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Editorial Director

Dr Robert McCaffrey
rob@propubs.com
(+44) (0) 1372 840 952



Editor

Peter Edwards
peter.edwards@propubs.com
(+44) (0) 1372 840 967



Web Editor

David Perilli
david.perilli@propubs.com
(+44) (0) 1372 840 952



Editorial Assistant

Jacob Winskell
jacob.winskell@propubs.com
(+44) (0) 1372 840 953



Commercial Director

Paul Brown
paul.brown@propubs.com
Mobile: (+44) (0) 7767 475 998



Business Development Executive

Sören Rothfahl
soeren.rothfahl@propubs.com
Mobile: (+44) (0) 7850 669 169



Account Executive - North America

Tina Rich
tina.rich@propubs.com
Mobile: (+44) (0) 7809 679 695
Office: (+44) (0) 1372 840 955



Company manager

Sally Hope • sally.hope@propubs.com

Subscriptions

Amanda Crow • amanda.crow@propubs.com

Office administration

Jane Coley • jane.coley@propubs.com

Views expressed in articles are those of the named author(s).
For details on submission, see: www.GlobalCement.com

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On the cover...

For over 20 years **HARDTOP Gießereitechnologie GmbH** has stood for innovative cast wear-part solutions that are applied, above all, in the extraction and processing of raw materials. China continues to occupy the top position in both the cement and coal industries, where cast wear-parts play a significant role. As a result, HARDTOP took the decision to establish, and recently commission, a second joint venture in order to be able to respond to the considerable demand. The main aim is to successfully establish the proven HARDTOP® bi-metal wear castings on the Chinese market.

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Dear readers,

Welcome to the December 2019 issue of *Global Cement Magazine* - the world's most widely-read cement magazine! This final issue of the year, indeed of the 2010s, kicks off with our multi-faceted review of the cement sector over the past 10 years, a period that gave us LafargeHolcim, President Trump, Extinction Rebellion and Gagnam Style (Page 10). The 2010s gave rise to a new breed of 'dominant regional players' - think UltraTech, Dangote Cement and Cementos Argos - as consolidation took hold among the largest players. Despite overcapacity concerns, both capacity and production rose sharply: Production from 3300Mt in 2010 to around 4200Mt in 2019 (USGS); Capacity increased by 843Mt/yr to 3975Mt/yr in 2019 from 3132Mt/yr in 2010 (*Global Cement Directories*). Plant efficiency increased in the 2010s, albeit at a slower pace than seen previously, as many producers came up against the law of diminishing returns. Now, as we enter the 2020s the industry is buzzing, with proposed 'step changes' towards a more sustainable cement sector, be it in terms of cement composition / supplementary cementitious materials (SCMs), new production technology or carbon capture and storage (CCS). All three of these topics are covered in this issue, on Pages 32, 28 and 22 respectively.

'Step changes' are indeed what cement producers need to remain a viable business in the increasingly ecologically-aware world of the 2020s. Some may claim that cement and concrete are vital to building the modern world. This is correct, but there will be more sustainable and less sustainable suppliers. To escape the wrath of the increasingly demanding global population, cement producers need to act now, to ensure they remain on the 'more sustainable' side of the equation. Otherwise, they may find that they fall by the wayside or become part of a more eco-conscious player. After all, as the 2010s showed, large-scale rearrangement of the sector is not only possible, but inevitable. Whatever the new decade brings, *Global Cement* will continue to develop and grow, bringing you up-to-the-minute news, views, reports and technical features. As part of this ongoing development, we are happy to announce another new member to the *Global Cement* team: Tina Rich. A California native, Tina is already busy developing client relationships in North America.

Enjoy the issue and see you in the 2020s!

Peter Edwards
Editor



Cement Industry Suppliers' Forum



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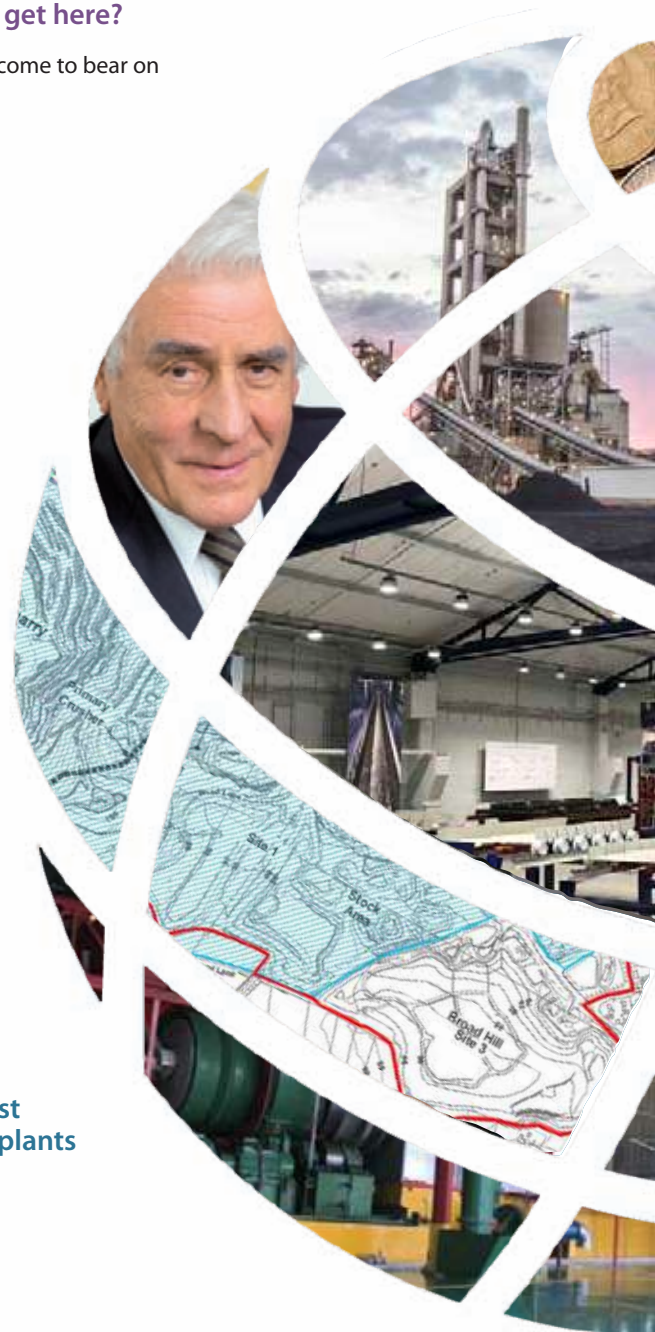
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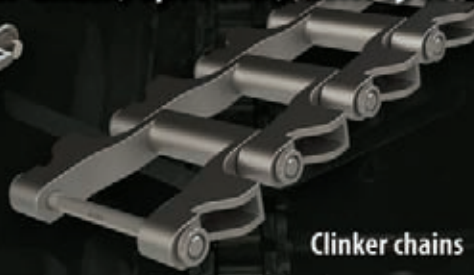




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3-6 December 2019
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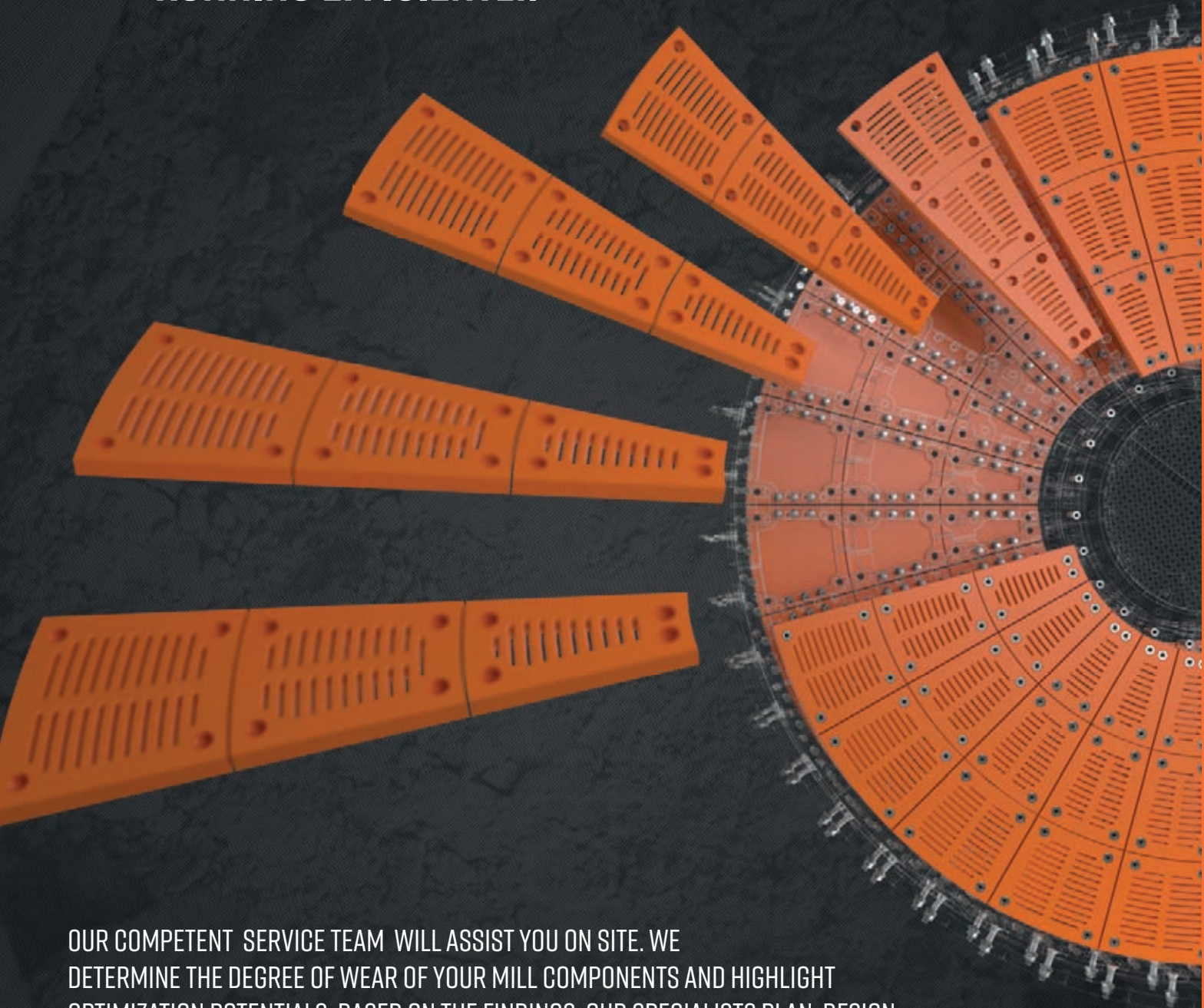
62nd IEEE-IAS/PCA Cement Conference & Exhibition
19-23 April 2020, Las Vegas, US
www.cementconference.org

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Peter Edwards, *Global Cement Magazine*

The 2010s: A decade in the cement sector

This final issue of the 2010s provides a unique opportunity to look over the major cement sector events of the past 10 years, a contradictory decade of expansion and consolidation, overcapacity and huge new projects, with heightened environmental awareness alongside rising emissions. Here, *Global Cement* attempts to extract some sense from this confusing time...

It's 2010, so let's set the scene. On 4 January the Burj Khalifa, the world's tallest building, officially opened in Dubai, UAE. A week later Haiti, one of the poorest countries on earth, was ravaged by a devastating earthquake that left 316,000 dead. On 23 March Barack Obama, still riding high after his first year as US President, signed 'Obamacare' into law. Shortly afterwards, in April, the BP Deepwater Horizon oil platform exploded in the Gulf of Mexico, killing 11 workers, bringing ecological devastation to the Gulf and giving Obama his first major presidential test.

2010 also saw: The ash cloud from Iceland's Mount Eyjafjallajökull disrupt flights across Europe; Wikileaks release thousands of classified US government documents, and; The initial events of the 'Arab Spring'. In 2010 we were yet to be horrified by ISIS and the Syrian Civil War. President Trump, Extinction Rebellion and Brexit were concepts to be realised several years down the line.

Cold hard numbers tell part of the story

Despite the worst ever financial crisis at the end of the 2000s, the world of 2010 was optimistic that normal business conditions, i.e. growth, would return soon enough. In terms of global GDP, this transpired. GDP rose from US\$66.0tn in 2010 to US\$85.8tn in 2018, an increase of over 30%.¹ The IMF forecasts further 3.5% and 2.6% growth in 2019 and 2020 to a total GDP of US\$92tn at the end of that year.² In contrast, global GDP/capita rose by 18%, from US\$9539 to US\$11,298 over the same period. The difference in these two growth rates is down to rapid population growth. In 2010 the world's population was still below 7 billion. At the time of writing, Worldometer's population clock³ shows 7.74 billion, a near 12% rise at more than 140 extra people per minute.

Most new arrivals have been in developing regions, so one might think that there would have been an increase in wealth inequality over the 2010s. Indeed this is the case by some metrics, with the

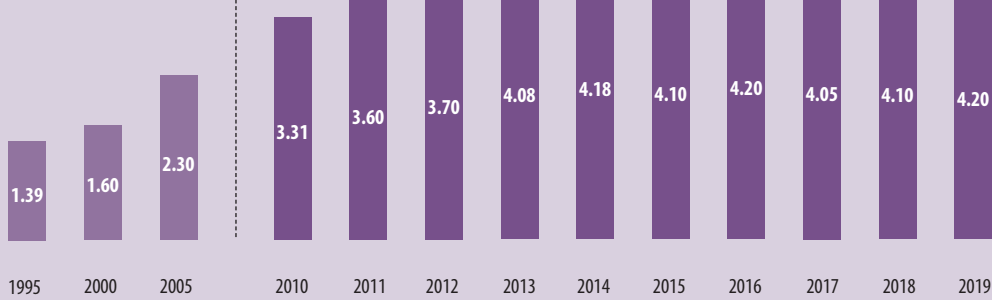
Right - Figure 1: Normalised global population, GDP, GDP/capita and cement production, 2010-2019. (2010 = 100).

Sources: World Bank Data Indicators, USGS.

- Population (Billions)
- GDP (2018 US\$)
- GDP/capita (2018 US\$)
- Cement Production (Bnt)



Global cement production



Left - Figure 2: Global cement production (Bnt) for 2010 - 2019, with selected earlier years for comparison. **Source:** USGS.

Cement production in the 2010s was a tale of two halves. The first five years continued the strong production growth seen in previous decades, in large part due to the Chinese and Indian cement sectors. From 3.31Bnt of cement made in 2010, production rose to 4.18Bnt in 2014. Since then, cement production has fluctuated around the 4.0-4.2Bnt/yr bracket, as markets struggle to absorb the additional capacity that has been added to many countries. *Global Cement Directory* data shows an additional 843Mt/yr of integrated cement capacity was added between 2010 (3132Mt/yr) and 2019 (3975Mt/yr). Although Chinese data has to be taken with a pinch of salt, India has added 23 integrated cement plants and upgraded existing plants, taking

its capacity from 214Mt/yr to 320Mt/yr. There have also been large gains in Africa and Central and South East Asia. Even established markets have expanded. There were 102 active cement plants in the US in 2010 sharing ~105Mt/yr, but 'only' 94 in 2019. However, the country added around 15Mt/yr of capacity over the same period, despite the closures.

Not all regions have seen expansion. Although not strictly covering the right time period, CemBR reports that 52 integrated cement plants closed in the region covered by the EU Emissions Trading Scheme (ETS) between 2005 and 2018. Turn to Page 18 for more about the EU ETS. See Figure 3 (Page 12) for more national changes over the past decade.

wealthiest 1% of adults controlling more of global wealth in 2019 (~45%) than in 2010 (~42%). However, both of these are lower than in 2000 (~47%).⁴ The financial crash is responsible for this dip.

At the same time, the proportion of wealth controlled by the poorest 90% of the global population increased from around 11% in 2010 to 18.3% in 2019. The wealth controlled by the wealthiest 5-10% shrank accordingly, along with the wealth of other middle and lower income brackets. Many in the 'middle' are now trapped between rising living costs and stagnant incomes. Projections from the UK's House of Commons Library cross party group suggested in April 2018 that, if the 2008-2017 trends continue over the next decade, the globe's wealthiest 1% would control two thirds of global assets by 2030.⁵

The movement of wealth away from middle income groups has already led to a backlash against 'the 1%' in the form of the Occupy Movement, stoked by events like the release of the Panama Papers. In the second half of the 2010s, (perceived)

economic stagnation in developed markets also led to a rise in populist political tendencies and protectionism, including the US-China trade dispute, the UK decision to leave the EU and a turn towards increasingly authoritarian leadership in Turkey, Russia, Brazil and elsewhere.

Below: The Ohorongo Cement plant in Namibia produced its first clinker in November 2010. It was one of many new African plants commissioned in the 2010s. **Source:** Waldo van der Waal, Ohorongo (Pty) Ltd / BEUMER Group, entrants to the *Global Cement Photography Competition*.





Right - Figure 3: Cement producing countries, colour-coded by integrated cement capacity (Mt) in 2010 and 2019.

Two major world regions stand out in terms of integrated cement capacity growth between 2010 and 2019: Africa and a 'belt' running from Central Asia across the Indian sub-continent to Indonesia. African cement capacity grew by 55.7% from 140.3Mt/yr in 2010 to 316.9Mt/yr in 2019, while the countries in the 'belt' group saw a 36.8% increase from 51.4Mt/yr to 810.9Mt/yr.

Europe's integrated capacity (including Russia) fell by 6.1% to 389.7Mt/yr from 413.4Mt/yr.

North America's integrated capacity (US, Canada & Mexico) rose from 170.2Mt/yr to 201.7Mt/yr, an increase of 31.5%.

Central and South America's integrated capacity rose by 14.0% to 199.5Mt/yr in 2019 from 171.5Mt/yr in 2010.

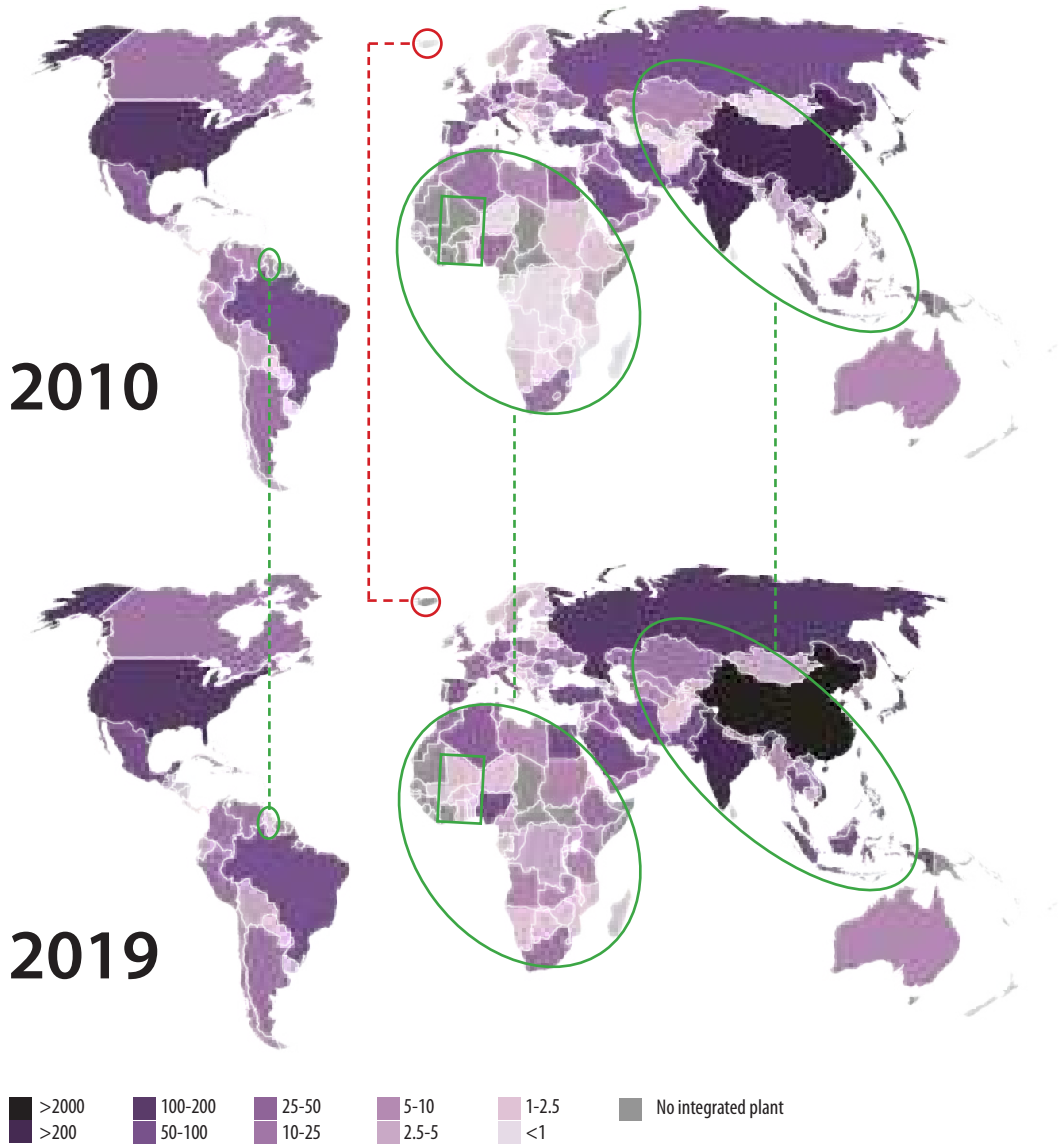
The Middle East's integrated capacity rose from 290.7Mt/yr to 384.7Mt/yr, an increase of 24.4%.

Countries with particularly large changes included:

India:	+106Mt/yr
Vietnam:	+71.7Mt/yr
Indonesia	+50.5Mt/yr
Nigeria	+39.9Mt/yr
Egypt	+32.8Mt/yr
Spain	-4.4Mt/yr
Italy	-16.1Mt/yr

Guyana, Mali, Togo, Burkina Faso, Bhutan and Cameroon joined the ranks of integrated producers in the 2010s.

The sole integrated cement plants in Iceland and the Netherlands converted to grinding only.



A decade of big moves

Like many other sectors, the global cement industry started the 2010s battered by the financial crisis. Indeed, some established producers have spent almost the whole decade in something akin to 'survival mode.' This has meant mergers and acquisitions, divestment of non-core assets and upgrades, particularly those with low capital expenditure, as well as significant efforts towards digitalisation and improved customer service. At the same time, a number of smaller regional players have come to the fore, snapping up assets as they become available.

The *Global Cement Directory 2010* provides a snap-shot of the situation prior to this activity. Most obviously we have Lafarge and Holcim as separate large European multinationals, a full five years from merging. In 2010 Italcementi was an independent player and competitor to HeidelbergCement, its parent since 2016. In China, CNBM and Sinoma were both large, but a world away from becoming the 512Mt/yr industry-leading behemoth we know today.

New kids on the block

As these major players have merged into each other, they have consolidated their positions, both due to competition requirements and by choice. The initial chief beneficiary of this was Ireland's CRH, which absorbed US\$6.5bn of former Lafarge and Holcim assets, including 25Mt/yr of capacity across 24 integrated plants. It also subsequently acquired US-based Ash Grove Cement (9.5Mt/yr), boosting its capacity to 51.7Mt/yr. Previously linked with the sale of Binani Cement in India, CRH stated in August 2018 that it was preparing a US\$7.8bn 'war-chest' for 'anything from acquisitions to share buybacks.' It is clear that CRH's rise up the global cement ranks will continue in the 2020s.

Other 'risers' in the 2010s included Dangote Cement. A local producer with just two integrated plants (8.0Mt/yr) in Nigeria in 2010, the Nigerian producer has built new plants in a number of sub-Saharan markets to transform into a regional giant. As well as additional capacity at home, Dangote has expanded its presence into Ghana, South

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	Net CO ₂ emissions		Alternative fuels used	Biomass fuels used	Power used
	kg/t (clinker)	kg/t (cementitious)	Mt	Mt	kWh/t (cement)
1990	906	755	2.30	0.34	119
2000	862	711	6.09	1.25	113
2005	847	674	8.56	3.83	111
2010	831	636	12.6	4.68	107
2011	824	627	12.9	5.14	104
2012	815	618	14.0	5.45	102
2013	812	616	14.6	6.02	102
2014	814	616	15.8	5.37	101
2015	813	618	16.8	5.28	101
2016	810	618	16.6	4.33	103
2017	805	617	16.9	4.73	102
Δ 1990-2000	-44 (-5.1%)	-44 (-6.2%)	3.79 (+62.2%)	0.91 (+78.2%)	-6 (-5.3%)
Δ 2000-2010	-31 (-3.6%)	-75 (-10.5%)	6.51 (+107%)	3.43 (+274%)	-6 (-5.3%)
Δ 2010-2017	-26 (-3.1%)	-19 (-3.0%)	4.3 (+34.1%)	0.05 (+1.1%)	-5 (-4.7%)
Δ 1990-2017	-101 (-11.1%)	-138 (-18.3%)	14.6 (+635%)	4.39 (+1291%)	-17 (-14.3%)

Above - Table 1: Assorted fuel, electrical power and emissions data for cement plants covered by the Getting the Numbers Right Database, 2010 - 2017. Indicative data for 1990, 2000 and 2005 shown for comparison.

While the steady downward trends seen in CO₂ emissions per tonne of clinker and electrical power use continued in the 2010s, other metrics have moved more dramatically.

An increase in use of supplementary cementitious materials in the 2000s is reflected in the more rapid decrease in CO₂ emissions per tonne of cementitious material over that decade, while the mass of alternative fuels used increased most dramatically since

2000. Biomass use has ebbed and flowed since 2000, with barely any net increase between 2010 and 2017. As a percentage of fuels used, fossil fuels decreased from 87.9% to 82.5% in 2017.

Source: Getting the Numbers Right (GNR) Database 2017, World Business Council for Sustainable Development / Global Cement & Concrete Association.

Note: GNR Database does not cover all cement plants. In 2010 coverage was 25%, in 2017 it was 19%, with variation by world region. This results in European and North American data being over represented, thus trends may not be entirely indicative of the global situation.

Africa, Cameroon, Ethiopia, Zambia, Tanzania, Sierra Leone and the Republic of the Congo. It is currently building plants in Niger and Togo and has long-standing plans to build an integrated plant in Nepal. It aims to have 62Mt/yr of capacity in Africa in 2020, up from 45.6Mt/yr in 2018.

Also in Africa, South Africa's Pretoria Portland Cement has simplified its name to PPC, while taking its capacity to 9.0Mt/yr from 5.5Mt/yr. CIMAT, which didn't produce a single tonne of cement until 2012, has exploded onto the scene in north and west Africa from its base in Morocco. In addition to the two Moroccan plants (3.2Mt/yr) it launched in 2012, CIMAT also operates 10 other cement plants in a further nine African countries via its CIMAF subsidiary. The CIMAT

/ CIMAF plants combined share a total capacity of 10.0Mt/yr. Three further plants currently being built will bring an additional 2.0Mt/yr in the early 2020s.

In India, UltraTech Cement is another prominent example of a regional player that has expanded during the 2010s. Today it claims to have 117.4Mt/yr of capacity across 23 integrated, one clinker-only and 27 grinding plants across India, the UAE, Bahrain, Bangladesh and Sri Lanka. It had 23.1Mt/yr to its name in 2010, entirely within India. This transformation has been achieved via a merger with assets from Grasim Industries (to around 50Mt/yr), the acquisition of ETA Star Cement (4.5Mt/yr) and Binani Cement (8.8Mt/yr), plus numerous upgrades at its existing plants.

Elsewhere, Cementos Argos has taken bold steps outside of its native Colombia. The product of an eight-way domestic merger in 2005, Cementos Argos first moved into the Caribbean and Suriname in 2009, before expanding to the United States in 2011 with the purchase of Lafarge's Harleyville and Roberta plants. It has since bolstered its position with the purchase of Lafarge Honduras (2013), ex-Lafarge plants in Florida (US) and French Guiana (2014), a terminal in Puerto Rico (2015), HeidelbergCement's Martinsburg plant in West Virginia (US) (2016) and further Puerto Rican assets in 2017. It is also active in Haiti, Panama and on many small Caribbean islands. From 9.3Mt/yr of cement capacity in 2010, Cementos Argos has since more than doubled in size to 20.2Mt/yr at the end of 2019.

Expansion: It's not for everyone...

While there have been numerous tales of successful growth over the past 10 years, some of the more established names have fared less well. Perhaps the most obvious example is Mexico's Cemex, which bought a large number of assets from Rinker in 2007, just prior to the financial crash. More than a decade later it has divested non-core cement, concrete and aggregate assets in a number of markets, seeking to achieve divestments of US\$1.5-2.0bn by the close of 2020. A non-exhaustive list of the asset reduction in 2018 and 2019 includes: The sale of a Spanish white cement plant and other cement assets (plus closure of two grey plants), German concrete and aggregate facilities, a Latvian cement plant, a raft of Scandinavian terminals, minor assets in Brazil and the downgrade of its Ponce plant from integrated to grinding. In the earlier 2016-2017 period, it sold minor stakes in Mexican subsidiary GCC, cement plants in the US, Bangladesh, Thailand and concrete and aggregate assets in Hungary and Austria. It also re-jigged its assets in Germany in a complicated exchange with LafargeHolcim. This has lowered Cemex's integrated cement capacity from 77.5Mt/yr in 2010 to 64.6Mt/yr in 2019.

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The 2010s in the Chinese cement sector

After massive capacity expansion in the 2000s, China entered the 2010s with huge cement overcapacity. In 2012 the National Bureau of Statistics of China (NBSC) officially warned that too much cement was being made and, in 2013, China's State Council issued guidelines to tackle the issue. Plans were drafted to promote mergers and acquisitions.

In 2017 the CCA elaborated on its plans, stating that 393Mt/yr of clinker capacity and 540 small to medium-sized cement grinding plants would be closed by 2020. The aim is to reach clinker and cement utilisation rates of 80% and 70% respectively. This has included forced closure of older capacity, bans on new plants and expansions and forced campaign production around major cities. Each of these has tied in with China's increased environmental focus. A ban on 32.5 grade cement brought in during December 2015 is estimated to have sidelined more than 340Mt/yr of capacity alone.

A complete ban on new capacity was announced in February 2018. In the same year, a huge merger between CNBM and Sinoma was completed, giving rise to the largest cement maker the world had ever seen (521Mt/yr).

Domestic profits have been adversely affected by these consolidation efforts, especially since 2015. After a poor year, major producers set about repairing their balance sheets in 2016 and 2017. In the past three years, there has been a large up-tick in projects carried out by Chinese firms overseas.



Above: Beijing. China grew in the 2010s, but not at the rapid pace of the prior decade.

Chinese companies are involved in a variety of projects, many of which are joint ventures. In 2018, *Global Cement* was made aware of 41 projects, across north Africa (6), sub-Saharan Africa (8) the Middle East (2), South America (3) and central (7), north (3), south (6) and south east (6) Asia. These projects comprise 52.4Mt/yr of cement capacity in the form of new clinker lines, grinding plants and expansion projects that have been ordered, are under construction, were commissioned or entered into production in 2018.

Between 1 January and 11 November 2019, at least 13 further projects have been announced in 11 different countries. They encompass a further 19.5Mt/yr of new non-Chinese capacity in which Chinese firms are either the supplier, investor or both.

In March 2018 it finally appeared as if Cemex was 'out of the woods' when CEO Fernando González announced that it would start to *spend* on acquisitions in Brazil and India in 2019. Events since, however, suggest that González jumped the gun. Right now, Cemex's priority, as for many years, remains the recovery of an investment grade rating.

Turning to LafargeHolcim, the world's biggest multinational producer, contraction has also been on the cards, albeit more recently. From combined Lafarge and Holcim capacities of 427.2Mt/yr in 2010 (before each separately began to offload capacity), the newly-formed LafargeHolcim took on around 340Mt/yr of capacity in 2015. In its 2018 Annual Report, the company stated that it controlled 312Mt/yr of capacity. In 2019 LafargeHolcim's wholesale exit from the ASEAN market has reduced its capacity by an additional 33.8Mt/yr, taking capacity to ~278.2Mt/yr. That's a combined contraction of 150Mt/yr for Lafarge & Holcim / LafargeHolcim over the space of 10 years.

HeidelbergCement meanwhile, which acquired the former Italian cement group Italcementi in 2016, has fared somewhat better. In November 2019 it reported that it had increased its sales in the first nine months of 2019 by 7.0% to Euro13.4bn. It said it had cut its net debt by Euro1.1bn and reached sales and administration savings targets of Euro100m

15 months ahead of schedule. It has even been on something of a shopping spree, buying the Bath, Pennsylvania plant from Giant Cement in the US and UltraTech Cement's stake in Emirates Cement in September 2019 and various Moroccan assets in July 2019. It is undertaking a massive expansion with KHD at its Mitchell plant in Indiana, US. In the early 2010s it invested heavily in grinding assets in West Africa: Benin, Burkina Faso, Ghana, Sierra Leone, Mauritania, Liberia and Togo.

A consolidating picture..?

These mergers, acquisitions and other combinations have increased the concentration of the global cement sector outside of China since 2010 (Figure 4). In early 2010 the top 10 global producers (outside of China) controlled around 571Mt/yr of integrated cement capacity, 23.2% of the global total outside of China that year. By the end of 2012 this had increased to 689.2Mt/yr (33.5%). At the end of 2015 - following the LafargeHolcim merger - it rose to 824.7Mt/yr (36.7%). It then rose to 867.8Mt/yr (42.3%) by the end of 2016 on the back of HeidelbergCement's acquisition of Italcementi.

However, the concentration factor as a proportion of global capacity fell during 2017 to 864.4Mt/yr (36.0%) as regional players such as Dangote Cement, UltraTech and Cementos Argos picked up a raft of divestments from around the

sector. The Top 10's capacity rose again to 910Mt/yr (37.9%) at the end of 2018. This pattern, with a peak of capacity held by the top 10 seen in 2014-2016, is due to the large combinations of Lafarge and Holcim in 2015 and of HeidelbergCement and Italcementi in 2016.

The final version of the *Global Cement*

Directory 2020, which details the situation at the end of 2019, is still being compiled. However, with LafargeHolcim offloading 33.8Mt/yr of capacity, Cemex's sales in Spain and a number of minor sales by HeidelbergCement, it appears that the Top 10 will have lost at least 40Mt/yr of capacity during 2019. This would give the top 10 around 870Mt/yr (34.8%) of integrated capacity. The situation heading into the 2020s is hard to read. On one hand, it is likely that multinationals - particularly LafargeHolcim, which is rumoured to be mulling divestments in Africa and the Middle East - could continue to sell assets, further decreasing concentration. However, the newer Top 10 producers like Cementos Argos, UltraTech and Dangote may well add to the top 10's tally in 2020.

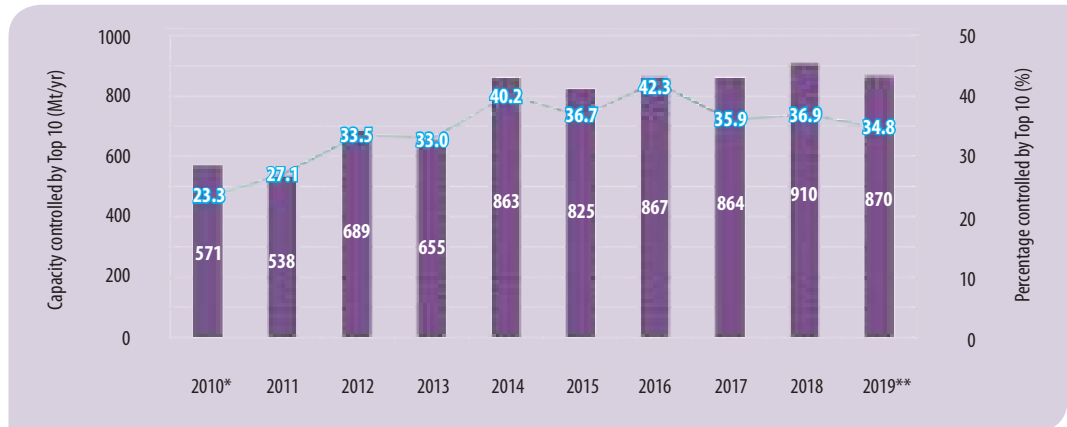
What does *Global Cement Magazine* tell us?

Global Cement Magazine has followed the ups and downs of the global cement sector over the past decade and has attempted to keep up with new technologies and trends as they arise. We have increasingly sought out new technologies, particularly in the areas of energy efficiency, alternative fuels, renewables and carbon capture and storage (CCS).

A brief look at the most frequent words by issue actually indicates that this has been the case since 2010. The six most frequent words in the December 2009 - January 2010 issue were: *Slag* (105), *emissions* (96), *production* (86), *CO₂* (84), *fuels* (76) and *alternative* (74) - after removal of a number high-frequency words (including, but not limited to: cement, plant, global, industry, year, company, new, countries, and others). The most popular two word phrases included *alternative fuels* (63), *CO₂ emissions* (23) and *low-carbon* (20).

The most common words in the January 2012, 2014, 2016 and 2018 issues were: *Production* (81 in 2012, 141 in 2014 and 69 in 2018) and *energy* (95 in 2016). In the January 2012, 2014 and 2016 issues the top two word phrases were *alternative fuels* (19 to 41 instances), *sewage sludge* (20 in 2012) and *renewable energy* (12 in 2018).

An increase in non-technical words associated



Above - Figure 4: Integrated cement capacity (Mt/yr) and percentage of total capacity (%) controlled by the Top 10 cement producers outside of China, 2010-2019.

■ Capacity (Mt)
— Share (%)

Data for 2011-2018 years is as at year end.

*2010 data from early 2010.

** = 2019 data is provisional.

Source: *Global Cement Directories 2010-2019 and research towards 2020 Edition.*

with global trends is noticeable from 2016 onwards, as global cement increased the number of trends and keynote articles. For instance, *population* appears 89 times in the January issue that year. *Demand* appeared 46 times in the same issue, while *construction*, indicative of discussion of cement's place in the wider building materials sector, hits the top 10 words in the January 2016 and 2018 issues.

Finally, the November 2019 issue resumed the trend for *production* as the top hit (69 instances), indicating that, at the end of the day (decade) cement producers remain firmly in the business of cement production, rather than energy saving, renewables, waste-heat recovery or anything else - 'They produce cement!'

A review of the 2020s...

So... what might we write on these page in a future review of the 2020s? Over the next few years we might reasonably expect continued divestments from the major players and lower concentration at the top of the sector. One doesn't need a crystal ball to envisage continuation of existing trends: more alternative fuels, higher impacts from CO₂ pricing, a heightened rush for SCMs and increased efficiency through increased digitisation efforts.

Looking further ahead, if the past decade teaches us anything, it is that the global cement industry is fluid. Seemingly invincible players (Cimpor, Ciments Français. Italcementi and, in the 2000s, Blue Circle) disappear. With increasing pressure from the public, CO₂ trading schemes, scarce resources and chronic overcapacity, the playing field is only becoming more ruthless. It is not a bold statement to say: One or more major players *will* vanish by 2030. Keep reading *Global Cement* to find out which ones!

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Claudia Stefanoiu, CemBR

The EU ETS and cement: How did we get here?

This article offers a data-backed review of the EU Emissions Trading Scheme (EU ETS) and its impact on the cement industry in Europe, based on a recently-published report by CemBR. The report examines all countries and integrated cement plants within the EU ETS. The analysis was carried out with reference to detailed data since the onset of the EU ETS back in 2005.



Above: Claudia Stefanoiu, Head of Research at CemBR, a data, research and intelligence provider in the global cement sector. CemBR's team consists of several cement-related professionals with a wide range of expertise. Its mission is to provide the most accurate, insightful and data-driven cement related intelligence in the market.

The EU ETS has been operational for almost 15 years. In the early years of its application, carbon pricing was high, but the cement sector had more than enough free allowances to cover its operations. Later, the situation became even more comfortable for the sector. CO₂ prices were low and the sector retained a significant surplus of free allowances. However, in the last years things have become more interesting.

CO₂ emissions permit prices began to rise in early 2018, reaching Euro28.57/t in August 2019. At the same time, as cement demand had recovered in certain parts of Europe, an increasing number of cement plants were confronted with the need to purchase CO₂ credits at the increased pricing levels (many expect prices to keep increasing) or to consume stocks of accumulated credits held by the company. In addition, Phase IV of the EU ETS is now being developed, with future allowances (beyond 2020) expected to be based on lower production activity levels for most of the countries and their respective cement plants.

To make things even more complicated, it is now generally accepted that the cement sector has not met the targets set out by the EU ETS. An increasing number of large cement companies are raising the climate change issues to the top of their corporate agenda.

Below - Table 1: The largest variance in CO₂ emissions of cement plants in the EU ETS is due to the fuel requirements of different process technologies.
Source: CemBR.

Process	Capacity (t/day)	Dimensions (m)	Feed H ₂ O (%)	Energy Consumption (MJ/t clinker)	Energy Consumption (KCal/kg clinker)
Wet	200 - 3000	Ø = 3.0 - 7.0 L = 100 - 220	25 - 45	4500 - 7500	1080 - 1800
Semi-dry	500 - 2000	Ø = 3.5 - 5.0 L = 55 - 75	12 - 17	3300 - 4200	800 - 1000
Dry (4/5 stage Preheater)	500 - 4500	Ø = 3.0 - 6.0 L = 40 - 105	0.5	3000 - 4200	710 - 1000
Dry (4/5 stage Precalciner)	1500 - 13,000	Ø = 3.5 - 6.0 L = 60 - 105	0.5	2900 - 4000	690 - 950

Cement process and CO₂ emissions

Around 60% of CO₂ emissions from the cement sector emanate from the decarbonation step when making clinker. The remaining 40% of emissions are due to burning the fuels needed to heat the kiln up to 1400°C to achieve clinkerisation. While the decarbonation component of the emissions is quite stable across plants at around 520-550kg of CO₂ per tonne of clinker, the fuel component varies significantly depending on the type of fossil fuel, the use of alternative fuels and their biomass content.

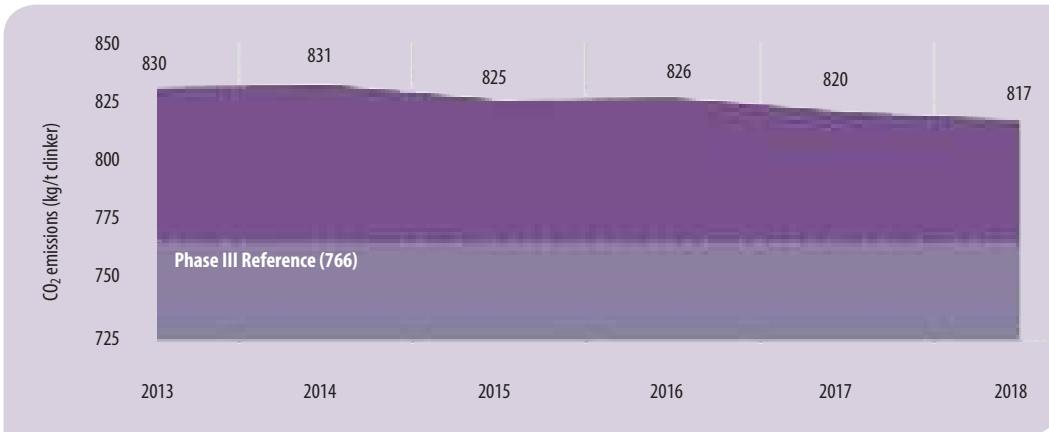
The various plant technologies currently operating in Europe significantly impact the fuel requirements and thus the CO₂ emissions due to combustion.

Working the system?

All the phases of the EU ETS have so far been characterised by what many would describe as over-generous allowances of CO₂ emissions credits for the cement industry, especially in the first two phases. The carbon pricing history, coupled with the more than adequate allowances (with the gap between free allowances and verified emissions increasing significantly after the financial crisis and the resultant decimation of cement production in most of Europe), may have led producers to actions that were not always supportive of lowering CO₂ emissions per tonne of clinker. Even in Phase III, when the benchmark of 766kg of CO₂ per tonne of clinker

was adopted, the allowances were broadly adequate to keep the cement players producing at no additional cost. CemBR estimates that, as a result of this, CO₂ emissions per tonne of clinker fell by just 0.4%/yr between 2005 and 2018. This rate was consistent across all phases of the EU ETS.

Some suggest that the above factors have also conspired to induce a financial bonanza for



Left - Figure 1: EU ETS CO₂ emissions per tonne of clinker (2013 - 2018).
Source: CemBR.

various cement producers, who have either sold surplus credits for cash or banked them (after Phase II) for future use.

As CO₂ credit prices began to increase from 2017, they became more of a financial consideration for cement producers than an incentive to reduce CO₂ emissions. The abundance of credits coupled with the high prices have allowed many cement producers to keep uneconomical plants open by way of exporting, thus edging production just above the 50% threshold whereupon they retained full allowances. One might argue that the EU ETS had the exact opposite effect on cement producers than the one envisaged by its advocates.

The alternative fuels conundrum

A proud achievement of the European cement industry during the period of the EU ETS (and even before its introduction) has been the increasing replacement rate of alternative fuels. By 2018, it is reported that the industry has reached an overall substitution rate of 44%, up from 5% back in 1990.

Indeed, this is an achievement not seen anywhere else in the world. However, as alternative fuels were on the rise the per tonne of clinker carbon emissions have made only minimum advancements. The CemBR report identifies two factors that contribute to this paradox. The first refers to the 'accounting' of CO₂ emissions under the EU ETS. It is only the biomass content of alternative fuels that is not taken in the tally of verified emissions. Of course, not all alternative fuels have high levels of biomass. So, if a cement plant increases its alternative fuels usage by, for example, burning oil sludge, it gets no recognition from the EU ETS. However, it does improve its cost structure significantly.

The second factor refers to the inevitable (as shown by real life data) increase in the fuel consumption per tonne of clinker produced as alternative fuels are introduced on a cost-driven basis and not on a CO₂ reduction basis. The high moisture content of RDF for example, unless removed prior to entering the kiln, increases fuel consumption.

Alternative fuel	Calorific Value (GJ/t)	Biomass content (%)
Used tyres	28	30
Waste oil	30	0
Paper	5	100
Plastic	23	0
Animal meal	18	100
RDF	18	50
Solvents	25	0
Sewage sludge (wet)	3	10
Oil sludge	5	0
Others	18	50

Left - Table 2: Common alternative fuel calorific values and their average biomass content.
Source: CemBR.

Consequently, the alternative fuels success story is true in financial and environmental / waste management contexts, but not so much in terms of reducing CO₂ emissions.

Leaders and laggards

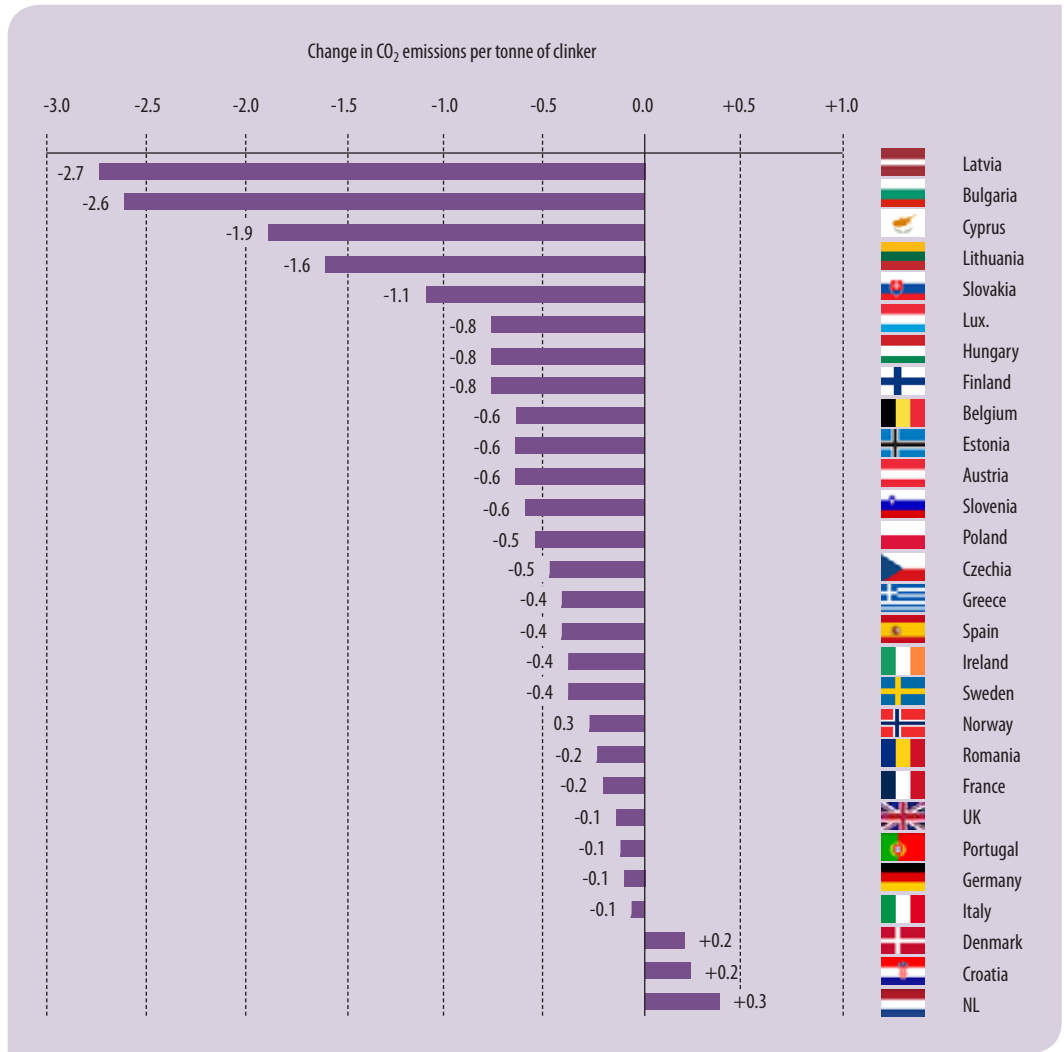
CemBR identified that the variability between all 28 EU ETS member states in terms of CO₂/t of clinker is substantial. Three of the 31 EU ETS member states have no integrated cement plants and thus are not relevant here. The myriad reasons behind this divergence are explained in detail in the CemBR report but suffice to say that one of the main reasons for the discrepancy in performance is wet to dry process upgrades. This results in significant overall reduction in CO₂ emissions. Smaller countries with a few plants (or even just one plant) tended to be affected by this disproportionately. It is not possible to pinpoint accurately the impact on CO₂ emissions from these upgrades. However, CemBR estimates that a large proportion of CO₂ emission reduction comes from step technological changes, not micro-process improvements.



Right - Figure 2: Rounded long term compound annual growth rates (CAGR) of CO₂ emissions (kg/t of clinker) by country in the EU ETS. Lux = Luxembourg. NL = Netherlands. Source: CemBR.

Note: For all countries, the CAGR reflects the period 2005 - 2018 except for those countries that joined the EU ETS later or had inconsistent reporting in the early years.

Bulgaria = 2007 - 2018
 Romania = 2007 - 2018
 UK = 2008 - 2018
 Norway = 2008 - 2018
 Croatia = 2013 - 2018



Other key findings from the CemBR report

The data- and analysis-driven insights from the report cannot be included in this short article but as an indication some further key findings include:

- The CO₂ intensity variation between the 28 EU ETS member states is significant, ranging from 750kg/t of clinker to 1085kg/t of clinker;
- A total of 52 integrated cement plants in the EU ETS closed between 2005 and 2018;
- The 2018 activity level of each remaining plant shows that several are producing at a rate close to or above their Historical Activity Level (HAL), the median clinker production rate between 2005-2008. This means they are now in a CO₂ permit deficit. Others still operate at very low levels but secure free allowances;
- 2018 was the first year that the industry presented a deficit of CO₂ credits. This is expected to widen further in 2019 and 2020;

- EU ETS has been generous with CO₂ allocations for the cement industry, resulting in inconsistent behaviours between the various cement producers. Reducing CO₂ emissions per tonne of clinker has not been at the top of corporate agendas;
- The variation between northern and southern Europe is significant, with the so-called 'olive line' separating two very different CO₂ outcomes;
- There are eight types of country profiles regarding the CO₂ impact depending on the combination of domestic sales, regional sales, imports, exports (and their destination or source);
- The financial impact of carbon credits is significant in the industry. Simulations suggest that earnings before interest, tax, depreciation and amortisation (EBITDA) margins vary from 50% to -16% depending on the combination of sales, imports, exports, alternative fuels and the plant's actual capacity utilisation rate.




Looking forward to Phase IV

CemBR understands that, at the time of writing, the EU ETS Phase IV implementation details are still being refined. However, the findings from this report lead us to pose some questions for Phase IV to which cement producers will want answers:

- What will the new benchmark for CO₂ be per tonne of clinker?
- Will there be ‘carbon leakage’ protection in Phase IV? (not available for previous phases)
- If there is a ‘carbon leakage’ protection mechanism, how will it be implemented? A blanket CO₂ import tax or a more sophisticated remedy that considers the importing source’s emissions?
- How could answers to the above influence potential non-scheme exporters to Europe?
- What will cement companies decide to do in the face of significantly reducing allowances and increasing CO₂ emission permit prices?
- Will there be different strategies between the various plants in the scheme? And why?
- Will there be closures of hitherto ‘surviving’ plants?
- How would exports from scheme members to outside the scheme members develop?

An additional complication for the UK is, of course, Brexit, despite three ‘departure deadlines’ now having been missed. Will cement plants in that country still be included in the EU ETS?

CemBR together with its advisory arm (CBA) is working on answers to all of these questions and more, as well as the various scenarios that might materialise in Phase IV. Stay tuned for more in 2020. 



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Interview by Peter Edwards, Global Cement Magazine

In discussion: Guloren Turan, Global CCS Institute

Carbon capture and storage (CCS) is variously hailed as a 'silver bullet' by some in the cement sector and denounced as 'impossible' by others. It is neither, argues the Global CCS Institute's Guloren Turan, and it's also essential...



Global Cement (GC): Please could you introduce the Global CCS Institute?

Guloren Turan (GT): The Global CCS Institute is an international think-tank backed by governments, businesses and non-profit organisations. It was launched at the G8 Summit in Rome in 2009 by the Australian government. It is a private organisation, headquartered in Melbourne, Australia, that exists to accelerate the deployment of carbon capture and storage (CCS) solutions on a global basis.

GC: What is the institute's global footprint?

GT: As well as Melbourne, the Global CCS Institute has offices London, Brussels, Washington DC, Tokyo and Beijing with around 40 staff in total. It has around 50 members, including the governments of the US, the UK, China, Japan and, of course Australia, as well as power generators, researchers, technology providers and start-ups. It's a small organisation but the focus is global. It is the only organisation focused solely on CCS.

GC: What is the most important aspect of your role as General Manager - Advocacy?



GT: My main aim is to get the message out to a wide range of stakeholders, from policy makers to industrial players and the public at large, that CCS is not a 'silver bullet', but rather part of a range of climate mitigation 'options.' However, I would go so far as to say that meeting certainly the 1.5°C scenario *without* CCS is nigh on impossible. It is critical as a methodology and that's why we must support it.

GC: What have been the institute's main achievements over its first 10 years?

GT: Over the past decade the Global CCS Institute has become a leading authority on CCS technology worldwide. It is a prolific publisher of insight, information and analysis on the topic. It hosts a comprehensive database of all CCS facilities, both large and small scale. It publishes Global Status Reports every year to coincide with the COP series of conferences, this year the COP 25, now in Madrid. It is just one of many events in which the institute participates, where it reports on policy to help stimulate debate and inform the CCS discussion.

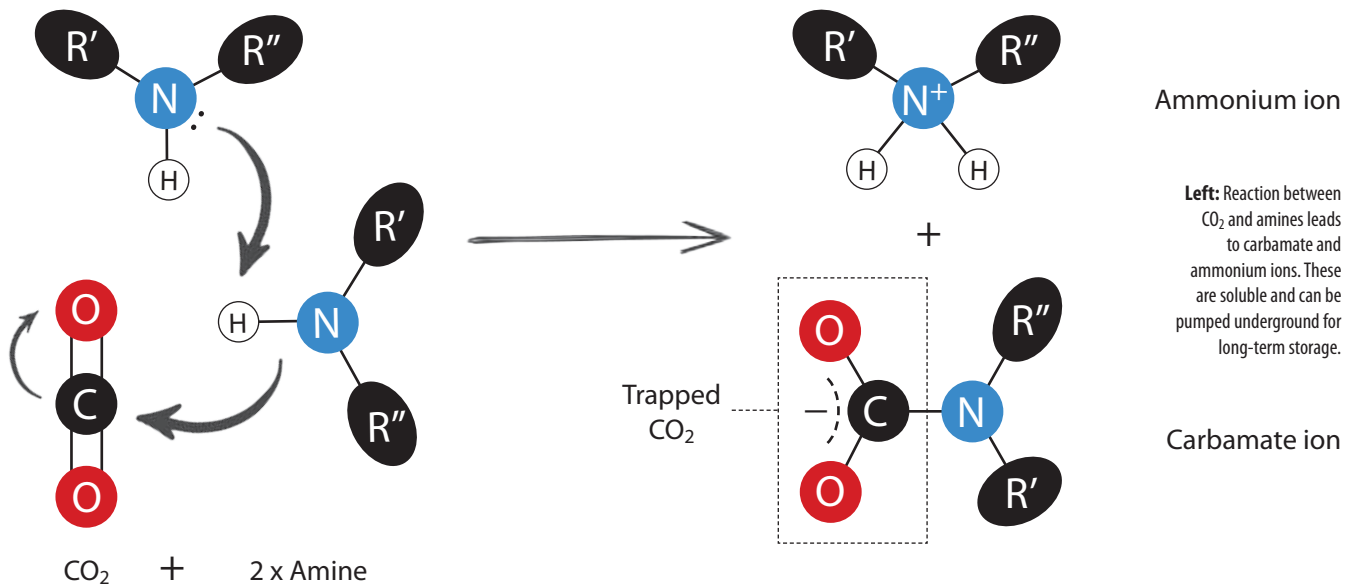
GC: So, how many CCS projects are currently in action around the world?

GT: There are 18 large-scale active CCS projects, plus five large projects under construction. There are a further 20 that are in planning but have not yet begun construction. There are many further pilots and demonstration plants that we list in the Global Status Reports that I can't go into full detail about here. The institute is mainly interested in meaningful large-scale deployment of CCS. That's what's needed to meet challenging climate targets.

Contrary to what many people think, only two of the 18 active plants are in the power sector. The majority of the active systems are used by 'industrial applications,' which is quite a broad category. They are predominantly processes in which the cost of capturing CO₂ is relatively low, i.e.: streams in which the CO₂ is already fairly highly concentrated, for

Above: Guloren Turan has been the Global Carbon Capture and Storage Institute's General Manager - Advocacy since October 2018. She is based in the institute's London office. Guloren has extensive experience in the energy and climate fields. From 2015 to 2017, she led the Government Affairs activities at the Trans-Adriatic Pipeline. Prior to this she held a number of roles over the course of nine years at BG Group, now a part of Shell.

Right: CCS is just one of a number of levers to reduce CO₂ emissions.



example fertiliser production, ethanol production, steel and some others. This also includes things like gas processing, where CO₂ is removed from natural gas streams before it can be put into the pipeline.

“We can electrify our way out of a lot of emissions. This is not the case for cement...”

GC: Wait a second... You’re saying that CCS is being used to facilitate fossil fuel production. How does that fit with the Global CCS Institute’s sustainability goals?

technology used and it may turn out some other chemistry comes to the fore. The institute focuses on the discussions around reducing the cost of establishing such facilities, however that is carried out.

GT: Yes, CCS is used to clean natural gas streams, but it’s better than releasing that CO₂ to the atmosphere. For me, this highlights the versatility of CCS to a very wide range of industrial processes.

GC: What barriers have to come down to enable greater uptake of CCS?

GC: What is the main technology used?

GC: The technology exists. What we really need is a robust and consistent price for CO₂. How that is achieved, again, the institute is ambivalent. Robust prices will enable a stable environment in which companies can commit to projects and carry them to completion. These are multi-year undertakings and they need stability.

GT: The active large-scale projects use amine-scrubbing technology to capture the CO₂ as a soluble carbonate salt, which are stored underground as a solution. It is important to highlight that the Global CCS Institute is totally neutral with regards to the

The EU has its approach under the ETS, which is sometimes held up as ‘the way’ to lower CO₂ emis-

Below: The Norcem (HeidelbergCement) Brevik plant in Norway is the site of the most advanced CCS project in the cement sector.





sions. In the US, however, CCS as a solution has been specifically encouraged by way of a tax credit for captured CO₂. This gives companies 'money off' their tax bill, in a fairly predictable way, if they invest in CCS. This is very appealing to US companies and it works. In the common analogy the EU approach is the 'stick' and the US model is the 'carrot.' Different approaches can work in different jurisdictions.

GC: Which world region is taking the lead with CCS at the moment?

GT: The US is the leader in this regard. It has 11 of the active 18 projects and a wide range of users. It has innovative and impressive policies. The 'CCS tax credit' that I mentioned above is US\$35-50/t, one of the highest rates in the world.

GC: Where is the next world region that will develop in terms of CCS projects?

GT: I certainly hope that Europe will pick up the ball with CCS, following something of a stop-start relationship with it to date. There are only two active projects there, but there are nine under development. Six of those are in the UK. There is tremendous help from industry, the EU, NGOs and other stakeholders.

GC: Has Brexit affected these projects in any way?

GT: The development of the six UK projects is not dependent on membership of the EU. I think that the current UK government and any future government will remain committed to them, especially as the UK committed to a net-zero CO₂ emissions target for 2050 earlier in 2019. My personal view is that the support will remain in place.

GC: What cement sector projects show the most promise?

GT: There are no operational major CCS projects in the cement sector at the moment. However, there are two major projects with which your readers may already be familiar. The first is the Norcem (HeidelbergCement) plant in Brevik, Norway, which is due for final funding approval in 2020 or 2021. The second is the LEILAC plant in Lixhe, Belgium, another HeidelbergCement facility.

Cement is in something of a unique bind, given that the chemical process itself is such a source of CO₂. There appears to be no real alternative to cement and concrete in the short to medium term, which means that CCS is essential to deeply decarbonise the sector. Let's not forget, cement production emits something like 5-8% of global CO₂ emissions, depending on who you ask, so this is an important goal.

The dusty nature of cement process gases also poses a big challenge to CCS. Indeed, the lack of cement sector projects shows that cement production is at the higher cost end of the CCS process. This is why the LEILAC project uses Calix's Direct Separation Reactor (DSR) to keep the process and fuel CO₂ streams separate. That process collects the process CO₂.

At present costs, full CCS is estimated to add around 70-90% to the existing price of cement. It certainly sounds like a problem. However, others claim that the cost of a building would only increase by 1% if CCS were to be used on the cement it uses. Remember that cement is actually a low-cost product for what it does. It is important to look at the entire construction chain, from low-CO₂ clinker, lower amounts of clinker in the cement, lower amounts of cement in the concrete and lower amounts of concrete in the building.

Right: Overview of the CRH Rohoznik plant in Slovakia. The plant uses waste heat recovery equipment from Turboden, another way for the cement sector to reduce its CO₂ emissions.
Source: Ottavio Tomasini, entrant to the *Global Cement Photography Competition*.





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Right: An overview of the CBR (HeidelbergCement) plant in Lixhe, Belgium. The plant is host to the ongoing LEILAC CCS project, which uses Calix's Direct Separation Reactor.



GC: Could one say that the cement sector is actually really 'good' for CCS, precisely because it cannot be electrified?

GC: There is a misconception that we can electrify our way out of a lot of emissions. This is not the case for cement, which really does need CCS if it is to continue in anything approaching its current form in a carbon-constrained economy. It would make a valid target for CCS equipment manufacturers, especially when we consider the vast quantities of cement and concrete that will be demanded by future urbanisation.

GC: Does the institute look at carbon capture and utilisation (CCU)?

GT: The institute considers CCU to have the potential to be complementary to CCS, provided that the use permanently removes the CO₂ from the atmosphere. Therefore, we would support CCU that produced a non-oil-derived plastic, for example, but not one that makes an artificial fuel.

In any case, the sheer quantities of CO₂ that have to be captured means that geological storage is the only real option. There may be breakthroughs that allow greater use, which would be fantastic, but we have to work with the realities of the situation as it stands.

GC: What about direct air separation (DAC)?

GT: DAC is becoming more interesting at present, with a lot of investment in start-ups. The costs are on the high side at the moment and we see it as complementary to CCS. We are yet to see how the costs change as it scales up. I am personally hopeful that it can be realised on a commercial scale.

GC: Does the magnitude of the CO₂ issue mean that we cannot afford to wait until these things are 'commercial?' Should governments instead invest in them, as they do in infrastructure and health?

GT: That's a good point and some would advocate for that. The Global CCS Institute is, once again, agnostic, but you can't blame companies for operating in the capitalist system they inhabit. For some industrial players, including many cement multinationals, there is more and more pressure from shareholders to increase transparency in their operations and to make them more sustainable. At the end of the day, consumers drive how companies behave and this will be increasingly true as sustainability moves up the agenda.

GC: What does the Global CCS Institute expect from the next 1-5 years?

GT: We will continue to help educate all parties regarding the opportunities of CCS so that we can help shape policies that give rise to increased numbers of projects, across all industrial sectors. We will continue to use all of our reporting methods, knowledge sharing and publicise CCS successes.

In the cement sector, I can't wait for the Norcem project to come online. This is important for the cement sector, for Europe and for CCS as a whole. My understanding is that, post-2021, there are opportunities, with the support of the Norwegian government, to expand the storage capacity at the Brevik site, as well as others. This could open up opportunities to pipe CO₂ from heavy industrial users elsewhere in Europe where storage opportunities are not as good. I hope that Norway makes a good return out of its CCS endeavours, as this would show the way to a future where CO₂ storage is a real asset and an important new area, not just for global sustainability, but for the global economy too.

GC: Interesting times ahead. Thank you very much for your time today Guloren.

GT: You are very welcome indeed.



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Tang Jinqun, Yu Hai, Tang Zhaowei, Jianweize Energy Saving and Environmental Technology Co. Ltd. & Bai Shaojun, AVIC International Beijing Co. Ltd.

Externally-heated rotary kilns: A new way to reduce CO₂ and SO₂ emissions

CO₂ and SO₂ emissions from cement plants are serious issues that require mitigation. To this end, this article recommends a new type of externally-heated rotary kiln for cement production. The technology already produces high-activity lime and magnesia powder on a proof-of-concept basis, while also manufacturing high-purity food grade liquid and solid CO₂ at low cost. The application of the technology to cement production could have a range of benefits for the sector.

In recent decades energy conservation and emission reduction technologies have been widely applied by cement producers in response to rising standards. These represent important contributions, but more drastic steps will be needed to meet the challenges of the Paris Agreement.

However, further gains will be more difficult. In particular, CO₂ emission reduction technologies for cement kilns are complex and remain at the trial stage. Future hypothetical facilities have massive footprints, are highly complex and come with exorbitant investment costs. To help circumvent these challenges, this article introduces a simple and effective technology that lowers CO₂ emissions from cement plant preheaters, while also lowering SO₂.

CO₂ mitigation in China

As a major signatory country to Paris Agreement, the Chinese State Council issued the 13th Five-Year Plan of Work on Controlling Greenhouse Gas Emissions

in October 2016. It proposes that CO₂ emissions per unit of gross domestic product (GDP) in 2020 will be 18% lower than in 2015. As a result of various measures taken since, China is expected to have the largest CO₂ emissions permit trading market in the world by the mid 2020s, creating a strong push toward technical CO₂ separation solutions for cement production.

Ways to reduce CO₂ emissions

Advanced methods to reduce CO₂ emissions focus on the recovery and purification of the CO₂ gas contained within the flue gas from the preheater and subsequent conversion of the purified CO₂ into gaseous or liquid CO₂ products. These have a range of uses in welding, oil extraction, fuel gas production, concrete mixing, industrial cleaning, fertilisers, cold-chain transportation and in foods and beverages.

To date there is only one cement group in China that operates a CO₂ emissions reduction system for flue gas from a single cement preheater. The system, which uses adsorption distillation in conjunction with chemical adsorption, was fitted to the 5000t/day clinker line in 2018. It reduces emissions by 50,000t/yr, providing significant CO₂ reductions and a valuable demonstration that CO₂ separation solutions for the cement sector are available.

Traditional 'issues'

Due to the complex composition of cement process gases, CO₂ separation methodologies have historically suffered from some fairly limiting issues. Usually, industrial grade CO₂ is expensive to produce from flue gases. When traditional food-grade CO₂ production costs are US\$45/t and sales prices are ~US\$52/t, there is little room to invest in separation equipment that can cost US\$220-290 to extract a single tonne of CO₂, even for non-food uses.

Below: One of four externally-heated rotary kilns that have been calcining magnesite on a demonstration basis since March 2018.





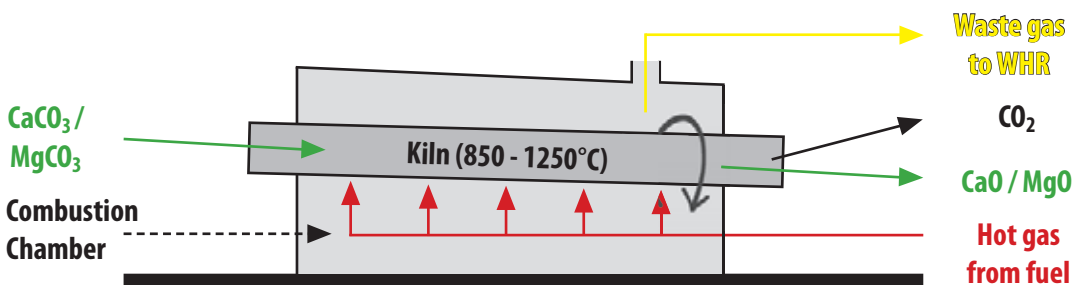
External combustion type rotary kilns

Jianweize Energy Saving & Environmental Technology and AVIC International Beijing have conducted research and development into externally-heated rotary kilns for carbonate minerals calcined at high temperatures. The project developed a range of externally-heated rotary kilns in which the material being calcined does not come into contact with the combustion gases. This greatly facilitates separation of the CO₂. The project's aims were to solve issues surrounding wasted tailings, product quality, energy consumption and environmental protection, in the magnesia and lime sectors, as well as recovery of CO₂. Since 2001, four main stages of development resulted in four demonstration kilns, each 2.5m in diameter and 56m in length, that use external combustion to calcine carbonate minerals.

Proposal 1 in detail

Part of the material in the fourth-stage cyclone of a five-stage preheater is diverted to the externally-heated rotary kiln, reducing the amount of limestone entering the calciner. The separated portion is decomposed into CaO and pure CO₂ gas. The CaO produced in the external combustion type rotary kiln is sent to the first cyclone stage of the preheater. After passing through the entire preheater, lowering SO₂ as it goes, it enters the calciner and kiln to make clinker. The CO₂ gas is then further processed into food grade liquid or solid CO₂. The high-temperature CO₂ and flue gas from the fuel can be used in any existing WHR boiler, which is often the case in China.

In a hypothetical 2800t/day clinker line, where the proportion of limestone in the raw meal is 80%, the CaO content of limestone is 48%, the decom-



Left: Simplified schematic of externally-heated rotary kiln.

Trial production has been carried out since March 2018. Production is calculated to be 150,000t/yr of lightly-calcined active magnesia powder, 100,000t/yr of food grade liquid CO₂, 30,000t/yr of food grade solid CO₂ (dry ice) and 50,000,000kWhr of power from waste heat recovery (WHR) equipment.

Each of the kilns can produce 50,000t/yr of high-activity magnesia or lime. Larger examples could reach capacities of 100,000t/yr, greater than conventional technologies. This generates economies of scale. In addition, higher activity products increase efficiency of customers' processes, while reducing costs. Pertinently, the technology costs US\$22/t to make food grade liquid CO₂ and around US\$80/t for solid food-grade CO₂ (market price is ~US\$440/t). This is much lower than some other methods and opens up new revenue streams.

Externally-heated rotary kilns as applied to cement production

Externally-heated rotary kilns consist of the kiln itself, WHR units, dedusting and liquefaction plants for CO₂ gas and a solidification plant for liquid CO₂. It is proposed that these could be used in cement production in two different ways: 1. Diverting part of the material from the fourth stage preheater cyclone to the externally-heated kiln; 2. Diverting part of the limestone used for raw meal preparation to the externally-heated rotary kiln.

position rate of CaCO₃ in the material at the outlet of the fourth cyclone in the preheater is 15%, the material temperature is 750°C, Proposal 1 would generate 25,000t/yr of CO₂. The amount of material that enters the externally-heated rotary kiln would be 15.6t/hr. The amount of material produced by the external combustion rotary kiln would be 11.4t/hr, including 6.3t/hr of CaO, 4.2t/hr of CO₂ and 5.1t/hr of other material. The high temperature CO₂ and flue gas produced from fuel burning could produce 6.4t/hr of steam for the WHR system.

The CaO produced in external combustion type rotary kiln is of high activity, sinters easily and is highly effective at desulfurisation. The cement clinker output and quality can be increased and heat

Below: Rod-form food-grade CO₂ can be made from CO₂ collected. At US\$440/t this could provide a lucrative new income stream for cement producers.





Right: Large storage tank for liquid CO₂. Not possible at atmospheric pressure, liquid CO₂ can only exist at pressures above 5.1atm between -56.6°C and 31.1°C.



consumption can be reduced by 30kCal/kg of clinker if the 2800t/day rate is maintained. Alternatively it is possible to increase the production rate by 105t/day at the previous energy consumption.

Proposal 2 in detail

Some of the limestone that would otherwise be used in raw meal preparation, is separated and crushed to <5mm, then directly fed to the externally-heated rotary kiln. This reduces the amount of limestone that enters the preheater. The diverted limestone is calcined in the externally-heated rotary kiln to produce CaO and CO₂. The CaO is fed to the main kiln, bypassing the preheater and calciner. The CO₂, as in Proposal 1, is concentrated and purified into CO₂ products. WHR can, as before, also be incorporated to maximise energy recovery in tandem with an existing WHR systems.


Taking the 2800t/day kiln used to illustrate Proposal 1, the amount of limestone entering the external combustion type rotary kiln is 230t/day, such that the amount of limestone entering the kiln is reduced from 3500t/day to 3270t/day. The output of the externally-heated rotary kiln is 125t/day and the

volume of CO₂ gas produced is again 4.2t/hr (or 25,000t/yr). The high temperature CO₂ and CaO produced will generate 6.2t/hr of steam. The CaO produced is again of very high purity and activity. The heat consumption would fall by 20kCal/kg at a stable 2800t/day, or production could be increased by 70t/day at the same energy consumption.

Common features

With both proposals, the purity of the CO₂ gas generated is >99%, such that it can be further processed into food grade products. Alternatively, in combination with steam from the WHR boiler, it can even be made into a synthetic fuel (2000kCal/kg / 1600kCal/Nm³), which can be used to fire the externally-heated rotary kiln. Also common to both is the minimisation of waste heat throughout the entire system. The volume of CO₂ produced can also be tuned in both.

The investment required for either system is estimated to be slightly higher than other CO₂ separation techniques. However, the potential returns from selling food-grade CO₂ are much higher. The investment cost for the system is estimated to be US\$440-590/t of CO₂ to be removed, making a 25,000t/yr plant US\$11-14.7m. The payback period from CO₂ sales is anticipated to be 3-4 years, before one even considers the (possible) benefits of increased clinker production, decommissioning of the previous desulphurisation system, recovered waste heat energy and the financial benefits associated with CO₂ trading and tax systems.

It is thought that the technology, as developed by the authoring companies, may be very suitable to the cement sector. Indeed, on 3 June 2019, a construction contract was signed by a cement company in Fujian, China to construct a demonstration project that will reduce CO₂ emissions from its 6000t/day clinker line by 50,000t/yr. The authors will report on the project's progress in due course. 



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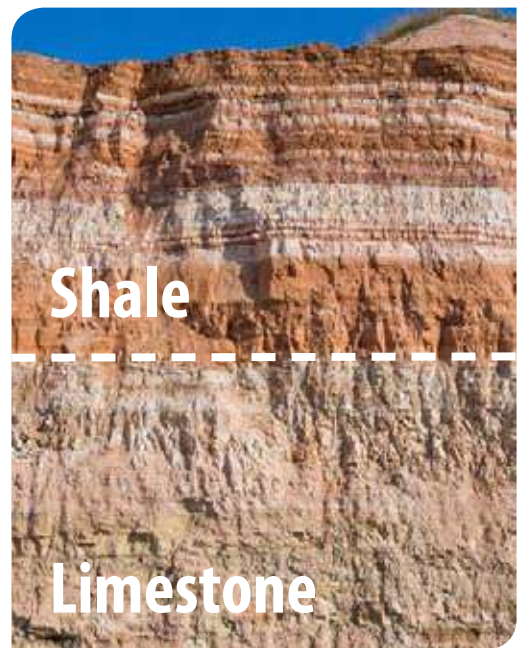
Dr Martin Hagsted Rasmussen & Dr Lasse Nørbye Dassing, CemGreen ApS

Shale: Solving the global SCM crisis

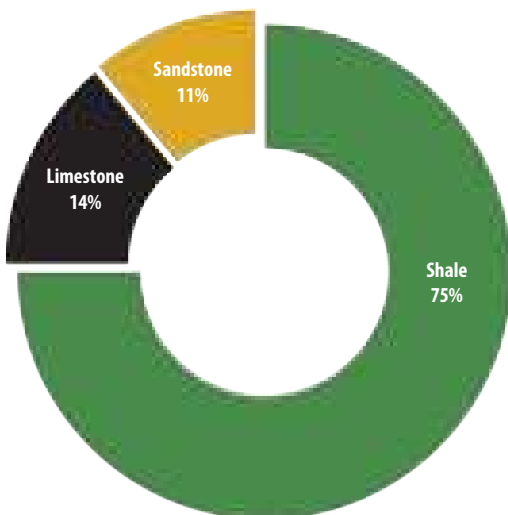
Supplementary cementitious materials (SCMs) are widely applied in cement and concrete products due to some immediate advantages such as: Lower production costs, improved properties, resource efficiency and lower CO₂ emissions. By far the most used SCM is fly ash, a by-product from coal-fired power plants. However, due to the widespread reduction in coal usage, as seen in Europe, this source is now leaving a gap that must be filled. CemGreen has developed a patent-pending process, called *CemShale*[™], in which globally available shale is converted into a valuable SCM that can substitute fly ash one-to-one.

Fly ash has been used as a supplementary cementitious material (SCM) for more than 40 years and now accounts for more than 70% of total SCM volumes.¹ Today it is used in some 65% of Chinese cement and more than 90% in Europe. With high demand has come higher prices and, in some areas, even shortages, turning fly ash into an export commodity. Combined with the planned phasing-out of coal-fired power plants in the forthcoming years, further price increases are expected. For instance, close to 30% of fly ash in Germany is expected to disappear by 2022.² In the United States close to 300 coal-fired power plants have been closed since 2010,³ in this case due to the availability of domestic gas. This represents around 20% of the US coal-fired capacity and therefore an impending shortage of fly ash.

Elsewhere, for instance in South America, SCM fly ash is often not local because power supplies are not based on coal. Consequently, cement and concrete producers have to use limestone or low-quality fillers. Such regions thus also have an interest in quality substitute SCMs for fly ash.



Right - Figure 1: A typical example of intercalated shale and limestone.



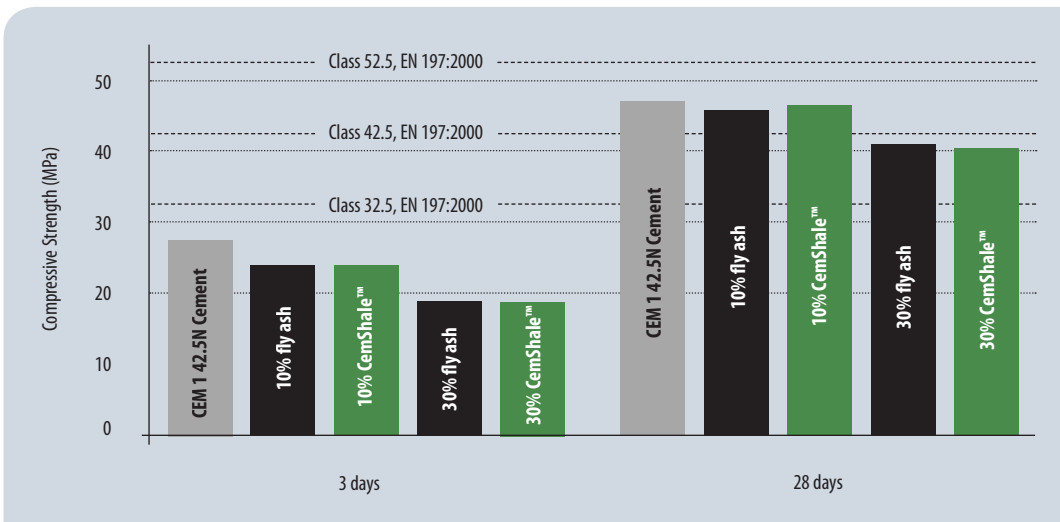
Right - Figure 2: The relative abundance of the three main classes of sedimentary rocks.

What does an SCM need to offer?

For a new SCM to be viable and relevant it must meet four key criteria. It must be:

1. Readily and globally available in vast quantities;
2. Low-cost;
3. Consistently induce cementitious properties;
4. Meet applicable regulations regarding SCMs.

Failure to meet one or more of these criteria is the main reason for a general lack of new SCMs entering the market. New entrants are either too expensive, not available in large quantities, do not bring a consistent quality product or fail to meet regulations.



Left - Figure 3: Compressive strength developments of five different cement blends at 3 and 28-days of curing.

Shale: A familiar yet novel SCM candidate

Shale is a fine-grained sedimentary rock, which is already used in OPC due to its aluminium contribution. It is formed in ancient marine environments together with limestone. This is important because shale and limestone are often found in the same quarry (See Figure 1). More importantly, shale is five times more abundant than limestone, so it is globally available in large quantities (See Figure 2).

During limestone mining, shale is often removed and piled elsewhere in the quarry, where it is considered a ‘waste material.’ This means that the raw material is already mined and broken down to workable sizes. Consequently, the shale is often ‘free.’ Indeed, in some regions there may even be situations where cement producer could get paid to take ‘waste’ shale from other mining operations, for example some types of iron ore extraction. Thus, if shale is not found together with the limestone, it will very often be readily available within a reasonable distance.

Activation of cementitious properties

Shale must be calcined to become activated and achieve cementitious properties. However, as opposed to limestone-based cement, the cementitious properties of shale are very sensitive to temperatures above 1000°C. If this temperature is exceeded, the shale becomes inert and unreactive, significantly lowering the compressive strength of the final blended cement product. Consequently, there must be a strict control of the calcination process in order to obtain optimal SCM properties. This issue has now been addressed by CemGreen through the patent-pending CemShale™ process.

In Figure 3, the compressive strength developments of a commercially available CEM-I 42.5 N Portland cement is compared to a commercially available siliceous fly ash (V) and a shale gained from an active limestone quarry that has been processed using the CemShale™ process. The compressive strength

tests are conducted according to EN-197:2000. This specific test consists of three and 28 days terms using 100% cement and two different substitution rates of 10% and 30% for both fly ash and shale.

With the CemShale™ process, CemGreen is able to produce a product that obtains a compressive strength development of the blended SCM cement, which is on par with a siliceous fly ash at all substitution rates after 28 days. This means that cement producers can produce their own SCMs, while securing the SCM supply chain to make them independent of waste products from other industries. A positive side effect of the CemShale™ process is that it emits just 10% of the CO₂ per tonne of produced material compared to OPC due to a lower calcination temperature. Additionally, there is no release of CO₂ from the shale during calcination and significantly fewer processing steps.

Current regulations

Cement production and products are subject to significant regulations, which means that introducing new products is a difficult and time consuming process. However, calcined shale produced through the CemShale™ process is covered by current cement standards, for instance EN-197-1:2000 and ASTM C150-99. The amount of shale that can be added to the final product varies from region to region and from cement type to cement type but a substitution rate of at least 35% is allowed in most countries. From a regulatory standpoint, implementing the CemShale™ process on an industrial scale and getting approval for the product are straightforward.

Why use shale as SCM?

Almost all existing SCMs are ‘waste’ products from other industries. However, due to government regulations many of these are currently being phased out, giving rise to insecure supply chains. To remain sus-

Right - Figure 4: A part of CemGreen's in-house test facilities in Denmark.



tainable and to secure the supply chain, the cement industry will have to invest in new SCMs. Using higher amounts of high-quality calcined shale as an SCM will:

1. Turn zero value waste into a valuable product with a sales price equal to fly ash;
2. Decrease OPC production costs by 35%;
3. Decrease the capital expenditure required for a new cement plant by 20%;
4. Secure the SCM supply chain;
5. Reduce CO₂ emissions from cement production by 30% compared to OPC.

Pilot plant


CemGreen is now at the point where production of CemShale™ has reached pilot plant scale. It is now able to establish the required process parameters for obtaining the highest possible quality of any shale-based SCM.

Below - Figure 5: As coal goes off the menu, fly ash is becoming increasingly expensive and scarce. Shale can provide an answer.



CemGreen's in-house facilities (Figure 4) form the basis for testing the cementitious properties of different shale materials and at the same time obtaining information's for the design of a full-scale facility. Thus, the next step for CemGreen is, in collaboration with an industrial partner, to establish the first full-scale production line based on the CemShale™ process. CemGreen will publish further updates in these pages in the coming months.

Shale: Solving the global SCM crisis

The global availability and low cost of shale makes it a very interesting SCM and a direct alternative to fly ash. Furthermore, calcined shale is already allowed within the present standards making immediate implementation possible. However, until now the utilisation of shale has been limited due to difficulties in the activation of the cementitious properties. This missing link is now solved by CemGreen through the patent-pending CemShale™ process, thereby enabling shale to meet the four key criteria for a new SCM. This consequently makes shale a viable solution as a low-cost and globally available alternative to existing commercially available SCMs and provides a mean to secure the supply chain for the cement and concrete industry. 

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Daniel Quinn & Paul Eaton, DustScanAQ

Prediction as a basis for planning dust suppression in quarries and cement plants

Predicting and preventing dust emissions from mineral processing sites traditionally involves detailed knowledge of site operations, access to local weather forecasts and the availability of controls like fixed water sprays and mobile bowsers. Sometimes, such control measures are either applied unnecessarily as a blanket measure, or too late once dust is airborne and there is a risk of complaint. This article outlines an innovative approach to predicting when there might be a need for dust suppression, potentially enabling resources to be deployed more effectively than at present.

Judicious control of water and energy resources is important at all cement sites, especially where the need for dust control is frequently localised and/or temporary. It becomes even more important where expensive additives are used, especially if their on-site efficacy has not been tested. Continuous dust suppression is seldom required.

DustScanAQ has been working closely with Tarmac at Mountsorrel Quarry in Leicestershire, UK, for many years on dust, odour and air quality matters. An Air Quality Management Area (AQMA) with respect to fine particulate matter (PM₁₀) was declared by Charnwood Borough Council in 2011 for the area comprising the quarry and some residential properties in the neighbourhood.

Dust monitoring at Mountsorrel Quarry has involved monitoring for both nuisance dust and PM₁₀, as well as weather conditions at several on- and off-site locations for both compliance and overall quarry improvement purposes. A Turnkey Osiris real-time ambient PM monitor was installed downwind of the asphalt and load-out area with respect to the prevailing wind direction in 2017 (Figure 1). It is a certified 'indicative' device that is connected to its own wind vane and anemometer, to provide reliable 'real-time' directional PM₁₀, PM_{2.5} and PM₁ data. The information is conveyed directly to the quarry management team through immediate email alerts and daily summaries, which enables on-site actions to be taken on-site to address dust issues far sooner than previously possible.

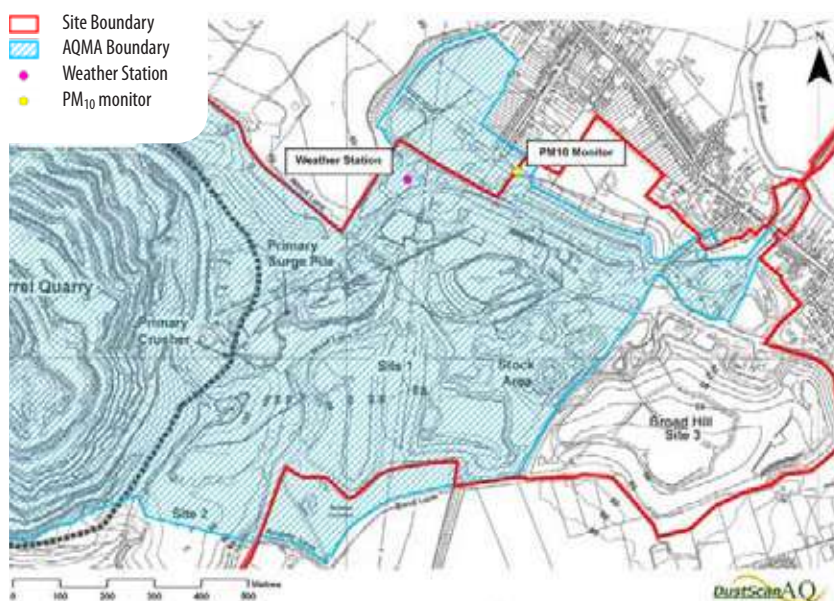
It was recognised that, while a real-time alert-based system for PM₁₀ monitoring can have a positive impact on PM₁₀ levels, it is inherently *reactive*. Once an alert has been triggered, the unacceptable emission has already occurred and mitigation measures must

then be taken in an effort to once again reduce airborne concentrations to acceptable levels. A better system would *predict* when unacceptable emissions are likely to occur, so that site management can put preventative suppression in place before an emission occurs.

On this basis, DustScanAQ has developed a bespoke PM₁₀ predictive tool based upon site-specific historic meteorological and PM₁₀ data, which enables site staff to reduce unacceptable emissions, or even prevent them from occurring entirely. It has developed this site-specific tool with Tarmac's team, which takes a positive and proactive approach to environmental management and safety.

While Mountsorrel Quarry extracts granite, versions of the tool clearly have the potential to be utilised at many other mineral processing plants, including limestone quarries and cement facilities.

Below - Figure 1: Map of the Tarmac Mountsorrel Quarry.





Right - Figure 2: Example of predictor output.

weekdays, Saturdays and Sundays. Seasonality has also been included as an additional temporal factor as the extent to which a meteorological parameter influences PM₁₀ concentrations varies depending upon the time of year.

Prediction in practice

The PM₁₀ predictor is primarily a dust and air quality management tool. The predictor output (Figure 2) is designed to be quickly and easily understood by busy site managers who have to control dust and PM₁₀ emissions in the context of numerous operational considerations around different on-site processes. The prediction is in the form of a simple 'Traffic Light' system, which allows rapid and efficient interpretation of dust/air quality risks and action to allocate dust suppression equipment and staff.

The predictor utilises open-access meteorological forecast data with a three hour resolution from a reputable source. A summary of these data is presented alongside the PM₁₀ predictions for each three hour period of the following day, the idea being that the quarry manager need only look in one place for all forecast and prediction data necessary. A four day forecast also allows for overview predictions to be made for the three subsequent days by calculating the average risk level over the operating hours of the site.

PM₁₀ predictions are sent out each day at a time pre-agreed with site management to ensure that suitable preparations can be made for the following day. This may involve having extra dust suppression on standby, putting down extra suppression in anticipation of high-risk periods or even reducing or stopping specific dust-generating processes.

Ongoing work

To ensure that the predictor continues to be a useful management tool, the model's performance is being assessed against site-specific monitored data on a regular basis. Hence the model can be further refined as more data are obtained.

Other investigations might include the relationship between PM₁₀ emissions and daily variations such as quarry output or campaign overburden stripping etc., as it is recognised that such activities might have a significant impact on PM₁₀ concentrations.

The authors consider this empirical approach to be worthwhile at many large minerals and minerals-adjacent operations where off-site impacts are potentially significant, especially if there are dust components of concern to neighbours or regulators.

Acknowledgments

The authors are grateful for the support of Tarmac Trading Ltd and the advice of Dr Hugh Datson, Retained Consultant at DustScanAQ.

Methodology

24 months of concurrent PM₁₀ and meteorological data were collected to investigate empirical relationships between PM₁₀ levels and different meteorological parameters. Initially, trends were examined for wind-direction, wind-speed, temperature and precipitation. It was found that there were strong relationships between PM₁₀ concentrations recorded at the Osiris monitor and the four parameters investigated, particularly wind-direction.

For each parameter, data were grouped into bins. Grouping was informed by the relationship between PM₁₀ concentration and meteorological parameters. These bins were used to create and inform an empirical model that evaluates the relative importance of different parameter groups in creating conditions conducive to high PM₁₀ concentrations.

Initial model testing against forecast data highlighted the need for temporal elements to be included in the model, after continually over-predicting weekend results, when minimal on-site work occurs. Further parameters were therefore introduced to account for changes in operations throughout the day, as well as differences between

Below - Figure 3: An example of dust generation caused by a dump truck travelling along a haul road.



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Interview by Peter Edwards, Global Cement Magazine

In discussion: Franz-W. Aumund, AUMUND Group

The AUMUND Group is a well known manufacturer of reliable machines for conveying and storing bulk materials in a multitude of key industries, such as cement, limestone, gypsum, mining and minerals, iron and steel, chemicals and fertilisers, alternative fuels and ports and terminals all over the world. Here, third generation Group Owner and President Franz-W. Aumund explains what makes the Group successful, why he places so much emphasis on unity between the group's global members, his strong emphasis on social causes and how he sees the future...



Above: Franz-W. Aumund is the third generation President and Owner of AUMUND Group. Established in 1922 by his grandfather, Professor Heinrich Aumund and carried on by his father, Günter Claus Aumund, Franz-W. Aumund has been at the helm for over 30 years. (All photos AUMUND)

Global Cement (GC): Mr Aumund, your group of companies has enjoyed great international success. What are the main factors that have upheld the position of the AUMUND Group as a global leader in conveying and storage technology?

Franz-W. Aumund (FWA): German specialised machinery manufacturing, which benefits from the 'made in Germany' brand, is characterised by three pillars: innovation, quality and reliability. For me this means that the top priorities are our continuous research and development work, high quality machines and services, ongoing staff training and the aim to always be a reliable partner to our customers. A further important factor is the financial strength that allows AUMUND to develop existing markets and also to invest in new areas in order to establish ourselves in different sectors. The third pillar of success is our global presence and international focus.

GC: How large is the group today?

FWA: Today we comprise 19 companies, subsidiaries and branch offices, and five service centres across the world. We have ~500 employees in Europe,

Asia, India and North and South America, as well as a global network of more than 80 agents. The AUMUND reference lists document currently more than 22,000 machines in over 150 countries. Through these, we can expand our experience every day for new projects and in new markets.

GC: AUMUND is a household name in the cement industry but what other sectors is it involved in?

FWA: The activities of the company were influenced in the early 1920s by the German coal mining industry. At this time, the need for robust and reliable steel pan conveyors, which were a technical innovation in underground applications, became clear. When the mining crisis took hold in the early 1960s, our involvement with the then emerging cement industry increased under the management of my father, Günter Claus Aumund, particularly in Germany. The first products were pan conveyors, followed by bucket elevators. Equally attractive was the requirement in the iron and steel industry for heavy steel pan conveyors, which had to withstand temperatures of up to 1100°C.

Right: Historical image of an AUMUND curved steel plate conveyor.



Far right: Historical image of an AUMUND railway wagon tipper.





AUMUND pan conveyors and bucket elevators are real all-rounders. There is no bulk material, however hot, abrasive or chemically aggressive, that they cannot convey. The specific application dictates the technical design and size. These are the keys to penetrating further bulk materials markets of increasing importance to us, such as mining and minerals and the chemicals industry, in particular fertilisers.

GC: What particularly stands out about the AUMUND Group of companies today?

FWA: Today we have to look at the Group's complete range of products and services from its three manufacturing brands: AUMUND Fördertechnik, SCHADE Lagertechnik and SAMSON Materials Handling. Essentially, our products are always the connection between two stages of a process, whatever the industry. For example, we have been a partner to the cement industry all over the world since the 1970s, assisting with layout and design planning. In this sector, we are able to incorporate our entire product range, from material extraction in the quarry or reception of material from ships or rail wagons, to bulk materials storage in circular, longitudinal or homogenising stockyards, through the complete production process up to loading of clinker.

GC: What current examples can you give us of measures to safeguard the future of the company?

FWA: Innovation and investment are of the utmost importance to me. They secure the future of the individual companies and the Group. Targeted measures are always required to keep a house in order and then to extend it in future. We have an investment agenda that, among other aspects, takes into consideration markets, manufacturing locations, ideas and innovations, as well as investment in employees.

This is why we don't just concentrate on activities in our core industries, but we also open up new areas like alternative fuels. Currently we are developing our own technology for processing replacement fuels from treated or pre-selected municipal waste streams. This is a field that is becoming more and more important, from both environmental and energy efficiency perspectives.

In order to sustain our extremely high level of commitment to the quality of our products into the future and on a global scale, and at the same time to future-proof our Rheinberg location (Germany), we run a multifaceted investment programme. For example, we are investing in our production facilities. We recently commissioned a new robotic welding system and new water jet belt preparation technology. Both of these systems will enhance precision and quality while reducing lead times and optimising costs.



Above: An AUMUND KZB type Pan Conveyor handling hot clinker in a German cement plant.

As well as belts, our chains constitute the core components of our bucket elevators. With the acquisition of the experienced chain manufacturer TILEMANN in 2016 we took the first step to self-sufficiency in chains, and upgraded the facility with the latest CAD technology and presses. Now that this high-quality chain manufacturer is part of the Group, we are no longer dependent on outside suppliers. Product quality and product development are in our own hands.

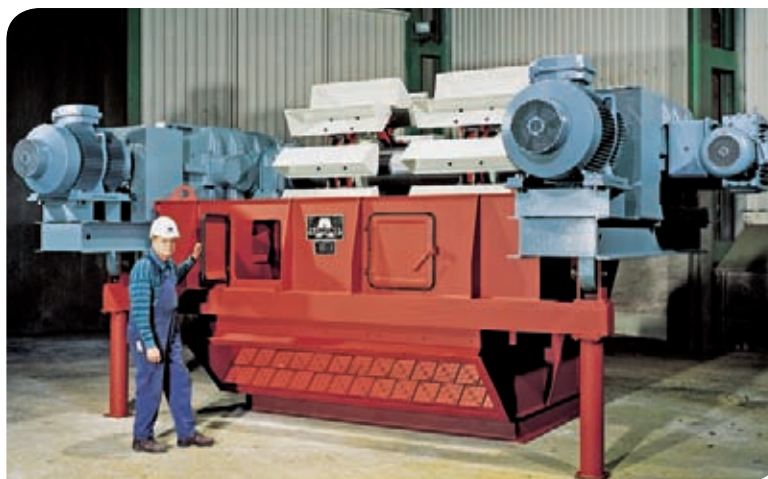
On top of this, we opened a new show room in July 2019 at a cost of ~Euro200,000. It was established in a converted factory hall in Rheinberg. Since opening, it has been used as a meeting point for customers as well as training and seminar participants.

Finally, conservation has long been a serious matter for us. In 2010 we installed a solar panel system on the roof of all 12 production halls in Rheinberg, which cost Euro2.2m. It provides 600,000kWh /yr of electricity. In 2020 we will invest around Euro1.1m in a state-of-the-art precipitation water drainage system in Rheinberg.

GC: You have recently added new companies to the Group. What were the reasons for this?

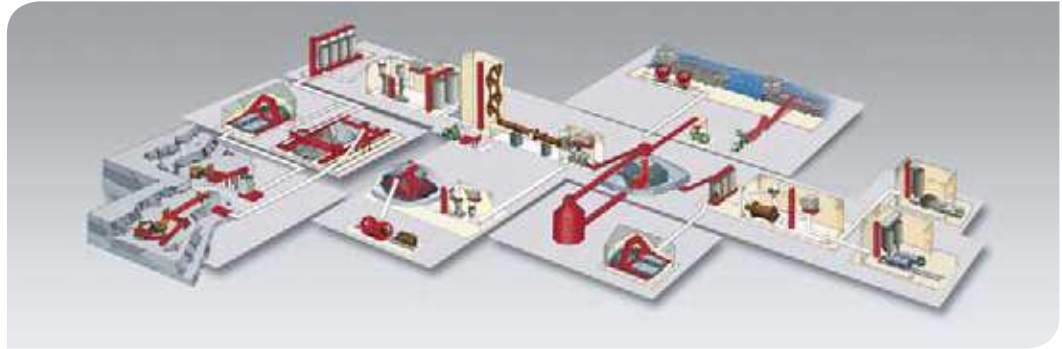
FWA: Looking back on the whole time period up to now, we can identify three strategic phases. The first

Below: An AUMUND BWZ-D type Bucket Elevator with central chain.





Right: Typical applications of AUMUND, SCHADE and SAMSON products in a cement plant. Products shown in red.



phase went up to the end of the 1990s. During this period we invested predominantly in the development of our own products. Some of the significant product launches were the Pan Conveyor in 1962, the Bucket Elevator with Central Chain in 1968, Belt Bucket Elevator and Steel Silos in 1977, the Armoured Chain Conveyor in 1988 and the first Arched Plate Conveyor in 2000.

The second phase began in the early 1990s. We started to expand our product portfolio by acquiring companies with an exact fit. My purpose in securing LOUISE Maschinenbau and WTW Engineering in 1991 and Besta & Meyer Maschinenfabrik in 2014 was first and foremost to concentrate the product know-how in drag chain conveyors and silo discharge systems, but also to strengthen our important spare parts business.

When we acquired SCHADE Lagertechnik, founded in 1879, in 2001 and B&W Mechanical Handling, founded in 1966 in 2002 (now SAMSON Materials Handling), we deliberately carried on the established brands in order to preserve their international name, their competence and their own identity and, of course, to benefit from these advantages ourselves.

The impact of the AUMUND Group on the market in this day and age is largely due to the three product companies, AUMUND, SCHADE

and SAMSON. With their product ranges they are equally active in all key industries, often in conjunction with each other. The synergies between the companies, and their comprehensive conveying and storage solutions often lead to them being asked to give joint proposals for large projects.

We are currently in the third strategic phase, expanding our international focus. As the three product companies and the AUMUND subsidiaries are active internationally, the AUMUND Group now spans the globe. In 1975 the AUMUND subsidiaries in Brazil and Canada were incorporated, and in 1980 the US followed, with France in 1991, then Switzerland, in 1996 India and Hong Kong in 2005. The AUMUND representative office for technology, purchasing and production was opened in Beijing, China in 1994 and this was followed by the incorporation of the AUMUND subsidiary in Beijing in 2006. AUMUND is so well financed for the future that I am sure we will be able to remain in investment mode.

GC: How do you see the position of the AUMUND Group in terms of service?

FWA: A comprehensive service package is one of the paramount criteria for success in this competitive environment. AUMUND has massively increased its service spectrum in recent years, starting with an after sales function responsible for the classic spare parts business and for running maintenance seminars for plant managers and maintenance personnel. This recently culminated in the incorporation of AUMUND Group Field Service GmbH in 2017, to secure a globally standardised commitment to quality in installation and commissioning of our own AUMUND, SCHADE and SAMSON machinery, as well as equipment of other manufacturers, with an internationally established network of about 60 supervisors.

Our innovative service concept PREMAS 4.0 is currently focusing on another important factor. Its name reflects its programme, standing for 'preventive' and in the style of Industry 4.0. Our '4.0' stands for 'Predictive Maintenance Service,' meaning proactive, digitally supported maintenance instead of

Right: An original AUMUND bucket elevator chain.





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Above and above right: The foyer (above) and inside (above right) the new AUMUND Show Room.

just precautionary maintenance. The hub for these activities is PREMAG AG in Switzerland, fully supported by our pool of inspectors and supervisors. This is another important advantage within the AUMUND family.

GC: AUMUND employs staff from around 30 countries. How do you manage solidarity and enable efficiency?

FWA: The knowledge and experience of our employees is for me the most important asset of the company, which is why we invest continually in education and training. We build on qualified personnel from our own ranks as well as from outside. Our concept of lifelong learning starts off with opportunities for school pupils and continues with our technical and commercial apprentices and students. What's more, a new AUMUND Seminar Centre is currently being established in Leipzig (Germany), where we will hold courses on specially selected subjects.

For staff development, in particular for managerial roles, we use our globally-integrated network

of AUMUND locations. In order to encourage international exchanges within the Group, high achievers get many fixed-term transfer opportunities to gain valuable experience in other countries and get to know other cultures.

In addition to the personal development of the employees, I think this is a good way to improve international team spirit and knowledge transfer. For example, Germany is the technological centre of AUMUND, but our colleagues in India support us by developing software. So, in addition to the sales activities of AUMUND India, we effectively have our own software company.

The best pay-back that we get from our staff development is the strong loyalty of individuals to the company. Almost two thirds of our staff members have been with us for over five years, many for well over 15 years. Overseas postings are also possible for participants in the scholarship programme that I initiated, together with Professor Detlev Borstell from Koblenz University of Applied Sciences, in 2009. To date we have sponsored almost 50 full-time mechanical and industrial engineering students. Some of these, as well as several dual work-study students, have since been taken on as employees.

We also work closely with the universities of Aachen, Bochum, Münster and Freiburg and with many other technical universities, taking advantage of their research activities in conveying technology. In addition we partner up with engineering firms and cooperate with other companies with similar strategies.

GC: The foundations you have established serve educational and social purposes. Why do you have these issues at heart?

FWA: In decades of travelling to more than 100 countries, I have had some amazingly rewarding experiences, but at other times I have been left with very negative impressions. Based on such encounters, I decided to take a

Below: AUMUND Group spanning the world.



global approach to supporting people and projects. With the mission statement ‘Training and education of young people is the most valuable investment in the future,’ the Franz-W. Aumund-Stiftung and the companies of the AUMUND Group help children and young people from underprivileged backgrounds to find their place in society, by giving them a chance through education.

In 2018 the Aumund Foundation, AUMUND Fördertechnik and the AUMUND Group companies supported projects for education and social issues in Germany and abroad to the tune of more than Euro600,000. Alongside international projects in education and science, the Aumund Foundation, which I established in 2018, pursues initiatives in the medical field.

GC: When you look back at your 50 years with AUMUND, what has had the biggest impact?

FWA: From the very beginning, my contact with customers and the many different people all over the world is what has left its mark on me most strongly. One of my first trips took me to the cement industry in Brazil, where in 1975 I established the first AUMUND subsidiary. This was followed by the US, France, China, India, Hong Kong, Moscow, St Petersburg, Dubai and now also Poland. I have been exposed to the most varied of cultures and characters, but one thing has always stayed with me: I do not have to embrace ‘different,’ but I do need to respect it unconditionally.

GC: In 2022 AUMUND will celebrate its 100th anniversary. What makes you sure that the Group can look forward to a successful future?

FWA: For over 40 years the AUMUND Group has exported more than 80% of its products. For decades we have known for certain what globalisation means, where opportunities and risks lie, and what effects geopolitical influences can have. This has taught us to always be vigilant and to try to recognise any changes in our sales markets, plus political or economic uncertainties at an early stage, so that we can take precautionary counter-measures.

A further prerequisite for success, now and in future, is that AUMUND Fördertechnik be led by a new and young management team. The Managing Directors, Dr Pietro de Michieli (Sales), Reiner Furthmann (Technology) and Dr Volker Brandenburg (Finance) have many years of international experience. They are complemented by our experienced managers in the overseas subsidiaries who all have excellent knowledge of their markets. I am convinced that we are well-positioned now and for the future and that we will always



Above: PREMAS® 4.0 Predictive Maintenance Service.
Source: Google.

have the right ideas to enable us to recognise and fulfil our customers’ requirements.

GC: Recently you celebrated your 75th birthday. What are your personal goals for the future?

FWA: I will gradually step back from business operations and adjust to a future consulting role. Principally I will concentrate more fully on the activities of my foundations. I am also working on the extended new edition of the AUMUND company chronicles, ‘3 Generations - 3 Emphases,’ which documents in detail the development of AUMUND during the eras of my grandfather and my father, and in my time of growing the international focus of the company and the expansion of the Group.

GC: How do you feel about meeting up for another chat in 2022 when AUMUND turns 100?

FWA: Absolutely, let’s do it!



Below: Franz-W. Aumund with the Managing Directors of AUMUND Fördertechnik GmbH. From left to right: Reiner Furthmann (MD Technology), Franz-W. Aumund (President), Dr Pietro de Michieli (MD Sales), & Dr Volker Brandenburg (MD Finance).





Jacob Winskell, *Global Cement Magazine*

RDF production with the new Lindner Atlas primary shredder

Lindner's next-generation Atlas 5500 pre-shredder is fully operational at several waste processing sites across Europe. Lindner invited *Global Cement Magazine* to see it in operation near Klagenfurt, Austria, where we spoke to Stefan Scheiflinger-Ehrenwerth, Head of Product Management, about the Atlas range, refuse-derived fuel production and the importance of waste sorting practices for the cement industry in 2019 and beyond.

As over a hundred international delegates from the cement and waste processing industries look on, unsorted municipal, commercial and industrial waste delivered by digger disappears into the Atlas 5500 at a rate of 50t/hr.

Unlike the Jupiter range, which shreds by cutting, the Atlas is a ripper. Eight intricately-shaped hooks on twin shafts set to work, their electric drive providing asynchronous direction changes at a rate of up to 60/min to remove the risk of overheating and enable continuous feeding, while reducing operating expenditure (OPEX) by 57% to under Euro1.0/t compared to Euro1.48/t for a comparable hydraulic drive. The shafts can be taken out for repairs either in their cassette or individually in 30 minutes and replaced entirely in 60. Crucially for a machine upon which the entire waste processing line depends, the Atlas can claim to operate 24/7, with an average downtime of 17hr/yr giving 99.7% availability.

The output is a stream of uniform pieces with an area corresponding roughly to a page of print readers' copies of *Global Cement Magazine*. Incidentally, this is the optimum size for reception by current automatic waste sorters such as near infrared (NIR) systems.

"Robotic sorting will be state-of-the art by 2025," said Lindner's Head of Product Management, Stefan Scheiflinger-Ehrenwerth. Lindner envisions the integration of its shredders at every stage. In its view, Atlas opens untapped revenue streams for cement

producers that process refuse-derived fuel (RDF) from waste. *Global Cement Magazine* spoke to Herr Scheiflinger-Ehrenwerth about the changing role of cement producers in waste management.

Interview with Stefan Scheiflinger-Ehrenwerth (SSE)

Global Cement (GC): What is your background and what do you do at Lindner?

SSE: My educational background combines product management with electrical engineering - I did my MSc in Industrial Engineering and Management. I worked for almost ten years for a plastic goods manufacturer. I thought: *We're producing new products all the time. What becomes of all these products? They're going to become refuse.* Then I joined Lindner. Processing refuse is its speciality. I've been with Lindner for five years and I am Head of Product Management..

GC: What is Lindner's modern-day footprint?

SSE: Currently we have a workforce of 350 people operating out of three locations in Austria, Germany and the US. We are in the process of consolidating our production by establishing an entirely new facility on a greenfield site in Carinthia, Austria.

GC: How many cement industry customers does Lindner have?

SSE: It's hard to say. At least a third of the shredders we produce annually are sold directly to the cement industry. The majority of our other customers process refuse derived fuel (RDF) to sell on to cement plants. In one way or another, nearly all of our customers are focused on RDF production for the cement industry.

Below: Head of Product Management Stefan Scheiflinger-Ehrenwerth introduces the Atlas.

Below centre: Project manager Marco Regger recounts Atlas success stories.

Below right: Sales manager Marco Egger briefs the attendees for the afternoon's site visits.





GC: Which shredder does the cement industry like best?

SSE: Until recently it was the still-popular Komet secondary shredder. Three years ago, we brought the Polaris onto the market. It integrates preliminary and secondary shredding in a single machine: the input is waste; the outcome is a granulated product that is suitable for burning in calciners. It was aimed at waste-processing specialists but – with cement producers increasingly prioritising concurrent fuel production and waste disposal – we are seeing a large and growing market in the cement sector.

GC: How is Lindner preparing for the changing needs of cement producers in the future?

SSE: We shall see over the next couple of years whether cement plants that take in untreated waste continue to be able to process it measure-for-measure into RDF: in the not-too-distant future, even cement producers will have recycling quotas to fulfil. The Atlas will play a big role there, because as soon as you want to recycle, you need the best available machine at the beginning of the process, capable of tackling any input. From there, plant operators can separate out base materials, such as high-quality plastics, and use the remaining fraction as a substitute fuel.

GC: What are the benefits for cement producers?

SSE: There is currently a large proportion of plastics in refuse. This gives it an excessively high calorific value for use as calciner fuel. These plastics' removal opens new possibilities. The cement industry has an interest in alternative fuel substitution, and therefore processing. In many countries, cement plants are already involved in waste collection. Lindner enables plants to prepare refuse, to process it into fuel and extract high-quality plastics. Why shouldn't a plant go a step further and make use of this valuable material? Plants stand to gain by selling their extracted plastic to a recycling line.

GC: When did Lindner first enter RDF production?

SSE: We're very proud of the fact that we were the first. Commercial RDF processing only began a couple of decades ago, in Austria. In the 1990s, first in Austria, then Germany, landfill bans came into force. One day, you were no longer able to dump the waste that you'd been sending to the tip. Due to this, the industry developed a lot earlier here. Lindner was the first to say: *Having started as a timber mill equipment manufacturer in 1948, we know how to shred wood. Now, let's build a waste shredder.* To this day, the area within a 200 or 300km radius of Klagenfurt is the Mecca of shredding technology.



GC: Where will Lindner take RDF from here?

SSE: The cement industry was built around coal fuel. RDF processing is still very young. In the 1990s, facilities were processing 200 - 400kg of refuse into fuel hourly. 400kg/hr was fantastic; anything more was inconceivable. Today, facilities are processing 40,000 - 60,000kg/hr. So we have achieved a great deal in the space of 30 years. The next step will be filling the jobs of the people who provided technical services throughout the sorting process. These are skilled and educated people and there are fewer and fewer of them. With the beginning of Industry 4.0, we're seeing the start of this shift, albeit in moderation. As a machine manufacturer, it falls to Lindner to provide turnkey automated solutions to RDF production lines, which by 2025 will be running daily operations robotically.

GC: Herr Scheiflinger-Ehrenwerth, thank you for your time today.

SSE: My pleasure.

Top: The Atlas goes to work on unsorted waste at FCC Entsorga in Tainach, Austria.

Above: Pre-shredded waste leaves the Atlas at KKAB Carinthian Waste Management in Klagenfurt.





David Perilli, *Global Cement Magazine*

Review: CemProspects 2019, Kraków, Poland

The central theme of the 2019 CEMBUREAU *Energy Market Prospects (CemProspects)* conference in Kraków, Poland on 7-9 October 2019 was one of market uncertainty. Geopolitical events, trade wars, environmental legislation and indicators of a potential global recession have all contributed to a volatile situation for energy forecasters. Added to this, as environmental legislation tightens, new products have become commodities or are on the way to becoming so. Such proto-commodities include carbon credits in emission trading schemes and waste fuels such as refuse-derived fuel (RDF).

Jim Rushworth, CEMBUREAU, set the scene for sustainability and the European cement industry. His argument was that cement and concrete are essential products for modern society and are vital parts of a low carbon economy. Cembureau's 5C vision for sustainability (clinker, cement, concrete, construction and carbonation) offers ways to mitigate CO₂ emissions along the supply chain. Rushworth was keen to underline CEMBUREAU's position that a facilitating regulatory framework is required to support this approach along the supply chain to allow commercial competitiveness. For example, CO₂ capture and storage (CCS) technologies may require public finance or the building sector needs to adopt a building life cycle approach.

CEMBUREAU has five parallel routes towards the 2050 Paris climate targets, including resource efficiency, energy efficiency, CCS and reuse, product efficiency and downstream initiatives. Innovations exist right along the value chain, from many different low or no-clinker cements to all sorts of pilot projects and beyond including CCS, solar powered calcination research and digitisation initiatives. However, all of this needs funding to make it happen. Rushworth stated that he was unclear whether CO₂ pricing schemes would be a sufficient driver for change in the absence of such funding.

Arnaud Pinatel, On Field Investment Research, followed with an overview of the global cement industry. The global picture was one of muted growth in 2019 backed up by growth in China and India. The rest of the world and India is forecast to drive growth in 2020 as China's growth declines. Alongside, industry margins should improve following a lost decade post-2008.

The key information here though was on the implications of CO₂ taxation. As Pinatel put it, 'the world needs cement but it doesn't want CO₂' Several regions have now introduced, or are introducing, emissions trading schemes, but Pinatel focused on the EU Emissions Trading Scheme (EU ETS). Looking at future ETS credit prices, Pinatel said that, above Euro30/t European cement producers become vulnerable to Turkish exporters if carbon leakage concerns are not addressed. At this value, wet and semi-dry plants, and even dry ones without a preheater, become uneconomical. Pinatel noted the strong climate change rhetoric of EC President-Elect Ursula von der Leyen but also the possibility that she might introduce a CO₂ border tax. Interestingly, On Field predicts that CCS starts to become financially necessary for cement plants if the CO₂ price exceeds Euro60/t.

CEMBUREAU's **Nikos Nikolakakos** then gave a summary of alternative fuel use in Europe. The share of thermal energy from alternative fuels in the cement sector in the European Union (EU) rose to 46% in 2017 from 19% in 2007 and just 2% in 1990. In 2017 thermal energy use broke down into 54% from conventional fossil fuels, 30% from alternative fossil fuels and 16% from biomass. The largest proportion of alternative fuels, 40%, was refuse-derived fuel (RDF). Municipal waste production in the EU is around 250Mt/yr. At present about half of this (117Mt) is recycled, with the remainder landfilled or incinerated. The EU wants to raise the share of recycling to two-thirds (162Mt), mainly by reducing landfill. It aims for a municipal waste-recycling rate

1: The Wawel Royal Castle in central Kraków. The *CemProspects Conference* took place at the nearby Sheraton Grand Hotel.





of 65% by 2035. At present the EU average is 45%, although Germany has already exceeded the 2035 target. Drivers for increased co-processing rates include incentivising treatment methods, the production of high quality pre-treated wastes, cement industry waste uptake and the price and price volatility of fossil fuels. Notably, a range of landfill bans and landfill tax rates exist across the EU, affecting co-processing rates differently in each country. Barriers to co-processing include low-availability of high quality waste, bureaucracy surrounding waste permits and imports, negative public perception and very low landfill taxes.

Andy Hill, N+P, then argued that, despite various events in the macro environment, the outlook for alternative fuels markets looked promising. In Europe, the UK's planned withdrawal from the EU (Brexit) was most likely to cause market uncertainty. The UK government was expected to 'grandfather' or continue all EU legislation to start with, including CO₂ taxation. The practical impact of tariffs at border posts remained uncertain, but Brexit would allow the UK to tap into new solid recovered fuel (SRF) markets outside of the EU. Immediate problems for the UK waste export markets would also include reduced truck movements from the EU to the UK leading to fewer backhaul opportunities and higher prices and the displacement of UK producers by European ones, such as those in France and Italy. Outside of Europe, China's increasing focus on sustainability has caused disruption to supply chains, as it now accepts fewer waste imports. This has caused disruption to waste exporters in Europe, which have scrambled to find new markets in Turkey and South-East Asia. Despite this, the growing EU ETS CO₂ price and the growing number of ETS schemes around the world offer a promising outlook for alternative fuels markets. Hill also mentioned the scope for growth for biomass. He stated that RDF and agricultural residues could compete with coal on price. Hill roughly placed the potential for SRF markets for the cement and lime sector at 44Mt/yr worldwide and at 2.2Mt/yr in Europe alone for a 5% improvement in the thermal substitution rate. Overall, he placed the potential at 109Mt/yr worldwide across cement, steel, chemical and power generation sectors. Hill also discussed whether SRF has become a commodity yet. He said that it could be classed as a commodity in terms of it having a constant specification, but that demand and availability were still too low.



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Darren Malone, IHS Markit, presented an overview of the coal market in 2019. Coal prices fell in the first half of the year and the market had continued to suffer in the second half following a mild northern hemisphere winter and continued supply growth. Malone's theme was that some major markets are trying to reduce their reliance on coal and the import markets are moving accordingly, typically to Asia. Alongside this, high freight and low gas prices are making the transition more complicated.

The EU was moving away from coal with an on-going decline forecast to 2050 and Japan was following a similar trend. Chinese imports were expected to peak in 2019 just above 200Mt. With coal import growth of 7%/yr, India is the world's leading steam coal importer. Elsewhere in Asia, import growth is forecast in Malaysia in the short term and in Vietnam, the Philippines, Bangladesh and Pakistan in the short to medium timeframe. On the exporter side, Malone expected little growth from major countries like Colombia, Russia, South Africa, the US and Australia but said that 'good' figures had been reported in Indonesia in the first half of the year.

Conference convenor **Frank Brannvoll** then looked specifically at coal prices. He admitted that most of his forecasts at the 2018 *CemProspects Conference* were wrong due to a slump in oil and coal prices in late 2018. One forecast he did call correctly was the EU ETS CO₂ price, a point several other speakers commented upon. The coal price forecasts were later revised correctly in a March 2019 *CemReview* update. The wider point was that the energy markets face uncertainty from a variety of sources: fears of a global recession; trade wars including that between the US and China and a potential one between the US and the EU; Brexit; and geopolitical tensions in the Middle East. Ultimately this is expected to lead to a weaker US Dollar in the

2: Conference convenor Frank Brannvoll (Branvoll/Cimeurope) introduced delegates to the event.

3: Arnaud Pinatel, On Field Investment Research discussed global market developments in the global cement sector.

4: Nikos Nikolakakos, CEMBUREAU presented a summary alternative fuel use in the European cement sector.

5: Lawyer Philipp Studt-Tartarotti from Mayer-Brown was on hand at the event to ensure that no speakers broke the conference's competition guidelines. If anyone said anything contentious, he was ready to raise a yellow or a red card.



5



6: Fuel markets will be best characterised as uncertain in 2020.

long term. He also noted the tight control that the Chinese government exerts over the US Dollar/Chinese Yuan Renminbi and the risk of further devaluation that it faces.

Examining energy markets directly, Brannvoll set the scene for crude oil of a delicate situation where a drone and missile attack in Saudi Arabia in September 2019 disabled 5% of world supply. OPEC and Russia have agreed to cut production in March 2020 to defend their margins but in a slow enough manner to discourage US shale oil producers from hedging the market. The Brent Crude price is expected to remain stable into 2020. On the carbon market Brannvoll noted the new CO₂ commitments from the incoming European Commission and ongoing changes to the allocation and rules in Phase IV of the EU ETS including heavier protection from carbon leakage. All of this was deemed likely to support a slow rise in the CO₂ price.

Joy Scurr of Gibson Shipbrokers started the second day of the conference with an analysis of dry cargo freight. The key issue here was the uncertainty surrounding the implementation of the International Maritime Organisation's (IMO) rules on ship SO_x emissions in 2020. Scurr predicted that operators would prioritise scrubber-fitted vessels for longer loaded voyages relative to port time, typically affecting Cape sized vessels between Brazil and China and Panamax vessels for grains and oilseeds from South America and the US to the Far East. Long cross-basin freight routes would also be disadvantaged by the need to use low-sulphur fuel, pushing up freight prices and encouraging vessel 'slow-steaming' leading to reduced supply.

World seaborne freight demand was forecast at 5.3Bnt in 2019, a slight increase compared to 2018. Both volumes and distances affect the freight price. Incidents like the Vale mine collapse in Brazil in January 2019 and the US-China trade dispute have distorted the iron ore and agricultural markets as suppliers switched to closer destinations, reducing volume per distance and shipping volumes.

Lauren Masterson, Argus, started the first of two presentations on petcoke markets with a talk entitled 'regulatory landscape clouds coke fundamentals.' The title was accurate given that government actions such as environmental regulations in Europe, the US-China trade war and the IMO SO_x emission

rules were all shown to be distorting petcoke markets and creating uncertainty. The scene was that coke supply had remained relatively flat since 2017 as US and Indian suppliers underwent maintenance. However, this is set to change as new European capacity is commissioned. In the US, weakness in the Gulf market is expected to reverse as the market reacts to the IMO 2020 rules and excess US supply heads to seaborne markets.

On the US-China trade war, Materson showed how US Gulf Coast markets had been more affected than US West Coast ones. Despite the tariffs, China has remained the main US West Coast green and calcined coke buyer. The US market has focused on lower-sulphur green coke exports to China, with Saudi Arabia and Canada increasing their own share in the high-sulphur market as tariffs kick in. Anecdotally, Materson mentioned reports of Chinese customs blocking US petcoke with >3% sulphur content but she reiterated it was 'very unclear' what the actual policy is... or will be.

Advisian's **Ben Ziesmer** continued the petcoke theme, focusing more on restrictions in the Indian market showing the timeline as the Indian judiciary, central and state governments have striven to tackle air pollution by restricting petcoke usage to four core industries: cement, lime, calcium carbide and gasification. The steel industry is still attempting to gain access to this fuel. In China he explained that the central government had prohibited the use of petcoke with more than 3% sulphur in the north-east region and the Yangtze river delta region. The geopolitics of the US-China trade war had further exacerbated this trend.

Finally, **Frank Brannvoll** returned to the podium to present his petcoke forecasts for 2020. He first summarised selected points from the previous speakers, highlighting the 'massive' uncertainty in the petcoke market in 2019. One new point he did raise here was the introduction of a new trading platform for the physical market that was presented in Houston by Argus. Both medium (4.5%) and high (6.5%) sulphur petcoke prices fell in 2019, following coal prices, but the spread between medium and high sulphur petcoke also halved at the same time. CemReview uses the historical relationships between coal and petcoke to create discount zones ranging from expensive to cheap to inform forecasts predicting the discount from coal. Currently, US Gulf Coast FOB high-sulphur petcoke is in the 'cheap' zone as high freight prices depress its price and US Gulf Coast ARA high-sulphur petcoke is in the 'neutral' zone. Consolidating coal prices are expected to stabilise these trends.

The event's closing discussion panel consolidated many of the themes above to general market uncertainty caused by incoming legislation like IMO 2020 and general geopolitical events such as tensions between Saudi Arabia and Iran.



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Sweden: Swecem slag grinding mill contract for Gebr. Pfeiffer

Construction and engineering conglomerate Peab's subsidiary Swecem has engaged German-based Gebr. Pfeiffer for the supply of one MVR 2500 C-4 grinding mill at its granulated blast furnace slag (GBFS) grinding plant in Oxelösund in Södermanland. The mill has four grinding rollers and a table diameter of 2.5m, giving a 25t/hr slag grinding capacity.

Swecem operates a concrete plant in Kungsängen. It currently uses ground granulated blast furnace slag (GGBFS) supplied by Irish-based Ecocem's 0.7Mt/yr Dunkirk grinding plant in France.

UK: Flexicon unveils tip-top handling solution

Bulk handling equipment and systems provider Flexicon has launched an open-chute bin tipper with an integral flexible screw conveyor. The tipper hydraulically raises buckets laden with up to 1.35t of cement or other bulk materials up to a height of 3m for depositing into a receiving hopper.

US: South Texas Cement receives unloader

Bruks Siwertell, the producer and installer of conveying and storage systems for cement and other dry bulk materials, has delivered a fully-assembled Siwertell ST 640-M, the screw-type ship unloader, to South Texas Cement's Corpus Christi port terminal. The supplier has announced that it awaits clearance from South Texas Cement and GCCM Holdings to commence testing and commissioning of the turnkey installation, which the latter ordered in September 2018. Bruks Siwertell rates the cement handling capacity of unloaders of the ST 640-M type at 1500t/hr.

US: Solidia Technologies partners with Xpansic CBL Holding Group to monitor CO₂

Solidia Technologies has partnered with Xpansic CBL Holding Group (XCHG) to develop data technology products for precise measurement of CO₂ emissions and water usage in cement production. "Digital Feedstock enables industrial consumers to seamlessly connect sustainability ambitions with procurement decisions, wholly disrupting the way the cement industry meets consumer demand for accountability," said Solidia Technologies CEO Tom Schuler.

Solidia Technologies produces reduced-CO₂ concrete with lower-energy cement and water-free CO₂ curing.

Europe: Cemex buys Doosan wheel loaders

Cemex has ordered around 100 new wheel loaders for loading and handling applications across its European operations from South Korea-based Doosan's subsidiary Doosan Infracore Europe. The wheel loaders will have bucket capabilities between 2.2m³ and 6.0m³. Cemex operates cement, aggregates and readymix plants in Czechia, France, Germany, Poland, Spain and the UK.



Germany: New Siemens motor

Siemens has announced what it calls a 'plant lifetime-increasing' Simotics HV M slipring motor for mills, crushers, conveyors or fans. The 4.5MW motor completes Siemens' 0.5MW - 8.2MW slipring range. The product uses Global Vacuum Impregnation Technology to increase reliability, giving maximum plant reliability. Siemens Large Drives Applications CEO Hermann Kleinod said "The motors can be easily integrated using 3D-model data."

Thailand: Siam Cement Group invests in innovation

Siam Cement Group (SCG) has announced its involvement in the establishment of an innovation hub at the National Science and Development Agency in Pathum Thai. The Bangkok Post has reported that the development will cost US\$14.3m. SCG's partner for the project is the Chinese Academy of Sciences, a 100-site, 70,000-member body established under the Chinese Government's Belt and Road foreign investment initiative. When operational, it will market new products, initially consisting of petrochemicals, energy storage and batteries and smart cities.

High-value-added products and services made up 39% of SCG's total sales in 2018 of US\$15.7bn (US\$6.11). It spent US\$0.15bn on research and innovation over the period, around 1.0% of total revenue.

Oman: Al Tasnim Cement Products opens plant

Al Tasnim Cement Products has opened a 425m³/hr ready-mix concrete plant in Duqm's Special Economic Zone. Arab Finance has reported that four batching plants will supply cement to the facility; one on-site and three elsewhere in Duqm.

Canada: Bashaw Concrete opens new line

Alberta-based Bashaw concrete has supplemented its 40-plus year-old readymix concrete production line in Bashaw with a second line. The development is a response to the inability of production at the original line to stay astride of its batching processes, which computer technology has reduced to four minutes from 10 minutes per 18.1t load. The company said that the 'speed and efficiency enhancing installation' included winter storage for six trucks, enabling year-round full capacity utilisation.



Argentina: New Holcim Argentina concrete range

Holcim Argentina has developed the Ultraseries range of 11 concretes for various applications to be produced at its Malagueño plant in Cordoba. José Villacreses, Holcim Argentina general manager of concretes, said "We aim to facilitate a leap in productivity, aesthetics and costs, with comprehensive solutions," according to La Voz.

The company has announced that its upgraded 3.1Mt/yr Malagueño cement plant will be inaugurated in February 2020.

Spain: HeidelbergCement Hispania has its eyes to the floor

Germany-based HeidelbergCement's Spanish subsidiary HeidelbergCement Hispania has presented a range of readymix concretes for use in floors and pavements with a focus on sustainable production at the Spanish Innovation Forum on Architecture, Construction and Reclamation in Barcelona. Its I.Tech Cargo cement-based premix based on TX Active technology boasts lower CO₂ emissions in the cement production stage, while its I-Pro Stabex premix replaces cement with natural hydraulic lime.

UK: Hanson supplies warehouse floor concrete

German-based supermarket chain Aldi will use HeidelbergCement UK subsidiary Hanson's concrete for the floor of its new Euro23.3m Sawley Regional Distribution Centre in Derbyshire. Contractor Snowden Seamless Floors has shared plans to use 16,000m³ of Hanson's 20% ground granulated blast furnace slag (GGBFS) mix, which has a reduced risk of thermal cracking.



UK: Tarmac partners with Port of Tilbury for UK's largest materials terminal

Tarmac has announced plans for the construction of a materials terminal including aggregate processing and manufacturing facilities at the Thames' new Tilbury2 port in Essex. The terminal will be able to receive vessels of up to 0.1Mt. Tarmac and the Port of Tilbury will develop the site from late 2019, ending in the establishment of operations before 2021.

UK: Safety-conscious Cemex hosts London Mayor

The Mayor of London Sadiq Khan has visited Cemex UK's Stepney readymix concrete plant to launch a road safety initiative along with Transport for London (TfL) and London Councils. The initiative consists of a ratings scheme of up to five stars for in-cabin vision for heavy goods vehicles (HGVs), with a ban on zero-star vehicles inside of Greater London. The regulation comes into effect in November 2020, before which time HGV operators may install a 'Safe System' consisting of sensors and noise alerts, in order to apply for a Safety Permit to keep their vehicles on the roads.



Italy: Buzzi sales rise strongly

In the nine months to 30 September 2019, Buzzi Unicem's net sales rose by 13.4% year-on-year to Euro2.42bn from Euro2.14bn. Cement volumes rose by 5.7% to 22.1Mt from 20.9Mt in the corresponding period of 2018. The company said that, "Growth was continually mitigated by weakened manufacturing activity due to reduced investments and political and economic uncertainty."

Italy: CCS project at Vernasca

Buzzi Unicem's 1.3Mt/yr Vernasca plant in Piacenza will receive a Cleanker Project pilot system for carbon capture and storage (CCS). The installation is EU-funded as part of Horizon 2020, a seven-year research and innovation framework programme, and its success will be closely monitored for possible implementation at other cement plants in the EU and beyond.

Germany: HeidelbergCement shares nine-month trading report

HeidelbergCement's sales in the first nine months of 2019 were Euro14.3bn, up by 7.0% from Euro13.4bn in the corresponding period of 2018. It reached its savings target for sales and general administration costs of Euro100m, 15

months ahead of schedule, and cut net debt by Euro1.1bn. Bernd Scheifele, chairman of the managing board of HeidelbergCement, said "Price increases and strict cost discipline more than compensated for slightly weaker demand in the third quarter."



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Greece: Titan profit falls by 10%

Titan Cement has increased its nine-month turnover by 9.7% year-on-year to US\$1.21bn to 30 September 2019 from US\$1.10m in the corresponding period of 2018. Net profit after tax fell by 9.9% year-on-year to US\$45.3m from US\$50.2m. The company noted progressive sales momentum growth throughout the period, with profitability in all regions except the Eastern Mediterranean, and projected further growth with the continued recovery of markets in south east Europe.

Russia: Plant plan causes uproar

The government of the Republic of Turva has announced its approval of a 2Mt/yr integrated cement plant near the extensive limestone and clay reserves around Shagonar. Local investors will undertake the development, scheduled for comple-

tion in late 2020, at an estimated cost of US\$5.48m. The announcement has attracted uproar from residents of the area for the proximity of the intended site to the 'sacred' mountain Haiyakan, where the most significant limestone deposits are located.

UK: Fire at Cemex Rugby

A fire spread over three floors of the preheater tower at Cemex UK's integrated Rugby plant in the early hours of 6 November 2019.

Operations were unaffected and none of the plant's 180 employees were injured by the fire, which was caused by a mechanical malfunction in a belt conveying raw materials.



Ireland: CRH sells Europe Distribution arm

CRH has concluded a deal with an unspecified party for the sale of CRH Europe Distribution for Euro1.64bn. The Financial Times reported in July 2019 that private equity funds managed by US-based Blackstone would buy the company's European distribution division. CRH will reportedly use the proceeds of sale for future acquisitions including its own share buyback programme.

France: Vicat revenue increases on back of price rise

Vicat sold Euro2.06bn-worth of cement in the nine months to 30 September 2019, up by 5.7% year-on-year from Euro1.95bn in the corresponding period of 2018. Its cement section's sales lagged behind concrete and aggregates, with a rise of 4.5% to Euro991m from Euro948m in the nine months to 30 September 2018. "The Group's strategy of raising prices is paying off in almost all operating regions, while energy costs fell," said Vicat Group Chairman and CEO Guy Sidos. He expects exchange rate gains to pay dividends in the final quarter, notably in Turkey.



Image: FLSmidth headquarters.
Source: FLSmidth.

UK: FLSmidth profit up by 17%

FLSmidth recorded a third-quarter profit of Euro25.4m in the three months to 30 September 2019, up by 17% year-on-year from Euro21.7m in the corresponding period of 2018. Its revenue over the same period rose by 9.3% to Euro634m from Euro580m.

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Spain: CPV CEO reassures Alcalá staff

Pedro Carranza, the CEO of Cementos Portland Valderrivas (CPV), has sought to reassure his company with regards to the future of the Alcalá de Guadaíra plant in Andalusia following a dispute with local authorities.

"The future of the Alcalá de Guadaíra cement plant is assured," he said. "It is an efficient, low-cost and very well located plant in a very attractive economic environment where construction growth is above the national average. The Alcalá plant is here to stay." Carranza added that only 'distortion of international markets' could compromise the plant's future. He additionally called for a surge in public infrastructure investment as soon as possible.

The plant has been involved in a long-running dispute with local authorities regarding co-processing of alternative fuels. A project is now underway. The plant is also exploring long-term renewable energy purchase contracts and the installation of solar panels on its site.

Spain: Molins income rises by 8%

Cementos Molins' nine-month income rose by 8.0% year-on-year to Euro594m from Euro550m in the corresponding period of 2018. Its earnings before interest, taxes, depreciation and amortisation (EBITDA) rose by 6.3%. Its South American subsidiaries' sales and EBITDA outstripped those in other regions. The company's consolidated net profit for the period rose by 9.7% to Euro70.2m from Euro64.0m in 2018.

Spain: Terminal delivered early

Cementos Tudela Veguín's new cement terminal on the El Musel North Pier of the Port of Gijón is fully constructed and licenced for operation. The terminal will serve for the reception and storage of 0.7Mt/yr of clinker for the company's Narón grinding plant in La Coruña.

Russia: Trouble at Gornozavodskcement

A total of 577 Gornozavodskcement employees became unemployed in the six months to 30 June 2019. 87 resigned, 195 retired and 295 left by agreement with the company. This follows South Ural Mining and Processing's takeover of the struggling cement producer in December 2018. Kommersant has reported that the liquidation of auxiliary departments is a part of unit optimisation that extends to the company's facilities, with the site of a planned dry line at its 2.2Mt/yr (wet) integrated Perm cement plant currently being used for parking.



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Slovenia: LafargeHolcim submits environmental permit request for mothballed plant

Lafarge Slovenia has submitted an application for an environmental permit for its 0.5Mt/yr Cementarna Trbovlje grinding plant. Business News Europe has reported that the company hopes to resume grinding, storage and dispatch at the facility, which went out of operation after losing its environmental permit to make clinker in late 2014.

"The plant will no longer produce raw materials itself, but source them from elsewhere, along with other cement additives," said operations manager Čepprav Delo.



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Peru: Cementos Pacasmayo improves third-quarter profit

Cementos Pacasmayo recorded a net profit of US\$40.2m in the three months to 30 September 2019, up by 20% from US\$33.4m in 2018's third quarter. The company has said that structural changes such as the centralisation of type V production at its Pacasmayo plant caused temporary increases in costs, slightly restricting this margin. Net sales likewise increased by 20% year-on-year to US\$383m from US\$319m. July and August 2019 set monthly sales volumes records for the company, driven by increased concrete and prefabricated shipments, which it forecasts will continue to grow. This is a positive signal for the realisation of Cementos Pacasmayo's vision of becoming a 'construction solutions company' by 2030.

Trinidad and Tobago: Trinidad Cement appoints new group finance manager

Trinidad Cement has appointed Edgar Campos Piedra as Group Finance Manager. He succeeds Luis Ali Moya. Campos Piedra has been employed with Trinidad Cement owner Cemex and its subsidiaries for over 14 years in various positions. Ali Moya, who held the position of TCL Group Finance Manager since 2016, has been promoted to a new role within the group.

Colombia: Cementos Argos shares results

Cementos Argos' revenue in the three months to 30 September rose by 44% year-on-year to US\$1.52bn from US\$1.06bn. Lower sales across its cement and concrete sections caused the company's three-month profit to drop by 65% year-on-year to US\$10.3m over the period from US\$29.6m. Higher costs also offset the income from the sale of the group's Barranquilla natural gas power station for US\$420m in September 2019.



Mexico: Cemex third-quarter results reflect falling volumes

Cemex has reported a gross profit in the three months to 30 September 2019 of US\$3.34bn, down by 8.0% year-on-year from US\$3.64bn. Its operating earnings before interest, taxes, depreciation and amortisation (EBITDA) were US\$1.88bn, down by 11% year-on-year from US\$2.11bn in the three months to 30 September 2018. The company stated that lower volumes offset higher sale price in all regions.

Mexico: Grupo Cementos de Chihuahua sees profit slip while sales rise

Grupo Cementos de Chihuahua (GCC) reported a gross profit of US\$188m in the third quarter of 2019, down by 4.8% year-on-year from US\$198m. GCC CEO Enrique Escalante stated that the company 'overcame a difficult start to 2019' with 'record cement volumes in certain increasingly competitive markets' and strengthened pricing. Sales rose 4.2% year-on-year to US\$706m from US\$677m, with US sales lagging behind the overall increase at 3.0% to US\$515m from US\$500m.

US: Lafarge North America quarry wins Community Relations Excellence award

LafargeHolcim subsidiary Lafarge North America's Presque Isle quarry, which supplies raw limestone to its 2.6Mt/yr Alpena integrated cement plant – both in Michigan – has won the National Stone, Sand and Gravel Association (NSSGA)'s Gold Award in the Community Relations Excellence category. Business Wire has reported that it previously won Gold for Environmental Excellence in 2018. In recognition of its consecutive Golds, the NSSGA honoured the quarry with its prestigious Two Stars of Excellence award. LafargeHolcim's operations in the country extend over 350 sites across 43 states. Its aim is to 'help build better communities with innovative solutions that deliver structural integrity and eco-efficiency.'



Paraguay: INC secures pricing agreement with Housing Ministry

Industria Nacional del Cemento (INC) has signed an agreement with the Ministerio de Urbanismo, Vivienda y Hábitat (MUVH), the government body responsible for commissioning residential home construction, for preferential cement prices for companies to which the latter awards building contracts. INC president Ernesto Benítez Petters said "Cooperation with the MUVH will strengthen the consumption of cement produced in Paraguay by ensuring it a price and the provision of demand from this type of project."

Colombia: EcoCementos opens plant

Empresa Colombiana de Cementos (EcoCementos), a 50-50 joint venture between Colombian multinational Organizacion Corona and Spain-based Cementos Molins, has announced the start of production at its new 1.5Mt/yr integrated cement plant at Sonson, Antioquia province. The plant, which was constructed with an investment of US\$380m, extracts limestone from its own quarry and will produce Alion brand cement for the Colombian market. The unit is Cementos Molins' first in Colombia. It already operates units in Argentina, Bolivia and Uruguay.

US: Anchorage Port Commission costs cement terminal repairs at US\$81m

The restoration of Anchorage Petroleum Cement Terminal in Alaska to fully functioning docking capabilities for oil well cement offloading operations after its ruin in an earthquake of 30 November 2018 will cost US\$81m. At a special meeting on 23 October 2019, the port Commission voted to petition the Anchorage Assembly for a progressive tariff increase on all petroleum imports over 10 years to US\$399/t from US\$116/t.

The works are scheduled for completion by January 2021, with the possibility of a reduction in the rate of tariff increase subject to grants received from the state.

Peru: Production makes gains on domestic demand

Cement producers in Peru dispatched 0.94Mt of cement in September 2019, up by 7.4% on the September 2018 figure of 0.88Mt. Demand continues to outstrip domestic production, with a 6.5% increase to 1.0Mt from 0.97Mt in September 2019. Consumers imported a total of 50,000t, primarily from Vietnam.



Mexico: Holcim Mexico plans 0.7Mt/yr Yucatán grinding plant

Holcim Mexico has announced a forthcoming investment of US\$40m in the construction of a 0.7Mt/yr grinding plant in the state of Yucatán. Jamie Hill Tinoco, general director of Holcim Mexico, said that the plant, which will receive clinker from Holcim Mexico's Macuspana and Orizaba cement plants, signifies the company's commitment to the state, enabling it to 'optimise local solutions with greater benefits for customers and communities.' The plant will be Holcim Mexico's sole dedicated grinding unit in a total installed cement production capacity of 11.8Mt/yr.

Holcim has had a presence in Yucatán since 1992 through its Uman distribution centre.

Argentina: Holcim Argentina opens technical training facility

Holcim Argentina opened a technical training centre on 17 October 2019 at its 1.2Mt/yr Campana grinding plant. The Holcim Technical Academy will provide specialist training to managers and supervisors from Holcim's Campana, Córdoba, Jujuy and Mendoza plants, with courses on quality, processes, maintenance and quarries.

UK: Global Cement Magazine welcomes new Accounts Executive North America

Global Cement Magazine is happy to introduce California native Tina Rich as its new Accounts Executive for the North America region. Tina brings 27 years' business development and sales experience and has lived and worked across the US and UK. Besides networking and travel, she is passionate about art history. Commercial enquires may be made to her at tina.rich@propubs.com.

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India: New JK grinding plant

JK Cement is awaiting environmental clearance to commence construction of a 2.0Mt/yr grinding plant at Aligarh in Uttar Pradesh. The project has been valued at US\$37.5m. Domex has reported that FLSmidth is in the process of supplying machinery to the facility, for which civil work has been completed. Its 2.0Mt/yr Ordinary Portland and Portland Pozzolana Cement production capacity will bring JK Cement's installed capacity to 12.9Mt/yr.



India: Ariyalur upgrade completed

Tamil Nadu Cement has constructed a second 1.0Mt/yr production line at its 0.7Mt/yr Ariyalur cement plant, bringing its total capacity to 1.7Mt/yr. Projects Today has reported that Tamil Nadu Cement, which also operates a 0.4Mt/yr integrated cement plant in Alangulam, will employ 250 at the second line, the development of which cost US\$115m. In the 12 months to 31 March 2019, Tamil Nadu Cement sold 74% of cement produced at its plants (0.4Mt) to the Rural Development Agency and other government departments at lower than the market rate.

Indonesia: Holcim acquisition boosts Semen Indonesia

Semen Indonesia has reported revenues of US\$2.00bn in the nine months to 30 September 2019, up by 31% from US\$1.53bn in the corresponding period of 2018. The Group's acquisition of Holcim Indonesia in February 2019 expanded its domestic cement production capacity to 39.4Mt/yr, which it says has bolstered its competitiveness against importers in a crowded domestic market.

The company recorded US\$91.7m in profit over the period, down by 38% year-on-year from US\$148m as its foreign sections failed to grow.

China: Anhui Conch's profit up 13%

Anhui Conch's three-month net profit to 30 September grew by 13% year-on-year to US\$602m in 2019 from US\$533m in 2018. The company attributed this to a leap in total operating income to US\$5.53bn over the period compared to US\$4.54bn in the third quarter of 2018, an increase of 22%.

Bangladesh: UltraTech formally agrees to sell Emirates Bangladesh

UltraTech Cement Middle East Investments (UCMEI) has announced that it has entered into a binding agreement by which it will sell its entire shareholding in Emirates Cement Bangladesh and Emirates Power Company to HeidelbergCement Bangladesh.

Under the terms of the agreement, UCMEI will divest its entire shareholding at an enterprise value of US\$29.5m. The deal is subject to regulatory approvals in compliance with the laws of Bangladesh.

Turkmenistan: Lebap ramps up

Lebap Cement plant produced nearly 0.74Mt of cement in the first half of 2019, exporting around 0.24Mt (32.5%). The plant has a capacity of 1.5Mt/yr but only made 0.94Mt in 2018, giving it a capacity utilisation rate of 63%. However, if Lebap continues to produce cement at the rate seen in the first half of 2019, it will have operated at nearly 100% of its capacity across the calendar year.

Malaysia: Tasek's loss widens

Tasek Corp Bhd's net loss for the third quarter of 2019 narrowed to US\$1.3m from US\$1.45m a year earlier. It said that it was hampered by high production costs and increased price competition. Its revenue however, rose by 6.9% to US\$38.7m compared with US\$36.2m in the third quarter of 2018.

Over the first nine months, Tasek's net loss widened to US\$5.6m, from a revenue of US\$102.7m, up by 1.3% year-on-year. "The board views the outlook for the last quarter of the year to remain challenging if pricing pressure continues," reported Tasek, as cited by the Sun Daily.

Australia: Wagners to resume Boral supply

Wagners Holdings announced on 23 October 2019 that it will resume the supply of cement products to Boral at an undisclosed price following the suspension of deliveries due to a collapse in relations in March 2019.

Pakistan: Output rises 9.2%

The All Pakistan Cement Manufacturers' Association has released figures showing a total cement output of 4.98Mt in October 2019, up by 9.2% from 4.56Mt in October 2018. Business Recorder reported that this is a national record for monthly despatches; the second month of growth following year-on-year falls in July and August 2019. Exports continued to rise, to 0.79Mt, up by 28% from 0.62Mt in October 2018.



Philippines: LafargeHolcim unit sees major improvement

Holcim Philippines improved its profit in the third quarter of 2019 by 158% year-on-year to US\$9.00m from US\$3.48m. Its sales in the quarter fell by 2.7% year-on-year to US\$163m from US\$167m in 2018. The company sustained price increases in spite of lower demand causing a fall in volumes. Nine-month sales fell by 13% to US\$465m from US\$536m in the corresponding period to 30 September 2018. Upgrades to its La Union and Davao cement plants in previous quarters dragged on its nine-month profit, which rose by 7.9% year-on-year to US\$36.9m from US\$34.2m in the corresponding period of 2018, but paid dividends in the third quarter, bolstered by the resumption of government infrastructure spending.

Japan: Taiheiyo profit falls in first half

Taiheiyo Cement made a net profit of US\$150m in the six months to 30 September 2019. This was a fall from US\$160m in the same period of 2018. Its revenue for the same period of the 2019 fiscal year was US\$395m, a fall from US\$402m a year earlier. For the full year to 31 March 2020, Taiheiyo forecasts a net profit of US\$570m.

Japan: WHR unit for Saitama plant

Taiheiyo Cement's 1.4Mt/yr integrated Saitama cement plant is to receive a 53MWh/yr waste heat recovery (WHR) unit. The company says that the installation, which will become operational in September 2022, will reduce carbon dioxide (CO₂) emissions by roughly 27,000t/yr.



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Japan: Sumitomo slips slightly

Sumitomo Osaka Cement has recorded sales of US\$1.10bn in the six months to 30 September 2019, down by 0.9% from US\$1.11bn in the corresponding period of 2018. In spite of this, as well as high fuel costs and an upgrade to its Shimizu cement terminal during the period, it increased its six-month profit by 7.5% to US\$57.8m in the six months to 30 September 2019 from US\$53.8m in the corresponding period of 2018.





Contents

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Ad Index

Nigeria: Dangote Cement entrusts performance management to GE

Dangote Cement has extended its services agreement with US-based General Electric to the implementation of asset performance management (APM) digital products at its 12.5Mt/Obajana and 12Mt/yr Ibese integrated cement plants, with the aim being to reduce unplanned downtime. Dangote operations director Ravi Sood said that "Operational performance is crucial to a plant's overall productivity, directly affecting end products. The introduction of GE's latest digital solutions will improve efficiency and enable us to become more self-sufficient in power generation."

Zambia: ZCCM Investment Holdings appoints new chair

The majority government-owned Zambia Consolidated Copper Mine (ZCCM) Investment Holdings has appointed Mabvuto Chipata its chair. ZCCM's cement division faces the challenge of national overcapacity due to market saturation as it moves ahead with the US\$600m construction of a 1.6Mt/yr integrated cement plant and 57MW power station in Masaiti, Copperbelt province. Thierry Charles, speaking on behalf of the Euronext minority shareholders, expressed relief at 'the definitive turning of a page on several years of hazardous, inconsistent and disastrous investments.'

Saudi Arabia: Yamama Cement turns a profit in third quarter of 2019

Yamama Cement achieved a US\$12.2m third quarter net profit in 2019. This compares with losses of US\$12.3m in the corresponding three months of 2018. The company reported a 73% leap in revenues year-on-year to US\$49.7m from US\$28.7m.

Kuwait: Kuwait Portland slumps 75%

Kuwait Portland Cement reported a 75% decrease in its net profit during the third quarter of 2019. Its profit was US\$2.0m in the third quarter of 2019 compared with US\$8.0m in a year earlier. Kuwait Portland's nine month profit came to US\$20.3m, a 21% fall year-on-year compared with US\$25.7m. It attributed the decrease in profit to lower net returns on investments.

Nigeria: CCNN and Obu Cement set to merge

Obu Cement and Cement Company of Northern Nigeria (CCNN), both subsidiaries of BUA Group, are set to merge. Abdul Samad Rabi, founder and executive chairman of BUA Group, said that the merger 'marks the culmination of the first phase of the BUA mid-term strategic plan' aimed at deepening the domestic cement market and enhancing industrial growth.

Rabi stated that the completion of the 3Mt/yr integrated Sokota Kalamaina II cement plant and a 48MW power station, construction of which began in 2018, has been scheduled for the second half of 2020. In addition to its four existing plants, this will bring the group's total integrated cement production capacity to 11Mt/yr.

Qatar: Qatar National Cement Company faces 41% decline in nine-month profit

Qatar National Cement Company recorded a net profit of US\$35.5m in the nine months to 30 September 2019, down by 41% compared to US\$60.1m in the corresponding period of 2018. The depleted profit was due in part to increased expenditure from the company expanding its export base to Africa and India.

Jordan: Nine-month losses rise to US\$87m in 2019 for Jordan Cement

Jordan Cement, a 21.8% state-owned 50.3% subsidiary of LafargeHolcim, has laid off 200 of its 550 employees after incurring losses of US\$87m in the nine months to 30 September 2019. Reuters has reported that the company, whose 2018 losses were US\$48.9m, up by 4.0% year-on-year from US\$47.0m in 2017, made the sackings 'to ensure its continuity,' according to Jordan Cement CEO Samaan Samaan. The company has operated a single line at its 2.0Mt/yr integrated Rashadiyah cement plant since the closure of its 2.0Mt/yr Fuhais plant in 2013. The country's 9Mt/yr-capacity cement sector serves a domestic demand of just 4Mt/yr.

Saudi Arabia: Najran Cement shows US\$3.77m third-quarter profit

Najran Cement has reported a net profit after tax in the three months to 30 September 2019 of US\$3.77m, compared to a loss in the third quarter of 2018 of US\$6.33m. Its earnings rose by 81% year-on-year to US\$25.9m from US\$14.4m. The company, whose total capacity at its Najran integrated cement plant is 5.6Mt/yr, made operational and personnel changes over the period, including appointing Mohammed Bin Manaa Bin Sultan Aballa as its new chairman in September 2019.



Zimbabwe: PPC sees sunny side in power shortages

PPC Zimbabwe is looking to enter into a partnership with investors to build a solar energy plant of up to 16MW to supply its two plants in Bulawayo and Colleen Bawn. It also intends to have a 28hr battery back-up facility.

The company said that the move to solar would ensure uninterrupted power supplies to its plants, which have been badly affected by the prevailing power shortages in the country. Power utility Zesa Holdings has been forced to ration power in mid 2019 as production at its main hydro-power plant dwindled due to water shortages. Its main thermal power station experiences constant breakdowns due to its old age.

Nigeria: Dangote announces nine-month results

Dangote Cement increased its volumes by 1.1% year-on-year to 18.0Mt over the nine months to 30 September 2019 from 17.8Mt in the corresponding period of 2018. Earnings before interest, taxes, depreciation and amortisation (EBITDA) fell by 1.6% over the period for Africa's largest cement producer to US\$0.84bn from US\$0.85bn. Group CEO Joe Makoju noted a year-on-year 0.6% increase in Nigerian volumes to 10.8Mt from 10.7Mt, as well as growth in Tanzania and good sales in Senegal, as helping to offset economic and operating challenges in key territories such as Ethiopia and South Africa.

Togo: Dangote gets go-ahead for US\$60m plant

Nigerian-based Dangote Cement has received government clearance for construction of a 1.5Mt/yr grinding plant in Togo, its first in the country, at a cost of US\$60m. When operational, it will bring Togo's installed capacity to 5.7Mt/yr – 1.7Mt of it grinding only – and grind clinker from Nigeria and Togo. Agence Ecofin has reported that the sum is part of a raft of investments by Dangote Group in the country totalling US\$3.47m and involving infrastructure and phosphate fertiliser production projects.

Niger: Aliko Dangote approves 1.6Mt/yr Niger plant

Aliko Dangote, chairman of Dangote Cement, has cleared plans for the construction of a 1.6Mt/yr integrated cement plant in Keita, Niger. The 26-month project, which will include the construction of a 100MW coal-fired power station, has a US\$280m budget.

Nigeria: Abia finds investors for new 2.0Mt/yr plant

Abia Cement, Russian-based Drobmash and Energomotor and Czech-based PSP Engineering signed a memorandum of understanding for construction of a 2.0Mt/yr integrated cement plant in Abia province at the first Russia-Africa Summit on 2 November 2019. The latter companies will supply equipment to the development, while Abia cement will receive an export loan from Russia's Roseximbank.

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Dangote identified its Seven Sustainability Pillars for management as enabling it to realise its commitment to increasing value for all stakeholders. This may have contributed to its ranking second in Sub-Saharan Africa in Forbes' Global 2000 World's Best Employers.

Jacob Winskell, *Global Cement Magazine*

Cement in East Africa

In this article, *Global Cement Magazine* appraises the cement situation in 10 East African nations: Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, South Sudan, Sudan, Tanzania and Uganda.

East Africa is a land of greats. Here, Africa's 'Big Five' roam from the Ethiopian Highlands to the African Great Lakes - an area of 4.45 million km² transected by the Great Rift Valley. This geography supports a correspondingly great biodiversity. Lake Victoria, at the head of the Nile, alone contains 500 fish species. Biologically closer to home, the East African Rift plays a special part in our species' story as the conjectured Cradle of Humanity.

The 350 million people who call East Africa home have a diversity to rival Lake Victoria's fish. Five of the six African language families are spoken in the region, in addition to languages variously inherited by East African nations from their former colonisers. The population's cement needs are served by domestic cement industries with a combined total production capacity of 44.6Mt/yr. Five of the countries produce >5.0Mt/yr; four <1.0Mt/yr and one (South Sudan) no cement. They appear in order of installed capacity in Table 1 and are shaded according to capacity in Figure 2 and per-capita GDP and capacity in Figures 3 and 4 respectively. Smaller, independent cement producers predominate in number and capacity, just under half of which (49%) belongs to companies which operate in a single country, followed by regional multinationals (36%) and three global producers. Figure 1 shows how the market is split between different types of producer. Table 2 details the top 10 producers by installed capacity.

Below: Giraffes roam at the foot of Mount Kilimanjaro.



Burundi

Long periods of civil strife and political repression have precipitated a state of economic stagnation in landlocked Burundi.



Its sole cement producer, Burundi Cement Company (Buceco), has a grinding capacity of 0.1Mt/yr at its plant in Cibitoke, near the Burundian capital of Bujumbura. The company was established in 2004, only entering production in 2011 with an output of 34,500t/yr. Prior to this, the country imported its cement from Kenya, Tanzania and Uganda.

In 2012 Buceco more than doubled volumes year-on-year to 70,500t/yr. The company's vision of full capacity utilisation by 2014, however, never materialised; nor did a projected capacity-doubling expansion. In May 2019, Iwacu English News reported on a conspiracy by independent traders to hide stocks of Buceco cement, precipitating a temporary hike in the local price of Buceco cement to between US\$15.2/t and US\$15.8/t from US\$13.1/t.

Djibouti

Typically for a former French colony, Djibouti achieved independence relatively recently, in 1977 under President Hassan Gouled Aptidon.



The Arab Spring culminated in Aptidon's nephew, the incumbent President Ismail Omar Guelleh's, victory in the first contested election in 2013. The country's situation on the Red Sea and the Gulf of Aden gives it strategic importance to shipping in the region. It hosts several foreign military bases.

Djibouti's cement production capacity consists of Cimenterie d'Ali Sabieh's 0.2Mt/yr integrated plant at Gabode, constructed with a loan from the Indian government and converted from grinding only in 2019. Acquisition talks with Oman's Raysut Cement in December 2018 failed to produce an outcome.

Country	Integrated (Mt/yr)	Grinding (Mt/yr)	Total (Mt/yr)
Ethiopia	12.4	0.2	12.6
Tanzania	9.8	0.8	10.6
Kenya	4.2	3.5	7.7
Sudan	7.0	0.4	7.4
Uganda	2.7	2.2	4.9
Rwanda	0.6	0.1	0.7
Eritrea	0.4	-	0.4
Djibouti	0.2	-	0.2
Burundi	-	0.1	0.1
South Sudan	-	-	-
TOTAL	37.3	7.3	44.6

Eritrea

Independence from Ethiopia in 1991 failed to translate into economic prosperity for Eritrea.



In 2018, 80% of the population lived by subsistence farming. Underground lies a wealth of minerals: Eritrea's main exports by value are zinc ore at 75%, copper ore (14%) and precious metals (7.0%).

Since entering production in 2011, the total capacity of the country's two integrated cement plants, which currently stands at 0.4Mt/yr, has kept abreast of domestic demand, with Massawa Cement's 0.1Mt/yr Massawa plant infrequently making small shipments to Qatar. Both this and Gedem Cement's 0.3Mt/yr Massawa grinding plant are owned and operated by single plant producers. *Global Cement Magazine* first reported on imports of Ethiopian cement to Eritrea at a rate 18,300t/yr in 2018.

Ethiopia

No foreign power ever colonised Ethiopia. Since its 1974 revolution, abysmal poverty, including the famine of 1983 - 1985, which killed 1.2 million, has characterised the nation's fortunes. The economy picked up



following the first democratic elections in 1995, although the country depended on foreign aid to avert a further famine in 1998 - 2000. GDP/capita has increased eightfold in the past two decades to US\$951/capita in 2019. Industrial-scale farming fuelled by foreign investment is the primary economic activity in the frequently drought-afflicted nation, where mass displacements remain common.

In its 2019 nine-month report Dangote Cement, which has operated a 2.5Mt/yr integrated cement plant in Oromia since 2015, noted 'economic and operating' challenges in the country. The Nigerian-based company competes with five all-Ethiopian producers, giving a total national capacity of 12.6Mt/yr, 12.4Mt/yr of it integrated. The Ethiopian Constitution restricts land ownership to 'the state and the people,' with government-owned land available for lease for up to 99-years, making the likelihood of newcomer penetration into the market low.

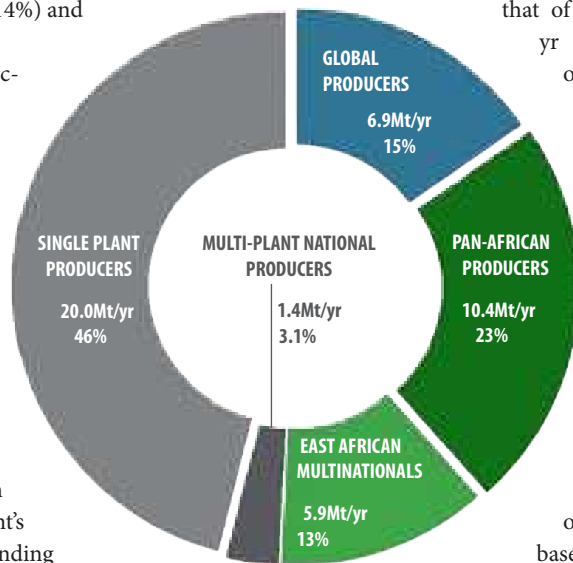
With 3.2Mt/yr integrated capacity, Messebo Cement leads the domestic cement industry in terms of volumes. It has operated an integrated cement plant in Tigray since 2001, expanding on the original 2.2Mt/yr FLSmidth line with a 1.0Mt/yr line supplied by China's Hefei Cement Research and Design Institute in 2011.

Derba Midroc's capacity equals that of Dangote, with a 2.5Mt/yr integrated cement plant operational in Derba since 2012. The third-largest producer is Mughar Cement, which expanded its 0.7Mt/yr capacity with two new dry lines to 1.6Mt/yr via a Chinese contract in 2011. Habesha Cement operates a 1.4Mt/yr integrated plant in Holeta which is 38% owned by South-African based PPC. National Cement Share company (NCSC), a public-private partnership between East Africa

Mining, the government of Ethiopia and others, operates a 1.2Mt/yr integrated plant and a 0.2Mt/yr grinding plant. A sixth Ethiopian company, Abay Industrial Development, announced the construction of a 1.8Mt/yr integrated cement plant near Dejen in January 2019 at a cost of US\$100m, towards which a downpayment was at that time made to FLSmidth.

In June 2019, *Global Cement Magazine* reported that three-month domestic production fell due to electricity rationing halving operating hours. This was caused by the failure of hydroelectricity (the source of 90% of Ethiopia's power) in a drought.

Left - Table 1: East African countries, ranked according to installed cement capacity in 2019. **Source:** Research towards *Global Cement Directory 2020*.



Left - Figure 1: East African cement capacity in 2019 by type of producer. **Source:** Research towards *Global Cement Directory 2020*.



Kenya

Kenya takes its name from the 5199m-high Mount Kenya - the country's highest peak - its name being the Kambu word for 'ostrich feathers' for its snow-streaked rock faces. A presidential democracy and Commonwealth member, Kenya's is the largest economy in East Africa.



Kenya's situation on the Indian Ocean makes it an attractive target for cement exporters - traditionally Chinese producers. Moreover, its 7.7Mt/yr total production capacity is seriously under-utilised by a domestic demand of 5.8Mt/yr in the first quarter of 2019, down by 3% year-on-year from 6.0Mt/yr. Exports dwindled to 0.6Mt/yr from 1.6Mt/yr, a drop of 63%, due in large part to a 2018 ban on Kenyan cement imports to Tanzania, allegedly because of clinker origin and quality uncertainties. Talks aimed at the resumption of tariff-free trade in line with East African Community rules opened in May 2019. At time of publication, no resolution has materialised.

In March 2019, *Global Cement Magazine* published figures from the Kenya National Bureau of Statistics (KNBS) for the market shares of various cement companies. These were: Bamburi Cement (33%), Mombasa Cement (16%), East African Portland Cement (EAPCC) (15%), Savannah Cement (15%), National Cement (8%) and Athi River Mining (ARM) Cement (13%). The pressures of under-utilised capacity in a saturated market have taken their toll on these figures as 2019 proved a critical year for the cement industry in Kenya.

Onlookers will have noted one plant's change of ownership play out across the pages of *Global Cement Magazine* between May and September 2019. Placed in administration on 18 August 2018, ARM Cement's Kenyan assets were sold by administrators PricewaterhouseCoopers to National Cement for US\$50m on 20 May 2019. A legal challenge by erstwhile owner Pradeep Paunrana with Kenyan-based Rai Group's backing failed to prevent the sale and National Cement executives entered the 0.7Mt/yr integrated Kaloleni plant on 14 October 2019 with the announcement that all 1100 employees would keep their jobs.

The addition of the former ARM Cement plant brought National Cement's capacity to 3.1Mt/yr, 2.1Mt/yr of which is in Kenya and 1.9Mt of which is integrated. The company began grinding clinker at the 1.0Mt/yr Tororo grinding plant of its subsidiary Simba Cement on 31 August 2018. This makes National Cement the fastest-growing cement producer over the year to 30 June 2019 in the region under review, with a year-on-year increase in installed capacity of 121% from 1.4Mt/yr at the close of the first half of 2018. It is Kenya's largest producer, having entered production in third place with

1.2Mt/yr integrated and 0.2Mt/yr grinding capacity, and plans for expansion of the latter to 0.6Mt/yr. Its subsidiary Cemtech, which Simba Cement took over in March 2019, has been planning a 1.2Mt/yr integrated cement plant in West Pokot County since 2010. An influx of liquid assets from the industrial giant behind National Cement, Kenyan-based conglomerate Devki Group, may put an end to a decade's dormancy for Cemtech in 2020.

Right - Table 2: Top 10 cement producers in East Africa, by installed capacity. **Source:** Research towards *Global Cement Directory 2020*.

Rank	Parent Company	Capacity (Mt/yr)	Headquarters
1	Dangote Cement	5.5	Nigeria
2	LafargeHolcim	3.6	Switzerland
3	National Cement	3.4	Kenya
4	Messebo Cement	3.2	Ethiopia
5	Derba Midroc	2.5	Ethiopia
6	ARM Cement	2.4	Kenya
7	HeidelbergCement	2.0	Germany
8	Al Rajhi Cement	1.8	Sudan
9	ASEC Cement	1.6	Sudan
=	Mombasa Cement	1.6	Kenya

LafargeHolcim is Kenya's number two producer via its subsidiary Bamburi Cement, in which it holds a 58.6% stake. Bamburi's production portfolio consists of one 1.1Mt/yr integrated cement plant in Mombasa and one 1.5Mt/yr grinding plant in Athi River. It settled a long-standing US\$38.5m tax bill in May 2019 for US\$3m and applied for a waiver of US\$2.8m accrued in penalties since it first defaulted on tax payments in 2012. Energy and raw materials costs were the reason given by the company for a 83.4% drop in profit year-on-year to US\$6.73m in 2018 from US\$40.7m. This is a precipitating factor of a shift toward alternative fuel substitution. It published plans to increase the rate of biomass-derived fuel co-processing in the Mombasa plant kilns to 30% from 12% in November 2019. The company has signed an agreement with the Port of Mombasa for the supply of confiscated goods, and said it is also targeting municipal waste and waste tyres for use as fuel sources.

Kenya's largest city hosts a second producer, which shares its name. Mombasa Cement's 1.6Mt/yr integrated Vipingo plant in Mombasa is in the process of receiving a second production line. In July 2019, Gebr. Pfeiffer reported that it had received an order from Mombasa Cement for a vertical roller mill of the same specifications as the one installed at the company's 1.8Mt/yr Tororo integrated cement plant in Uganda. The mill will have a drive power of 2900kW, giving it an Ordinary Portland Cement (OPC) production rate of 150t/hr.



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Savannah Cement operates a 1.2Mt/yr grinding plant in Athi River. Legal wranglings between shareholders have held up the Kenyan-Chinese investment partnership venture's planned expansion to 2.4Mt/yr grinding capacity, first announced November 2016. On 15 July 2019, the company reported that the second FLSmidth mill was in place, but it has missed its scheduled commissioning date of 'late 2019.'

EAPCC faced compulsory acquisition by government of a large parcel of idle land around its flagship 0.6Mt/yr integrated Athi River plant on 26 August 2019, just 59 years into a 945-year lease. EAPCC is seeking buyers for two further parcels of land to help towards clearing its debts. The company is 27% worker-owned through the National Social Security Fund. Government holds 25% and Cementia Holdings, Associated International Cement and Bamburi Cement, all LafargeHolcim subsidiaries, together hold 42%.

A bizarre series of restructurings ensued through mid-2019 for EAPCC. Under acting managing director Stephen Nthei, appointed on 29 May 2019, it issued a notice of redundancy to 220 of its 821 employees on 4 June 2019, only to withdraw it on 9 August 2019. On 19 September 2019 it issued a dismissal with one month's notice to its entire management staff except for acting managing director Stephen Nthai. Business Daily reported that the company would seek to rehire a small proportion of the sacked personnel with a 60% pay cut to oversee the redundancy of its entire junior staff, which in turn would be taken on with a view to bringing the total number of employees to 600.

Lastly, Karsan Ramji & Sons grinds 0.6Mt/yr of clinker using Cemengal's Plug&Grind units at two locations in Athi River and Engashura.

Electricity prices as high as US\$145/MWh exacerbate the challenges of a highly competitive marketplace, with LafargeHolcim the only global cement producer to maintain a foothold, albeit collaboratively with domestic producers and the government. Both Oman's Raysut Cement and minority investors in South Africa's Mafeking Cement expressed interest in ARM Cement, but lost out to Narendra Raval's Devki Group and National Cement. The continued rise of Raval's homegrown giant will likely make Kenya an interesting market to watch in 2020.

Rwanda

The second-smallest nation by area within the scope of this review is also the most densely



populated. Rwanda's largely young and rural population of 12.6m people generates a cement demand exceeding domestic production and one that grows at a rate of 7-8% annually, Reuters reported in May 2019, according to Cimerwa Cement chairman Gatera Jonathan.

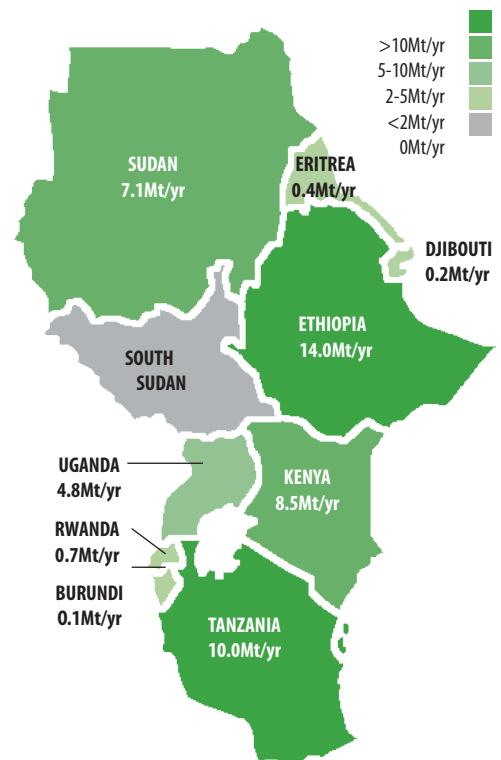
Rwanda's integrated capacity consists of one 0.6Mt/yr cement plant in Cyangugu belonging to South Africa-based PPC's subsidiary Cimerwa Cement, which is part-state-owned. PPC passed up on the opportunity to buy the government's stake after performing a share valuation exercise in June 2019. Additionally, ARM Cement operates a 0.1Mt/yr grinding plant in Kigali, for which the Kenyan company has been seeking a buyer since September 2018.

Angola-based Milbridge Holding subsidiary Prime Cement began construction of a second grinding plant on 28 August 2019 with a capacity of 0.7Mt/yr which when operational will double national production capacity.

The Rwandan Bureau of Standards announced in April 2019 that a 30t shipment of Hima from Uganda had been blocked due to its failure to meet import standards.

In May 2019, Rwanda Today reported that the price of a cement bag in Kigali had risen to between US\$10.30 and US\$10.73 from between US\$9.34 and US\$9.66 in a single month. This had a knock-on effect of even greater price rises in upland areas whose cement needs are served via the capital.

Right - Figure 2: Cement capacity of East African countries.
Source: Research towards Global Cement Directory 2020.





South Sudan

The World's youngest nation, South Sudan, which split from Sudan on 9 July 2011, also has the lowest average age of all populations in our review; the United Nations (UN) recording roughly half of its 12 million people as under 18. Its GDP per capita is likewise the lowest. South Sudan's oil reserves, the third largest in Sub-Saharan Africa, are a source of revenue both for South Sudan and Sudan, upon which the former relies for its pipelines, refineries and Port Sudan Red Sea access. The cement map of the region inverts this, with 100% of South Sudan's cement entering the country from Sudan.



At the time of independence, the International Monetary Fund estimated that South Sudan's oil reserves would halve by 2020 without new discoveries. Reuters reported South Sudan's first finding in August and exploitation of its 53m barrels began in late 2019. Given the small and isolated nature of this discovery, diversification of the economy away from oil, which constitutes 98% of government revenue, is to be expected if the country is to survive its first decade. A ready supply of oil well cement would undoubtedly strengthen South Sudan's hand in its black gold dispute with its northern neighbour, but the reality of a South Sudanese cement plant seems remote until a binding border agreement is reached.

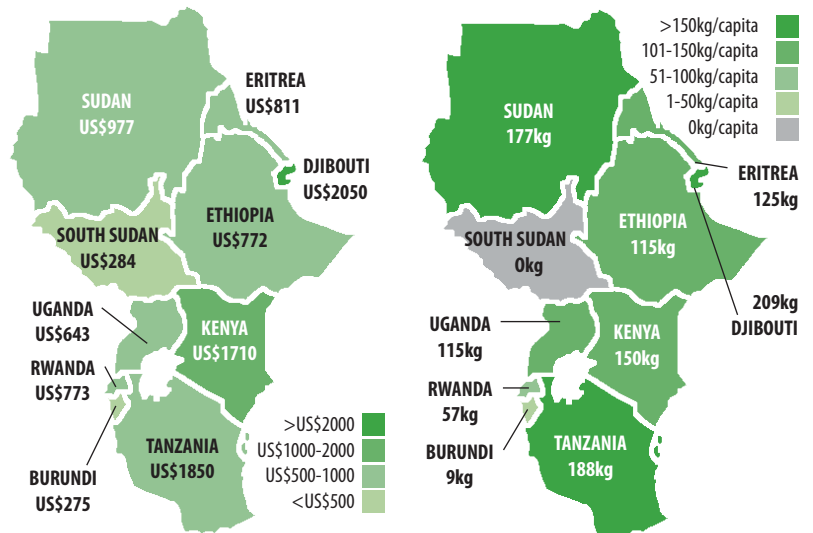
Sudan

Sudan's violent history since its 1956 independence from Britain led in 2003 to the Darfur genocide, 'the first genocide of the twenty-first century,' perpetrated against 3 million people by the government and Jinjaweed nationalists as part of an ongoing conflict in the west of the country.



Two regional multinationals and four local producers operate six integrated cement plants with a combined capacity of 7.0Mt/yr along the Nile in eastern Sudan. Besides infrastructure and transport connections, the area's limestone deposits were a determiner of plants' locations. For a cement industry which developed around the pre-2011 availability of oil in a unified Sudan, fuel supply issues are the major threat to production, intermittently more than halving output - most recently in July 2019 to 1.5Mt/yr.

Al Rajhi Cement's 1.8Mt/yr integrated Atbara cement plant is Sudan's largest, followed by Egyptian-based Arab Swiss Engineering Company (ASEC) Holding's Cement subsidiary Al Takamol Cement with an integrated capacity of 1.6Mt/yr. The latter's US\$253m FLSmidth plant entered operation in January 2011.



Above Left - Figure 3: GDP/capita (US\$) of East African countries. Source: World Bank Data Indicators.

Above - Figure 4: Cement capacity/population of East African countries. Calculated from Figure 2 and World Bank Data Indicators.

Berber Cement Company (BCC) and Jordanian-based Mass Group Holding's subsidiary Al Shamal Cement each operate with integrated capacities of 1.4Mt/yr. BCC is 25.4% owned by UAE-based National Cement Company of Dubai (NCCD) and has been operational at Berber since 2010. A collaboration between Japanese-based Taiheiyo Cement and Germany-based major equipment supplier KHD Humboldt Wedag brought Al Shamal Cement's Al Shamal plant online in 2005.

Al Salam Cement engaged Karplen Consultants for the installation and commissioning of its 0.6Mt/yr Al Salam integrated cement plant, also in 2005, at a cost of US\$150m. Lastly, Nile Cement Company (NCC) operates a 50-plus year-old 0.2Mt/yr integrated plant 520km from the nearest Sudanese cement plant on the White Nile near the South Sudanese border. It was built in 1967 as a 0.1Mt/yr plant.

Two small grinding plants complement Sudan's integrated capacity. They are the 0.4Mt/yr Aslan Cement plant and the <0.1Mt/yr Dubai Cement plant, both in the capital city of Khartoum.



Left: Al Salam Cement's 0.6Mt/yr integrated cement plant in Atbara, Sudan.



Tanzania

Tanzania is one of Africa's most ethnically diverse countries, with a population that speaks over 130 languages. Unlike its northern neighbour Kenya, its 25-year-old presidential democracy sees parties and their candidates contend for parliamentary seats and the Presidency along lines primarily of political ideology rather than ethnicity.



Tanzania's cement plants number eight, combining 9.8Mt/yr of integrated capacity with a single 0.8Mt/yr grinding plant in Dar es Salaam belonging to Kenya-based ARM Cement for a total installed capacity of 10.6Mt/yr. On 21 February 2019 an unspecified producer in the country was embroiled in a spot of geopolitical bother when it was found to have imported nearly 0.3Mt of Iranian clinker via a US-based intermediary between mid-2014 and early-2015, the latter having acted in contravention of the US government's Iran Sanctions Programme. The major development of 2019 was the incursion of a second Chinese player into the domestic cement industry in September 2019.

Nigeria-based Dangote Cement has led domestic production since December 2015 at its 3.0Mt/yr-capacity integrated Mtwara plant. Dangote's third-quarter 2019 report indicated that the plant had delivered the pan-African company's strongest sales in the nine months to 30 September 2019.

ARM Cement is the second-largest producer both by installed capacity (2.4Mt/yr) and integrated capacity at its 1.6Mt/yr-capacity Tanga plant alone. National Cement has divested ARM of its Kenyan assets, and the fate of its Tanga integrated and Dar es Salaam grinding plants depends on buyers being found. Significantly, China's sixth largest producer, Huaxin Cement, which produced 70.7Mt of cement globally in 2018, made an inroad into Tanzanian production with the acquisition of ARM Cement subsidiary Maweni Limestone on 26 September 2019. The 100Mt/yr-capacity producer said that the move was 'integral to its broader strategy' of expansion in emerging markets. Maweni Limestone is its first African asset in a portfolio of overseas cement production capabilities encompassing Cambodia, Nepal, Tajikistan and Uzbekistan.

Germany-based HeidelbergCement subsidiary Tanzania Portland Cement increased its capacity to 2.0Mt/yr with a third line at its Wazo Hill integrated plant in Dar es Salaam in late 2018.

The fourth largest producer is South Africa-based Afrisam-owned Tanga Cement, which operates a 1.3Mt/yr integrated plant in Tanga, followed by 61.5% LafargeHolcim-owned Mbeya Cement, with its single 1.1Mt/yr-capacity line at its Mbeya plant in the west of the country.

India-based Lake Cement trades under the brand Nyati Cement in Tanzania, Rwanda, Burundi and the Democratic Republic of Congo (DRC) from its 0.5Mt/yr integrated Lake Cement plant in Dar es Salaam. It was the country's first plant with a vertical roller mill and a dedicated energy source - a 10MW coal-fired power plant. The company also sources its own limestone by surface-mining at its quarry adjacent to the Lake Cement plant. A second integrated plant of 1.4Mt/yr in Bagamoyo, announced in November 2016, failed to materialise in mid-2019.

China's Lee Building Materials' 0.3Mt/yr Lee plant is Tanzania's smallest production unit.

Uganda

Uganda's fortunes have been marred by militancy both at home and abroad. In 2005, the International Court of Justice ruled that



Uganda had illegally invaded and committed human rights abuses in the DRC during the Second Congo War, the 'Great War of Africa,' and a 32-year-old civil war begun in northern Uganda continues in the DRC and Central African Republic (CAR) to the present day.

The state-owned Uganda Cement Industries was privatised in 1994, leading to the formation of Tororo Cement and Hima Cement. The former's capacity is 1.7Mt/yr at the single dry line of its integrated Tororo Plant. Hima Cement, meanwhile, is 71.01% owned by LafargeHolcim and operates a 0.9Mt/yr integrated cement plant in Kasese. In January 2019, it announced an upcoming US\$250m plant for which government land had been appointed. Private speculators' exploration licences on the land held up the start of development, leading Hima Cement managing director Nicolas George to warn of the possibility of relocation of the project to Kenya on 4 April 2019. Hima Cement provided 0.1Mt of cement to China-based SinoHydro for its River Nile Karuma Hydropower hydroelectric dam project on 15 April 2019.

Uganda's two grinding plants are Kampala Cement's 1.2Mt/yr Namataba plant and National Cement subsidiary Simba Cement 1.0Mt/yr Tororo plant.

Conclusion

East Africa's population growth rate is double the African average, rising 6.7% between 2013 and 2017. Over the same period, life expectancy in both Kenya and Rwanda gained 8.5 years. East Africans are living increasingly well and for longer. Cement producers like Narendra Raval's National Cement will strive to serve the burgeoning population's development needs, and in doing so will likely have to face down newcomers from around the globe.





Here *Global Cement Magazine* presents its monthly review of global cement prices, in US\$ for easy comparison. Additional price information is only available to subscribers to *Global Cement Magazine*. Subscribe on Page 72. In this issue subscribers receive extra price information from India, as well as Pakistan, China, the US, Malaysia, Turkmenistan, Thailand, Colombia, Ethiopia and more.

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

India: Business Standard reports that cement prices in India have been flat during the monsoon season, with private construction activities and government projects coming to a halt.

However, average prices have been moving up since August 2019. In the north of India, prices increased marginally by US\$0.07/bag since August 2019 to an average of US\$4.52-4.66/bag (50kg) as sales volumes declined by 5-7%. Demand was driven largely by individual home builders, with an uptick in prices noticed after Diwali (27 October 2019).

Region	August 2019	September 2019	October 2019
North	4.38 - 4.45	4.45 - 4.59	4.52 - 4.66
West	4.38 - 4.45	4.45 - 4.52	4.52 - 4.66
Central	4.59 - 4.66	4.52 - 4.59	4.52 - 4.59
East	4.17 - 4.31	4.31 - 4.45	4.38 - 4.52
South	5.15 - 5.28	4.87 - 4.94	4.52 - 4.66

In the eastern part of the country, similar to the North, prices have been increasing since September to US\$4.38-4.52/bag, while in the west, prices increased to US\$4.52-4.66/bag.

At the time of going to press, it was expected that prices would increase throughout November and December 2019 due to the resumption of public works, especially in rural areas.

Nepal: Locals in Bhaktapur have complained that cement prices as high as US\$7.12/bag (50kg) are

unreasonable and liable to sudden changes. Contractors have said that the high price of cement despite ample domestic production and import substitution is questionable. Imports from India have fallen significantly in the past year as Nepal's own clinker capacity has come online.

"There is no change in price of domestic cement in the market despite the country becoming self-sustained in cement production. The price is the same as that of various other foreign brands of cement that were available in the market," stated one contractor to local press on the condition of anonymity.

However, cement manufacturers claim that cement prices have fallen by at least 15%. "On average, the ex-factory price of OPC cement today is around US\$6.15/bag, depending on the brand against its price of around US\$6.59/bag per sack a year ago," said Pashupati Murarka, director of Argakhanchi Cement. "Similarly, the price of PPC cement has come down to US\$5.21/bag per sack from US\$6.07/bag a year ago."

On 7 November 2019, Udayapur Cement reported that sales of its Gaida brand cement had doubled after it dropped its average price by US\$0.22/bag. The product is now available for US\$6.74/bag, down from US\$6.98/bag at the end of October 2019. It had earlier cost US\$8.31/bag.

"We felt it was good to lower the price instead of piling up product in our warehouse," said Dhruba Devkota, deputy general manager.

EU ETS: CO₂ emissions permits cost Euro24.39/t on 13 November 2019, a 1.6% week-on-week fall from Euro24.79/t on 6 November 2019, a 1.0% month-on-month rise from Euro24.15/t on 14 October 2019 and a 21.1% year-on-year rise from Euro20.14/t on 13 November 2018.



Left: All India cement prices, August, September and October 2019.

Source: Business Standard.

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

Contact: Peter Edwards
peter.edwards@propubs.com

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Cement and concrete have a lot of advantages - let's tell the world!

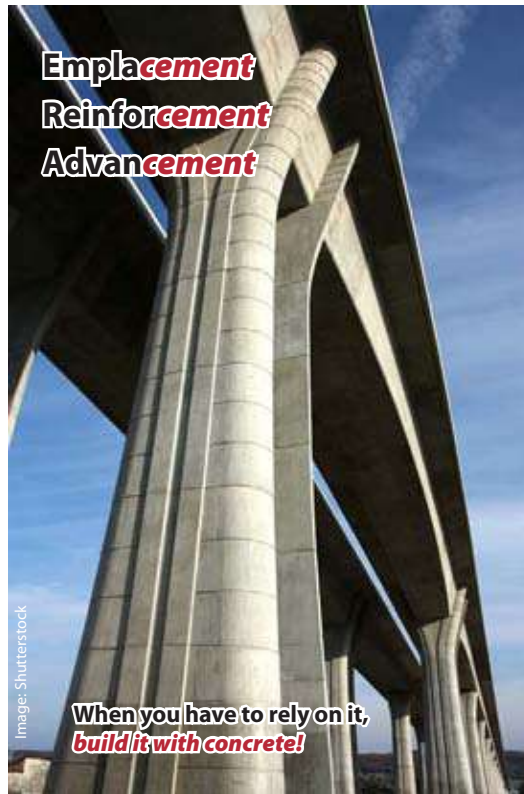
Robert McCaffrey Editorial Director, *Global Cement Magazine* (rob@propubs.com)



Concrete has a lot of advantages over other building materials - relatively low-cost, ease of use, ubiquity, familiarity, strength and proven durability among them. Those in the industry know this already, but those outside do not (even to the extent of not knowing the difference between cement and concrete). Often, those outside the industry view concrete as graffiti-ridden, decaying and brutal, often from their own experiences. Alas, the viewpoint on concrete can be biased by myriad poor examples, rather than the rarer excellent examples. Additionally, other building materials seem to be driving their message home to consumers better than the cement and concrete industries (just think about what you think, when you think about *wood*). It's time for cement and concrete to fight back.

I've come up with these advertisements, that use three elements: the fortuitous inclusion of -cement in many apposite words, such as emplacement, reinforcement and advancement; A striking image; and the 'sign-off' phrase, ending 'build it with concrete!'

To my knowledge, the concrete industry does not advertise to consumers at the moment (if you know differently, please send any examples to me at rob@propubs.com). In the meantime, you can have these advertisement ideas for free. Please, tell the world! 🌐





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Advertising enquiries:

Paul Brown: +44 (0) 7767 475 998 / paul.brown@propubs.com
Sören Rothfahl: +44 (0) 7850 669 169 / soeren.rothfahl@propubs.com
Tina Rich: +44 (0) 7809 679 695 / tina.rich@propubs.com

Editorial enquiries:

Peter Edwards: +44 (0) 1372 840 967 / peter.edwards@propubs.com
Jacob Winskell: +44 (0) 1372 840 953 / jacob.winskell@propubs.com

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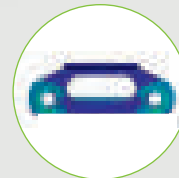
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