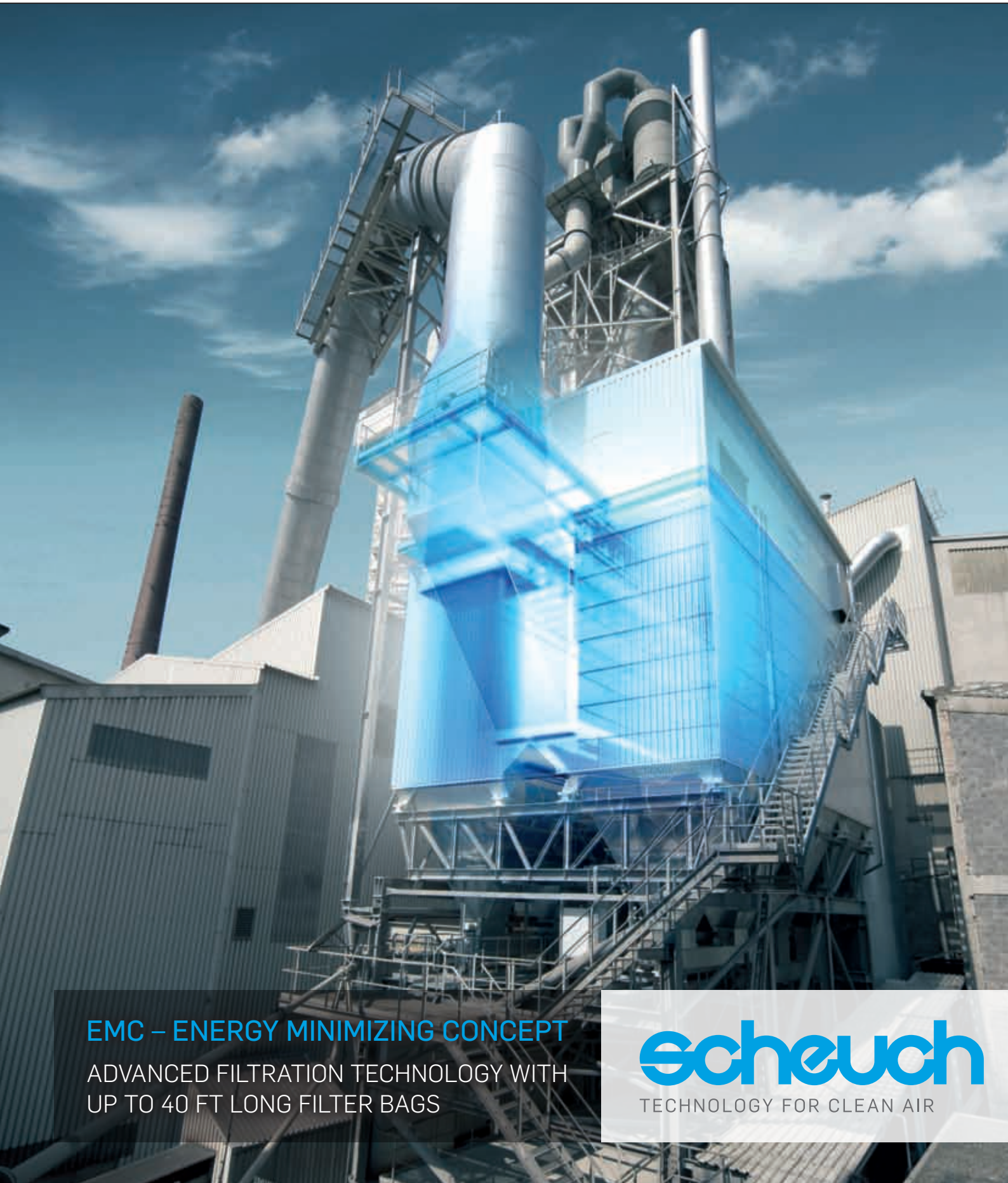
www.globalcement.com

global cement™ MAGAZINE

Contents Subscribe Ad Index

JUNE 2016



JOHN KING

CONVEYOR CHAINS & SPROCKETS WORLDWIDE

WORLD LEADERS IN MANUFACTURE OF SPECIALIST AND HEAVY DUTY CONVEYOR AND ELEVATOR CHAIN

Please come and **visit us** at **Hillhead 2016.**

28-30 June 2016, Hillhead Quarry, Buxton.

Main Pavillion stand number **PE1.**

All Enquiries Please contact
William Wadsworth
Email: ww@johnkingchains.co.uk
or **Robert Wood**
Email: rw@johnkingchains.co.uk

REG NO: FM77342

JOHN KING

POWERMOTION
Precision Laser Cut Components

John King Chains Limited
New Climax Works, Lancaster Business Park, Sherburn-in-Elmet LS25 6NS UK
Tel: (44) 1977 681 910, Fax: (44) 1977 681 899
Email: general@johnkingchains.co.uk Website: www.johnkingchains.com

Linking you to EXCELLENCE since 1926

This issue's front cover...

BREAKING THE MERCURY CYCLE WITH XMERCURY
In order to reduce mercury emissions, the Austrian company Scheuch GmbH developed a new technical innovation: the Xmercury split preheater system.

Plug & Play: From the first operation hour the Xmercury system shows excellent performance. The extremely low operating costs and the simple mode of operation are two of the solution's unbeatable advantages. Last but not least the technology comes from a company, that supplies everything from a single source – consultancy, engineering, comprehensive solutions and service.

For more information please check: **www.scheuch.com**

global cement MAGAZINE

www.globalcement.com

Exclusive Official Magazine for

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

Dear readers,

Welcome to the June 2016 issue of *Global Cement Magazine* - the world's most widely read cement magazine! As well as the latest global cement industry news, products and trends, this issue contains a wealth of articles and features.

Coinciding with the Hillhead quarrying and recycling show (featuring numerous live equipment demonstration and held in the bottom of an enormous quarry in beautiful Derbyshire, UK), you will find our annual review of the UK cement industry written by Edwin Trout of the Mineral Products Association and starting on page 48 of this issue. As always, *Global Cement Magazine* will exhibit at the Hillhead quarrying show (we'll be in the Pavilion) and the magazine will be widely distributed to attendees.

This issue features a plethora of articles on a variety of topics from around the cement industry. We start with a full review of the recent Global EnviroCem Conference in London (on page 8) which covered environmental impact abatement for the industry. Starting on page 16 we have articles on continuous emissions monitoring (by ABB, page 16), power distribution in cement plants (page 22), Çimsa Çimento's order of Aumund machines (page 24), enhanced grinding and performance for limestone Portland cements (page 25), news of a new zeolite-based well cement (page 29), Kalenborn's wear protection in action in France (page 32), dust suppression (page 33), the applications of SNCR and SCR in cement plants (page 36) and the latest contract and product news (page 40). In addition we have our usual round-up of news from around the globe as well as CEMBUREAU's view on the next steps for the EU ETS post-2020 (page 42).

Perhaps appropriately for an issue that looks at the UK cement industry, this month's 'Last Word' is on the pros and cons of EU membership for the UK. It's a finely-balanced argument for many citizens in the UK, although a show of hands at the recent Global Slag Conference showed that most European delegates would vote for their own countries to stay in the EU. However, I wonder what would be the outcome if the cement industry of each country had a vote? If you are in the EU, perhaps it's worth asking yourself, has the EU been good or bad for the cement industry (in your own country) overall?

We are currently planning our forthcoming issues and we're looking to feature exciting and innovative cement plants around the world. If you would like to spotlight your new cement plant - or upgrade project - then please contact me at rob@propubs.com.

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

Robert McCaffrey
Editorial director

Cement Industry Suppliers' Forum

MIX Paper from responsible sources FSC® C010219

Printed on Forest Stewardship Council (FSC®) certified papers by Pensord, a company with ISO 14001:2004 environmental certification.

Editorial Director
Dr Robert McCaffrey
rob@propubs.com
(+44) (0) 1372 840951

Web Editor
David Perilli
david.perilli@propubs.com
(+44) (0) 1372 840952

Commercial Director
Paul Brown
paul.brown@propubs.com
Mobile: (+44) (0) 7767 475998

Business Development Executive
Sören Rothfahl
soeren.rothfahl@propubs.com
Mobile: (+44) (0) 7850 669169

Deputy Editor
Jonathan Easton
jonathan.easton@propubs.com
(+44) (0) 1372 840967

Company manager
Sally Hope
sally.hope@propubs.com

Subscriptions
Amanda Crow
amanda.crow@propubs.com

Office administration
Jane Coley
jane.coley@propubs.com

For full details on article submission, please see:
www.GlobalCement.com

ISSN: 1753-6812
Published by Pro Global Media Ltd
First Floor, Adelphi Court 1 East Street,
Epsom, Surrey, UK KT17 1BB
Tel: +44 (0)1372 743837 (switchboard)
Fax: +44 (0)1372 743838

Global Cement articles

European cement

Cement in the Americas

Asian cement

Middle East and African cement

Regulars and comment

Hillhead 2016
28-30 June 2016, Buxton, UK
www.hillhead.com

BULKEX 2016
5-6 October 2016, Harrogate, UK
www.mhea.co.uk/bulkex-2016/

16th Global Gypsum Conference & Exhibition
25-26 October 2016, Bangkok, Thailand
www.GlobalGypsum.com

21st Arab-International Cement Conference and Exhibition
16-18 November 2016, Abu Dhabi, UAE
www.aucbm.com

11th Global CemFuels Conference & Exhibition
2-3 February 2017, Barcelona, Spain
www.CemFuels.com

2nd Global SynGyp Conference & Exhibition
30-31 March 2017, Düsseldorf, Germany
www.GlobalSynGyp.com

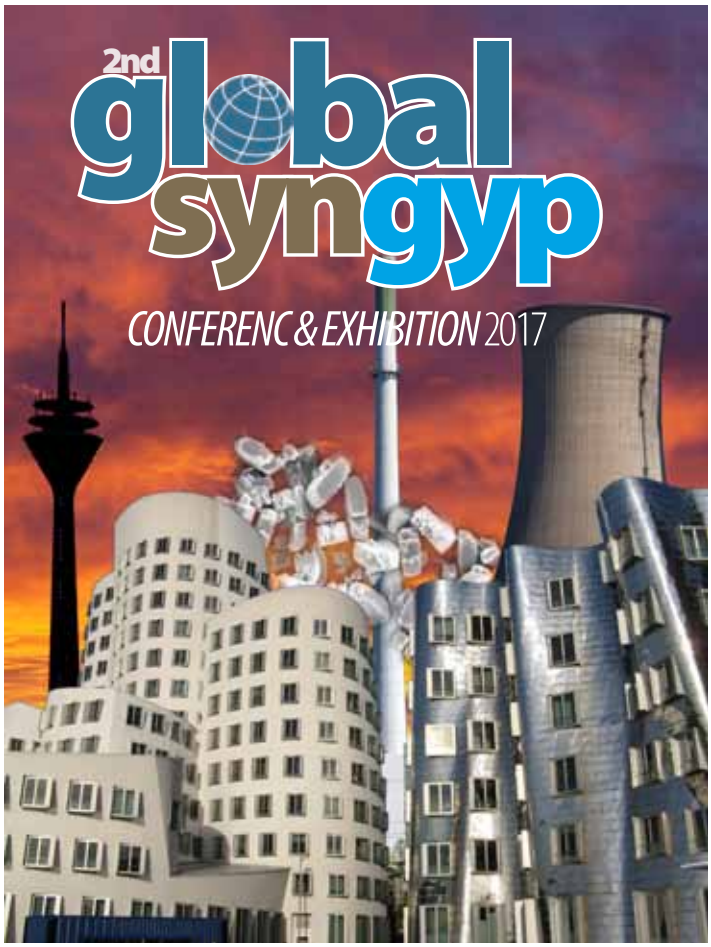
1st Global CemProcess Conference
24-25 April 2017, London, UK
www.CemProcess.com

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

More information on all events at...
www.Cement-Events.com

30-31 MARCH 2017 DÜSSELDORF



globalsyngyp.com
#syngyp

Global Gypsum is pleased to announce the second biennial Global SynGyp Conference and Exhibition, which will take place in Germany in March 2017. The event will once again bring together scrubber operators and other syngyp producers together with syngyp users, as well as equipment producers, shippers, traders, academics and analysts in one place, for information exchange, networking and business. Covering all types of synthetic gypsum (including FGD gypsum, also known as DSG and REA Gips), the event will look at the delicate balance between cost-effective flue gas desulphurisation and the production of a high-quality synthetic gypsum product that can be used by wallboard, cement, agricultural and other sectors.

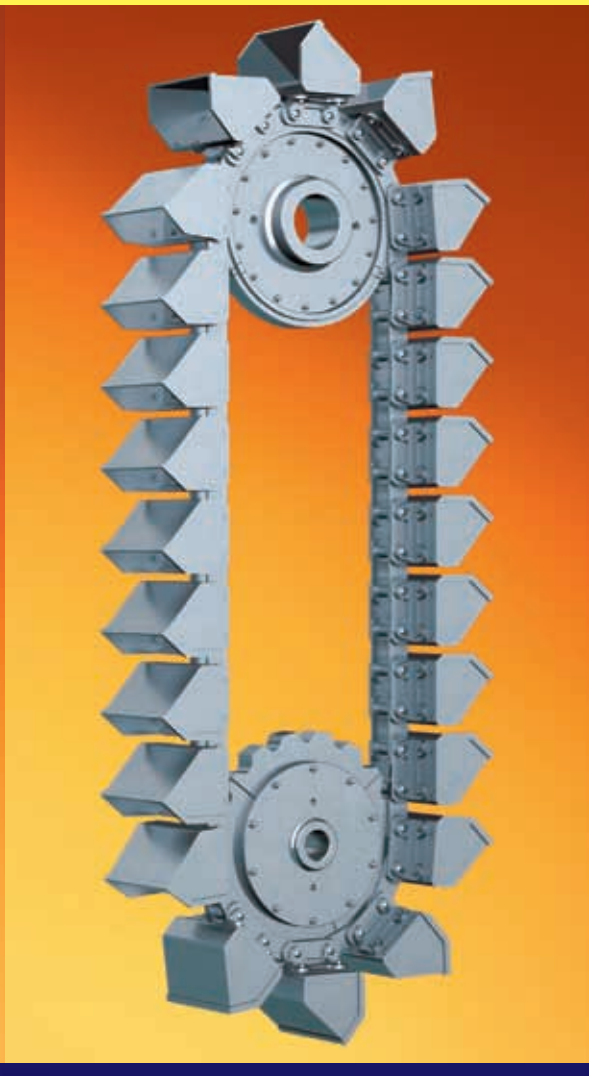
If your business involves synthetic gypsum, you must attend the 2nd Global SynGyp Conference and Exhibition in 2017!

HEKO®

HEKO components
for bucket elevators

- Round link chains
- Central chains
- Plate link chains
- Rollers and Sprockets
- Bearings
- Buckets

HEKO offers the whole range of chains and other wear parts for bucket elevators and chain conveyors. Proven in thousands of elevators and conveyors, worldwide.



HEKO Ketten GmbH

Eisenbahnstraße 2 | 58739 Wickede (Ruhr), Germany | Telephone +49 (0) 23 77-91 80-0 | Fax +49 (0) 23 77-10 28 | E-Mail: info@HEKO.com

www.heko.com

Robert McCaffrey, Editorial Director

3rd Global EnviroCem Conference reviewed

The 3rd Global EnviroCem Conference on environmental technology for the cement and lime industry has taken place in London on 10-11 May, with delegates from 15 different countries in attendance and a total of 14 presentations on environmental impact abatement approaches, including the reduction of CO_2 emissions from the industry.

The third Global EnviroCem conference started with a presentation by **Philippe Fonta** of the Cement Sustainability Initiative (CSI), speaking about the impact of the Paris Climate Change Agreement on the cement industry. The Paris Agreement aims at a comprehensive decarbonation of the worldwide economy by the end of the century. Adaptation and mitigation are considered at the same time as finance in the agreement, with a proposed new mode of international cooperation, including states and non-states (including businesses and NGOs). The legally-binding agreement will involve nationally-determined contributions (NDCs) for all countries (both developed and developing), financial and technological packages and an agenda of solutions. The agreement is both applicable immediately and is subject to continuous ratification, entering into law once at least 55 states representing at least 55% of CO_2 emissions have ratified the agreement. The agreement seeks to limit the rise in global temperatures above pre-industrial levels to less than 1.5°C. Regular inventories of greenhouse gases from individual countries will be required, while there are also accounting checks on the large flows of money that are expected to take place (US$100bn/year), as well as other transparency measures. The NDCs themselves are to be revised every five years. Philippe suggested that cement will have a role in the future due to its ability to build robust structures that can resist harsher climatic conditions. The CSI has presented the Low Carbon Technology Partnership Initiative for the cement sector: a 'statement of ambition' by the CSI suggests that CO_2 emissions may be reduced by 20-25% by 2030 compared to business as usual, if the use of alternative fuels is maximised, if the clinker ratio is reduced as far as possible and if new clinkers and cements are developed. In addition, enhanced energy efficiency in the cement manufacturing process and carbon capture and storage will be used to reduce emissions. If the Paris Agreement is finally ratified, very great changes are in store for the cement industry around the world.

1: Mats-Ove Eriksson, left and Alexia Yiakoumi, right of Höganäs Bjuv in discussion with, centre, Richard Lydon of Clear Edge Filtration.

2: Alistair Starkie of Fairport Engineering, left, in discussion with Felix Bartknecht of Sick AG.

3: Martin Hermandinger, left, of Scheuch talks with Hannah Clark of Lafarge Cauldon.

4: Jan Theulen, Director Alternative Resources, Global Environmental Sustainability, HeidelbergCement presenting his popular paper 'HeidelbergCement driving Carbon Capture and Storage/Utilisation'.

Jan Theulen of HeidelbergCement next spoke about his company's approach to current environmental challenges. "Coal-fired power production is out," stated Jan at the start of his presentation, suggesting that fossil-fuel based investments will become 'stranded assets' in the future (and provoking the related question, could the same happen to CO_2-intensive cement production?). The cement industry produces a large amount of CO_2, but the cost of capturing this CO_2 is relatively high, compared to other industries. HeidelbergCement believes that carbon capture and storage (CCS) is required for full decarbonisation of the cement industry, that it will need financial support to be competitively feasible, as well

2-3 FEBRUARY 2017 **Barcelona, Spain**

11th global cemfuels

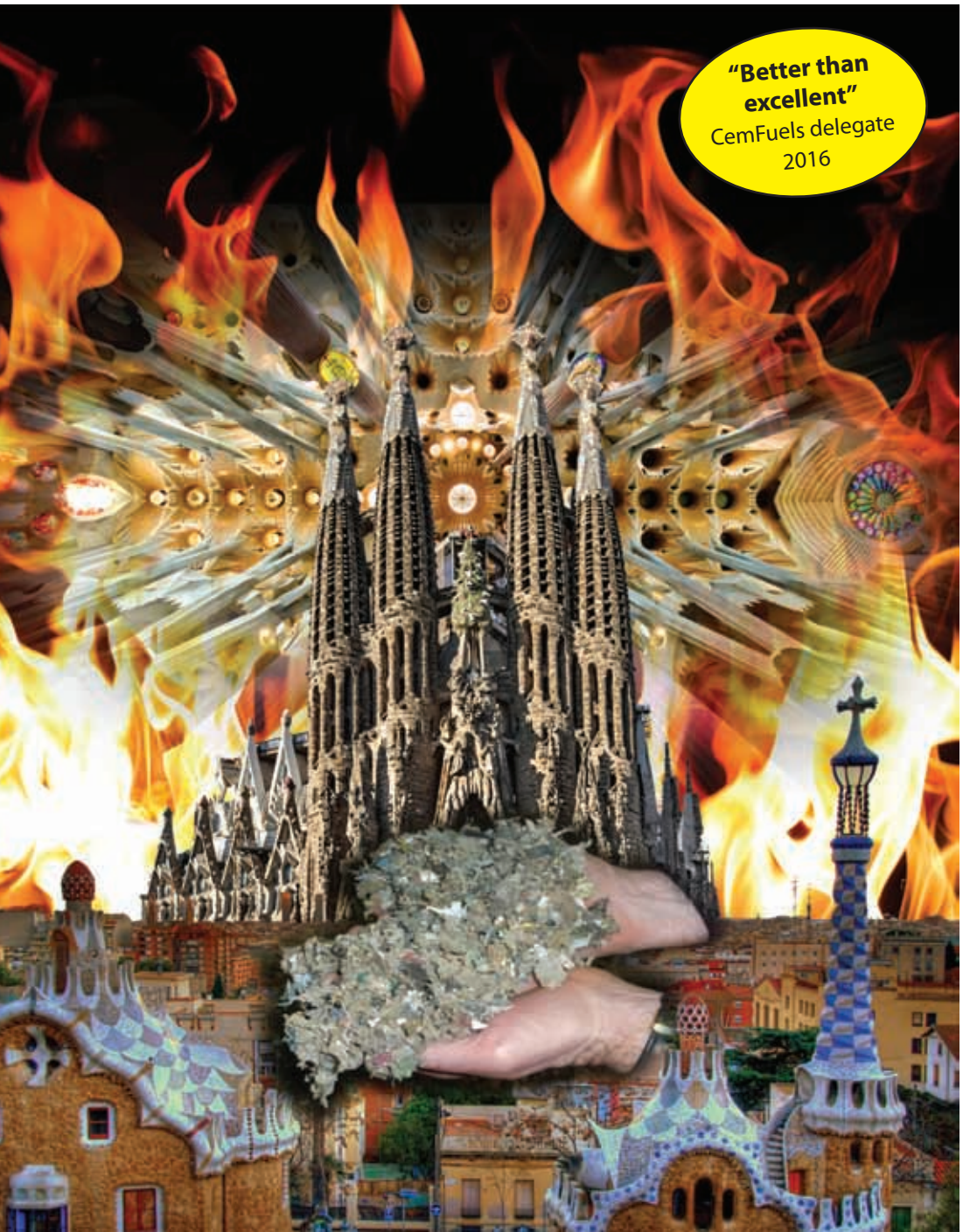
CONFERENCE • EXHIBITION • AWARDS

Alternative fuels for cement and lime
Global CemFuels Awards
Gala Dinner
Major exhibition

www.cemfuels.com

Global CemFuels Conference and Exhibition has established itself as the largest specialised annual alternative fuels event in the world, attracting 150-200 international delegates and many exhibitors each year.

The 11th Global CemFuels event in Barcelona will showcase the best alternative fuels projects and equipment from the cement industry in Europe and from around the world. Delegates are expected to attend from more than 40 countries (with strong representation from South America), to learn from experts how to start to use - or to increase their use of - alternative fuels. If your business is in alternative fuels for the cement and lime industry, then ***you must attend***!



What's at CemFuels?

Alternative fuel trends

Pricing factors

Sourcing and trading

Storage and handling

Processing and dosing

Combustion optimisation

Business opportunities

NETWORKING!

11th CemFuels Exhibition
Please contact Paul Brown with all exhibition enquiries:
paul.brown@propubs.com,
Tel +44 1372 840950
or Mob: +44 776 7475 998

Who should attend?

Cement and lime producers who want to reduce their fuel bills

Legislators and regulators

Alternative fuels equipment manufacturers & service providers

Fuels producers, agents, traders & shippers

Those with an interest in fuel project financing

Energy and fuel analysts

Academics & researchers

Organised by:
global cement MAGAZINE

5: Best presentation awards: in third place was Philippe Fonta of the CSI for his paper on the Paris Agreement and its implications for the cement industry; in second place was Matthias Mersmann of aixergee process optimisation GmbH for his paper on how to achieve 200mg/m3N of NH3 without using a catalyst; while the winner was Dan Summerbell of the University of Cambridge for his paper suggesting that the cement industry can gain a 20% performance improvement - for free. (left to right, Philippe Fonta, Dan Summerbell, Matthias Mersmann).

6: Steve Werrell of PCME Ltd giving his presentation 'Using Predictive Emission Monitoring Systems (PEMS) to reduce particulate emission events and to ensure compliance'.

7: Carl-Henrik Persson, Yara Environmental Technologies AB give his presentation 'NOx reduction to 200mg/Nm3 with SNCR'.

8: Sean Turner of Enotec GmbH, left, talking with Olufunke Madojutimi of Lafarge Africa Plc, Nigeria.

9: Mark Tilley, Lixivia, Inc gives his paper 'Stabilising converter slag for use as fillers in cement using Lixiviant Technology'.

as currently lacking public acceptance. Carbon capture and utilisation (CCU) is commercial today for small and high-value end-products and CCU has the potential to significantly contribute to CCU/S for the cement industry. Jan stated that the cement industry in Scandinavia could have a zero net CO_2 emission by 2030, if governments 'co-operate.' Jan gave details of a number of different technologies that are in the process of development for the cement industry. An amine-scrubbing system and three other technologies were tested by Gassnova at the Norcem Brevik cement plant. A CO_2-based cooler will be installed at HC's Hanover cement plant. The LEILAC CO_2 project involves the indirect heating of the raw materials, so that exhaust gas and decarbonation-generated CO_2 are not mixed and CO_2 can be more cheaply captured - and a pilot plant is now under construction at the Lixhe cement plant in Belgium. In terms of the use of captured CO_2, algae can be grown using exhaust gases, the algae then being used for bulk materials, transport fuels and even for neutraceuticals. Modified cyanobacteria can be used to produce ethanol, for example by US company Joule Inc. Another use can be to use low- or negative-cost surplus 'green' electricity (for example surplus electricity from wind turbines) to electrolyse water, using the oxygen for combustion and using the hydrogen to combine with CO_2 to produce methane as a fuel. CO_2 can also be used to 'cure' ash, bypass dust and quarry fines (for example as accomplished by UK-based company Carbon8) to produce artificial aggregates. Jan Theulen concluded that HeidelbergCement is testing and implementing CCS/U and that in this area it is providing leadership in the cement industry.

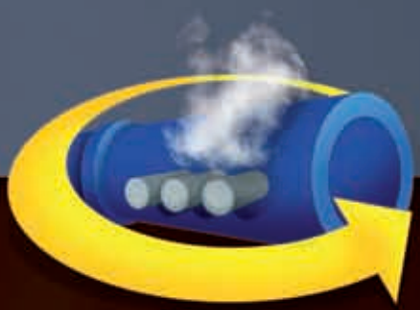
Next **Albrecht Keiser** for STEAG Powitec GmbH spoke about the implications for selective non-catalytic reduction (SNCR) of Germany's latest NOx/NH_3 regulations, which inevitably involve ever-more stringent and lower limits. Albrecht suggested that hitting some targets is simple with a good temperature window, but hitting both NOx and NH_3 targets, all the time using a 'better' temperature window, is that much harder. By 2019, no allowance will be made in the regulations for ammonia slip (excess, unreacted ammonia) from SNCR, meaning that a 'perfect' (higher) temperature window will need to be hit every time for NOx and NH_3. This can be a challenge with fluctuating process conditions (O_2, gas speed, fluctuating AF compositions) and with older or 'idiosyncratic' plants. Albrecht's company can supply an on-line computational fluid dynamics (CFD) calculation system to allow optimised reagent injection, in order to create the best possible set points for the ammonia injection nozzles.

Matthias Mersmann of aixergee process optimisation GmbH continued on a similar theme, about how to achieve low levels of NOx and NH_3 without the use of a catalyst. Both SNCR and selective catalytic reduction (SCR) use injected ammonia or urea to reduce NOx levels, but in higher-capex SCR a catalyst is used to transform NH_3 to N_2 and water. With lower-capex SNCR, temperature, retention time and mixing can be limiting factors of process efficiency. Ammonia must be injected at temperatures of 850-1050°C, retention time must be above 0.5-1 second, while there should be intense mixing immediately after injection. The burnout of solid fuels should have been completed by the injection point, while there should also be low levels of CO, which otherwise delays the kinetics of the SNCR reactions. CFD-based SNCR optimisation provides information on temperatures, NOx and CO concentrations, turbulence, retention times and fuels burnout, while at the same time calculating the optimum injection point for reagents. Matthias gave an example of a European cement plant which had NOx emissions of 500-600mg/m^{3}N, which has successfully used SNCR to reduce NOx emissions levels to the legal limit of 400mg/m^{3}N at the stack. However, the situation was not 'future-proof' in that it would not cope with forthcoming lower emission level regulations. The system was extensively modelled with CFD, with gas measurements backing-up the modelilng. A new injection point was added to the calciner, on the basis of the CFD modelling. The new injection station brought about a reduction in NOx, down to a minimum of 200mg/m^{3}N, without recourse to SCR.

Georg Lechner of Scheuch GmbH went on to

Cooling your Kiln Shell

www.kimaE.de



KilnCooler

Infrared controlled water cooling of kiln shell

- cost savings due to higher cooling efficiency
- automatic hot spot detection and fast cool down
- reduced mechanical tension due to selective cooling
- targeted cooling on kiln's circumference
- almost no energy consumption

A jointly development with the VDZ Duesseldorf, Germany

KIMA

www.kimaE.de

Innovative Measurement and Control Systems

Guestener Str. 72 / 52428 Juelich / Germany / Phone: +49 2463 9967 0

KIMA Automatisierung GmbH

More than 15 years of development and experience make us an attractive partner in the cement industry.
Our products optimize production, save costs and enhance efficiency in more than 1500 installations worldwide.

10: Thomas Binninger, CTP Chemisch Thermische Prozesstechnik GmbH presents his paper 'CTP's advanced RTO, RCO and hybrid Emissions Control Systems'.

11: Mats-Ove Eriksson, Höganäs Bjuf AB gives his presentation 'Reduced energy consumption and lower emissions with advanced-concept insulating kiln refractory lining'.

12: Darko Matovic of Miodrag Matovic, Canada, left, in discussion with Thomas Binninger, CTP Chemisch Thermische Prozesstechnik GmbH on the company's exhibition stand.

13: Matthias Mersmann, aixergee process optimisation, giving his paper 'How to achieve 200mg/Nm3 NOx without a catalyst'.

14: Dan Summerbell, University of Cambridge, presenting his winning paper 'Can we reduce CO2 by 20% for free? Case studies of performance variation in the cement industry,'

15: Xavier d'Hubert, Cadence, left, in discussion with right, Matthias Mersmann of aixergee process.

give details of his company's technologies for particulate matter (PM), NOx, volatile organic compounds (VOC) and mercury reduction. The catalyst in SCR reduces the activation energy for reactions, in this case down to 200-400°C, leading to high efficiencies and lower reagent costs, as well as reducing the possibilities for ammonia slip. Scheuch can provide SCR installations for both high-dust and low-dust positions, as well as the proprietary DeCoNOx process, which combines regenerative thermal oxidation (RTO) with a low-dust SCR to also reduce CO and VOCs. Such a system has been installed at the Kirchdorfer Zement plant in Austria, combined with a waste heat recovery (WHR) system, with all project guarantees met, including <200mg/m^{3}N NOx and 99% reduction of CO (with the high CO levels allowing the system to run autothermally, without additional fuel). In addition, Scheuch now offers the 'eXmercury' system to 'break' the mercury cycle. The high-mercury filter dusts are essentially 'washed' using water sprays and an activated-carbon absorbent, with the absorbent then being separated and sent for disposal. The eXmercury system has been installed at the Wietersdorfer Zement plant and the system has achieved mercury reduction of around 80%, "with low disposal costs, no thermal losses and easy operation."

Mats-Ove Eriksson of Höganäs Bjuf AB next spoke about the possibility of reducing energy consumption through the use of advanced-concept insulating refractory linings in the cement industry. Corrosion problems have previously been caused by condensation of alkalis behind refractory linings, particularly when using alternative fuels, often leading to the failure of refractory anchors and eventual refractory failure. Mats-Ove suggested that a double-layer insulation/refractory lining can lead to energy savings, reduced kiln shell temperatures and reduced corrosion, particularly in the cooler sections of the pyro-system.

Ullrich Speer of Lechler GmbH spoke about how gas-to-liquid interactions can be optimised to increase gas cleaning efficiency in the cement industry. Lechler's spray nozzles and lances are used in various places in the cement plant, for SNCR, in gas conditioning towers and in various cooling applications. Lechler Laval nozzles are particularly suitable for the cement industry, being clog-resistant and allowing both air and liquids to be independently adjusted. The level of sophistication of SNCR systems can now be very high, including the possibility of individually controllable nozzles, the use of CFD and online coating detection. Through these approaches, the best gas cleaning can be achieved with the lowest possible use of water and of expensive air and reagents.

After the end of the first day of the conference, discussions continued at a social evening at a local hostelry, with traditional British beer and 'bangers and mash.'

Conference second day

On the second day of the conference, **Carl-Henrik Persson** of Yara Environmental Technologies continued on the subject of SNCR, in which Yara has over 100 references in the cement industry worldwide. Carl-Henrik revealed a series of tests with a mobile SNCR unit, to find out the optimum position of lances, the best dosage rate and the most effective reagent. Ammonium hydroxide, NH_4OH, (rather than urea) is Yara's preferred reagent, since the reaction is more direct, the reaction time is quicker, there is a higher level of reduction (typically in the region of 85%, compared to 29% with urea), there is a lower level of ammonia slip and there is a lower operational expenditure. It was found that the best place for injections was just after the goose-neck, for example on the top level of a five-cyclone preheater tower. Carl-Henrik reminded listeners that SNCR is a reducing reaction and may cause an increase in CO formation, although this varies from plant to plant.

Steve Werrell of PCME Ltd next spoke about using predictive emission monitoring systems (PEMS) to reduce particulate emission 'events' and to ensure compliance. PCME manufactures all of the main technologies for particulate monitoring (opacity, laser scattering and probe electrification), each of which has its own advantages and disadvantages. Many bag houses are now obliged to fit burst-bag detectors, but these detectors can also be used to provide remote observation of the baghouse performance, to find the exact location of any burst bags, to allow preventative maintenance and to save money through improved filter performance.

Richard Lydon of Clear Edge Filtration next spoke about hot gas filtration using ceramic filters. Ceramic or mineral fibre filter candles are employed like fabric bags in the filter housing and are capable of operating at high temperatures up to 900°C. The

Global Cement

A global industry needs a global magazine:

global cement™ MAGAZINE

Download the Pro Global MediaBook advertising guide at:
www.globalcement.com/advertise

16: Steve Werrell, left, and Lewis Parry, right of PCME Ltd with their company's exhibition display.

candles have high efficiency, with emissions down to 2mg/m^{3}N and are corrosion-resistant. The candles are cleaned in the same way as filter bags, using a pulse of cleaning air. Clear Edge candles tend to have long life-spans, of three years or more, partly because these ceramic filters now use a denser outer layer which reduces dust penetration so that performance is retained for longer. Richard finished by giving details of the TopKat catalyst-coated ceramic candle, which can reduce NOx, SOx, HF, HCl and dioxins through a combination of SCR, direct solvent injection (DSI) and dioxin cracking. The first major (non-catalytic) ceramic filter installation has now taken place in the cement industry (in Italy), with good dust removal efficiency, low capex and low opex as well.

Mark Tilley of Lixivia Inc. next told delegates about the use of stabilised basic oxygen furnace (BOF) and ladle slag for use as fillers in cement. Lixivia's offering is the separation and purification of calcium from lime contained in slag using an ion-exchange approach, which generates a more stable aggregate material, as well as producing valuable purified calcium products such as precipitated calcium carbonate, magnesium oxide and rare earths and at the same time sequestering carbon dioxide. The company is currently operating at the laboratory scale, but is preparing for a scale-up stage.

Dan Summerbell of the University of Cambridge next asked the question, "Can we reduce CO_2 from the cement industry by 20% - for free?" Dan pointed out that cement plants have a day-to-day variability in fuel consumption, whereby they might be able to perform at a 20% better level around 10% of the time. Dan asked whether the plants could be made to perform at this better level 100% of the time. After visiting a number of plants, he came to the conclusion that the majority of the variability came from fuel mix and quality variations and from process operational changes, particularly the level of excess O_2 (above 2% or so) in the flue gas. Changing operational set-points might indeed bring about reductions in emissions, but the final question posed was whether the changes would be financially worthwhile.

The penultimate presentation at the conference was given by **Thomas Binninger** of CTP of Graz, Austria, on advanced emissions control. Thomas pointed out that the further down the regulation route that legislation passes, the less 'wriggle room' there is, so that the time to influence 'best available technology' BAT regulations is at the start, at the EU level, rather than at the national level. CTP offers thermal, catalytic and hybrid systems to address CO, TOC/VOCs, NH_3 and NOx. Thomas mentioned a regenerative thermal oxidation unit with an integrated catalytic system, which can achieve very high performance levels, albeit with a significant pressure drop (35mbar). Such a unit has been installed at the Wopfinger Baustoffindustrie plant at Waldegg, Austria, while another is currently being built in the US.

The final presentation was given by **Peter Brealey**, on opportunities in the Sudanese cement industry. Peter mentioned a cement factory that had just been built and was undergoing commissioning, whereupon a power cut stopped progress dead. Renewables such as solar may be part of the answer: six 34MW solar parks are planned to provide power for the cement plant, on a cost basis that is competitive with coal-fired generation, in the region of US$0.06/kWh. Peter suggested that the Sudan solar park might send electricity to Khartoum and might even export electricity to Europe, along a line akin to the 2375km-long 600kV (DC) Rio Madeira electricity transmission line in Brazil.

Awards and Farewells

Delegates voted for their favourite presentations at the conference: **Jan Theulen** of HeidelbergCement received a special mention. However, in third place was **Philippe Fonta** of the CSI for his paper on the Paris Agreement and its implications for the cement industry; in second place was Matthias Mersmann of aixergee process optimisation GmbH for his paper on how to achieve 200mg/m^{3}N of NH_3 without using a catalyst; while the winner was **Dan Summerbell** of the University of Cambridge for his paper suggesting that the cement industry can gain a 20% performance improvement - for free.

Delegates strongly praised the conference for its 'collegiate,' friendly and informal atmosphere, for its networking opportunities and also for the technical content of both the presentations and general discussions with delegates.

17: Philippe Fonta, Cement Sustainability Initiative (CSI) presenting his paper 'The Paris Agreement on climate change: Implications for the cement and concrete sector'.

18: Georg Lechner of Scheuch gives his presentation 'Three unique technologies for PM, NOx, VOC and mercury reduction'.

19: Ullrich Speer, Lechler presenting his paper 'High-efficiency SNCR within cement plants: Online computations fluid dynamics (CFD) control of modern injection systems - Solutions, projects and results'.

20: Georg Lechner, Scheuch, left, Michael Müller-Pfeiffer, centre and Martin Hermandinger, Scheuch, right pose on Scheuch's exhibition stand.

Stephen J. Gibbons, Business Development Manager, ABB Inc.; James W. Peeler, President, Emission Monitoring Inc.; Henry Vergeer, President, CEM Specialties Inc.

FTIR CEMS analyser successfully monitors cement plant stack emissions in extensive field study

With the Environmental Protection Agency (EPA) proposing legislation that would limit the amount of particulate matter (PM) levels throughout the US, ABB has created an analyser to monitor cement plant stack emissions in an attempt to aid cement plants in their efforts to reduce PM emissions.

A US cement manufacturing facility has completed a five-month field trial of the ABB ACF5000 hot/wet extractive FTIR Continuous Emission Monitoring System (CEMS). Testing concluded in August 2015. The trial primarily tested the system's capabilities to satisfy EPA HCl emission monitoring requirements. Secondarily, it checked how well the system monitored other regulated emission pollutants (SO_2, NO_x, CO, CO_2) and examined the analyser's performance in monitoring non-regulatory parameters of interest such as ammonia, formaldehyde and methane. Lastly, the tests included monitoring during different in-line raw mill operating conditions, which can contribute to significant variability in emissions.

Right - Figure 1 : The ABB ACF5000 FTIR CEMS.

The ABB FTIR analyser system

The ACF5000 FTIR CEMS is a hot/wet extractive analyser system using a high resolution ($1cm^{-1}$) FTIR spectrometer to simultaneously measure up to 15 gaseous components. The gas path from the sampling location to the analyser is maintained above 180°C (356°F), allowing measurement of very low concentrations of reactive pollutants such as HCl, NH_3 and HF.

An electronically controlled air injector creates a vacuum via the Venturi effect. It draws the sampled gas into the analyser cell, eliminating the need for a mechanical pump and associated maintenance.

The use of the air injector allows direct connection of the heated sample line to a heated block and subsequently to the gas cell. This arrangement ensures a constant temperature throughout the measuring system, avoiding potential 'cold spots' where condensation or chemical reactions could take place. A zirconia O_2 detector and a flame ionisation detector for total hydrocarbons (THC) can be close-coupled directly to the conditioning block if desired.

To monitor drift, the system can be equipped with a 'validation' unit that acts as an alternative to introducing calibration test gases. This unit has a disc with six holes, five of which hold films or gas-filled cells that can be swivelled into the spectrometer's optical path. This approach can eliminate the need to introduce test gases during normal operation.

Assessment criteria

The following assessment criteria were used to evaluate the analyser's performance.

16th global gypsum Bangkok, Thailand

CONFERENCE, EXHIBITION & AWARDS 2016

globalgypsum.com
#globalgypsumconference

Organised by: global gypsum MAGAZINE

The annual Global Gypsum Conference is well-known around the world as the largest meeting of gypsum professionals and as the must-attend gypsum event. The two-day event includes presentations, panel discussions, networking sessions and of course the world's largest gypsum-related exhibition. The conference in 2016 will return to Asia for the first time since 2007, back to the home of gypsum in Asia - Thailand - and back to the city where the very first Global Gypsum Conference was organised: exotic Bangkok. The event will appeal to gypsum users and wallboard producers from around the globe. The event includes world-class networking and business opportunities. The Global Gypsum Awards are also presented, at the Global Gypsum Awards Gala Dinner.

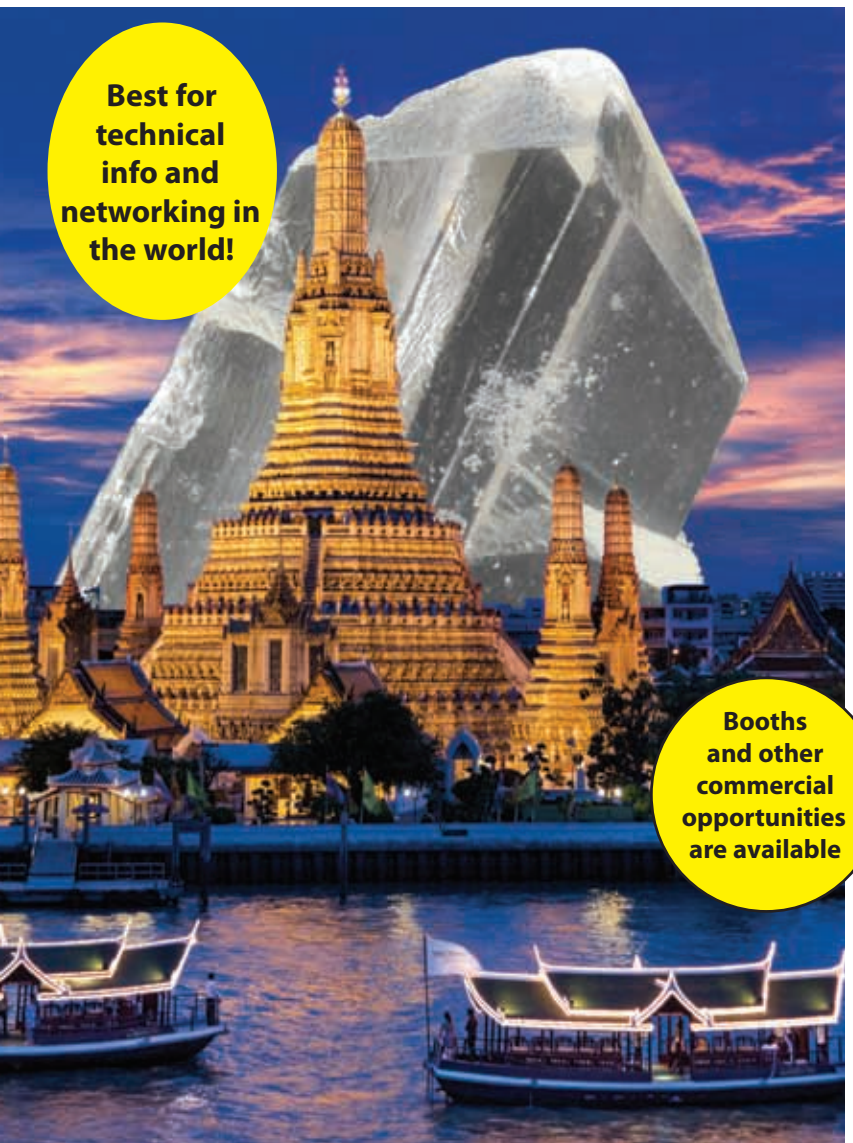
If your business is gypsum, you must attend the Global Gypsum Conference, Exhibition and Awards in 2016 in Bangkok, Thailand!

Issues covered:

- Gypsum market trends
- Cutting-edge research
- Plaster technology
- New applications
- Beyond commodity board
- Energy efficiency
- Sustainability

Who should attend?

- Researchers & Academics
- Technology companies
- Product manufacturers
- Equipment suppliers
- Shippers & traders
- Plant managers
- Market analysts
- Gypsum users



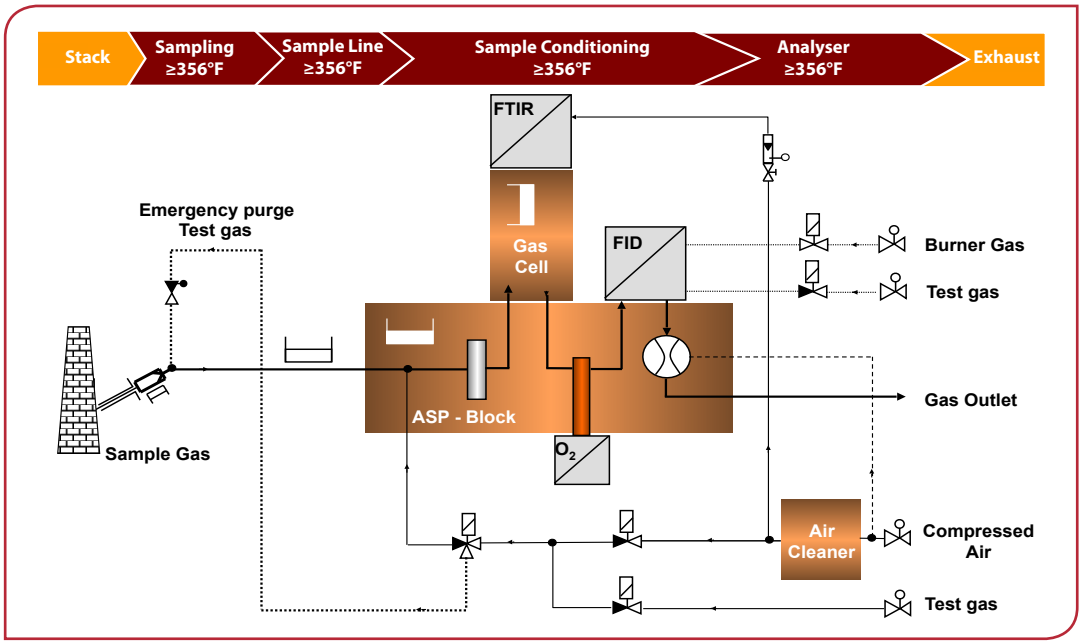
The world's largest gypsum exhibition

Exhibitors in 2015 included:
Albarrie Environmental Services; Alphaplatre; Argos Solutions; Arvos Inc. Raymond Bartlett Snow; Claudius Peters; Derco; Elkem; Erisim AS; Far-raus; Fenner; Forbo; Fuchs Lubritech GmbH; Gebr. Pfeiffer; Grenzebach; Gupsos; Gyptech; Hamburger Rieger; Haver & Boecker; J.C. Steele & Sons; Johns Manville; Jürgens Maschinenbau; Kukla; Limab; Luff Industries Ltd; Lutze Fördertechnik GmbH; M. Torres; Moist-Tech Corp.; Owens Corning; Polyscope Polymers B.V.; Raytek; Schenck Process; Sensortech; Shandong Sanjin; Shandong Tengfei Mechanical and Electrical Technology Co, Ltd; Sicit2000 SpA; Sika; St Marys Carbon; WTW & MHC Group; Zibo Jin-gxin Electrical and Mechanical Manufacturing Co., Ltd.

Previous events:

Bangkok 1999
San Francisco 2000
Miami 2002
Barcelona 2003
Prague 2005
Cancun 2006
Shanghai 2007
Dubai 2008
Rio de Janeiro 2009
Paris 2010
Las Vegas 2011
Istanbul 2012
Toronto 2013
Berlin 2014
New Orleans 2015

Exhibition and sponsorship enquiries:
paul.brown@propubs.com
Tel: +44 1372 840950
Mob: +44 7767475998



Right - Figure 2: ACF5000 FTIR CEMS flow diagram.

First, for HCl:

- Provide reliable HCl monitoring data;
- Achieve data availability of greater than 90% of kiln operating hours;
- Meet the initial CEMS analyser certification and on-going Quality Assurance requirements for cement kilns subject to EPA 40CFR63 Subpart LLL regulations.

Second, for SO_2, NO_x, CO, CO_2:

- Achieve data availability greater than 95% of kiln operating hours;
- Meet the initial CEMS analyser certification and on-going QA requirements for cement kilns subject to requirements in state permits.

Third, for other components of interest:

- Assess whether the CEMS can provide reliable NH_3 and organic compound data including formaldehyde (CH_2O) for engineering operations purposes as well as methane (CH_4) (for non-methane correction of total hydrocarbon data from flame ionisation detectors).

Fourth, for automated daily calibration checks:

- The analyser has the ability to use an internal validation unit for automated daily calibration checks of criteria pollutants, including HCl. The study evaluated both this approach and flowing test gases.

Fifth, for Dynamic Spike Audits (DSA):

- In some cases, the EPA allows DSA procedures as a quarterly accuracy audit option and for daily calibration drift assessments. For this study HCl dynamic spikes were performed using N_2O as a tracer gas.

Sixth, for different in-line raw mill operating conditions:

- In preheater / precalciner kiln systems, in-line raw mills take advantage of excess heat from the pyroprocessing line to dry raw materials during the grinding process. An environmental benefit of this process is the reduction of SO_2 emissions and other pollutants, such as total hydrocarbons, acid gases such as HCl, NH_3 and dioxins/furans. As in-line raw mills are not always operational, cement plants can exhibit variability in emissions. This particular cement plant has two in-line raw mills. Consequently, the CEMS must be capable of accurate measurements during the different operating conditions.

Results with in-line raw mills in operation

The ABB ACF5000 FTIR CEMS provided accurate measurements as compared to a carefully operated reference FTIR measurement system for all parameters present at measurable levels – see Table 1 (page 20) for results. Additionally, the CEMS analyser comfortably met the pertinent EPA relative accuracy requirements, including:

- PS18 relative accuracy HCl (ppmw) and/or HCl corrected to 7% O_2, dry basis;

1st global cemprocess

PROCESS OPTIMISATION IN CEMENT MANUFACTURE

CONFERENCE & EXHIBITION

www.CemProcess.com

#cemprocess

Global CemProcess is the new conference and exhibition for the cement industry that looks at process optimisation, at de-bottlenecking, at production maximisation and at troubleshooting. With over 2500 cement plants around the world, many of them in sold-out or hyper-competitive markets, the drive for the additional tonne of production and for process efficiency is ever-more important.

Global CemProcess will take place in London, the easy-to-access world city with direct transport links to over 300 cities via its six airports. A variety of hotel options are available for every budget.

If you are responsible for process optimisation or production maximisation in the cement industry, then you must attend Global CemProcess*!*

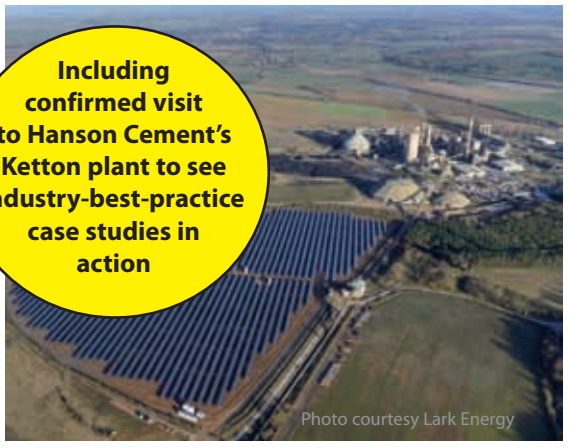


Photo courtesy Lark Energy

Process optimisation, de-bottlenecking, production maximisation and troubleshooting

Global CemProcess Conference and Exhibition will allow delegates to:

- Learn from process optimisation experts
- Discuss problems and find solutions
- Discover industry best-practice
- Make new cement contacts
- Find new suppliers
- Meet old friends
- Do business!

Outline conference programme

First day

Day theme: Process efficiency in a competitive market

Session 1: Global trends in cement supply and demand

Session 2: Process optimisation in the cement industry

18.00 Social evening

Second day

Day theme: Maximising production in a sold-out market

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

Session 4: Maximising cement production

Session 5: De-bottlenecking for production maximisation

18.00 Farewell party

Third day

Field trip to Hanson Cement's Ketton cement plant


Photo courtesy Loesche


Photo courtesy Stephen Elliott, Hope Construction Materials

Who should attend?

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

Exhibition and sponsorship enquiries
paul.brown@propubs.com
Tel: +44 1372 840950
Mob: +44 7767475998

Organised by: global cement MAGAZINE

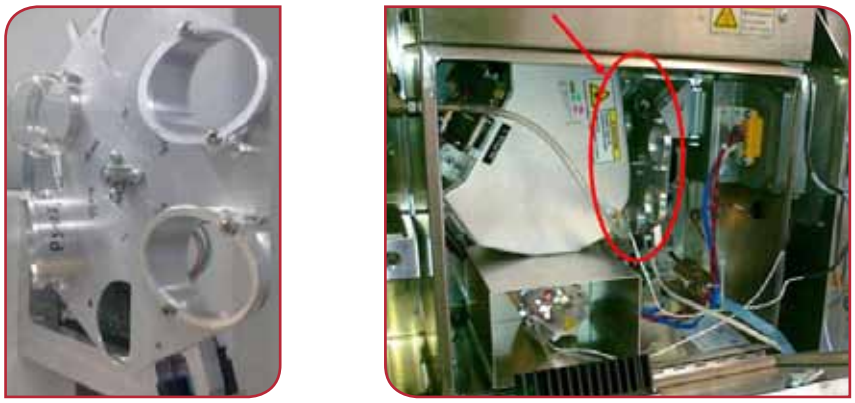


Figure 3: Validation unit with four calibration cells (left) and installation position in the analyser (right).

- PS2 for SO_2 and NO / NO_x;
- PS3 for O_2 and CO_2;
- PS4 for CO.

The ABB ACF5000 FTIR CEMS surpassed the relative accuracy requirements included in the evaluation criteria for non-regulatory parameters water vapour, methane, formaldehyde and ammonia as compared to the reference system. The accuracy of these measurements is sufficient for their use on cement kiln systems in:

- Conversion of emissions to a dry basis;
- Use in the management of NH_3 injections and/or condensable particulate and visible plume issues, and;
- Use in the management or determination of organic hazardous air pollutant emissions, including the exclusion of the methane contribution from total hydrocarbon measurements.

Results for different operating conditions

Limited comparative testing during mill-off operation revealed some differences in results between the ACF5000 FTIR CEMS and the reference FTIR system, although all were still within EPA performance requirements. The most significant difference occurred for the SO_2 measurements. In that case the ABB FTIR CEMS values were 13% greater than the reference measurements. While the exact cause is still unknown, extensive review of data from both FTIR systems data concluded that the discrepancy was not due to spectral interferences.

Comparative test results during the transition from two mills off to one mill on revealed increasing discrepancies between the two analysers for the reactive condensable compounds SO_2, HCl, and NH_3. These differences most likely originate from

Right - Table 1: Relative accuracy test audit (RATA) results with in-line raw mills in operation.

Parameter	Mean concentration (ppm/vol%)			Relative accuracy (% of mean reference value)		Relative accuracy (% of emission standard or ppm/vol%)	
	References	ABB CEMS	Difference	Result	Requirement	Result	Requirement
HCl (ppmw)	0.44	0.45	0.01	12.1%	≤ 20%	2.0%	≤ 15%
HCl (ppm @ 7% O_2 dry)	0.54	0.56	0.02	11.9%	≤ 20%	2.2%	≤ 15%
SO_2 (ppmw)	13.85	13.58	-0.26	2.8%	≤ 20%	0.4%	≤ 10%
CO (ppmw)	151.94	149.31	-2.63	3.6%	≤ 10%	0.5%	≤ 5%
NO (ppmw)	163.67	171.63	7.96	5.3%	≤ 20%	3.4%	≤ 10%
CO_2 (vol%)	20.30	20.56	0.26	1.8%	≤ 20%	0.36vol% CO_2	≤ 1.0vol% CO_2
NO_2 (ppmw)	-0.003	-0.33	-0.32	Too low	None	-	None
O_2 (vol%)	6.71	6.70	0.00	0.5%	≤ 20%	0.03vol% O_2	≤ 1.0vol% O_2
N_2O (ppmw)	0.34	0.71	0.37	121%	None	-	None
H_2O (vol%)	14.78	14.69	-0.09	0.8%	None	0.13vol% H_2O	≤ 3.0vol% H_2O
NH_3 (ppmw)	5.76	6.92	1.16	20.9%	≤ 20%	1.21 ppm	≤ 2.5 ppm
CH_2O (ppmw)	1.52	1.90	0.38	29.0%	≤ 20%	0.44 ppm	≤ 0.85 ppm
CH_4 (ppmw)	3.82	4.02	0.20	6.7%	≤ 20%	0.26 ppm	≤ 2.5 ppm

the different response times of the two measurement systems, caused by different sample flow rates. This result emphasises the importance of testing during stable effluent conditions.

Additional field study results

The ABB ACF5000 FTIR CEMS operation proved to be highly stable and consistent based on:

- 11-day zero and upscale drift tests with calibration gas injections (see Figure 4) and;
- 144 daily checks using internal calibration cells (see Figure 5).

The results obtained reflect a level of precision that far exceeds the EPA requirements for zero and calibration drift tests for all applicable measurement parameters, including HCl.

This field study exposed discrepancies with the certified test gas tag value of HCl. Comparing the 11-day upscale drift test data for HCl (Figure 3) against the 144-day checks using internal validation cells (Figure 4), the instability of the HCl test gas is very clear.

Accepting the HCl cylinder tag value as stated would have meant the ABB CEMS failing both the three-level measurement error tests and the dynamic spike tests. Therefore, it was decided to use the average of the two FTIR measurements as the true current concentration of the HCl gas standard.

Taking this approach, the ACF5000 FTIR CEMS was able to:

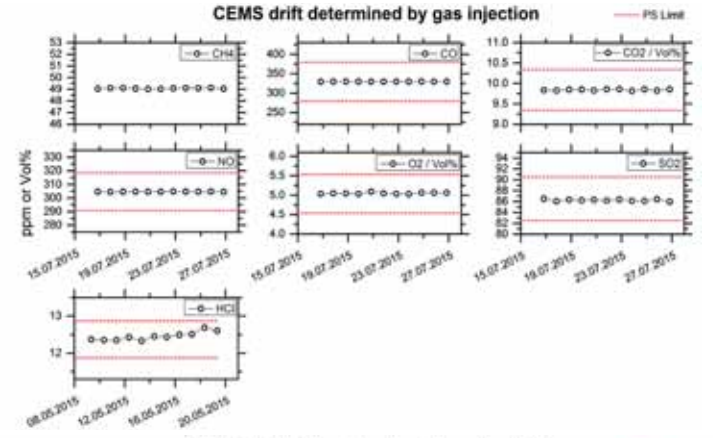
- Easily meet the three-level upscale HCl measurement error acceptance criteria of ≤5% of span for initial certification under PS18 and the zero and two-level cylinder gas audits required by Procedure 6;
- Achieve dynamic spike recoveries between 81.8% and 92.7% using N_2O as a tracer gas, resulting in acceptable dynamic spike errors (DSE) ranging from 4.3% to 1.8% of span;
- Demonstrate its ability to be certified under PS15 by performing dynamic spikes rather than relative accuracy tests.

Conclusions

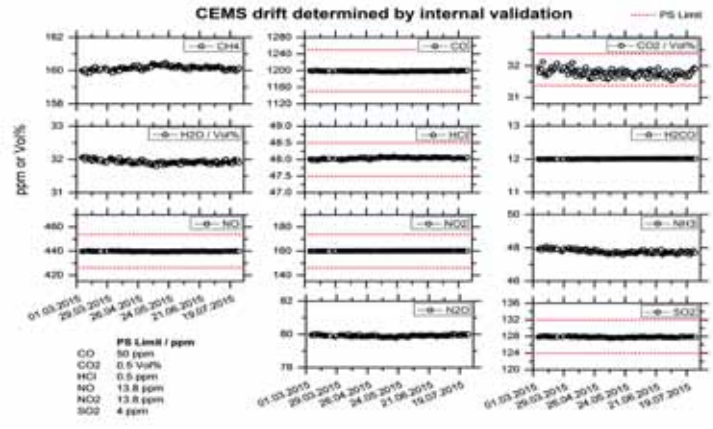
The ABB ACF5000 FTIR CEMS completed its commissioning and operated without any equipment malfunctions or repairs throughout the entire field evaluation, therefore demonstrating data availability well above 95% of kiln operating hours. In addition, the system was able to:

- Provide very reliable HCl monitoring data and meet the initial certification and on-going QA requirements for cement kilns subject to EPA 40CFR63 Subpart LLL regulations during all in-line raw mill operating conditions;
- Meet the initial certification and QA requirements for SO_2, NO_x, CO and CO_2 and provide reliable measurements of other components of interest, including NH_3, CH_2O and CH_4;
- Demonstrate a level of precision that far exceeds the EPA requirements for zero and calibration drift using both internal calibration cells and flowing test gases;
- Successfully respond to dynamic spikes of HCl using N_2O as a tracer gas.

Information extracted from '2015-CIC-1041 Field Evaluation of a Multi-Component FTIR CEMS Against PS-15, PS-18 and Procedure 6,' by Stephen J Gibbons, James W. Peeler, and Henry Vergeer, IEEE IAS/PCA Cement Conference, Dallas, TX, May 15-19, 2016



Left - Figure 4: 11-day calibration drift assessment by test gas injection at the probe.



Left - Figure 5: 144-day calibration drift assessment using internal calibration cells.

Mark Rumpel, product line manager, Eaton

Solutions for optimising power distribution and uptime at cement plants

In a constant struggle to optimise efficiency, power distribution is often overlooked. Here, Mark Rumpel, product line manager at Eaton's electrical sector, describes the importance of managing power and talks about how being in complete control of your plant's power distribution can lead to greater overall efficiency and operating cost reduction.

Cement plant managers face countless daily challenges in their efforts to improve efficiency and maximise productivity at their facilities. Any drop in productivity can cause disastrous delays in the delivery process, damaging reputations and the corporate bottom line.

An often-overlooked contributor to plant downtime is power distribution – namely, insufficient or ineffective power distribution equipment implemented within a facility. This is the equipment that facilitates the safe delivery of adequate electrical power to all the equipment in the facility. Thankfully, with a basic understanding of the different components, you can choose the right configuration of low-voltage distribution equipment to keep your facility running at optimal speed.

Right: Panelboards are used to protect against electrical overloads and short circuits.

Panelboards, switchboards and switchgear

The first key component in a power distribution configuration is the actual distribution equipment – typically panelboards, switchboards or switchgear. Definitions for these components are as follows:

- Panelboards – Panelboards are components that divide an electrical power feed into branch circuits while providing a protective fuse or circuit breaker for each circuit in a common enclosure. In essence, panelboards are used to protect against electrical overloads and short circuits while distributing electricity throughout a building or facility. Often referred to as a box, these are similar to what most facility managers have in their homes;

- Switchboards – For larger-scale buildings or sites, a large single panel, frame or assembly of panels can be used for mounting the overcurrent switches and protective equipment, buses and other equipment. These floor-mounted, free-standing systems are known as switchboards. They function similarly to panelboards on a larger scale at the low voltage of 600 volts or less;

- Low-voltage Switchgear – In some cases, more highly functional low-voltage distribution equipment is needed to best protect, control and monitor critical power electrical distribution systems safely and efficiently. This low-voltage switchgear provides centralised control and protection of low-voltage power equipment and circuits in industrial, commercial and utility installations involving transformers, generators and power feeder circuits.

In most cases, cement plant managers will likely look to switchboards or low-voltage switchgear to meet the needs of their facilities, as the significant amount of machinery at these plants require more advanced distribution solutions.

Left: Transfer Switches safely transition electrical power between normal and emergency sources.

Transfer Switches

In cement plants, where near continuous uptime is a high priority, an emergency power source such as a generator or backup utility feed is often used when the normal power source is unavailable (e.g., when the power goes out). In these scenarios, a transfer switch is responsible for quickly and safely transitioning all electrical power consumed by the circuit, equipment or systems connected to the transfer switch output between those normal and emergency power sources.

Transfer switches can transition loads between normal and emergency power sources in two basic ways: open or closed. An open transition transfer switch breaks the connection to one power source before making a connection to the other. A closed transition switch makes a connection to the new power source before breaking its connection to the old one, so there is no interruption and downstream loads receive continuous power throughout the transfer process.

For cement facility managers, the type of transfer switch chosen will be determined by the function the load plays in the operation of plant equipment. Typically, for mission-critical equipment, it is best to look for closed transition switches to ensure continuity with no break in operational performance.

Left: A typical power switching device.

Busway

With the amount of equipment typically housed in a cement plant, space is generally at a premium. Cable and conduit installations, which have traditionally been used to distribute electrical power to vital equipment, are prevalent in these facilities, yet often take up a significant physical footprint.

Busway solutions have recently emerged as an attractive alternative to cable and conduit that offers greater efficiency in a smaller space. These offerings are ideal for power distribution needs that are likely to be reconfigured frequently or evolve and expand over time, which is generally the case at cement plants, where new machinery is being added and facilities are scaling to support business growth. Busway's modular design allows for pieces to be added easily to an existing run, which brings scalable expansion not present in cable and conduit alternatives. In seeking them out, plant managers should look for busway products that feature high fault current ratings and which are certified by Underwriters Laboratories (UL®), the Canadian Standards Association (CSA®) or the International Electrotechnical Commission (IEC).

Conclusion

Cement plant managers have a broad variety of options when choosing electrical power distribution equipment for their facilities. With the right combination of components for their business, including panelboards/switchboards/switchgear, transfer switches and busway solutions, plant operators can reduce their operating costs while ensuring continuous uptime of their facilities as they grow and scale to meet future needs.

AUMUND/Çimsa Çimento

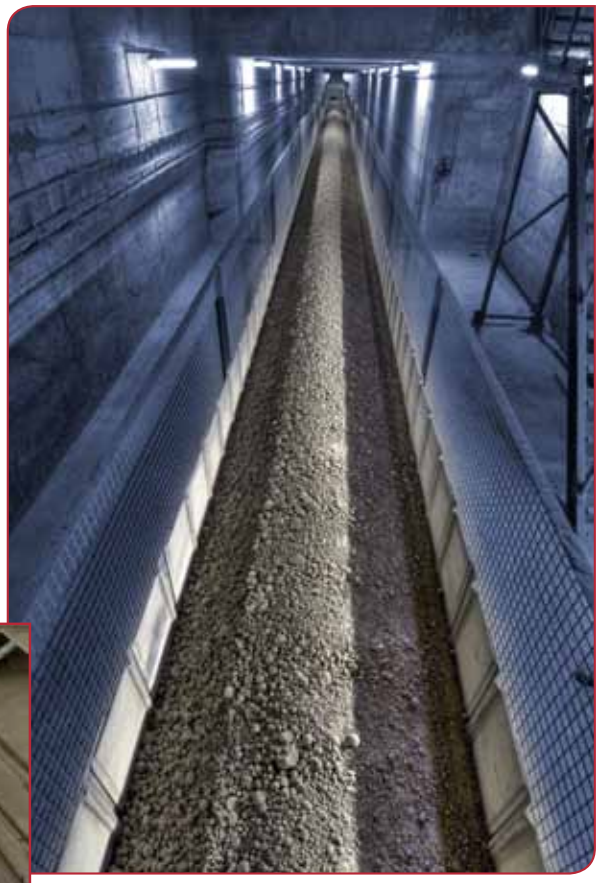
Çimsa Çimento orders Aumund machines

Çimsa Çimento, one of Turkey's leading cement producers with five plants, a clinker grinding plant and two cement packing plants, has ordered a total of 24 machines from Germany's Aumund, for its Çimsa cement mill.

The Turkish company Çimsa Cimento has ordered 24 Aumund machines for its cement mill at Çimsa. Parts of the order are 18 deep drawn pan conveyors, five bucket elevators with central chain and a pivoting pan conveyor. With five plants in Mersin, Eskişehir, Kayseri, Niğde and Afyonkarahisar, a mill in Ankara and two cement packaging plants in Marmara and Malatya, Çimsa is one of the leading companies of the Turkish cement industry.

All Aumund machines will be used for clinker transport: the deep drawn pan conveyors have a pan width from 600mm to 1400 millimeters, axis-centre distances between 17m and 139m and they work with a conveying capacity from 106 to 548t/hour. The five bucket elevators with central chain have axis-centre distances from 26m to 42m and have been designed for a transport capacity from 240 to 472t/hour.

The pan conveyor of type SPB (with axis-centre distance of 108m and with conveying capacity of 180 t/day) is built by only two producers worldwide. It makes the simultaneous transport of material in upper and lower run possible. With the reversible steel pan conveyor, a sliding back of the material conveyed is prevented by welding baffles to the U-shaped pans. The material to be conveyed can be discharged anywhere by remote control into intermediate discharge stations. The pan conveyor being delivered to Çimsa Cimento will be equipped with six discharge stations.



Right: Pan Conveyor Type KZB

Right: Pivoting Pan Conveyor Type SPB.

The pivoting pan conveyor makes the loading of silos by fixed discharge stations possible. The design of the pans is for charging several silos and bunkers simultaneously. Thus several drive and tension stations, complete steel platforms to accommodate the stations and dustproof transfer chutes can eliminated from equipment requirements.

Matthias Dietrich, Product engineer cement additives, Sika Services AG, Zürich

Performance enhancer for Portland Limestone Cement (PLC)

The motives to replace clinker with supplementary cementitious materials (SCM) are well known. However, granulated blast furnace slag, natural pozzolanes, qualified fly ash and further SCM have a limited availability; the total potential replacement of the global clinker production is less than 30%. Limestone is increasingly being used as a component in Portland-Limestone cements: Sika offers an additive to enhance grinding and performance.

Limestone has a rising recognition as a supplementary cementitious material (SCM) thanks to the following advantages:

- Cost effectiveness;
- Ease of availability;
- Short transportation distance;
- Unlimited shelf life;
- Unaffected by outdoor exposure;
- Good grindability.

Standards

In many European countries (e.g. Italy, France, Switzerland) portland-limestone cements (PLC) are broadly accepted and have reached a market share of much more than 60%.

Two circumstances encouraged this development:

- The local availability of limestone - and the low volumes of other SCMs;
- The European cement standard EN 197-1 which includes:
  CEM II/A-LL allowing a limestone content up to 20%;
  CEM II/B-LL with a limestone content up to 35%.

Nowadays these cements are not only used for the production of inferior concrete classes but can be accredited for concrete of many exposition classes according EN 206-1. Limits are often set due to marketing policy, tradition or special applications.

After an extensive review of research data and based on European and Canadian experience, the standard Committee revised ASTM C595 and introduced in 2012 the cement type IL with a limestone content up to 15%. It was found that portland-limestone cement (with 15% limestone) achieves equivalent concrete strength and durability to Ordinary Portland Cement.

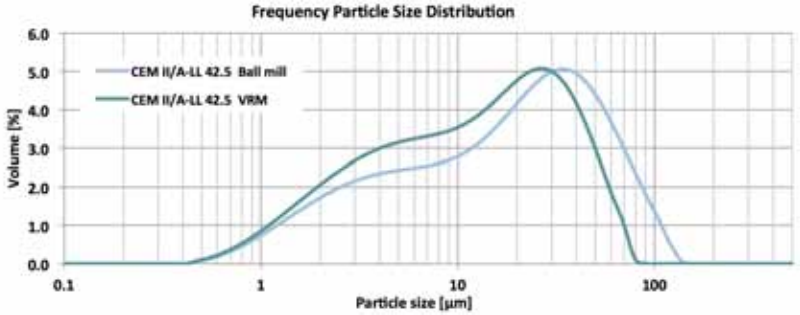
Mechanical strength

The mechanical strength of portland cement (PC) cannot be compared with portland-limestone cement without a discussion about the fineness of clinker and limestone. Is it correct to compare a PC with a PLC with the same specific surface (Blaine), with the same sieve retention or with the same particle size distribution? Even if it would be possible to produce portland cement and portland-limestone cement with an identical particle size distribution (PSD), it has to be considered that the laser method is based on the assumption that all particles have a spherical shape, which neither ground limestone nor clinker really have.

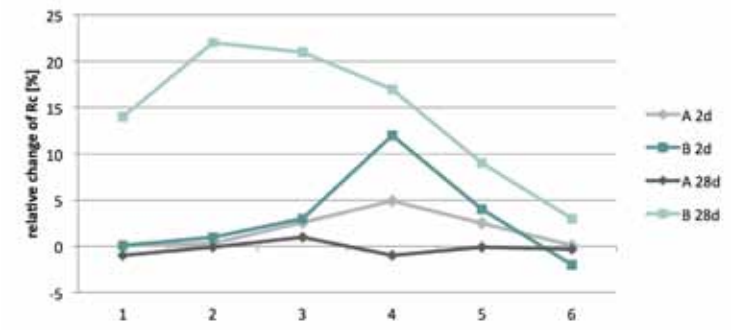
As limestone is much easier to grind than clinker, the fine limestone particles enrich the PSD segment where clinker is less present [1, 4]. Therefore the filler effect (dense particle packing), the faster precipitation of dissolved hydrates on the higher surface and further effects can improve the mechanical strength of PLC up to a limited content of limestone. This limit depends on the quality of the ingredients and further parameters: an addition of 5% is on the safe side [2].

In practice, portland-limestone cement is ground to a higher fineness compared to portland cement. An increase of Blaine in the range of 100cm^2/g is necessary to compensate for the strength reduction resulting from the addition of 1% limestone [3].

The mill type and process system play an important role. Intergrinding (co-grinding) in classical ball mills (closed system) leads to a broad PSD



Left - Figure 1a: Particle size distribution of 2 PLC with identical limestone content ground in 2 different mill types.



	1	2	3	4	5	6
A spec Laser [cm2/g]	2430	2630	3520	3890	4110	4560
x' [µm] in RRSB	33.2	29.7	22.6	20.1	18.9	18.8
BET [cm2/g]	7340	8920	9920	12110	13650	18720

Figure 2, above: Performance of two strength enhancers (A and B) in function of cement fineness, on six cement samples.

which is usually regarded as beneficial, e.g. regarding workability. Nevertheless, above a certain limit the fine limestone has an excessive water adsorbtion and separate grinding (ball mill and mixing equipment) is favoured [4].

The production of PLC with a Vertical Roller Mill (VRM) is advantageous. A comparison of two cements (CEM II/A-LL 42.5), one ground with a VRM and the other with a ball mill, shows a good performance of the VRM. The fineness parameters clearly indicate that the VRM can produce a higher fineness of the clinker without 'overgrinding' the limestone. Obviously the comparison is not thoroughly correct because clinker, gypsum and limestone come from a different provenance, but both cements have the same limestone content of 17-18%.

Sample		1	2
Mill type		Ball mill, closed system	Vertical roller mill
Limestone	[%]	17.9	17.4
x' in RRSB	[µm]	24.6	17.0
n in RRSB	[-]	0.87	0.94
d90	[µm]	57.7	38.8
d98	[µm]	89.0	56.4
Density	[kg/dm^3]	2.98	2.96
A spec Blaine	[cm^2/g]	3610	4675
Sieve retention 32µm	[%]	20.9	4.5

Figure 1b, right: Fineness parameters of two cements with the same limestone content.

In Figure 1a, both PSD graphs show the typical 'shoulder' (range 1-10µm) coming from the limestone. The clinker in the ball mill is clearly less ground than in the VRM, which will result in lower mechanical strength. Although the VRM grinds the clinker to a higher degree, the fineness of the limestone is not increased proportionally.

Figure 1b, above, shows fineness parameters of two cements with the same limestone content. The particle size distribution as well as the sieve residue clearly indicates that the high fineness is not only due to limestone but also to well-ground clinker.

Strength enhancer

Strength enhancers, based on alkanolamines for example tri-isopropanolamine (TIPA), are widely used in PLC. The effect of TIPA comes from iron-chelation which enhances the dissolution of C4AF, thereby increasing the alite surface area. Different mechanisms, including the increased formation of carboaluminates and the influence of the grindability of the minerals are discussed [5].

The performance of strength enhancers not only depends on the clinker and cement composition but also on the cement fineness. The influence of fineness on the efficiency of two alkanolamines (A and B) was tested with two different portland cements which were ground in the laboratory ball mill of Sika Technology AG (see Figure 2).

Workability

Like compressive strength, the workability of concrete (measured as slump or as flow table spread) is positively influenced by finely ground limestone. Bleeding is generally no issue with PLC. The maximum content of limestone which does not negatively influence the workability depends on the quality of the materials and the particle size distribution of clinker and limestone. In general, the use of up to 15% limestone can improve the workability of concrete and mortar (see Figure 3).

Higher levels of limestone addition require a high specific surface area to compensate the strength loss. Strength enhancers can mitigate the challenge between mechanical strength and workability to a certain extend. Another concept is the use of strength enhancers in combination with a superplasticiser. The use of superplasticisers which resist

Clinker	[%]	86.5	81.5	75.0
Limestone	[%]	9.0	14.0	21.0
Gypsum	[%]	4.5	4.5	4.0
SikaGrind-840	[%]	0.035	0.035	0.035
A spec Blaine	[cm2/g]	3160	3710	4210
Sieve retention 32µm	[%]	32.1	27.2	19.1
x' in RRSB	[µm]	35.6	28.1	22.1
Flow table spread, 0'	[mm]	194	203	196
Flow table spread, 30'	[mm]	185	192	185
Flow table spread, 60'	[mm]	168	177	173
Compressive strength, 2d	[Mpa]	22.5	23.0	23.1
Compressive strength, 28d	[Mpa]	47.5	47.9	47.4

Figure 3: Influence of limestone content on workability of mortar (EN 196-1) at constant w/c-ratio and constant compressive strength.

the mill ambient conditions and maintain the plasticising effect despite storage in alkaline conditions was pioneered by Sika [6]. Nowadays this approach is recognised and increasingly applied in practice for the production of portland-limestone cements (see Figure 4).

Figure 4: The workability is essential for the market acceptance of new cements. Low slump can be improved with PCE in the cement additive.

Powder flow properties

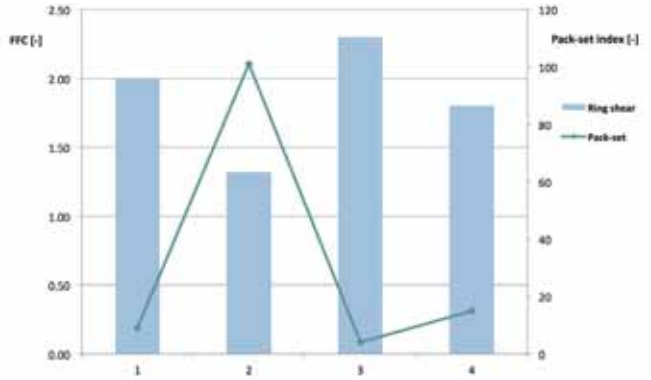
It is well known that portland-limestone cement tends to high cohesive resistance, due to the attraction forces between the fine limestone particles. This can hinder the discharge of trucks or silos because solids can generate stagnant zones.

Many empirical test methods such as the angle of repose, the comparison of bulk density or the pack-set method [7] have been developed to quantify the flow properties of cement. The pack-set index provides a numerical value to control the force required to overcome the vibration-induced consolidation. The test is an aid to routine control during cement production and is not suitable for specification purposes. The higher the pack-set index, the lower the powder flowability.

The awareness of the characteristics of PLC demands a test device which measures clearly defined physical properties. The ring shear tester [8] provides defined measurements of the flow properties which are helpful for the development of new cements and the design of silos. In the ring shear tester, the cement sample is contained in an annular shear cell (see Figure 5). A vertical load FN is applied through a thin loading rod on the lid. To shear the sample, the cell rotates relative to the lid (direction ω) and the torque necessary for shearing is determined from the forces F1 and F2 acting in rods fixed to a load beam.

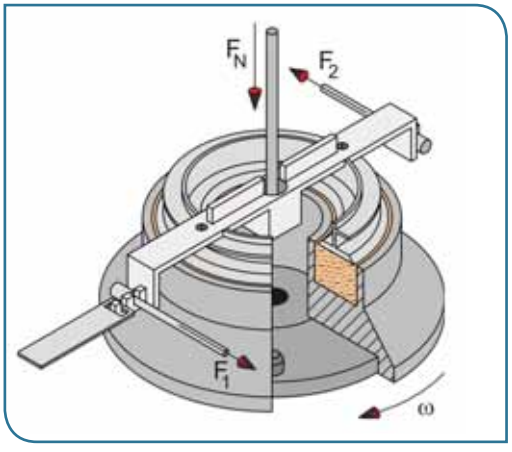
The ratio of consolidation stress to unconfined yield strength is used to characterise the flowability numerically. The larger the flowability number (FFC), the higher the powder flowability.

It is definitely possible to regulate the powder flowability of PLC by cement additives which contain polycarboyxlate ether (PCE) as part of an innovative formulation (Figure 6). Care must be taken to apply the correct dosage. Since the PCEs are very powerful dispersants, the powder flowability can become too high, with negative consequences for instance when cement transport on inclined belts is necessary. The dust load in the grinding station or the capacity of the filter bags can be another limiting factor. The content of PCE in the formulation of SikaGrind can be tailor-made to optimise the flow properties.



Sample N°		1	2	3	4
Clinker	[%]	100.0	80.0	100.0	80.0
Limestone	[%]	0.0	20.0	0.0	20.0
SikaGrind-870	[%]	0.000	0.000	0.030	0.030
A spec Blaine	[cm2/g]	2515	3295	2670	3575
Sieve retention 32µm	[%]	32.0	35.6	30.3	30.9
x' in RRSB	[µm]	31.1	26.1	30.3	29.5
Powder Flow, ring shear, FFC	[-]	2.00	1.32	2.30	1.80
Pack-set index	[-]	9	101	4	15

Right - Figure 6: SikaGrind-870 (PCE-containing strength enhancer) increases the flow properties of cement. The cement samples were prepared in a laboratory mill with constant grinding time, therefore also the fineness increased with the use of SikaGrind.



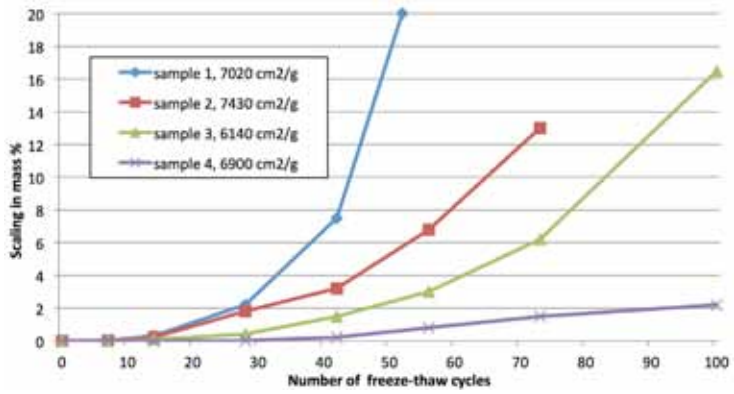
Right - Figure 5: Shear cell of ring shear tester (Schulze ring shear tester XSMr)

Durability

The cement type can affect the durability of concrete with and without reinforcement. The major topics are environmental actions and the alkali-silica reaction. The environmental actions are classified according to EN 206-1 into the following exposure classes:

XC: Carbonation-induced corrosion;
XS: Chloride-induced corrosion (sea water);
XD: Chloride-induced corrosion (de-icing);
XF: Freeze-thaw attack;
XA: Aggressive chemical environments (e.g. Sulfate).

CEM II/A-LL is used in most European countries for all exposure classes except XA [9]. CEM II/B-LL is on the rise and more and more cement producers achieve approvals for this cement class in all exposure classes except XA.



Right - Figure 7: Freeze-thaw resistance of PLC with different PSD. Blaine is not the decisive factor.

Corresponding to the Standard Specification for Blended Hydraulic Cements ASTM C595/C595M-15, Type IL cement is solely not permitted as a moderate (MS) or high (HS) sulfate resistance cement.

The German association of cement producers initiated a research project with the aim to determine the effects of the particle size distribution on the properties of cements containing limestone and the concretes produced using them [10, 11]:

A cement plant produced four PLCs with identical constituents in a ball mill by intergrinding. All cements had a content of 30% limestone. The parameters of mill and separator were adjusted to produce different cement surface (Blaine). An identical concrete mix (cement = 300kg/m^3, w/c = 0.60) was used to produce cubes which were subjected to the freeze-thaw test according to CEN/TS 12390-9. The concrete must have less than 10% loss of weight after 100 cycles to fulfill the requirement of the standard. Although the cements N°1 and 2 had a significantly higher surface area according to Blaine they did not comply with the requirement whereas cement N°4, with lower Blaine, achieved the target. Conclusion: The scaling level does not correspond with Blaine, but the particle size distribution of clinker and limestone is essential.

Below right - Figure 8: Pitting corrosion of reinforcement

What is the contribution of SikaGrind to durability? Tailor-made SikaGrind for PLC are very efficient grinding aids. The tendency of limestone to agglomerate is extremely well reduced by SikaGrind, therefor the share of limestone in the segment of very fine particles is reduced but the fineness of the clinker increased. In this way SikaGrind helps to reduce porosity and chloride diffusion which is an important factor to avoid pitting corrosion (Figure 8). Besides, SikaGrind performance enhancer for PLC improve the workability of concrete – a further positive impact on durability as it avoids the formation of e.g. honeycombs in concrete.

Approach with SikaGrind LS

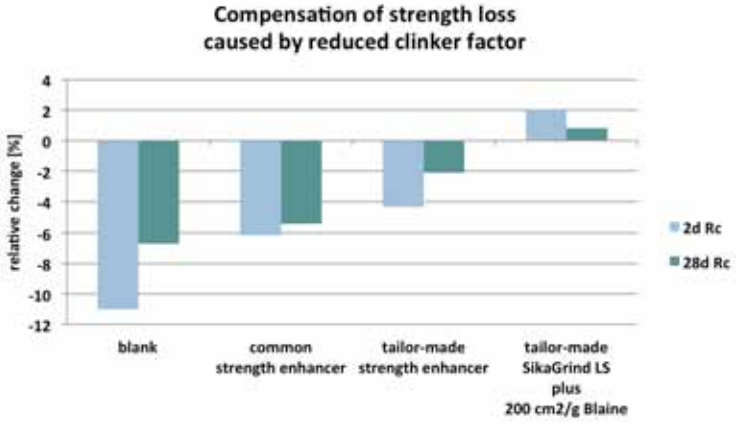
The strategy of SikaGrind LS is to compensate the strength loss with strength enhancers as far as it makes sense and to additionally increase the surface area. Eventual impacts of the higher surface on productivity, powder flowability or workability are reduced by SikaGrind LS.

Summary, conclusion

Practical experience and results of research are in line with the current trend to portland-limestone cement. Ecological and economical aspects make limestone the most interesting secondary cementitious material. At a certain content of limestone, its positive influence turns and the mechanical strength, the cement powder flowability as well as the durability and the workability of concrete are negatively affected.

Cement additives can be helpful to overcome these issues, but the benefit of strength enhancers is limited. Performance enhancers such as SikaGrind LS can extend the content of limestone in PLC, due to their impact on cement properties and cement production.

References are available from the author, dietrich.matthias@ch.sika.com



Right - Figure 9: CEM II/A-LL 32.5R. Reduction of 6% clinker content.

George Trabits, President, Trabits Group

Development of a lower cost, high performance, lightweight well cement

Trabits Group has developed a high performance, lightweight well cement using a patented method of intergrinding cement clinker with whole rock zeolite. The resulting cement is lower in cost than other commercial lightweight well cements, exhibits high early strength and is more environmentally friendly with a reduced carbon burden during product manufacture.

Trabits Group is a technology and resource development company headquartered in Wasilla, Alaska, USA. Trabits Group had extensive experience with zeolite and was intrigued with zeolite's potential in lightweight well cements. In 2008 Trabits Group negotiated a worldwide, exclusive license to develop technology that concerns zeolite-containing cement and zeolite-containing drilling fluids on patents held by Halliburton Energy Services.

What is zeolite?

The term 'zeolite' was derived from the Greek (zeo) meaning 'to boil' and (litos) meaning 'stone' It was observed in 1756 that when rapidly heated, zeolite produced large amounts of steam from water that had been adsorbed, hence 'boiling stone'. Zeolite is a crystalline, hydrated aluminosilicate having an open, three-dimensional structure. Zeolite is able to lose and gain water reversibly and to exchange cations without change of crystal structure. Zeolite is used as building stone, lightweight aggregate, a filler in paper, and to remove ammonia from municipal, industrial, and drinking waters. Given the uptake of ammonia, zeolite is used as a deodoriser in cat litters.

There are more than 40 natural zeolites that are known, each with different crystalline structure and different properties. Not all natural zeolites have characteristics suitable for use in cement formulations which, by necessity, results in a 'trial and error' approach to blend development.

Left : Zeolite in crystalline form

Early development

Shortly after acquiring the license rights, Trabits Group began a systematic approach on trial cement blends. This approach considered the variables of; zeolite type; zeolite particle size and percentage of zeolite by weight of cement. In 2009, Trabits Group noted in a blend with a 24% zeolite replacement of Class G cement, which when tested at 177°C, exhibited the expected strength retrogression but compressive strength was regained over a 10hr period. This observation led to the hypothesis that the technology could be expanded to high temperature environments such as geothermal wells.

Geothermal technologies research

In early 2010, Trabits Group submitted a geothermal cement development research proposal to the US Department of Energy, Geothermal Technologies Program. The stated goal of the research program was the 'Development of a zeolite-containing lightweight, high temperature, high pressure geothermal cement which would provide operators with an easy to use, flexible cementing system that saves time and simplifies logistics.' Nine target criteria were established:

- Thermal stability with little strength retrogression to 300°C;
- Tensile strength to withstand temperature and pressure changes;
- Low-density, low-viscosity slurries with low equivalent circulating densities (ECD) without the need for air or nitrogen foaming;
- A single cement blend to allow density adjustments without adversely affecting slurry properties to eliminate the need for separate blends for lead and tail slurries;
- Resistance to carbonation;
- Good bonding to casing and formation;

Right : Clinker at the Caspi Cement plant, Kazakhstan. Intergrinding clinker with zeolite can produce a high-quality, low cost cement.

- Accurate downhole densities throughout cement placement without significant changes in viscosity;
- Water absorption capacity without retaining free water;
- Adequate compressive strength.

During the initial screening, five different types of zeolite, each micronised to 5, 10 and 44µm, were used at three replacements of Class G and Class H cement at 15%, 27.5% and 40%. The initial screening samples totalled 180 individual tests.

Trabits Group selected one zeolite/cement blend for detailed testing and development. The zeolite used in this best blend was ferrierite, which exhibited excellent thermal stability. It was subjected to long-term testing in geothermal brine for a three month period after which it was tested for compressive strength, modulus of elasticity and permeability. This best blend met all nine target performance criteria.

The cost factor

In the geothermal technologies research, jet mill processing was used to micronise test zeolite types. Jet milling, while effective for research-sized batches, is not economic for commercial cement manufacture. The research clearly documented that a zeolite particle size of 15-20µm was optimal for performance at high and low temperatures. In addition to the cost of micronising zeolite, there was the cost of dry blending with a finished American Petroleum Institute (API) cement to make the final composite zeolite-containing cement.

Interground cement clinker and zeolite

US Patent 7,332,026 licensed to Trabits Group provides a method of intergrinding cement clinker and zeolite that can be done at the cement plant or at a standalone grinding facility. Intergrinding zeolite and cement clinker provides a bimodal particle size distribution given that zeolite is a 'softer' material than clinker, with the zeolite preferentially grinding finer. The result is increased compressive strength as compared to separately ground material. High compressive strength and greater flow characteristics of the interground clinker and zeolite combine two desirable characteristics of a cementitious composition in one material. The advantages of intergrinding are:

Rights: Oilfield Testing and Consulting in Houston, Texas is an independent third-party laboratory with over 22,000 square feet of floor space used for extensive cement testing.

- Economic gain of replacing a higher cost clinker with a lower cost zeolite;
- Improved physical properties: higher strength, lower permeability and resistance to carbonation;
- Lower emissions due to lower clinker factor.

Product development

The goal of the project was to manufacture an interground lightweight variable-density well cement with high performance that is economic with multiple applications from a single intergrind.

Trabits Group contracted with two US cement plants to test process an interground clinker/zeolite according to Trabits Group specifications. The first intergrind used a Class G clinker with the zeolite clinoptilolite. The second intergrind used a Type I/II clinker with the zeolite, ferrierite. Both intergrind plant runs were at full production scale. Grinding aids were not used in either intergrind.

Oilfield Testing and Consulting located in Houston, Texas, conducted extensive testing for Trabits Group. Of the two cement plant intergrinds the second using ferrierite gave the best overall performance.

Product brand name

In July 2015, Trabits Group filed a US Trademark application with the US Patent and Trademark Office (USPTO) for the mark 'FlexCem'. In February 2016 Trabits Group received the official USPTO Notice of Allowance for the mark.

FlexCem™ Products

Trabits Group has identified and tested three products that can be marketed from the same intergrind.

FlexCem LVD is a lightweight variable-density well cement. FlexCem LVD can be used in all types of cement applications, as a lead or tail slurry, and it is compatible with most currently-used cement additives.

Europomice's Pumice and Zeolite Quarry – Tuscany, Italy.

Table 1 shows the thickening time expressed in Bearden units (Bc) which is a measure of pumpability or consistency of the cement slurry.

Table 2 shows the compressive strength for two slurries, one at 1.5kg/L and one at 1.71kg/L. Both densities were tested using API test standard RP 10B-2. The test temperature for both slurries was 52°C with a test pressure of 34.5MPa.

Table 3 shows the thickening time in Bearden units when seawater is used for mix water.

Table 4 shows the Compressive Strength for a 1.55 kg/L slurry mixed with seawater. As before the slurry was tested using API standard RP 10B-2 at a test temperature of 52°C with a test pressure of 34.5MPa.

FlexCem GP/EF is an interground general purpose construction cement that is more environmentally friendly due to the reduction of greenhouse gas emissions during manufacture. FlexCem GP/EF provides compressive strength greater than 43.45MPa at 28 days. FlexCem GP/EF has a lower bulk density than an equivalent volume of Portland cement making the product easier to handle. (A standard US sack of OPC weighs 42.6kg whereas of FlexCem GP/EF weighs 29.5kg)

A Jacobs geothermal exploration drilling project in Wairakei, New Zealand. These kinds of projects are essential for researchers to find new and efficient methods of producing high-quality cement.

Conclusions

In difficult economic times, interground cement clinker with selected zeolite offers a method to manufacture a high performance, lower cost lightweight well cement. Without modification of the intergrind, the resulting composite cement is saltwater tolerant. This provides the benefit of not having to haul and store freshwater in offshore applications. The interground cement clinker and zeolite in the ratios developed by Trabits Group for well cement application can also be used as a general purpose, eco-friendly consumer product providing the same sack volume at a significantly reduced weight. As the interground well cement and the general purpose consumer product are the exact same intergrind, there is the production benefit in larger volumes.

Table 1: Thickening time

Density (kg/L)	Test Temp (°C)	Test Pressure (MPa)	Initial Bc	30 Bc at hh:mm	50 Bc at hh:mm	70 Bc at hh:mm	100 Bc at hh:mm
1.55	52	35.6.	31	v00:00	01:31	01:40	01:44

Table 2: Compressive strength

Density (kg/L)	0.34MPa at hh:mm	3.45MPa at hh:mm	MPa at 12:00	MPa at 24:00	MPa at 48:00	MPa at 72:00
1.55	02:01	07:34	4.82	8.27	14.28	16.48
1.71	01:23	03:03	9.35	14.81	21.05	22.88

Table 3: Thickening time (mixed with seawater)

Density (kg/L)	Test Temp (°C)	Test Pressure (MPa)	Initial Bc	30 Bc at hh:mm	50 Bc at hh:mm	70 Bc at hh:mm	100 Bc at hh:mm
1.55	52	35.6.	6	00:51	01:02	01:10	01:18

Table 4: Compressive strength (mixed with seawater)

Density (kg/L)	0.34MPa at hh:mm	3.45MPa at hh:mm	MPa at 12:00	MPa at 24:00	MPa at 48:00	MPa at 72:00
1.55	01:47	04:24	8.60	12.26	14.41	15.31

Kalenborn

Good protection is half the battle won

The south of France not only boasts olive plantations and fields of lavender. The region is also home to cement works which present Kalenborn with new challenges.

In order to optimise the process of grinding cement, a European cement manufacturer decided to procure a new vertical roller mill. However, as the facility only produces special cement containing a high fraction of granulated slag, the mill is subjected to heavy loading. This places great demands on the wear protection and on extending the lifespan of the facility.

The customer commissioned experts from Kalenborn to line the vertical roller mill and its systems. Kalenborn worked with the mill supplier to come up with an integrated solution in which three proven materials are used. In order to protect the classifier housing from the high temperatures which are generated, the installation team laid 280m^2 of KALOCER alumina ceramics in the upper section. Due to the vibrations that are to be expected in the area of the classifier, the KALOCER tiles were securely fixed in place with holes and weld-on sleeves. In the bottom and top section of the classifier and in the bottom section of the return cone, the decision was made to use KALMETALL-W hard overlay welded plates, which guarantee both high wear resistance and impact strength. A total of 55m^2 was lined using this material. The Kalenborn experts protected the dust line behind the mill over an area of lining of around 124m^2 with the hard compound KALCRET, which can be trowelled on. KALCRET is suitable for creating a quick and seamless lining and also ensures very good wear resistance and compressive strength – even at high application temperatures. The installation team installed all of the lining on site at the cement works within the specified schedule. Kalenborn was thus able to complete the assignment to the customer's complete satisfaction.

Right: Kalenborn KALCRET spray technology enables large surface areas to be coated quickly and safely.

Right: Ductwork with KALOCER alumina ceramic tiles as protection from the high stresses caused by fluctuating temperatures - note figure for scale.

Right: Application of KALOCER alumina ceramic tiles with simple tools.

Right: Kalenborn KALCRET spray technology used to coat a cyclone duct.

KALCRET – versatile wear protection

Linings with KALCRET protect plant components and pipes. There are already many successful applications throughout the raw materials industry, for example in mining, in power plants, in waste incineration plants and in the steel and cement industries.

In cement works, the pipes in clinker dust pipelines are lined with KALCRET and in cement grinding KALCRET is used to protect the classifier lining. As a casting compound, flat surfaces can be lined quickly and efficiently and with the Kalenborn spray technology for KALCRET large surface areas can be coated quickly and securely so that the plant availability is restored in a short period of time.

As a cement-bonded hard compound, KALCRET combines excellent wear protection properties with easy handling. Its particular advantage is its flexibility. Linings over large surface areas and repairs, even to complex geometries, can be carried out with simple tools. It can also be processed overhead. The surface which is lined can be subjected to loads again after just 24 hours.

KALCRET can be supplied for temperatures of up to 1200°C and is also capable of being combined with other materials from the Kalenborn wear protection range. Kalenborn individually matches the requirements for the material which is specially produced with the customer, in accordance with the particular intended uses.

Brigitte Pennington, Business Development Manager, Parker Conflow

Breathing easy with dust suppression

Brigitte Pennington, Business Development Manager at Parker Conflow, looks at the importance of effective dust suppression systems in quarries.

The European guidance document 'Good Practice Guide on Workers' Health Protection through the Good Handling and use of Crystalline Silica and products containing it,' published in 2006, made a significant impact on raising awareness of the issue of respirable crystalline silica (RCS) and its impact on workers in cement plants and quarries. It prescribed regulatory occupational exposure limits for RCS among all European member states and was agreed by employers and employee representatives from 14 industry sectors, including cement, minerals and aggregates. Quarries in the UK and across mainland Europe recognise their responsibilities to their staff and the Good Practice Guide gives a number of recommendations for how workplaces can comply with the requirements to control exposure to respirable crystalline silica.

Exposure to RCS, found in sand, stone and clays, over time has been found to cause hardening of the lung tissue, leading to impairment of lung function. This irreversible condition is known as silicosis, which is characterised by a severe shortness of breath, causing sufferers to sometimes find it difficult even to walk short distances. It is so debilitating that it continues to worsen even after exposure has stopped. A link has also been proven between exposure to silica and the occurrence of lung cancer along with an increased risk of contracting a range of other diseases, including kidney inflammation, tuberculosis and arthritis. Different types of stone contain varying levels of silica, ranging from sandstone, which is almost pure quartz at 70%, to limestone and chalk at around 2%.

As well as being compliant with the EU guidance, quarries also need to operate within the specific requirements of the Control of Substances Hazardous to Health (COSHH) Regulations 2002. In the UK, the workplace exposure limit (WEL) for RCS is 0.1mg/m^3 – which is expressed as an eight hour time weighted average (TWA). The Workplace Exposure Limit (WEL) applies only to the respirable fraction of the silica dust. This means the portion of dust that reaches the deepest parts of the lungs – around 10-20% of the total inhalable dust. In industries such as limestone quarrying, where silica content is low, exposure levels to RCS may be far below the WEL.

However, the quarry still needs to ensure that the amount of inhalable dust does not exceed 10mg/m^3 over an eight hour period and exposure to respirable dust should not exceed 4mg/m^3. Anyone operating or managing a quarry is required, under guidance from the Health and Safety Executive, to reduce the exposure of staff, contractors and those living close to a plant to silica dust generated by their operations.

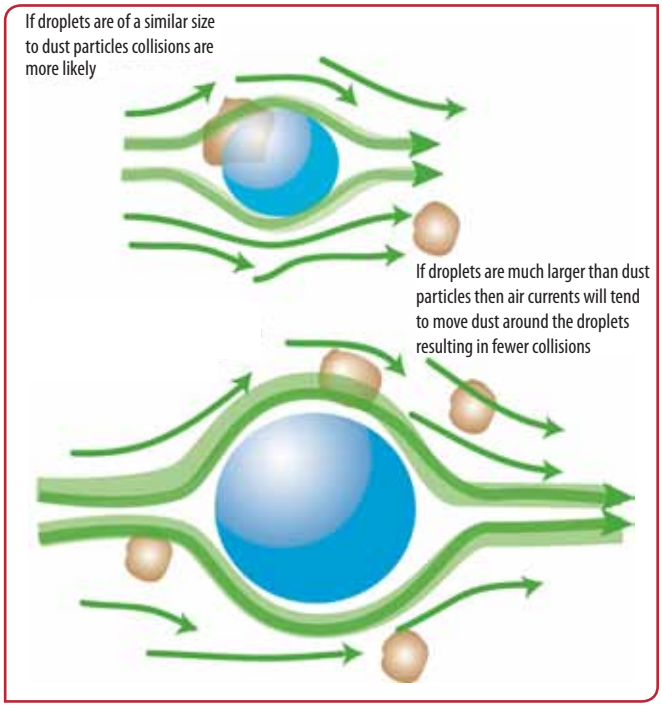
Exposure to RCS is governed by a variety of factors, which include the proportion of silica in the material, the mechanical work involved in breaking up or processing the material and the work patterns that influence when and how individuals may be exposed. Risk assessments should be carried out for each job or range of tasks. This includes identifying the potential for exposure to RCS, measuring the effectiveness of existing dust control systems, ensuring use of respiratory protective equipment and maintaining and regularly inspecting any control systems in place to ensure effective operation. Regulation 7 of COSHH states that employers have a duty of care to prevent exposure of employees to RCS, or to ensure that this is adequately controlled.

Dust particle size is measured in microns and it is typically between 50-70 microns. There are dust particles larger than this (which tend to settle in the immediate vicinity of whatever is generating the dust) and dust particles smaller than this. It has

been shown that dust particles of 20 microns or fewer can remain airborne for a very long time and can find their way onto and into machinery, into lungs and also into areas outside of the mine itself. Dust particles smaller than 10 microns in size are invisible to the naked eye and can remain suspended in the air indefinitely. Generally, the smaller the particle size, the more hazardous it is to health and equipment. In addition; the smaller the particle size, the harder it is to remove from the atmosphere.

One of the methods of reducing the effects of RCS is through wet dust suppression, which prevents fine dust particles becoming airborne by trapping them in water. Water sprays as part of dust suppression systems are one of the most effective ways of controlling RCS.

With dust suppression, the aim is to prevent dust escaping from its source, to collect it and to contain it. This is usually done through spraying mechanisms. Dust suppression systems provided by Parker Conflow spray water onto the source of the escaping dust. This is usually done at the point of extraction or crushing, ensuring that the respirable sized particles are wetted and entrapped by the water droplets. Alternatives to water are chemical suppression and solenoid valve dust suppression but these methods can be expensive and the dosage of chemical must be accurate at all times to be effective. This can add significantly to the overall overhead costs of a quarry. A solenoid valve dust suppression system requires a power source and requires regular maintenance. The Parker Conflow water dust suppression system is mechanical and requires no use of power making it inexpensive to run.



Right - Figure 1: Diagram illustrating dust absorption in water.

The principle behind Parker Conflow's dust suppression range is that the dust agglomerates with the water, causing it to fall under gravity. However, it is not just a question of providing a water spray. If the water droplets are too large then the airborne dust particles are just moved around in the resulting air currents and very little dust is removed from the air. Too much water also means a very soggy working environment. For the dust to be removed from the air, the water particles need to be of a similar size to the dust, which means a collision between dust particle and water droplet is more likely (Figure 1). The design of the spray head is therefore of paramount importance in ensuring that the right volume and size of water droplets is delivered. With dust suppression droplet size is less important.

Parker Conflow engineers are continually working with quarries and equipment manufacturers to improve and develop new products to protect equipment and personnel from the harmful effects of airborne dust. Parker Conflow is in the process of working together with OEMs to provide a value-added system to prevent and control dust. Environmental and health and safety legislation is becoming tighter and therefore these solutions are becoming more important. Not only does it make sense when considering the health of employees, but commercially as well. Controlling dust leads to less equipment downtime, lower employee healthcare costs and better community relations. Dust suppression systems can be retrofitted to any existing installation and assuming there is an adequate supply of water, the system can be operational in as few as a couple of hours.

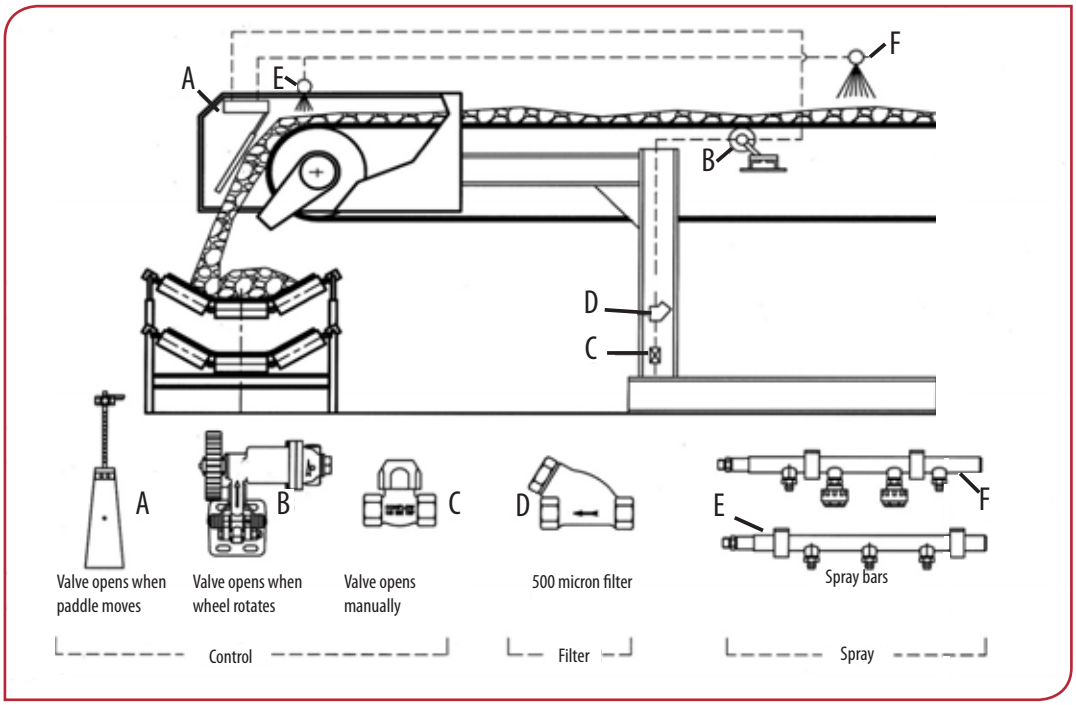
The Parker Conflow Dust Suppression System can be installed where the primary and secondary crushers are located as well as alongside the conveyors. Rain systems can be placed around the stockpiles and stackers for dust prevention.

Crushing

Crushing is usually carried out by compressive-type crushers, which produce dust, but do not themselves induce excessive air movement. Water suppression is often used to control dust from compressive crushers, providing that the moisture content of the product does not cause an issue at a later stage in the process.

Another area where dust issues can arise is on roadways within quarries, particularly during dry weather. Again this is an area where mechanical dust suppression can be used to reduce the issue of RCS.

For any dust reduction programme to be successful it requires careful selection of the appropriate



Left - Figure 2: Diagram illustrating dust suppression system.

Below Left - Figure 3: 100 Spray Control Valve.

equipment. Operators also need to be trained on the correct use of the equipment. Regulation 9 of the COSHH requires that measures are in place to keep the equipment in an effective state of good repair and regularly maintained. Innovation in dust suppression systems means that quarry owners can reduce risks to workers and their business, while ensuring that they are fully compliant with Health and Safety regulations. All Parker Conway dust suppression systems are bespoke to the application. The first step is to evaluate and fully understand the requirements of what the dust suppression system needs to achieve, then customers are provided with a full site audit evaluation.

This evaluation means that engineering teams can determine the design of the system with the optimum number of spray bars and appropriate size of nozzles, which determines the size of the droplets that need to disperse into the dust. It can also be designed into the system if a pump and a tank is required due to insufficient water pressure, as well as being low maintenance and very efficient.

Effective dust suppression makes sense both from a production and a health and safety point of view. It is an issue that no quarry can afford to ignore and is essential to being a responsible operator, reducing risks and remaining compliant.

Muhammed Emami, Cement industry expert, Ankara Turkey

Application of SNCR and SCR in cement plants

As well as CO_2, the production of cement produces nitrogen oxides (NO_x), sulphur dioxide (SO_2) and dust. There are specific abatement technologies for each of these, although the need to control NO_x is particularly crucial from the point of view of the environment and human health. Here Muhammed Emami explains the problem and the different solutions that are available, with a focus on chemical-based post-combustion technologies.

What's wrong with NO_x?

Nitric oxide (NO) constitutes about 90% of the NO_x from a cement kiln. It is is a poisonous substance that can cause: Irritation of the eyes and throat; Tightness of the chest; Nausea; Headaches; Muscle weakness; Violent coughing and; Difficulty in breathing. The other 10% is nitrogen dioxide (NO_2), which is also extremely toxic. It can lead to delayed chemical pneumonitis and pulmonary edema.

The reaction of NO and atmospheric O_2 to form ozone (O_3) is another problem associated with NO_x. This is especially undesirable in the lower atmosphere. Acid rain and smog are other undesirable and harmful phenomena attributiable to NO_x. In the atmosphere, NO reacts with water to produce highly corrosive acids like nitrous acid (HNO_2) and nitric acid (HNO_3).

Kinds of NO_x

During the cement production pyro-process, several kinds of NO_x may be created. Thermal NO_x results from oxidation of molecular nitrogen (N_2) present in the combustion air. Fuel NO_x is formed by oxidation of N_2 present in the fuel. Prompt NO_x is formed by the reaction of fuel free radicals with N_2 present in the combustion air. Feed NO_x is from the oxidation of N_2 from the kiln feed.

NO_x reduction techniques

There are three main ways to control NO_x. Pre-combustion controls concerns any changes or treatments on the fuel or raw materials that may help to reduce the level of NO_x. Combustion controls relate to modifications to the combustion parameters, for example flame parameters, temperature control, excess air and burner controls.

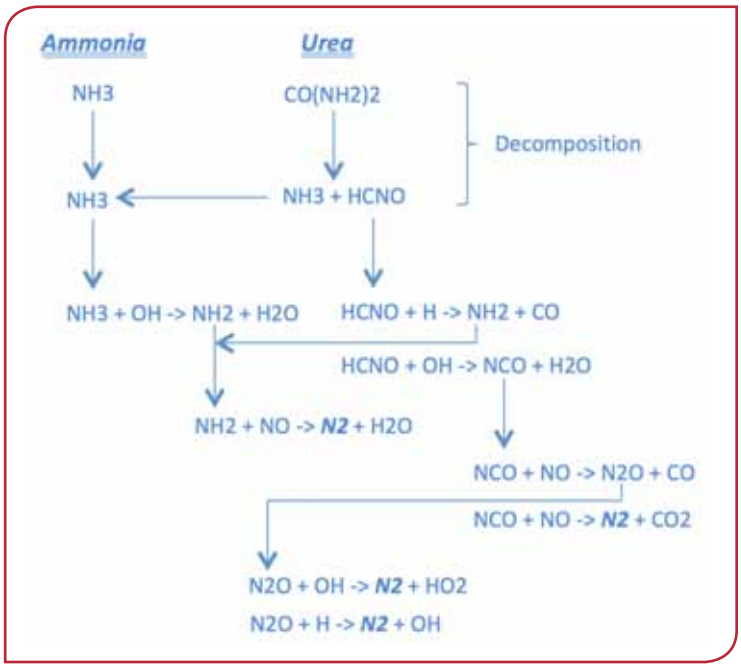
Post-combustion controls concern the treatment of NO_x-rich flue gas before it is emitted to the atmosphere. The most efficient technologies for post-combustion control are selective non-catalytic reduction (SNCR) and selective catalytic reduction (SCR).

SNCR

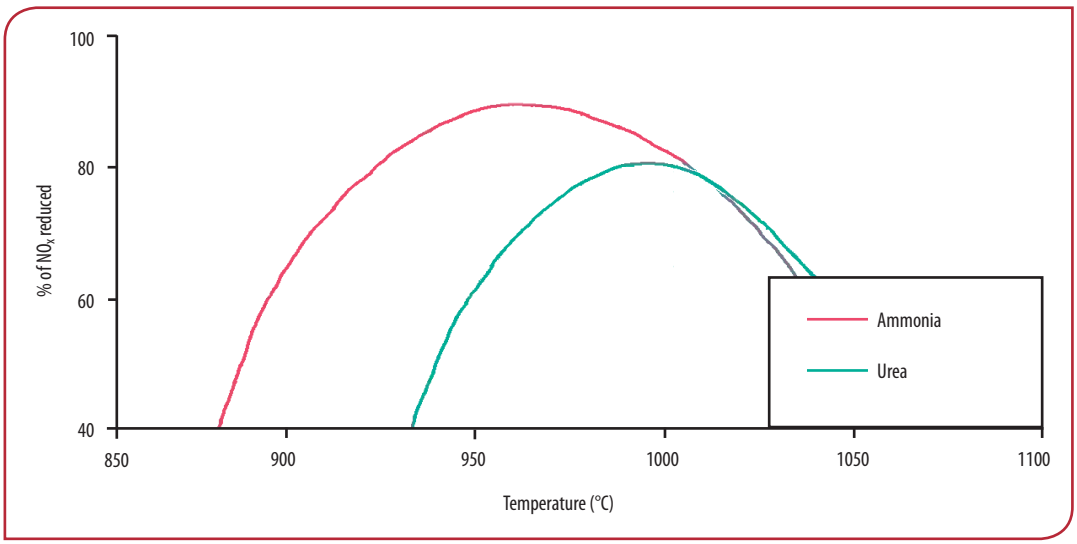
SNCR is a post-combustion control technology based on the chemical reduction of NO_x. NO_x in the flue gas can be reduced by selective reduction with a nitrogen-based reagent like ammonia (NH_3), urea ($(CO(NH_2)_2$) or cyanuric acid ($(HNCO)_3$), duing which both the NO_x and the reagent are converted into innocuous water vapour (H_2O) and free nitrogen (N_2), the major constituents of air.

Aqueous ammonia solutions (~20%) have been the most prevalent reagent used for this purpose in the cement industry to date. Alternatives include gaseous (anhydrous) ammonia and urea solution. The SNCR process is summarised in Figure 1.

Generally, the reduction of NO_x is executed by NH_2^- radicals, which come from reagents like ammonia, urea and cyanuric acid. The reagents decomposes to NH_3 (and HCNO when urea



Right - Figure 1: SNCR / SCR chemistry.



Left - Figure 2: Relative effectiveness of ammonia and urea for NO_x reduction.

is used) and in the subsequent steps the NH_2^- radicals are created by participating OH, H and other free radicals. The NH_2^- radicals take NO_x to eventually form N_2 and H_2O. The overall reactions are expressed as follows:

Ammonia-based process:

$4\ NO + 4\ NH_3 + O_2 \rightarrow 4\ N_2 + 6\ H_2O$ (Eq 1)

$4\ NH_3 + 2\ NO_2 + O_2 \rightarrow 3\ N_2 + 6\ H_2O$ (Eq 2)

Urea-based process (Eq 3):

$CO(NH_2)_2 + 2\ NO + ½\ O_2 \rightarrow 2\ N_2 + CO_2 + 2\ H_2O$

These equations allow the amount of reagent needed to reduce a given amount of NOx to be reduced.

Factors that affect NO_x reduction

1. Temperature: Figure 2 illustrates the optimum and acceptable ranges of temperature for both the ammonia-based process and the urea-based process. The optimum temperature necessary for ammonia-based process is lower than that of urea-based processes. The range is 870-1100°C. Ammonia has a slightly higher efficiency than urea at temperature between 760-930°C and urea performance is higher at 950-1050°C.

2. Ammonia slip: In the event of lower temperature, the reducing reactions become kinetically slower, leading to ammonia passing (slipping) into the flue gas without reacting. This is called 'ammonia slip' and can be a disadvantage of SNCR. On the contrary, when the temperature is higher than what is needed, the reagents may be oxidised and additional NO_x can actually be created according to Eq 4.

$4\ NH_3 + 5\ O_2 \rightarrow 4\ NO + 6\ H_2O$ (Eq 4)

To widen temperature range, additives such as methylamine, dimethylamine, trimethylamine, cyanuric acid, carbamates, ammonium carbonate, ammonium bicarbonate or cyanurates can be helpful.

3. Residence time: Considering that the SNCR reduction process features sequential reactions, an appropriate time interval is required to allow reagents to mix and react. Elongating the residence time increases the amount of NO_x reduced, especially in the case of narrower temperature windows.

4. Degree of mixing: The reagents must be properly dispersed, atomised and mixed throughout the flue gas, so that intimate contact between NO_x and the reagent is ensured. The type of injectors, the spraying angle, direction and velocity, the number of injectors and their locations are greatly important.

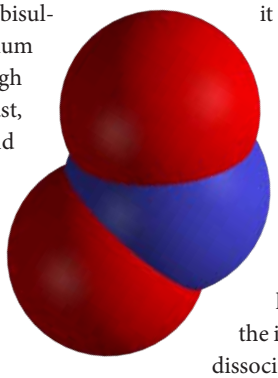
5. Turbulence: Intensifying the turbulence is very important to maintain a satisfactory mixing of injected reagent and flue gas. For this purpose, it is crucial to correctly design the cross sectional areas of ducts, number, locations and angles of injectors, the velocity of flues gas and other parameters.

6. O_2 content: The O_2 content in the flue gas must be sufficient to allow SNCR chemical reactions. Lower O_2 content can lead to excessive CO emissions.

7. NO_x concentration: The concentration of NO_x as a reactant has a direct effect on the quality of reaction. The reaction kinetics speed up as the NO_x concentration increases.

8. Normalised stoichiometric ratio: While the SNCR equation shows that two moles of NO_x can be removed by two moles of ammonia or one mole of urea, in practice, due to the complexity of reactions and mixing limitations between reagent and flue gas, a small excess is required.

9. Chlorine and sulphur compounds: Chlorine and sulphur-containing compounds in the fuels and/or raw materials can be potentially troublesome for



Right: Representation of NO_2.
Molecular weight: 46.00g/mol.
Boiling point: 21.2°C.

SNCR reduction chemistry. This is due to the propensity of NH_3 to form undesirable compounds such as ammonium chloride, ammonium bisulphate, ammonium sulphate and ammonium bisulphite with these. However, in the high temperature environment of the exhaust, the stability of ammonium salts is low and the ammonia can be rapidly re-formed. However, this still reduces the apparent effectiveness of NH_3.

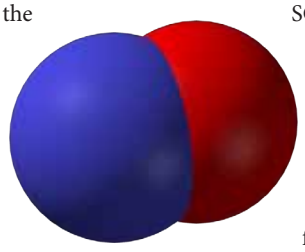
10. CO concentration: CO may have both a positive and negative impact on the reduction of NO_x. CO, in high concentrations, inhibits the reaction by consuming some of the present OH radicals (Eq 5) that would have reacted with NH_3. In the event of using urea as the reagent, this is exaccerbated by the localised creation of CO caused by dissociation of the urea.

However, in the presence of sufficient O_2, the consumed radicals can be reproduced (Eq 6) to maintain a sufficient supply of OH. Besides, a large portion of CO can be oxidised to CO_2 when O_2 levels are high enough (Eq 7).

$CO + OH \rightarrow CO_2 + H$ (Eq 5)
$H + O_2 \rightarrow OH + O$ (Eq 6)
$O + CO \rightarrow CO_2$ (Eq 7)

These processes create localised pockets of high temperature, which, in turn, can lead to the continuous creation of more radicals.

11. Reagent injection locations: Considering the importance of temperature and NO_x concentration, some ideal locations for the injection of reagents are: After the calciner hopper, but before the bottom stage cyclone; To the riser duct, after the alkali bypass take off, but before the tertiary air duct; At the gas exit of the lowest stage cyclone; Into the riser duct, after the tertiary air duct, but before the calciner; The lower and upper parts of the calciner and; The lower and upper parts of the riser duct.



Right: Representation of NO.
Molecular weight: 30.01g/mol.
Boiling point: -152°C.

Comparison of ammonia and urea

Both ammonia and urea have been successfully employed as reagents for NO_x in the cement industry. They have different advantages and disadvantages.

Ammonia can be used both in aqueous or anhydrous form. The use of anhydrous ammonia involves specific safety issues relating to its storage at certain pressures. It is also necessary to have a permit to install aqueous ammonia at concentrations higher than 28%.

Urea solution is generally used in a 50% concentration. Due to having a lower freezing point, it must be heated and circulated. However, urea is nontoxic and less volatile than ammonia, meaning that it is easier and safer to store and handle.

However, ammonia is both more effective than urea and is effective at a lower temperature, particularly in the preheater and calciner. When using urea, especially when it is injected into locations with low O_2 or high CO levels, the increase of CO is more prevalent since the dissociation of urea results in additional CO.

SCR

Another chemical-based post-combustion NO_x selective catalytic reduction (SCR). Its principle and application procedure is the same as SNCR, except that it uses a catalyst to promote the reactions and allow them to occur at lower temperatures.

The catalyst is composed of active metals or ceramics that have a highly porous structure. Catalysts configurations are generally ceramic honeycomb and pleated metal plate (monolith) designs A number of catalysts can be used, including titanium dioxide, vanadium pentoxide and zeolite-based materials.

The use of catalysts results in two primary advantages of SCR over SNCR. These are higher NO_x control efficiency and reaction within a lower temperature range (250-430°C). This means that it must be used in locations that have lower temperatures than those used in SNCR processes.

Comparisons between SNCR and SCR

SCR has higher NO_x reduction efficiency (70-90%) and its temperature range is lower than SNCR. SCR can be applied to sources with low NO_x concentration without being affected.

However, SCR has some disadvantages, which include high capital investment costs, higher operating costs, limited catalyst life, large plant footprint, high pressure drop and difficult retrofit operations.

Conclusion

Although SNCR effectiveness is lower (40-70%) than SCR, SNCR is more reliable and profitable technology for the cement sector. In the event of using SCR, the reagents must be injected into the upper stages of the preheater where the temperature is lower. However, in a cement plant, the temperatures required by SNCR are more prevalent. This, coupled to higher costs for SCR and retrofit difficulties associated with the use of catalysts, SNCR has become more predominantly used by the cement industry.

The Global Cement Directory 2016

The Global Cement Directory 2016 is now available

- Up-to-date listing of all global cement plants*
- Cement grinding plant section
- Basic process information (wet/dry, number of kilns)
- Contact details: Telephone and Fax numbers
- Up-to-date capacities and location maps
- Country reports for key regions, including China, India, US, Germany, South East Asia & more!
- Cement capacities for countries / regions
- Blockbuster size - 314 colour pages

* Except where unavailable

Order Form for Print and CD copies

Your first name _____ Your family name _____

Position _____ Company _____

VAT No. including country prefix (required for all EU companies) _____

Postal address _____

Town/City _____ State/County/District _____

Post/Zip code _____ Country _____

Email _____

Tel _____ Fax _____

Three options are available:

a) PRINT copy = €405 (1) (zero-rated for UK companies)

b) CD (PDF) copy = €405 (2)
(for UK companies add Standard VAT @ 20%, i.e. €81)

c) PRINT & CD (PDF) bundle = €495 (2)
(for UK companies add Standard VAT @ 20% to CD element, i.e. €544.50 total)

❒ I wish to purchase _____ x option _____with a 33% discount on 2nd and subsequent copies

❒ I am a subscriber to Global Cement Magazine (Subscriber No._____) and wish to purchase _____ x option _____ claiming my 33% subscriber discount

❒ I wish to subscribe to Global Cement Magazine (add Euro150)(1) and wish to purchase _____ x option _____ claiming my 33% subscriber discount

(1) = zero-rated for UK companies, companies in other EU countries must account for VAT under the reverse charge system, no VAT applies for companies outside the EU. **(2)** = Standard VAT applies to CD purchase for UK companies, however, companies in other EU countries must account for VAT under the reverse charge system; no UK VAT applies for companies outside the EU.

Total purchase price Euros _____ A paid invoice will be sent to the address you specify.

Three payment options are available:

❒ Send a cheque payable to 'Pro Global Media Ltd,' at the address below along with a completed copy of this form. A paid invoice will be sent to the company detailed above.

❒ Credit card number**_____ Expiry date (mm/yy) _____

Mastercard/Visa/Amex Security code (last three numbers on signature strip) _____

Name on card if different from above: First name _____ Family name _____

**Please note, credit card payments will be taken in UK£ using www.XE.com exchange rates on the transaction date. Local currency amounts charged on your card will therefore vary depending on currency fluctuations. Please send a completed copy of this form to Pro Global Media Ltd. at the address below or fax it to the number below. A paid invoice will be sent to the company detailed above.

❒ Pay by direct payment (bank transfer). To request an invoice, send a completed copy of this form to Pro Global Media Ltd. at the address below or fax it to the number below. An invoice including our bank details for payment will be sent to the company detailed above. Please quote this invoice no. when making your payment. Please note you must pay ALL bank charges related to the payment.

Please send this form to: Pro Global Media Ltd., First Floor, Adelphi Court, 1 East Street, Epsom, Surrey, KT17 1BB, UK or fax to +44 (0) 1372 743838

This form valid until 31 December 2016

Sri Lanka: Holcim Lanka inaugurates transport model

Holcim Lanka has inaugurated a transport model for the transportation of its raw materials. In a public-private partnership between Holcim Lanka and the government, the state railway will transport raw materials by rail from the port of Trincomalee to the Mahawa railway station. The company's dedicated trucks will then transport the materials to the Puttalam cement plant. The inauguration took place at the China Bay station in Trincomalee, according to the Daily News newspaper.

"The successful launch of this phase would not have been possible without the support received from the Ministry of Transport," said Holcim Lanka Procurement and Logistics Director Charith Wijendra.

Environmental and efficiency improvements of the new model include using Supramax bulk carriers instead of smaller ships, using dedicated containerised trucks to reduce spillages and cut journeys and a reduction in the use of the railway network.

Contents
Subscribe
Ad Index

Vietnam: Long Son Company orders mill from Loesche

Long Son Company has ordered a cement grinding mill from Loesche for its Dong Son Bim Son cement plant. The order is part of a contract with Sinoma-NCDRI. The contract includes a type LM 56.4 Loesche mill with a performance of 520t/hour. It will grind cement to a fineness of 12% R DIN 0.09mm. The gearbox of this mill has a power output of 3600kW.

UK: New BSI standard on alkali-activated cements benefits Lucideon

Lucideon has benefited from a newly published standard by the British Standards Institution (BSI) for alkali-activated cementitious material and concrete. The materials technology company has been developing and applying its proprietary MIDAR technology based on alkali-activated cements for several years. A recognised building standard gives it a stronger route to market in Europe.

"With the help of our materials experts, manufacturers can develop products using alkali-activated cement technology. This could potentially improve the performance and reduce the raw material costs and carbon footprints of products," said Rebecca Law, a development scientist at Lucideon.

Lucideon develops materials technologies for a range of industries including construction, healthcare and nuclear sectors. MIDAR is a technology that binds alkalis and aluminosilicate materials, such as those from waste streams including fly ash and blast furnace slags, to form a rigid inorganic material. This technology can be used to make solid or aerated building products.

Germany: thyssenKrupp to supply clinker production line to HeidelbergCement

thyssenKrupp Industrial Solutions has received a contract from HeidelbergCement to supply a new cement clinker production line. The 4500t/day line will be built at the Schelklingen cement plant in Baden-Württemberg as a replacement for an existing older production line. Start of production is planned for spring 2018.

Lothar Jungemann, CEO of the Cement operating unit in the Resource Technologies business unit of ThyssenKrupp Industrial Solutions, said "Although most of the cement contracts we have been awarded recently have been to build new production capacities in growth regions, this order shows that there is also demand in Europe to modernise and expand existing facilities. Our highly efficient technologies, which we continually improve together with our customers, guarantee maximum reliability and allow the production of innovative products in an economical and environmentally friendly way."

For the new kiln line thyssenKrupp Industrial Solutions will supply components including a five-stage, single-strand Dopol preheater, a Polro rotary kiln with a Polguide drive system and a Polytrack clinker cooler with roll crusher. The design of the calciner used in the preheater is intended to allow high fuel burnout with low nitrogen oxide emissions. The Polytrack cooler also features a highly efficient heat recovery system that minimises fuel input.

12th global slag CONFERENCE EXHIBITION AWARDS 2017

globalslag.com

#globalslag

Slag for profit

The 12th Global Slag Conference will return to the popular location of Düsseldorf in 2017 - where the first Global Slag Conference took place in 2005 - and is expected to attract a strong audience from within Europe and from around the rest of the world. The conference will allow all attendees to maximise their profits from slag, will keep them up-to-date with the industry state-of-the-art and will provide extensive networking and business opportunities.

If your business is slag, make it your business to attend the 12th Global Slag Conference in Germany!

Improving slag performance

New applications for slag

Global slag markets and trading

Who should attend?

- Slag producers
- Slag users
- Cement producers
- Cement users
- Equipment vendors
- Traders and shippers
- Academics
- Researchers

Call for Papers - Global Slag 2017

The conference convenors are interested to hear from prospective presenters for the 12th Global Slag Conference in Düsseldorf in May 2017

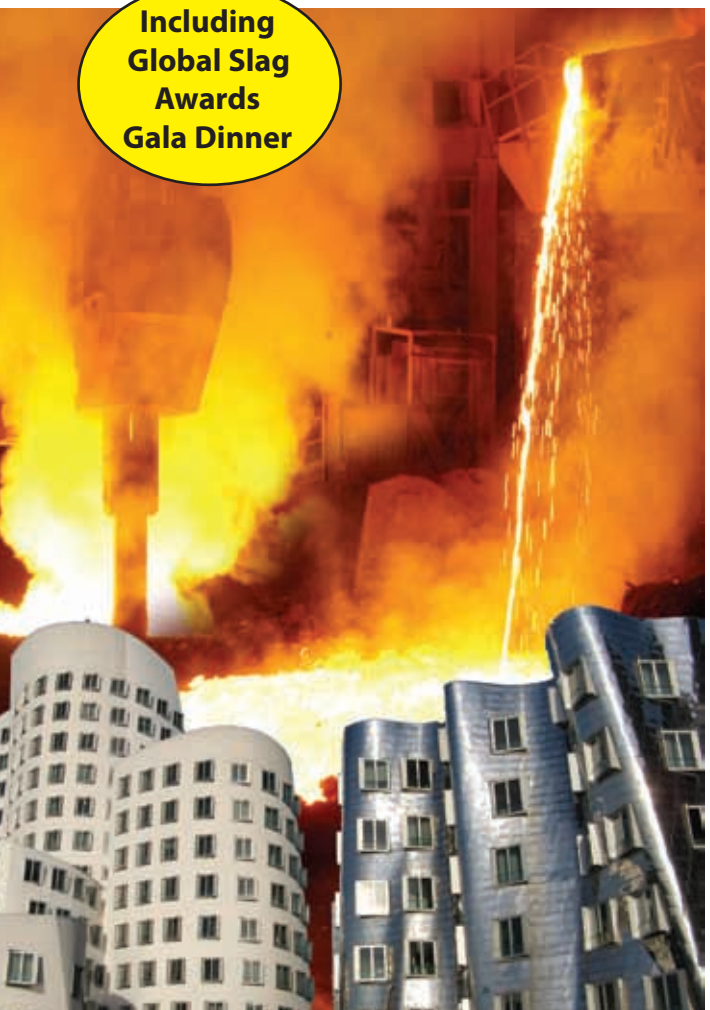
Papers should fit in with the main themes of the conference:

Slag and sustainability • Adding value to slag
Growing market share • Non-ferrous slags

Interested authors should send a proposed presentation title and the name of the author to the conference convenor, Dr Robert McCaffrey, rob@propubs.com, as soon as possible.

Previous events:
Düsseldorf 2005
Bangkok 2006
Istanbul 2007
Strasbourg 2008
Brussels 2009
Sydney 2010
Helsinki 2011
Las Vegas 2012
Dubai 2013
Aachen 2014
London 2016

Including Global Slag Awards Gala Dinner



What the delegates say:

"Good organisation"
"Quality very good"
"Strong focus on GGBFS"
"Gave good overall picture of handling, grinding, processing and testing"
"Good to see so many potential clients from outside the iron and steel industry"
"Excellent venue, well organised event"

Slag-related exhibition

Exhibition and sponsorship enquiries
paul.brown@propubs.com
Tel: +44 1372 840950
Mob: +44 7767475998

International Slag Association sponsors

NIPPON SLAG ASSOCIATION
SCA
BRASIL STEEL INSTITUTE
National Slag Association
asa

Event partner
EUROSLAG

Organised by:
global cement MAGAZINE

Views on the EU-ETS Proposal...

Koen Coppenholle Chief Executive of CEMBUREAU, the European Cement Association

Contents
Subscribe
Ad Index

With the European Parliament in full swing on the EU Emissions Trading Scheme (EU-ETS) dossier, stakeholders from across Brussels (and beyond) are actively seeking to get their voices heard in the debate over what the EU-ETS post-2020 should look like. The cement industry is no different, particularly given how great the impact could be on our sector if we do not get things right from the start. In this editorial we will focus on which elements of the proposal we feel will, on the one hand, reduce CO_2 emissions while, at the same time, maintaining a competitive industry in Europe.

The first of our two main messages is that those installations that have gone a significant way towards reducing their CO_2 emissions should not be penalised. Best-performing installations in the cement industry should continue to receive their allowances for free. Our second message to policy makers is that it is also important to ensure that installations receive the allowances to which they are entitled. This means that the allocation of allowances should be based as closely as possible on actual production. We should not receive allowances for more than we have actually produced. Based on the above, here are our views on EU-ETS proposal:

Ensure that best performers receive the allowances they need: The October 2014 European Council conclusions clearly give priority to the need for free allowances to ensure that the best performers are not submitted to undue carbon costs for both direct and indirect emissions. In order to meet this requirement, it is essential that Phase IV of the EU-ETS implements the following

- 52.5% of CO_2 allowances should be made available for auctioning and 47.5% for free allocation;
- The linear reduction factor should be maintained at 2.2%;
- There should not be a Cross Sectoral Correction Factor (CSCF). Nevertheless, in the event that the CSCF were to be implemented, up to 7% of allowances should be taken from the auction share;
- Allocating allowances for actual production: In order to tackle the issue of installations receiving more allowances than they actually need, a system of dynamic allocation needs to be introduced. In our view, to align the two as closely as possible, such an allocation system should be based on verified data from the previous year. Furthermore, dynamic allocation should also include an update of the benchmarks based on real data.

Ensuring protection from carbon leakage: In our view, the proposal to introduce a tiered approach to sectors at risk of carbon leakage does not take into consideration the fact that, for some sectors, the CO_2 emitted results from the process itself rather than combustion. As such, in its current form, tiering could exacerbate the risk of investment leakage in these sectors. Furthermore, it could potentially be challenged legally as it discriminates between sectors on the basis of unclear and unverifiable criteria. It could also introduce distortions in competition within downstream markets.

Compensating for indirect costs: We fully support the idea that EU Member States should be allowed to adopt financial measures to help mitigate any indirect costs incurred by sectors at risk of carbon leakage. In order to establish the eligibility of a sector to compensation for any indirect costs which arise as a result of the EU-ETS, the criteria used should be the same as that applied in the Directive to identify whether or not a sector is at risk of carbon leakage, i.e.: the cumulative combination of a direct plus indirect emission intensity criteria.

Germany: HeidelbergCement loss down in first quarter

HeidelbergCement has announced its results for the first quarter of 2016. While its revenue remained static at Euro2.8bn, cement volumes rose from 16.8Mt in the first quarter of 2015 to 17.6Mt in the first quarter of 2016. However, the group maintained an operating loss of Euro72m, albeit a significant improvement on the Euro123m lost a year earlier. HeidelbergCement's net debt was down by Euro237m to Euro5.9bn.

The group highlighted improving demand in the US as among the reasons for its improved performance. Cement volumes increased by 6% year-on-year in each of the two years to March 2016. Revenue in the US and Canada was Euro714m, a rise of 14.6% year-on-year. Net income for the region was Euro24m, a turnaround from a loss of Euro18m in the first quarter of 2015.

In Western Europe, positive cement sales trends were led by Germany and the UK. Cement sales in the region were up by 3.1% year-on-year for the quarter to a total of 3.4Mt. Volumes were also up in Scandinavia (1.7% year-on-year), Eastern Europe (6.6%) and in the group's Central Asia, Russia and Ukraine region (0.7%). In Western and Southern Europe revenue was down by 2.1% to Euro683m. The region saw a loss of onlyEuro8m for the quarter. Cement sales revenue improved by 1.8% to Euro290m, against a backdrop of falling aggregates, ready mix and asphalt revenues.

In North and Eastern Europe and Central Asia, cement volumes were 2.9% up year-on-year to 3.9Mt. Revenue for the region was Euro420m, a rise of 9.7% year-on-year, with cement revenues up nearly 7% to Euro225m. The group's net loss in this region increased marginally, to Euro28m from Euro25m a year earlier.

In the group's Asia-Pacific region, Indonesia saw better market conditions. India saw moderate increases in volume and Australia also improved. China saw lower prices and sales volumes. The total volume of cement sold in the region during the quarter was 5.8Mt and the region's revenue was Euro637m. This generated a profit of Euro120m, an 18.8% decline on the preceding year's profit of Euro148m.

In Africa and the Eastern Mediterranean Basin cement volumes were virtually flat at 1.9Mt. Total revenue was slightly down from Euro252m in 2015 to Euro240m in the three months to March 2016. Revenues from cement-based operations were down by 8.7% to Euro177m.

Excluding exchange rate and consolidation effects, HeidelbergCement expects a moderate increase in revenue and a high single to double digit increase in operating income and before non-recurring effects profit for the financial year. The company also expects increases in sales volumes of cement, aggregates and ready-mixed concrete.

Quarrying + Construction + Recycling
28 – 30 June 2016

Hillhead Quarry
Buxton Derbyshire, UK

Hillhead 2016

Register now...

Hillhead 2016

@hillheadshow
#hillhead2016

Follow us now

www.hillhead.com

Austria: Cement industry grows by 4% to 4.6Mt in 2015

The Federation of Austrian Cement Industry (VÖZ) has reported that its national cement market volumes grew by 4% year-on-year to 4.6Mt in 2015. Overall sales turnover increased by 4.3% to Euro388m. Alongside this, the use of alternative fuels by the cement industry increased to 76.1% in 2015 from 75.5% in 2015.

Rudolf Zrost, CEO of VÖZ, lauded the growth in cement volumes despite a 'difficult' year. Looking ahead to 2016 he expected that a turnaround in housing investment and hopes for infrastructure spending in 2016 would aid the market for cement.

Spain: Cementos Portland Valderrivas debt negotiations stall

The refinancing of a Euro825m loan of cement producer Cementos Portland Valderrivas has stalled. Fomento de Construcciones & Contratas SA (FCC) offered a 10% 'haircut' to the loan which matures in July 2016 but the offer has been rejected by the company's creditors. FCC, a Spanish civil engineering group, owns an 80% stake in Cementos Portland Valderrivas.

More than 50% of the debt of Portland is now in the hands of so called 'vulture funds' such as Apollo, Davidson and Avenue whose return requirements are different than those of traditional banks. After a recent Euro709m capital hike, FCC has set aside around Euro300m to appease creditors, according to the Expansión newspaper.

Cyprus: Bedeschi awarded construction contract for Vassiliko export terminal

Bedeschi has announced that it has been awarded a contract to construct a clinker export terminal for the Vassiliko Cement Plant in Limassol. The system will be installed in the port terminal of the cement plant, equipped with a ship-loader on tyres. The system works by conveying materials transported by trucks to the ship-loader and then it moves along the quay to optimise loading. The system will be able to load up to 550t/hour with the possibility of it loading up to 800t/hour in the future.

Italy: Cementir makes Euro6m loss in first quarter of 2016

Cementir has made a loss of Euro6m in the first quarter of 2016. It made a profit before tax of Euro3.8m in the same period in 2015. It reported that its revenue rose by 2.8% to Euro210m from Euro205m. Its sales volumes of grey and white cement rose by 8.7% to 2.01Mt from 1.85Mt.

Switzerland: LafargeHolcim net sales drop by 5.5% to Euro6.06bn in first quarter of 2016

LafargeHolcim's net sales have fallen by 5.5% year-on-year to Euro6.06bn in the first quarter of 2016 from Euro6.41bn in the same period in 2015. Its sales volumes of cement rose slightly by 1.4% to 56.6Mt from 55.8Mt. Its earnings before interest, taxation, depreciation and amortisation (EBITDA) fell by 15.6% to Euro774m. It blamed the fall in sales on 'challenging conditions' in Nigeria, Brazil and India.

By region the cement producer reported that sales volumes of cement in Asia Pacific rose by 6.6% to 30.1Mt supported by a stabilisation of the Chinese economy with growth in March 2016. However, its sales revenue was affected by low prices. In Europe cement sales fell by 3.1% to 7.7Mt due to slowing construction growth in the UK despite improvements in France and Switzerland. In Latin America cement sales fell by 10.7% to 6Mt mainly due to problems in Brazil. In the group's Middle East Africa region cement sales rose by 3.1% to 10.8Mt led by Algeria, Egypt and Nigeria. In North America sales of cement grew by 18.9% to 3.4Mt boosted by a 'vigorous' housing market.

"The first quarter is not indicative of our full year performance. We are on track with our plan and we see favourable underlying trends," said chief executive officer Eric Olsen in a statement. The multinational construction materials producer intends to keep to its 2018 targets announced in November 2015. It will do this through holding down costs, continuing its Euro3.16bn divestment programme and increasing benefits from synergies following the merger of Lafarge and Holcim in 2015.

Portugal: Cimpor appeals alternative fuel ban at Souselas cement plant

Cimpor has appealed a judgement by the Supreme Administrative Court cancelling permits to burn alternative fuels at its Souselas cement plant. The North Central Administrative Court cancelled the environmental licences, originally granted by the former Environment Minister Nunes Correia, in March 2016.

Greece: Titan reports 2016 first quarter Euro18.6m loss

Titan has reported a loss of Euro18.6m for the first quarter of 2016 compared to the net profit of Euro6.6m in the same period in 2015. However, its sales turnover rose by 19% to Euro338m from Euro284m and its earnings before interest, taxation, depreciation and amortisation (EBITDA) rose by 86% to Euro43.3m from Euro23.2m. The company blamed the loss on currency exchange variations particularly from the devaluation of the Egyptian pound against the Euro by 19%.

The group noted that its sales had increased in the quarter in all regions with the exception of Greece. By region it saw strong growth in the US with a 34% in turnover to Euro174m. In Greece construction was mostly limited to government projects, limited by the continued economic problems and capital controls. In the group's south-eastern Europe regions turnover rose by 27.6% to Euro35.8m. Turnover in the quarter increased by 8.3% to Euro65.3m.

Italy: Buzzi Unicem cement sales grow to 5Mt in first quarter of 2016

Buzzi Unicem's cement sales have grown by 3% year-on-year to 5Mt in the first quarter of 2016 from 4.9Mt in the same period in 2015. Overall net sales rose by 5% to Euro540m from Euro513m. Its earnings before interest, tax, depreciation and amortisation (EBITDA) rose by 87% to Euro50.8m from Euro27.2m. It attributed the increase in sales to strong performance in the US where cement sales grew by 16.3% in the quarter. Elsewhere cement sales fell in Russia and Ukraine.

Belgium: Cement consumption rises by 4.6% to 6.4Mt in 2015 say FEBELCEM

FEBELCEM, the federation of cement producers in Belgium, has reported that cement consumption rose by 4.6% year-on-year to 6.4Mt in 2015. It attributed the growth to favourable weather and growth in residential construction. It expressed concern that imports of cement also rose in 2015 by 18% to 1.51Mt from 1.28Mt. This increased the market share of imports to 23.6%.

Ireland: Irish Cement to cut proposed alternative fuels usage at Limerick plant

Irish Cement is planning to cut the amount of alternative fuels it intends to co-process at its Limerick cement plant to 90,000t/yr. The cement producer withdrew its initial planning application in March 2016 but has resubmitted a new application with a lower amount of alternative fuels, according to the Limerick Leader newspaper. It now aims to burn half of the original amount that was originally requested.

It originally announced its Euro10m plan to co-process alternative fuels including tyres at the plant in December 2015. The investment is intended to create 40 jobs. However, local citizens have opposed the plans with over 450 people signing a petition against the development.

Spain: Cementos Molins posts improved profit, while revenue falls

Cementos Molins has posted a net profit of Euro15.4m for the first quarter of 2016, a rise of 1.7% year-on-year. The group's consolidated quarterly revenue came in at Euro130.7m, 10% less than in the first quarter of 2015. Cementos Molins suffered a Euro6m negative impact on its accounts due to the depreciation of the Mexican and Argentinian currencies during the quarter, which was compensated by improved margins.

Edwin Trout, Cement Industry Suppliers Forum

The UK cement industry in 2015 / 2016

As the consequences of a market competitiveness investigation and the LafargeHolcim mega-merger continue to play out in the UK cement industry, Edwin Trout of the Cement Industry Suppliers' Forum (CISF) looks at these and other aspects of the UK cement sector over the past 12 months. Over the past couple of years the UK cement market has recovered, the market fundamentals remain sound and most forecasts are positive.

July 2015 saw the conclusion of the mega-merger between Holcim and Lafarge, to create the world's biggest cement maker LafargeHolcim. CRH of Ireland purchased the disposals required by the competition authorities in markets where the two existing businesses significantly overlapped.

The UK was one such market, in which combining Holcim's Aggregate Industries and Lafarge's share of the joint venture LafargeTarmac would create an unacceptable dominance. Anglo American agreed to sell its share in the LafargeTarmac joint-venture, allowing Lafarge to dispose of the entire UK business to CRH. This was subject to the retention of assets that LafargeTarmac had previously been required by the Competition and Markets Authority to sell. The merger went ahead and LafargeHolcim was launched on 15 July 2015.

Aggregate Industries became the UK's newest cement maker, taking control of the retained works at Cauldon and Cookstown. The acquisition of UK cement production facilities was described by the company's spokesman as 'a significant strategic opportunity.' Given the strength of the Lafarge brand, Aggregate Industries decided to continue with the Lafarge Cement name for its bulk business, although bagged products might be renamed in the future. 250 employees transferred to Aggregate Industries, and Joe Hudson, also formerly of LafargeTarmac, was appointed as the managing director of the new cement division.

"The UK was a market in which combining Holcim and Lafarge would have created an unacceptable dominance..."

Just days later, on 31 July 2015, the sale of LafargeTarmac was completed - with the exception of Cauldon and Cookstown. Since 1 August 2015 the successor business, now reduced in size due to Competition and Markets Authority (CMA) requirements, has been known simply as 'Tarmac - A CRH company.' According to its own announcement, the firm's new branding combines the heritage and innovation associated with the Tarmac name and the unique identity of the Blue Circle Logo it inherited from Lafarge. Tarmac employs a workforce of 7000 at 330 sites across the country.

Right: The Hope Cement Plant in Derbyshire is one of the country's largest with a capacity of 1.3Mt/yr.

Photo: Graham Hogg ©.

Hanson disposals

The same CMA judgement that had earlier required LafargeTarmac to sell at least one of its cement plants had also ordered the break-up of the monopoly in the supply of ground granulated blast-furnace slag. The primary requirement was that Hanson sell one of its grinding plants: in August 2015 it sold its Regen facilities at Scunthorpe to Francis Flower.

Preceding this forced disposal, parent company HeidelbergCement had taken the commercial decision to sell its Hanson Building Products Division in order to concentrate on its core businesses of

cement, aggregates and ready-mixed concrete. An agreement was reached with an American affiliate of Lone Star Funds to sell for Euro1.2bn. The deal was completed in March 2015. The company's name changed to Forterra in October 2015. Forterra will float on the London Stock Exchange in summer 2016.

Breedon's surprise move

In November 2015 Breedon Aggregates made the surprise announcement that it had entered into a conditional agreement with Cortolina Investments to acquire Hope Construction Materials (HCM). It aims to build a major integrated cement, aggregates and concrete producer to rival its multinational competitors. HCM's chairman, Amit Bhatia, is to join the new board and HCM's holding company, Abicad, will gain an 18.4% stake in the enlarged business. The deal remains subject to the approval of the CMA and is likely to require the disposal of between 17 and 26 ready-mixed concrete plants. Completion is expected in summer 2016.

Other CMA measures

The remaining measures from the CMA's review are:
1. The prohibition of generic price announcements and;
2. New restrictions on disclosure of market data, including cement production and sales volumes. Draft orders prohibiting generic announcements were issued for consultation at the end of 2015. Comments on the proposed order to restrict disclosure were due by 11 March 2016.

The order, accompanied by the final undertakings offered by Mineral Products Association (MPA), concerns the use of an independent third party for the collection of data submitted by producers. Comments on these were due by 29 March 2016 and the undertakings have since been agreed.

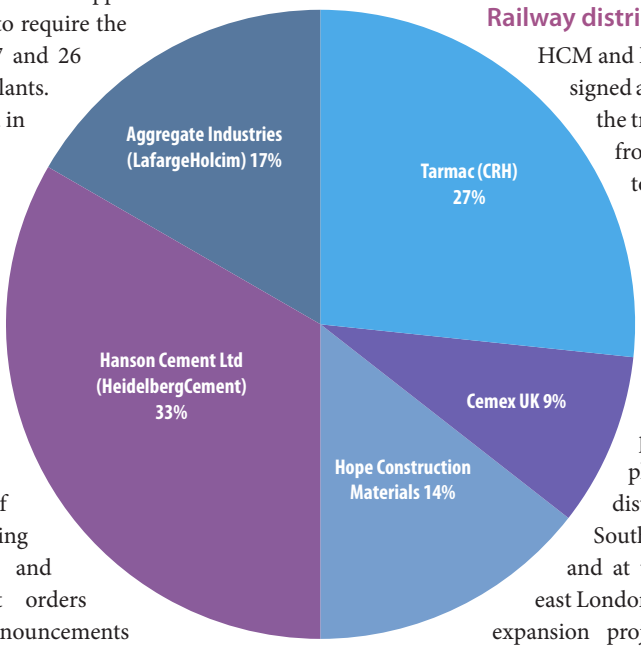
Major investments

Hanson and HCM have been the major investors in plant upgrades over the past couple of years and have remained so in recent months. Hanson installed a new drive at Purfleet over the winter of 2014-15. The new integrated drive system there is now saving around Euro112,000 in electricity costs and 771t of CO_2 emissions. The project, carried out by Siemens, used variable-speed drive technology to reduce both energy use and noise levels. Hanson also fitted a new clinker cooler at its Ketton plant.

A major investment has been ongoing for some time at HCM and while the installation of a flagship fuel handing system has largely been completed, other work remained in 2015. In May 2015 Höganäs Bjuf installed a kiln lining comprising its Magnus 87AF refractory bricks.

Both Hanson and HCM have invested in bagging and distribution facilities - Hanson at the Padeswood plant and HCM at Hope.

HCM has also opened new rail-fed depots in an effort to expand its market. In February 2016 it also announced the launch of its own range of bagged cements and will now sell under its own brand rather than through a third party. The cement, transported by rail from Derbyshire, is to be bagged at a new plant in Dagenham, Greater London, ready for onward distribution throughout the south.



Left - Figure 1: There are 5 cement producers in the UK cement sector. See page 50 for a full listing of plants.

Railway distribution

HCM and DB Schenker Rail UK signed a five-year contract for the transport of aggregates from Dowlow Quarry to ten locations across the country. The agreement also included the transport of coal twice a week from south Wales to HCM's Derbyshire plant along with plans for three new distribution depots: in Southampton, Dagenham and at the Olympic Park in east London. This adds to similar expansion projects in 2015, with facilities in Walsall, and the long-term lease of 48 railway wagons for the distribution of over 1Mt of cement to the company's other depots.

Tarmac, likewise, is expanding its use of rail-freight from an existing base of 9m tonnes of material a year. In January the company, in an effort to expand nationally, awarded a number of five-year contracts to create new strategic hubs. Four companies will deliver rail-freight services:

- Colas Rail for cement from Dunbar (with a new fleet of wagons from both Colas and VTG and a new locomotive named Dunbar in March);
- GB Rail Freight for aggregates from Dry Rigg, Swinden and Thrislington quarries;
- Freightliner for cement and lime from Tunstead;
- DB Schenker for aggregates in the West Country, and Mountsorrel granite in Leicestershire.

A visual guide to the UK cement industry

Five companies (Tarmac, Cemex, Aggregate Industries, and Hope Construction Materials) share all of the UK's cement capacity. The map on this page shows an accurate location of all 12 of the UK's cement plants including Cemex's grinding plant at Tilbury.

TARMAC
A CRH COMPANY

As a result of the mega-merger between Lafarge and Holcim, Lafarge disposed of LafargeTarmac with Ireland-based CRH purchasing the majority of the assets. The assets are now known as Tarmac.

1. Cookstown, 0.5Mt/yr.
2. Dunbar, 1Mt/yr.
3. Aberthaw, 0.6Mt/yr.
4. Tunstead, 0.8Mt/yr.

CEMEX

In October 2015 Cemex was recognised by the Chartered Institute of Logistics and Transport, winning its annual award for Excellence in Vulnerable Road Users Safety.

6. Rugby, 1.3Mt/yr.
7. South Ferriby, 0.8Mt/yr.
8. Tilbury, 0.8Mt/yr (Grinding).

AGGREGATE INDUSTRIES

Aggregate Industries became the UK's newest cement maker, taking control of the retained works at Cauldon and Cookstown from Lafarge Tarmac.

5. Cauldon,1Mt/yr.

HOPE
Construction Materials

In November 2015 Breedon Aggregates announced that it had entered into a conditional agreement with Cortolina Investments to acquire Hope Construction Materials (HCM)

9. Hope, 1.3Mt/yr.

Hanson
HEIDELBERGCEMENTGroup

Hanson installed a new drive at Purfleet over the winter of 2014-15. The new integrated drive system there is now saving around Euro112,000 in electricity costs and 771t of CO_2 emissions

10. Ribblesdale, 0.9Mt/yr.
11. Padeswood, 0.8Mt/yr.
12. Ketton, 1.3Mt/yr.

In May 2015, the MPA and the Rail Freight Group set out plans to develop the industry's use of the railways. With 60 minerals trains a day, reliance on the railways in the construction sector had been rising for a decade. It has increased over the year and forecasts suggest that further growth of 2.5%/yr can be expected.

Import terminals

Thanks to better integrated transport networks, the UK has required fewer production sites. Import facilities – dominated in recent years by CRH's expansion, through the acquisition firstly of Morrisey, Dudman, Southern Cement and Tarmac – have been established by other operators including two other Irish producers. In March, Quinn Cement (NI) Ltd signed a ten-year agreement with Warrenpoint Harbour Authority for a £2.5m investment in five new cement silos and the creation of 20 new jobs. Quinn has since added two silos to its terminal at Crown Wharf, Rochester, bringing storage capacity for its English operations up to 7,400t Ecocem of Dublin has also just established an import terminal in England, with a new facility at Runcorn that opened on 23 March. A second terminal in the south east is scheduled for construction in late 2016. In the south west, the Victoria Group has been granted conditional approval by Plymouth City Council to build a new storage and distribution terminal on the city's waterfront. Victoria says its plan will enable it to ship and store the cement in six silos, which will have a combined capacity of 12,000t.

Fuel processing plant

Due to the added attention to developing infrastructure, there has been minimal new investment in alternative fuel facilities. Apart from Saxlund's installation of the fuel handling system at HCM, the main project has been the waste processing plant for Cemex. After a lengthy planning process, Suez UK built and commissioned its plant at Malpass Farm, Rugby. With its existing sister plant at Landor Street, Birmingham, the new plant has a Climafuel production capacity of 250,000t/yr. It will supply Cemex for the next 25 years, in the longest such agreement that exists outside the Private Finance Initiative (PFI) system. The Rugby Solid Recovered Fuel facility opened on 18 September 2015.

The market

Although the figures for building materials production and those that indicate market demand are not closely synchronised, for they relate to different points in the construction cycle, they do agree in indicating that the rate of growth over the past two years or more has slowed in the second half of the year. Public infrastructure projects have emerged as the most active segment of the market, overtaking housing as the engine room of growth, though political pressure is likely to keep private housing on the agenda for some time to come.

Office of National Statistics

In the third quarter of 2015, UK construction output fell by 2.2%, the first negative figure in three years. In the fourth quarter of 2015, construction output fell by 0.1% (with monthly totals: +0.2% in Oct, -0.5% in Nov). New orders fell by 0.5% though these are 1.4% higher than Q4 in the previous year.

These figures, supported by those from Eurostat, have prompted David Kern, British Chambers of Commerce chief economist, to argue that "the construction sector is now in recession," (Jan 16). Construction market analyser Glenigan has reported that project starts in the fourth quarter of 2015 were 20% lower than in the same period a year earlier, blaming poor weather and claiming that new construction activity is in "the worst period of decline since crashing in 2009" (Feb 16). According to Eurostat the market was down 4.8% in August (when the UK had one of Europe's worst monthly decreases) and down 4.1% in September. Other indicators, such as from the monthly Construction Purchasing Managers' Index from Markit, on behalf of the Chartered Institute of Purchasing and Supply (Figure 2) indicated a more optimistic view of results.

Markit	CIPS Purchasing Managers' Index	Notes
May 15	55.9	
June 15	58.1	
July 15	57.1	
August 15	57.3	
September 15	55.8	
October 15	58.3	Construction output has risen in each of the preceding 26 months.
November 15	55.3	Lowest figure since mid-2013, though still positive.
December 15	57.8	
January 16	55.0	Weakest expansion of UK Construction output for nine months.
February 16	54.2	
March 16	54.2	
April 16	52.0	

Left - Figure 2: The monthly Construction Purchasing Managers' Index from Markit shows a more optimistic outlook for the UK cement market.

Closer to the interests of the cement industry are the returns from the MPA and the commentary from its parent group the Construction Products Association (CPA). Sales data from mineral products companies were generally positive for 2015, suggesting a less pessimistic picture for construction than the official data reflect. Reports from the CPA suggest continued, albeit slowing, growth and are accompanied by an optimistic forecast for 2016 supported by eleven consecutive quarters of rising construction activity. The fourth quarter of 2015 saw private housing, commercial and infrastructure as thriving sectors while public housing, repair and maintenance was weak.

In October 2015, 77% of heavyside firms reported increasing investment in plant and equipment. In January 2016, manufacturers anticipated growing sales for the year, reporting beneficial exchange rates and lower energy costs. Forecasts from market research agency Leading Edge in March were more positive, predicting that construction output in Great Britain would reach an all-time high of Euro177.78bn, growing by 3.3% year-on-year compared with 2015.

Prices

A survey of bulilding cost consultants suggested in January that after two years of price increases for construction materials and labour, the rate of inflation is levelling off. However, cement appears to have been less subject to inflation than other materials, such as bricks. Although actual price information is restricted, government price indices indicate a pattern of stability in 2015 and (provisionally) a slight decline so far in 2016.

Below - Figure 3: Indexed cement prices.

2015							2016	
June	July	August	September	October	November	December	January	February
118.2	119.4	119.4	119.0	119.0	119.0	119.0	118.5 P	118.6 P

Environmental

The MPA remains committed to seeking sustainability and finding a balance between environmental regulation and commercial viability. An MPA report, on behalf of the CBI Minerals Group, was issued in February. The report highlighted the significance of minerals extraction – including cement – to the British economy, underpinning Euro309.55bn or 16% of gross value. Mineral extraction remains the least popular form of development according to a survey in January 2015. In February 2015, the MPA published its fourth Annual Mineral Planning Survey that drew attention to the problem of declining raw material reserves. In October 2015 a report from the World Bank and Ecofys, entitled 'State and Trend of Carbon Pricing 2015', raised a warning, suggesting that while other factors also have to be considered, the impact of carbon pricing on the cement industry cannot be ignored.

"[New construction activity is in] the worst period of decline since crashing in 2009" - David Kern, British Chambers of Commerce chief economist.

Environmental performance

MPA Cement published the latest of its sustainable development reports in December 2015. It demonstrated how the British cement industry has responded to the challenge of supplying responsibly sourced materials while being aware of carbon costs. The report focuses on the continued reduction of dust and gaseous emissions, the increased use of waste-derived fuels and the net consumption of waste and by-products without any disposal of cement kiln dust to landfill. Similar achievements have since been announced by the MPA's British Lime Association: 86% reduction in SO_2 emissions, 49% fall in waste to landfill, NO_x down by 48%, dust emissions by 46% and CO_2, 29%.

Targets

At the COP21 Paris conference in December 2015, the global cement industry released a set of action plans aimed at reducing carbon emissions by 1Gt in the years to 2030, the WBSCD has announced. The Low Carbon Technology Partnerships initiative is a business collaboration to scale up the development and deployment of low carbon technologies, and has the support of chief executives at 16 of the major global cement groups.

Carbon capture and storage

The UK government controversially cancelled its Euro1.32bn competition to develop a prototype carbon capture and storage plant six months before it was due to be awarded. The Autumn Statement confirmed the ring-fenced fund was no longer available. Two projects, based at Drax and Peterhead, had been in the running, though Drax had already suffered from the withdrawal of one of its private sector investors. The Carbon Capture & Storage (CCS) Association criticised the decision for 'moving the goalposts,' describing it as 'devastating'. Consequently, plans for the proposed Euro2.63bn White Rose plant were shelved when the Capture Power consortium – comprising GE and BOC – disbanded, arguing the project was no longer viable without the government funding. The decision to prematurely abandon the carbon capture scheme was itself then investigated by the National Audit Office.

The project's cancellation has serious ramifications for the cement industry as manufacturers will now need to fund their own carbon capture schemes.

Low-carbon cementitious materials

The closure or conversion of many coal-fired power stations raised questions of supply of fly ash to cement suppliers, especially after the shortages of the previous year. In January 2016, the UK Quality Ash Association released statistics on the production of coal ash for 1999-2014, highlighting trends in both the supply and use of fly ash and furnace bottom ash. The report concluded than consumption of fly ash has increased from 50% of production at the turn of the century, to 70%, while furnace bottom ash is running at 100% of output. With 5Mt of fly ash produced, supply exceeds demand and around 40% remains surplus. Uses are increasingly diversified, with over 50% used for construction materials: in the manufacture of cement, as Type 1 and II additions, and for the production of blocks and grouts.

With the closure of coal-fired power stations effective or imminent, however, the future level of supply must presumably be lower. As a result, research is in progress to commercialise the re-use of stockpiled or lagoon ash. Likewise the precarious position of the UK steel industry, with several plants sold or closed in recent months, will likely have an adverse effect on the future production of ground granulated blast furnace slag (GGBS) and provide an opening for greater levels of imports.

Health and safety

Health and safety remains a major concern for the British cement industry. Though there were no fatal accidents on cement operations in 2015, a contractor died in October while working in one of Tarmac's quarries in Northumberland and both Cemex and Hanson Packed Products were fined recently for failings at their cement plants. Hanson was fined Euro986,385 in December and ordered to pay costs after the death of an employee at its Dagenham cement bagging plant in 2013. The worker died after being drawn into the powered roller of an in-feed conveyor. Courts heard that fixed guards should have surrounded the roller and that an HSE investigation had found that a critical guard had not been in place around the machinery for several days. In January 2016, the court apportioned blame to both Cemex and Cape Industrial Services Ltd for their failure to co-ordinate and plan high-level working to a higher standard, after a scaffolder fell from a 131-metre high cyclone tower at Rugby cement works in January 2012. A second man was also injured and has been unable to work since. The companies were fined Euro920,626 and Euro789,108 respectively.

Hanson suffered a mishap on 7 February 2016, when storm force winds damaged the 92-metre stack at Ketton, blowing a 30-tonne steel section down to a lower platform and causing considerable damage. No one was in the vicinity and there were no injuries, but the kiln was shut down immediately for assessment and repair, and remained off-line for a while.

Fortunately the record is otherwise far more favourable. In November, Cemex won the MPA's John Crabbe Trophy: the association's highest honour for health and safety. In awarding this accolade, the jury drew attention to excellent practice in four key areas: leadership training; embedding health and well-being as a core value; 'stepping in' to prevent unsafe behaviour; and firm management of contractors. More recently Hanson's GGBS plant at Port Talbot won the UK prize at HeidelbergCement's inaugural 'safe work, healthy life' awards in March 2016.

Much of the cement industry's (and the wider construction sector's) health and safety efforts over the past couple of years have been directed toward reducing cyclists' deaths – especially in London – by improving practices and technology in the delivery fleets. Initiatives include driver training, road-user awareness courses, enhanced vehicle design, and the fitting of assistive technology. Hanson, a 'CLOCS Champion', was one of the companies supporting the Construction Logistics & Cyclist Safety stand at the London Bike Show, helping cyclists realise the risks presented by blinds spots around heavy goods vehicles. Cemex has perhaps the highest profile in this area, and in October 2015 the company was recognised by the Chartered Institute of Logistics and Transport, winning its annual award for Excellence in Vulnerable Road Users Safety. The award was sponsored by Transport for London and highlights the safety initiatives undertaken by Cemex since 2004. Besides the on-going awareness campaign for cyclists, the company's fleet has been fitted with additional mirrors, proximity sensors and vehicle-mounted cameras.

Left: Cyclist safety has become a large area of concern for cement manufacturers in how they transport their products. Companies have made great efforts to educate both their drivers and cyclists and to promote greater road awareness.

Right: The outcome of the EU referendum will go far to determine the future of the cement industry in the UK.

Last summer both Cemex and Tarmac trialled the new Mercedes-Benz Econic cab, which has been designed to provide drivers with a wider field of vision than standard and so reduce the risk of hitting cyclists and pedestrians. The design includes a deep panoramic windcreen, a fully glazed floor-to-ceiling kerbside door and a low driving position to facilitate eye-to-eye contact with other road users. Crucially, the payload is four tonnes greater than previous high-visibility designs and therefore more economic to run.

The Safer Lorries Scheme first proposed by TfL in 2014, which aimed to ban from the capital those heavy goods vehicles not fitted with specified safety equipment, went out to consultation. That completed, TfL announced the scheme's launch in September 2015. A further proposal in January would enforce the use of panoramic windows, such as those of the Econic design trialled by Cemex and Tarmac.

Another best-practice initiative adopted by the cement makers is the Fleet Operators Recognition Scheme (FORS). Cemex has extended its participation to cover subcontractors and so by the end of 2015, 169 drivers in Cemex Logistics – which includes aggregates, asphalt and building products, as well as bulk cement – were FORS-registered or accredited.

CONCLUDING REMARKS

At the time of writing, the industry's 'next big thing' is Breedon Aggregates' proposed acquisition of Hope Construction Materials, but that appears insignificant when set against that other uncertainty of the summer of 2016: the outcome of the EU referendum and its consequences for – among many others – cement making in the UK.

Right: Cemex's Tilbury plant in Essex is the UK's only dedicated clinker grinding plant. Its location near the mouth of the River Thames makes shipping by freighter an efficient way to transport cement.

US: Worker killed in fall at Midlothian Ash Grove Cement plant

A worker has died from a fall at the Midlothian Ash Grove Cement plant in Texas on 10 May 2016. The worker, Roderick U Barnes, was a maintenance mechanic at the plant according to the Waxahachie Daily Light newspaper. Barnes had been working on the top of a concrete mixing tower. The Mine Safety and Health Administration and Ash Grove Cement are conducting investigations into the cause of the accident.

Venezuela: Venezuelan union urges government to invest in ailing cement industry

Representatives from the Sintuecav union have urged the government to invest in the cement industry. The union said that if no money is provided then Venezolana de Cementos might not be able to continue operations past June 2016, according to El Informador. Sintuecav added that cement production has more than halved since the country nationalised its cement industry in 2008. Before nationalisation, Venezolana de Cementos exported clinker from its Pertigalete cement plant. From January to September 2014 it imported 0.12Mt of clinker from Peru and Spain.

US: Essroc site faces fines for worker safety in Ohio

The US Department of Labor Occupational Safety and Health Administration's (OSHA) Cleveland Area Office has cited Essroc Cement for one repeated and 10 serious safety and health violations at its site in Middlebranch, Ohio. OSHA found that the company had exposed workers to machine, noise and respiratory hazards following an investigation started in November 2015 after a complaint was submitted alleging unsafe working conditions. The US subsidiary of Italcementi faces fines of up to US$92,000 for the violations.

"Employers have a responsibility to protect workers from exposure to noise and respiratory hazards that can lead to debilitating health conditions," said Howard Eberts, OSHA's area director in Cleveland. "Essroc needs to immediately re-evaluate its safety and health programs to keep workers safe on the job."

Essroc operates a slag grinding plant and a cement terminal at the site.

Mexico: Amortised debt worth nearly US$400m says Cemex

On 9 May 2016 Cemex announced that it had amortised debt worth US$397.4m as part of its refinancing strategy to lower costs. Cemex, which had been selling assets to cut debt, announced an offer to buy back up to US$400m in debt in April 2016.

2017

IEEE-IAS/PCA CEMENT CONFERENCE

Sustainable Strength through Innovation

ONLY HERE!

PLAN TO JOIN US IN:

Calgary, Alberta May 21-25, 2017

www.cementconference.org

IEEE IAS PCA America's Cement Manufacturers™

Brazil: LafargeHolcim opens new Barroso line in Brazil

LafargeHolcim has opened a new cement line at its cement plant in Barroso, Brazil. The group says that the construction of the new line at the existing Barroso site is part of the group's strategy to reduce the cost per ton of its cement, while improving quality and efficiency.

The new line in Barroso, which LafargeHolcim claims to be the most modern in Brazil, will increase operational efficiency and cost competitiveness based on its technology. Equipment includes the world's largest vertical cement mill from Gebr. Pfeiffer and an FCB Horomill for raw materials. The plant's total capacity will rise to 3.6Mt/yr and the new line will allow the total cost per ton of cement to fall by around 25% from 2014 to 2017.

Eric Olsen, CEO of LafargeHolcim, said, "The opening of Barroso is key to our strategy in Brazil and will allow us to further improve our cost structure while we continue to supply our customers with our high-quality solutions."

Paraguay: Industria Nacional del Cemento reports progress on upgrades

Industria Nacional del Cemento (INC) has reported progress on upgrade projects at its cement plants in Vallemi and Villeta. At its plant in Vallemi the company is continuing work on upgrading the fuels that the kiln can use. The project is expected to save up to US$22m/yr. CIE is conducting the work and the launch is scheduled for January 2017.

INC is also building a cement grinding plant at Villeta. The new mill is being built by Sinoma at a cost of US$11.5m and is scheduled for delivery in August 2016. It will have a cement production capacity of 80t/hour or be able to produce around 800,000 bags/month of cement. INC also plans to start operating a pozzolan drying unit at Villeta in September 2016.

US: Cemex to sell major US cement assets

Mexico's Cemex has agreed to sell a raft of assets in the US in a US$400m divestment to pay down the company's debt. The assets include the Lyons cement plant in Colorado, the Odessa cement plant in Texas, three terminals in Texas and building materials businesses in Texas and New Mexico.

The assets will be purchased by Mexican rival Grupo Cementos de Chihuahua (GCC), which already has three integrated cement plants in the south and central United States. The acquisition, due to be completed by the end of 2016, will increase GCC's cement capacity in the US by 1Mt/yr to around 5.6Mt/yr.

Cemex is expected to sell up to US$1.5bn worth of assets during the course of 2016 and 2017. It is still reeling from debt that it took on from its 2007 acquisition of Australian rival Rinker, which came directly before the onset of the global economic downturn.

US: FLSmidth and GE to partner on data platform

FLSmidth and GE (formerly General Electric) have announced a partnership to create digital solutions for increasing productivity in the cement and minerals industries. The new solutions developed on GE's cloud-based Predix platform will use FLSmidth's knowledge of cement and minerals processing along with GE's industrial application of networked physical objects (the internet of things) to increase the productivity of connected equipment units in the cement and mining industry.

FLSmidth will build their solutions on top of the Predix platform with applications for managing process flows. This should allow customers to leverage process data and analytics for monitoring, benchmarking their performance and predicting maintenance of their equipment.

"Cement and mining companies already collect significant volumes of data, but currently, only a fraction of it is used. This will be the first available solution for a full coherent process monitoring to leverage optimisation solutions offered by a full service provider like FLSmidth," said FLSmidth's head of Global Research & Development Jens Almdal.

Argentina: Cementos Molins to upgrade San Jacinto grinding plant

Cementos Molins plans to invest US$189m towards upgrading production at its San Jacinto cement grinding plant. The upgrade will increase the plant's cement production capacity to 1Mt/yr from 0.3Mt/yr. It will also create 130 new jobs. The project is expected to last 30 months. Cementos Molins operates in Argentina via its subsidiary Cementos Avellaneda.

Brazil: Magnesita revenue 1Q16 drops by 17% to US$66.9m

Magnesita's net operating revenue has dropped by 17% year-on-year to US$66.9m for the first quarter of 2016 from US$80.2m in the same period in 2015. The company's sales volumes of refractory materials fell by 8.7% to 232,000t from 254,000t. Earnings before interest, taxation, depreciation and amortisation (EBITDA) fell by 12.8% to US$11.4m from US$13.1m. The company blamed the falling revenue on falling steel production in South America and Western Europe and on a poor construction market in Brazil negatively affecting its cement clients.

"2016 began with interesting prospects for Magnesita. While the world is mired with excess steel production, uncertainties surrounding the Chinese economy and substantial political turmoil in Brazil, we have begun to see green shoots coming out of the US [in the building industry] and the first results of the array of self-help initiatives Magnesita has overtaken in the last few years," said Octavio Pereira Lopes, Magnesita's CEO.

Peru: New plant is now 70% complete

Cemento Andino has reported that work on its second production line at its cement plant in Candelaria, Trujillo is 70% complete. The new line will be completed in 2017. The US$103m line has a 1.12Mt/yr clinker production capacity and a 1.36Mt/yr cement production capacity. At present the cement plant has a clinker production capacity of 0.75Mt/yr.

Brazil: InterCement's 1Q cement sales drop by 11.2% year on year

InterCement's sales have fallen by 28% year-on-year to Euro454m for the first quarter of 2016 from Euro637m in the same period in 2015. Its cement and clinker sales volumes fell by 11.2% to 6.03Mt from 6.79Mt. Its earnings before interest, taxation, depreciation and amortisation (EBITDA) fell by 36.2% to Euro77.9m from Euro122m.

Cement and clinker sales volumes fell by 17% to 2.27Mt in Brazil, by 34.8% to 0.73Mt/yr in Portugal and by 7.1% to 1.41Mt in Argentina. However, volumes rose by 26.3% to 0.37Mt in Mozambique and by 2.8% to 0.32Mt/yr in South Africa. Overall sales volumes declines were attributed to the political instability and economic problems in Brazil and due to decreased exports from Portugal to Algeria due to issues with import licences.

US: Expansion at LafargeHolcim Joppa cement plant scrapped

Lafarge North America has scrapped plan to expand its Joppa cement plant in Illinois. One of the two kilns at the plant was shut in 2012. However, the company announced it was restarting this kiln and planning on building a third kiln in 2015, according to the Paducah Sun newspaper. The subsidiary of LafargeHolcim blamed the cancellation on poor market recovery for its products. Production is expected to continue at the cement plant using its existing two kilns. No job losses are anticipated.

Mexico: Cemex closes sales of assets in Bangladesh and Thailand

Mexican multinational Cemex has closed the sale of its operations in Bangladesh and Thailand to Siam City Cement for approximately US$53m. The proceeds obtained from this transaction will be used mainly for debt reduction and for general corporate purposes. The deal was announced in March 2016.

Indonesia: New slag grinding plant contract for Loesche

PT Krakatau Semen Indonesia has signed a contract with Loesche for a new 0.75Mt/y greenfield slag grinding plant at Cigading in Cilegon, Banten, Indonesia. In a JV with PT Semen Indonesia, PT Krakatau Semen Indonesia will grind to a fineness of 4500cm2/g, using a Loesche mill with an LDC classifier. The scope of supply for this contract also includes the raw material transport system, the mill dust extraction system, the reject system and the silo equipment. Subsidiaries of Loesche GmbH are also participants in this contract; Loesche ThermoProzesstechnik GmbH is supplying this grinding plant with a hot gas generator type LF-36L (fully inline) for the combustion of IDO (industrial diesel oil). Automation of the plant is supplied by Loesche Automatisierungstechnik GmbH. The Loesche mill will be put into operation as early as the 1st quarter of 2017.

China: Harbin Xiaoling Cement takes environment ministry to court

Harbin Xiaoling Cement in Heilongjiang province has taken the environment ministry to court after its approval to operate was rejected following complaints by residents. The cement company's representatives say the ministry was wrong to overrule a decision by the local authorities in 2011 that granted approval for production at the plant, according to the South China Morning Post.

The ministry took action following complaints by residents about noise and dust pollution. They argued that residents living within 500m of the plant should have been relocated following the recommendation of an environmental review conducted when the plant expanded production in 2009. However, the cement plant has countered that it was built in 1932, whilst the area was under Japanese occupation, before any resident moved to the area.

India: Government considers reopening Cement Corporation of India plant in Adilabad

The Heavy Industry Minister Anant Geete has arranged a meeting with officials of the Telangana state government and the Cement Corporation of India (CCI) to discuss the possibility of opening the closed CCI cement plant in Adilabad. The meeting will be held in June 2016 at Hyderabad or New Delhi, according the Hindu newspaper.

The meeting is the second occasion that ministers from Telangana have met with Geete to lobby for the reopening of the CCI plant. Options being considered include privatising the plant or retaining control by the government. The cement plant has a production capacity of 4Mt/yr.

India: Dalmia Cement withdraws appeal against LafargeHolcim deal

On 9 May 2016 Dalmia Cement withdrew its challenge to a conditional approval given by India's anti-trust regulator to the proposed merger of Lafarge and Holcim in india. The Competition Appellate Tribunal (CAT) accepted Dalmia's decision, paving the way for the sale of Lafarge India's 11Mt/yr of cement capacity as a part of the merger conditions. A statement from LafargeHolcim stated, "We are happy Dalmia has withdrawn their appeal to the CAT and look forward to completing the sale of Lafarge India."

Philippines: CEMAP lobbies for government projects to use blended cement

The Cement Manufacturers Association of the Philippines (CEMAP) has asked the government to use more blended cement in its infrastructure projects to meet its emissions targets. "In the Philippines, the private sector uses more than 80% of blended cement, but the government uses 80% Portland cement," said CEMAP president Ernesto Ordoñez in an interview with local press. In October 2015 the Philippines submitted to the UN its initial commitments to address climate change that included a 70% reduction of carbon emissions by 2030. The reduction is targeted to come from the energy, transport, waste, forestry and industry sectors.

South Korea: Baring Asia and Glenwood PE complete purchase of Lafarge Halla Cement

Baring Private Equity Asia and Glenwood Private Equity have completed their acquisition of Lafarge Halla Cement from LafargeHolcim. The company will be rebranded as Halla Cement. "The Baring Asia team impressed us with its knowledge and experience within the cement industry, and we have confidence in their ability to support our growth in the future. The industry in Korea is seeing a period of strong demand and we expect that to continue: We look forward to capitalising on this as an independent company," said Jong Goo Moon, CEO of Halla Cement. Halla Cement operates one 7.6Mt/yr integrated cement plant with four kilns. It runs two slag grinding plants located in Gwangyang, Jeonnam and Pohang, KyongSang with a capacity of 0.8Mt/yr and 1.5Mt/yr respectively. The company employs around 500 workers.

Australia: Australian Bauxite makes first shipment of cement-grade bauxite

Australian Bauxite has completed its first 5560t shipment of cement-grade bauxite from Bell Bay Port in Tasmania. The shipment is the first from Australian Bauxite's Bald Hill mine, the first new bauxite project in Australia for more than 35 years. The unnamed customer is preparing for a second shipment of 30,000 – 40,000t to be completed by the end of June 2016. The sales mark a change of direction by Australian Bauxite away from alumina refineries towards specialist cements and fertilisers.

India: Mining rights change could spur cement sector acquisitions

India's upper house of Parliament has approved changes to the country's mining laws to make it easier to sell mining rights, a move that could spur acquisitions in the cement and mining sectors.

Lawmakers approved the Mines and Minerals (Development and Regulation) Bill, allowing the transfer of mining rights by companies that received them through a government allocation. The bill was cleared by the lower house of Parliament in March 2016 and now needs to be signed off by the President to become law.

In the past, mining rights had either been distributed to companies through government auctions or through individual allocations, a method that raised questions about arbitrariness in decision-making.

In 2015 the government implemented a new law that made it mandatory to auction mining rights. It also permitted the transfer of mining rights previously won through auction, but was silent on whether rights received through a government allocation for captive uses could be sold.

The latest rule provides clarity and could help speed up proposed merger deals such as UltraTech Cement's planned takeover of Jaypee Group's cement plants and LafargeHolcim's plan to sell two cement units to Birla Corp.

Pakistan: Exports drive up utilisation rate to '95%'

Cement sales are up in Pakistan, with All Pakistan Cement Manufacturers Association Chairman Muhammad Ali Tabba claiming that the sector is using 95% of its installed capacity. He said that strong export growth in March 2016 was 'very encouraging' and had been a major factor behind the increased sales. Tabba highlighted new capacity being brought on by DG Khan, Lucky Cement, Cherat Cement and Attock Cement as indicative of the sector's confidence in the Pakistani economy.

Despite this, the sector remains accused of forming a cartel to keep cement prices high. Tabba rebuffed the claims, saying, "The industry is neither managing despatches nor the prices and is operating on the principles of free market economy."

South Korea: Hyundai Cement could be on sale in 2016

Creditors could put Hyundai Cement on sale in 2016, according to sources quoted by the Korea Herald. The South Korean cement producer has been on a debt management scheme. Its creditors, led by the state-run Korea Development Bank, will be able to complete any sale when the lock-up period on their shares in the company expires at the end of 2016.

Previously the company suffered financially from the misfortunes of its affiliate Sungwoo Engineering & Construction. Sungwoo has since been sold to other investors.

India: JK Cement stops production at Muddapur plant

JK Cement has stopped clinker and cement production at its Muddapur cement plant in Karnataka. It reported finding cracks in a raw material silo.

China: CNBM cancels acquisition of Shanshui Cement

CNBM has cancelled its acquisition of Shanshui Cement due to changes in the board composition, disputes regarding the control of Shandong Shanshui Cement Group, the financial difficulties of Shanshui Cement and the prolonged suspension of trading of the shares in Shanshui Cement. It added that the final issue 'significantly and adversely' affected the liquidity of the company and impaired attempts to determine the current market price of shares in Shanshui Cement. Shanshui Cement has faced financial troubles since a shareholder battle for control of the company took place in late 2015.

Vietnam: Loesche signs order for three mills for Thanh Thang Cement

Loesche has signed a contract with Sinoma-NCDRI for three mills to be supplied for Thanh Thang Cement in Bong Lang, Ha Na. A type LM 60.6 Loesche mill with a performance of 520t/hour as a reliable unit has been ordered to grind cement to a fineness of 12% R DIN 0.09mm. The gearbox of this mill has a power output of 4600kW. Two separate type LM 53.3+3 CS Loesche mills with a performance of 200t/hour will be in use to grind clinker to 3400 Blaine. The gearboxes of these two mills each have a power of 4600 kW.

The scope of delivery for this order also includes rotary feeders, water injection, metal detectors and sealing air fans. All three mills are to be put into operation by October 2016.

China: Anhui Conch net profit drops by 45% to US$123m in first quarter of 2016

Anhui Conch Cement's net profit has dropped by 45% year-on-year to US$123m in the first quarter of 2016 from US$233m in the same period in 2015. Its revenue fell by 5.5% to US$1.63bn from US$1.73bn. It attributed the decreases in profit and sales revenue to falling prices.

Cameroon: Cimencam to increase grinding capacity in 2018

Les Cimenteries du Cameroun (Cimencam), a subsidiary of the multinational LafargeHolcim, has announced that it has signed an investment agreement with the government for the construction of a new cement grinding unit in Nomayas.

The new US$40.3m installation is scheduled to start operation in 2018, initially with a capacity of 0.5Mt/yr. It will have the option to increase production to 1Mt/yr. The plant will use imported clinker from the port of Kribi.

Nigeria: Lafarge Africa launches US$302m refinancing bond

Lafarge Africa is marketing a US$302m bond to refinance some of the US Dollar-denominated debt held by its subsidiary United Company of Nigeria (UNICEM), which it bought in 2015. Chief finance officer Anders Kristiansson said that there was strong interest for the bond and that book-building was expected to open in the second week of May 2016.

The cement maker said it had received approval from Nigeria's Securities and Exchange Commission (SEC) for a US$500m bond, but will issue US$302m for five-years. "We are in the process of restructuring the UNICEM debt," explained Kristiansson. "We want to refinance the US Dollar borrowings that we have in UNICEM."

Nigeria: Lafarge Africa approves acquisition of UNICEM

The board of directors of Lafarge Africa has approved the acquisition of an additional 50% equity interest in the Untied Cement Company of Nigeria (UNICEM). The purchase was handled on the same terms of its initial acquisition of 35%. Following the acquisition Lafarge Africa will own an indirect interest of 100% in UNICEM.

The 50% share is currently held by Egyptian Cement Holdings, a company jointly owned by LafargeHolcim and Lafarge Africa.

Indonesia: Production at West Papua's first cement plant to begin in July 2016

A joint venture between the State Development and Investment Corp (SDIC) and Anhui Conch Cement Company will start production at its 1.5Mt/yr plant in Manokwari, West Papua in July 2016.

Iran: Iran cement exports fall by 20% to 18.5Mt in last fiscal year

Iranian cement exports fell by 20% year-on-year to 18.5Mt in the financial year that ended on 20 March 2016 according to Abdolreza Sheikhan, secretary of Iran's Cement Industry Employers Association. In comments to the Islamic Republic News Agency, Sheikhan blamed the fall in exports on security problems in the region, including Iran's main export market in Iraq. In the previous financial year Iraq represented 60% of Iran's export market for cement.

Sheikhan noted that Iraq increased its tariffs on imports of cement to US$13/t from US$4/t in the previous year and raised tariffs to US$72/t in the latest financial year. He added that Azerbaijan had increased its cement production capacity and that had also reduced its reliance on Iranian cement exports.

Somaliland: Raysut Cement terminal in Somaliland making progress

Oman-based Raysut Cement has revealed that its project with Barwaaqo Cement Company in Berbera, Somaliland is progressing well. Raysut Cement signed a joint venture agreement with the Barwaaqo Cement Company in September 2014 to build a terminal for packing and distribution of bagged and bulk cement. The terminal will have a storage capacity of 12,000t and will be built with a capital expenditure of US$7.5m, according to the Times of Oman.

Zimbabwe: Cement and Concrete Institute of Zimbabwe pushes for import ban

The Cement and Concrete Institute of Zimbabwe has presented a paper to the Ministry of Industry and Commerce suggesting government intervention in the cement industry including banning imported cement. The paper also calls for a protection tariff on imported cement of US$50/t, granting import licences to local producers, cancelling or reviewing all issued permits in circulation in the country and lowering duty on raw materials according to local press.

The country's cement producers include Lafarge, PPC and Sino Cement. Together they have a cement production capacity of 1.85Mt/yr compared to an estimated demand of 1.17Mt/yr in 2016. Together these cement producers have invested nearly US$185m in cement plant upgrades within the last five years. However, a surplus of cement in the region means that South Africa, Mozambique, Zambia and Botswana export cement to Zimbabwe which is threatening the local producers' investment.

Nigeria: CCNN revenue and income down in first quarter

The Cement Company Of Northern Nigeria (CCNN) has reported a net revenue of US$17.9m for the first quarter of 2016, compared to US$22.2m in the same period a year earlier. This represents a 19% decrease year-on-year. CCNN's profit before income tax dropped more dramatically, falling by 61% to US$1.79m from US$4.67m.

UAE: JK Cement's Fujairah plant expansion to come online by 2017

India's JK Cement has revealed that its plant in Fujairah, UAE is due to reach full production capacity by 2017. At full capacity the plant will be able to produce 0.6Mt/yr of cement.

The plant is unusual in that it can produce both grey and white cement from the same kiln. The expansion of the UAE plant's production capacity is in line with increased demand for white cement in the Middle East, according to JK Cement's Ajay Mathur.

Kenya: UK financier to take 40% stake in ARM

The UK-based development financier CDC is set to acquire a 40% stake in ARM Cement, after the firm injected US$140m into the family-owned Kenyan cement manufacturer. The CDC funds will allow ARM to retire expensive short-term loans that have been weighing down the company's earnings. The CDC is owned by the UK's Department for International Development.

"We are proud to back a founder-led frontrunner in East African manufacturing," said Mark Pay, CDC's managing director for equity investments. "This investment will strengthen a company (that is) making a difference to the local economy, bringing jobs and lower-cost raw materials to a region traditionally dependent on imports."

Zimbabwe: Lafarge Zimbabwe posts US$1.97m loss in 2015

Lafarge Cement Zimbabwe has reported a loss after tax of US$1.97m year-on-year in 2015. The company blamed the loss on a sub-optimal portfolio and price mix despite sales volumes growth. Its revenue grew by 2% to US$61.6m from US$60.5m and its cement sales volumes grew by 5%, according to the Herald newspaper.

The subsidiary of LafargeHolcim said that distribution in the improving local market was partly responsible for sales volume growth. However, it added that sellers' demands for discounts when buying in bulk have adversely affected cement prices. The cement producer expects prices to stay low in 2016 but it will aim for increased profits by cutting operational costs and increasing marketing.

Oman: Raysut Cement Company launches large silo at Salalah plant

Raysut Cement Company (RCC) has recently launched a new silo at its cement plant in Salalah. The storage capacity of the new silo is 20,000t. It has a diameter of 30m and a height of 43m. RCC say it is one of the largest silos in the region.

The silo contains three compartments with a capacity of 3000-12,000t. It is designed to hold Ordinary Portland Cement, sulphate-resistant cement and oil well cement. The silo also contains two units for the loading of bulk cement with a delivery rate of 300t/hour. Weighbridges have been fitted beneath the silo to allow direct weighing of bulk cement before it is packed. The new silo will feed a proposed packing plant with 150t/hour of cement. This new packing plant is expected to be completed in the fourth quarter of 2016.

RCC intends to use its new silo and packing plant to target local and international markets.

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

To get additional prices, you should subscribe - **See page 64**. In this issue subscribers receive more information from China, Iran and Indonesia.

Nigeria: A survey conducted in Delta State between January and April reveals that the prices of some building materials, including cement, had risen 6% due to the rise in transportation costs. A 50kg bag of Elephant brand cement which was sold for US$8.03 in January was later sold for US$8.53/bag.

Elsewhere in the country, economists have, described Dangote's recent cement price reduction as "the right move which will benefit consumer and stimulate construction works necessary to boost growth." Prof Humphrey Moshi of the University of Dar es Salaam said that "All in all, it is a good move as it will help many people to erect permanent structures and stimulate the construction sector." Dangote Cement, the largest cement producer in Africa, slashed cement prices to US$50.24 per 50kg bag in a move seen to enhance competition in the local cement market.

Alhaj Sada Ladan-Baki, the group executive director of Dangote Cement said in a statement that price reduction was in line with the company's commitment to help in the development of infrastructure and boost the effort to reduce housing deficit in Tanzania.

He said the company had pegged the Dangote 32.5 cement grade at US$50.24 per 50 kg bag, while the higher 42.5 grade is to sell for USD$52.75 per bag.

India: Jaiprakash Associates has withdrawn from some of its markets in north India as part of a streamlining of its operations. A spokesperson for the parent Jaypee Group confirmed that the company has chosen to withdraw from certain markets in Haryana and Delhi, according to Livemint.

"The company continues to sell cement in markets of north India. However, as a strategy the company has increased its focus on high realisation markets and has withdrawn from certain markets of Haryana and Delhi where due to low prices and high freights (long lead markets) the net realisation was very low and operations unviable," said a spokesman for Jaypee Group.

Non-payment to truck drivers and coal shortages at its cement plants in Himachal Pradesh are believed to have contributed to the decision to exit the north Indian market. Jaiprakash Associates has a cement production capacity of 4Mt/yr in Himachal Pradesh.

In late March 2016 Jaiprakash Associates signed an agreement with UltraTech Cement to sell 21.2Mt/yr of cement assets in five states for US$2.4bn. Following the deal Jaypee Group will be left with 10Mt/yr in Madhya Pradesh, Uttar Pradesh, Andhra Pradesh and Karnataka.

Russia: Filaret Galchev, the owner of Eurocement, expects that demand for cement in Russia will fall by 8% - 10% in 2016 after falling 12% in 2015. The cement producer will sell about 20Mt of cement in Russia and about 3.5M in 2016. He added that the group will produce cement at around US$25/t.

Galchev described Eurocement's sale of its 6.1% stake in LafargeHolcim in February 2016 as 'unexpected'. The Russian cement producer sold its share in LafargeHolcim after they lost nearly half of their value in six months. He added that he had no issues with Sberbank, the Russian bank that restructured Eurocement's debt after the sale of the shares in LafargeHolcim.

Originally Eurocement was a shareholder in Holcim and it received a stake in LafargeHolcim after that company was formed in a merger. The stake was subsequently transferred to Sberbank of Russia in January 2016 after the shares which Galchev had acquired, lost over 40% of their value in half a year. At the beginning of February 2016, Sberbank sold the 6.12% LafargeHolcim stake to investors from the UK, Switzerland, the US and other countries.

Prices are for cement in metric tons, 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.

GLOBAL CEMENT MAGAZINE: *SUBSCRIBE TODAY*

- Independent thinking and analysis
- Global cement industry trends
- Global cement news
- Country reports
- Plant visits and reports
- Industry interviews
- Global cement technology
- Your own copy, every issue!

global cement MAGAZINE

SUBSCRIBE TODAY TO GET MORE!

High-res download (printable)

Your own print copy - every issue

Additional cement prices

Global Cement Magazine SUBSCRIPTION FORM - June 2016

To subscribe to *Global Cement* simply fill in this form and fax it to **(+44) 1372 743838**, post it to **Global Cement**, First Floor, Adelphi Court, 1 East Street, Epsom, Surrey, KT17 1BB, UK or scan and email it to **subscriptions@propubs.com**.

First name:_____ Family name:_____

Company:_____ Position:_____

VAT No. including country prefix (required for all EU companies):_____

Nature of business:_____

Address:_____

_____

Phone:_____ Fax:_____

Email:_____ Internet:_____

Date:_____ Signature:_____

I wish to subscribe to Global Cement Magazine for:

☐ **3 years GC €382.5** **(normally €450 - total discount 15%)**

☐ 2 years ***GC*** €270 (Normally €300 - **total discount 10%**)

☐ **1 year GC €150 (11 issues per year)**

Three payment options are available:

☐ Send a cheque payable to Pro Global Media Ltd. to the address above with a completed copy of this form. A paid invoice will be sent to the address you have specified.

☐ Pay by credit card*: Card No: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Expiry date mm/yy: ____/____ Security code (last three figures on signature strip) ☐☐☐

Name on card (if different from the subscriber named above)_____

A paid invoice will be sent to the address you have specified.

**Please note, credit card payments will be taken in UK£ using www.XE.com exchange rates on the transaction date. US$, Euro or other local currency amounts charged on your card will therefore vary depending on currency fluctuations.*

☐ Pay by bank transfer (direct payment). Send a copy of this form to Pro Global Media Ltd. at the address above or to the fax number or email address above. An invoice including our bank details for payment will be sent to the postal or email address that you have specified. Please quote the invoice number with your payment. You must pay ALL bank charges related to the transfer.

NB: *Subscriptions are zero-rated for UK VAT but come under the reverse charge system for customers in other EU countries.*

Without reform, there is no way ahead for a unified EU.

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

A book by David Charter, titled 'Europe: In or Out?[1] and subtitled 'Everything you need to know,' is sometimes infuriatingly impartial and even-handed. After reading the book, you will either have had your mind changed from one side to the other, will be even more convinced of your previously-held beliefs, or you will continue to be as resolutely undecided as you were before. Let me précis the book's contents for you.

On the issue of democracy, every EU member state has one appointed European Commissioner and one judge at the European Court of Justice. Ministers need to win allies to get their way under the Qualified Majority Voting scheme, but have some vetos in sensitive areas. The EU has shown that if any state wants full access to the EU's lucrative Single Market, then it must follow all the laws on the freedom of movement of capital, goods, people and services (whether the state has a vote on them or not). The 751 members of the European Parliament, their staff and their paperwork are obliged under EU treaties to move offices once a month, from Brussels to Strasbourg in France's Alsace (a German-speaking region of France) - and back again 'to symbolise the post-war reconciliation between Europe's two great foes,' at a cost of Euro180m per year. Despite almost universal derision, no-one seems able to change the situation.

'Free movement' applies to all EU citizens: Anyone in the EU can live, work and receive welfare benefits anywhere else in the EU. Note: some places in the EU seem to be more popular to live in than others. Around 2.6 million people born in the EU now live in the UK, of whom 700,000 are Polish. On the other hand, 1.2 million people from the UK live in other EU countries.[2]

In terms of jobs, it is clear that the tariff- and barrier-free economy of the EU has led to a large increase in trade and economic activity across the bloc, leading to an increase in the number of jobs (most especially in Germany, perhaps less so in Greece). The City of London is the EU's undisputed financial centre with a 70% market share of financial services in Europe - a 'Brexit' will certainly imperil this (and the billions in tax revenues it generates). It is estimated that 3 million jobs in the UK depend on EU membership, but those that back a UK departure say that trade will continue under a new series of agreements and may increase if bipartisan agreements can be made with states such as China and the US.

It is impossible to calculate the cost of WWI and WW2 in Europe: Economists have tried and have published wildly varying estimates, from US$1trn to US$1000trn (inflation-adjusted). What is known is that 10 million died in WWI and 50 million in WWII. Since the end of WWII, Europe has now enjoyed 70 years of peace. The UK is a critical military, diplomatic and intelligence partner for the EU *and vice versa*.

Richer countries in the EU (and Norway and Switzerland), which have already built their own infrastructure, subsidise the building of cement-intensive infrastructure in the less well-off states of the EU. You will not find many cement companies in Greece, Portugal or Bulgaria, for example, complaining about this.

EU member states have progressively handed-over portions of their sovereignty to the EU, under a centralised programme of 'ever-greater unity.' In fact, states 'share sovereignty in a range of policy areas with the other 27 EU nations to make decisions together on laws proposed by the European Commission.' States must implement EU laws, but have a veto over tax and defence (for now). The British have negotiated an opt-out from 'ever-greater unity,' effectively establishing a 'two-speed Europe' (if this can be incorporated in a treaty change).

The EU has set extremely challenging targets to decarbonise its economy, which will effectively lead to the closure of much coal-fired power generating capacity (with less pollution but also less synthetic gypsum and coal ash), much higher costs for electricity which is currently hitting industry around the region and which will also hit the cement industry. The EU ETS has been an ineffective farce, albeit so far a lucrative one for some cement producers. It can be argued that the EU has set a strong environmental agenda for the whole continent.

EU social laws impose greater costs on EU states, but have led to greater worker protections, such as minimum annual leave periods, maternity leave and limits to working hours. The Common Agricultural Policy accounts for 39% of EU spending, and is notoriously corrupt and resistant to change. The EU's fisheries policy, on the other hand, has recently been radically reformed.

There are good and bad things about the EU. One sentence, for me, stands out in Charter's book: "Without the prospect of a better EU, there is no answer to the attractions of Brexit.' I'm an optimist who believes that the EU can be reformed, so I'll be voting to remain.

1 Europe: In or out. Everything you need to know; David Charter, Biteback Publishing 2014. ISBN 978-184954-684-3

2 https://fullfact.org/europe/eu-migration-and-uk/

GLOBAL CEMENT: *ADVERTISER INDEX*

global cement™ MAGAZINE

The world's most widely-read cement magazine

Advertisers: June 2016

AMF-Bruns GmbH & Co. KG	OBC	dirk.schwerter@amf-bruns.de • www.amf-bruns.de
BME Services	43	marketing@servicesbme.com • www.servicesbme.com
EAB Elektroanlagenbau Reinhausen GmbH	47	sales@eabreinhausen.de • www. eabreinhausen.de
Global Cement Directory 2016	39	rob@propubs.com • www.globalcement.com/directory
Global Cement Magazine - advertising	13	paul.brown@propubs.com • www.GlobalCement.com
Global CemFuels Conference 2017	9	rob@propubs.com • www.CemFuels.com
Global CemProcess Conference 2017	19	rob@propubs.com • www.CemProcess.com
Global Gypsum Conference 2017	17	rob@propubs.com • www.GlobalGypsum.com
Global Slag Conference 2017	41	rob@propubs.com • www.GlobalSlag.com
Global SynGyp Conference 2017	6	rob@propubs.com • www.SynGyp.com
Hardtop Gießereitechnologie GmbH	45	info@hardtop-gmbh.de • www.hardtop-gmbh.de
HEKO Ketten GmbH	7	info@heko.com • www.heko.com
Hillhead Quarrying and Recycling Show 2016, Buxton, UK	44	harvey.sugden@qmj.co.uk • www.hillhead.com
IEEE-IAS/PCA Cement Conference	56	bill@world-class-events.com • www.cementconference.org
Intercem Engineering GmbH	46	info@intercem.de • www.intercem.de
John King Chains Ltd.	IFC	ww@johnkingchains.co.uk • www.johnkingchains.com
Keith Mfg. Co.	55	sales@keithwalkingfloor.com • www.keithwalkingfloor.com
Kima Echtzeitsysteme GmbH	11	contact@kimaE.de • www.kimaE.de
Lapace Minerals	61	sales@lapaceminerals.com • www.lapaceminerals.com
PRÉCIMÉCA environnement	35	christophe.garcia@precimeca.com • www.precimeca.com
robecco GmbH	15	robert.becker@robecco.de • www.robecco.de
Scheuch GmbH	FC	g.lechner@scheuch.com • www.scheuch.com
Testing Bluhm & Feuerherdt GmbH	57	info@testing.de • www.testing.de
UNTHA shredding technology GmbH	15	info@untha.com • www.untha.com
Ventilatorenfabrik Oelde GmbH	IBC	info@venti-oelde.de • www.venti-oelde.com

Next issue: July-August 2016

Advertising deadline: 25 June 2016

Special Issue: Global Cement Trends: Trade, fuels, markets

Global Top 10 Cement Companies & Profiles

Bulk Handling; Belt Conveying, Filling & Packing, Bulk Dispatch, Weighing, Marine Loading & Unloading, Alternative Fuels, Environmental Technology, Wear, Slag

Plant report: To be confirmed

Event Review: Global Slag Conference, IEEE-IAS/PCA Dallas

Following issue: September 2016

Advertising deadline: 25 August 2016

Distribution: RWM UK, VDZ Düsseldorf

Refractories, Grinding, Fans, Laboratory & Analysis, Silo Focus, Pneumatic Conveying, Alternative Fuels, Metal Detectors, Additives, Valves, Shredding

Country report: Germany

Country report: China

Event previews: RWM, VDZ

To advertise: Paul Brown - paul.brown@propubs.com +44 (0) 776 74 75 998
Sören Rothfahl - soeren.rothfahl@propubs.com +44 (0) 7850 669169

Editorial contributions: editorial@propubs.com +44 (0) 1372 743 837

We wear out fans in a flash!

But not our fans.

They are protected against wear and long-lived.

With optimal wear protection measures for fans based on years of experience, Venti Oelde has significantly extended service life.

- **Longer maintenance cycles**
- **High efficiency**
- **Increased cost-effectiveness**

We make air work for you.

Venti Oelde

info@venti-oelde.de
www.venti-oelde.com

- Process gas fans
- Process gas dust collection
- Process gas cleaning plants
- Secondary fuel technology
- Ventilating and air-conditioning plants
- Optimization of air-handling systems

CUSTOMIZED SOLUTIONS FOR HANDLING BULK MATERIALS

Conveying Technology engineered in Germany

Our competence for your needs

» TECHNICAL ADVICE
» PLANING OF YOUR PLANT
» GERMAN ENGINEERING
» TURN-KEY SOLUTIONS
» WORLDWIDE SERVICES

Our core Products

» COOLING / HEATING SCREWS
» BUCKET ELEVATORS
» CHAIN CONVEYORS
» SCREW CONVEYORS
» BELT CONVEYORS

EUROPEAN MARKET
Mr. Dirk Schwerter
(Headquarter Germany)
Phone: +49 44 89 - 72 72 27
Mobile: +49 151 - 571 457 35
dirk.schwerter@amf-bruns.de

EASTERN-EUROPE
Mr. Artur Pawlik
(Office Breslau, Poland)
Phone: +48 74 856 58 89
Mobile: +48 606 418 529
artur.pawlik@amf-bruns.de

MENA
Mr. Jaber Malandi
(Office Dubai, UAE)
Phone: +971 7 244.51.74
Mobile: +971 52 8465083
jaber.malandi@amf-bruns.de

WORLDWIDE
Mr. Christian Rothe
(Headquarter Germany)
Phone: +49 44 89 - 72 72 24
Mobile: +49 160 - 979 195 61
christian.rothe@amf-bruns.de

AMF-Bruns GmbH & Co. KG · Hauptstraße 101 · 26689 Apen · Germany
Phone: +49 44 89 - 72 7100 · www.amf-bruns.de