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Dear readers,

Welcome to the October 2020 issue of *Global Cement Magazine* - the world's most widely-read cement magazine! This issue kicks off with a rare side-by-side comparison of the relative sustainability of different cement producers around the world. By comparing their thermal energy use, power consumption, alternative and biomass fuel use, clinker factor and CO₂ emissions, *Global Cement* has generated a list of the most (and least) sustainable producers (Page 12). Due to the inconsistent nature of reporting, the information is necessarily incomplete. Indeed Chinese producers are not represented at all. However, the exercise can hopefully shed some light on an issue that can, at times, become hijacked by producers rushing forward with their most flattering data.

In an attempt to unify producers in their sustainability approaches, the Global Cement & Concrete Association (GCCA) has just announced the preparation of its 2050 Climate Ambition (Page 36). Its aim is bold: A zero CO₂ concrete sector by 2050. Its approaches - more co-processing, greater use of renewable power, lower use of cement in concrete, carbon capture, recycling of construction waste and less clinker - are now very familiar levers. As with the Cement Sustainability Initiative (CSI) 2DS road map - used in our comparison - some may feel that the GCCA is placing unrealistic expectations on the role of 'novel technologies' - read 'carbon capture and storage' (CSS). To help reduce the emphasis on what could prove expensive and ungainly CCS solutions, John Kline suggests that we look again at how supplementary cementitious materials are used (Page 18). Indeed, the physical properties of SCMs, specifically how their size fits into the concrete matrix, can be more important than chemistry. By carefully tuning the particle size mix, it is possible to achieve high concrete strength with as little as 25% clinker.

Whatever the future holds, it is clear that a zero CO₂ construction sector will not be the result of a magic bullet. It will rely on millions of tiny improvements to existing methods, as well as rapid identification and development of new approaches. We hope that this issue is a (very) small piece of that effort - Enjoy!

P Edwards

Peter Edwards
Editor



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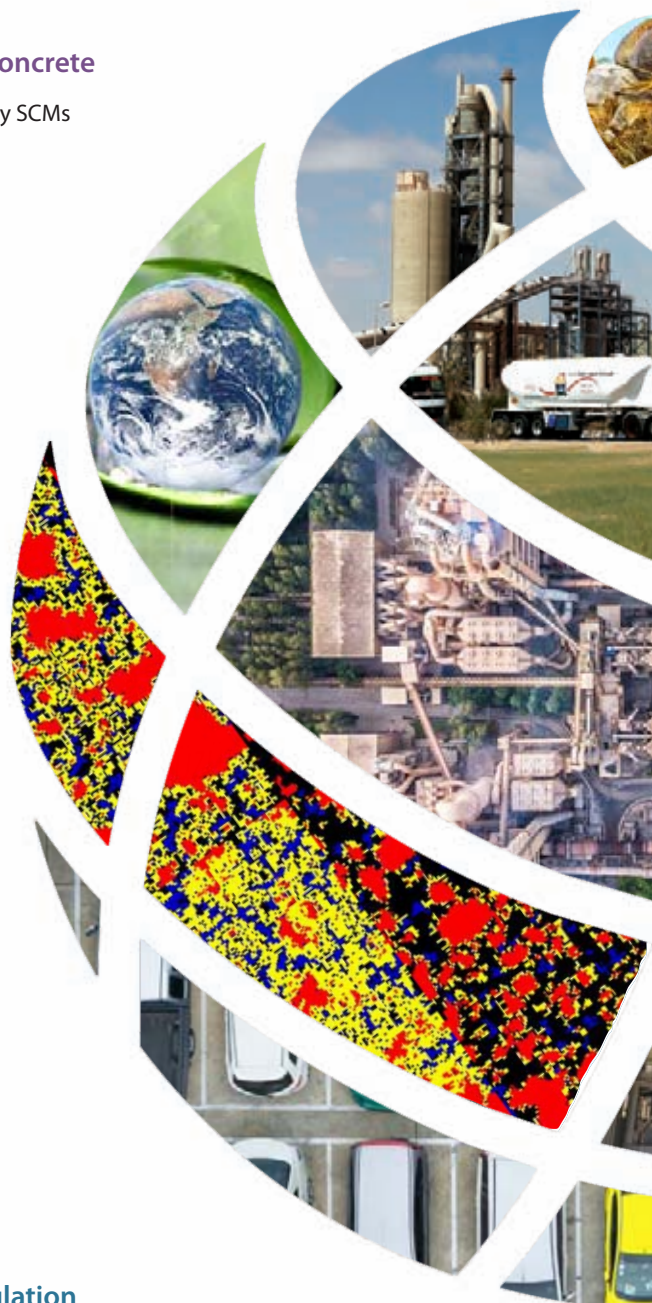
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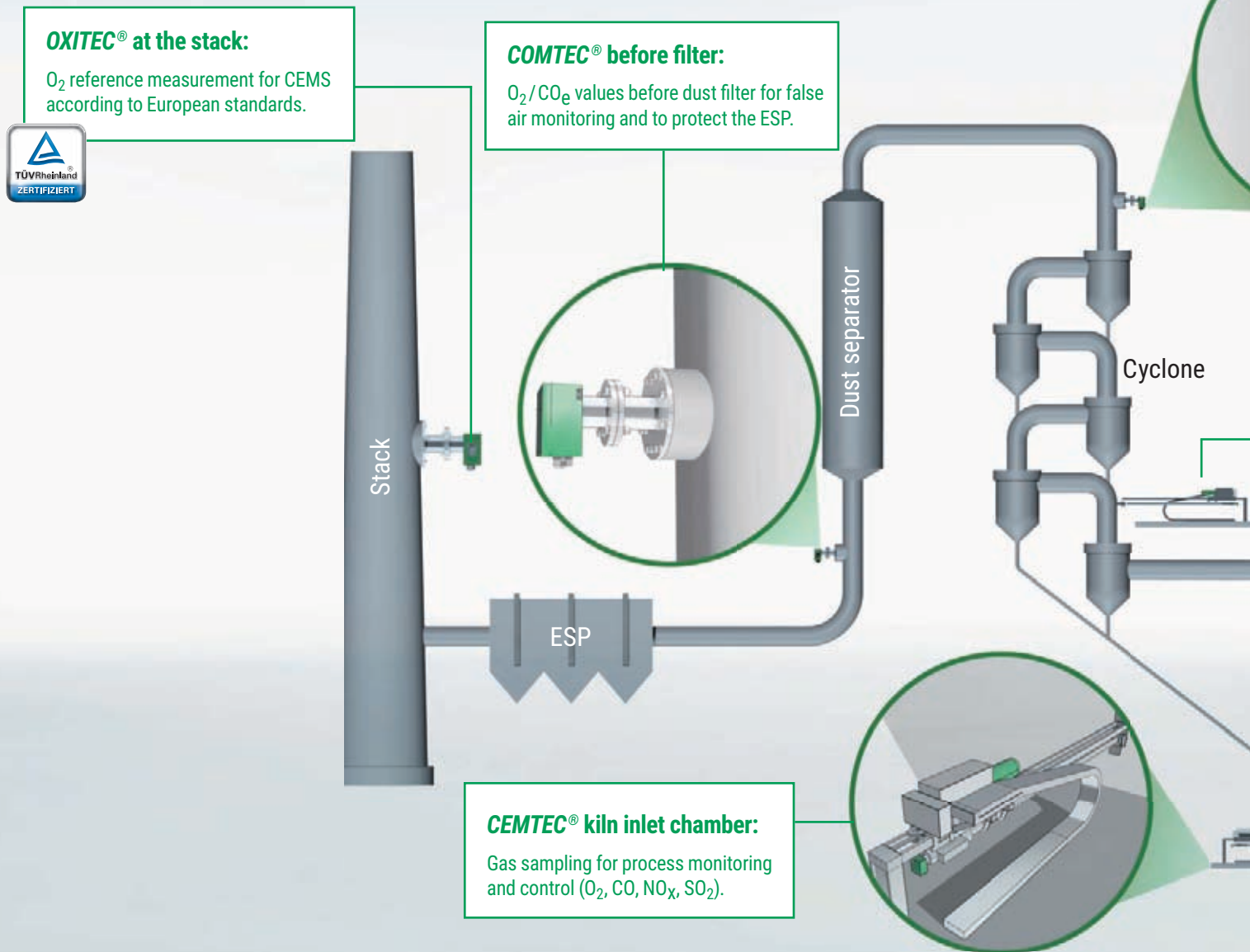
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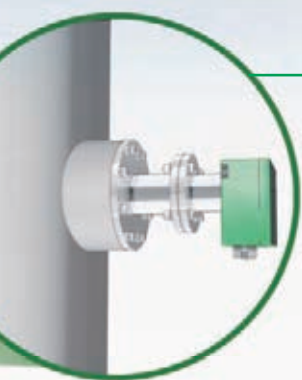
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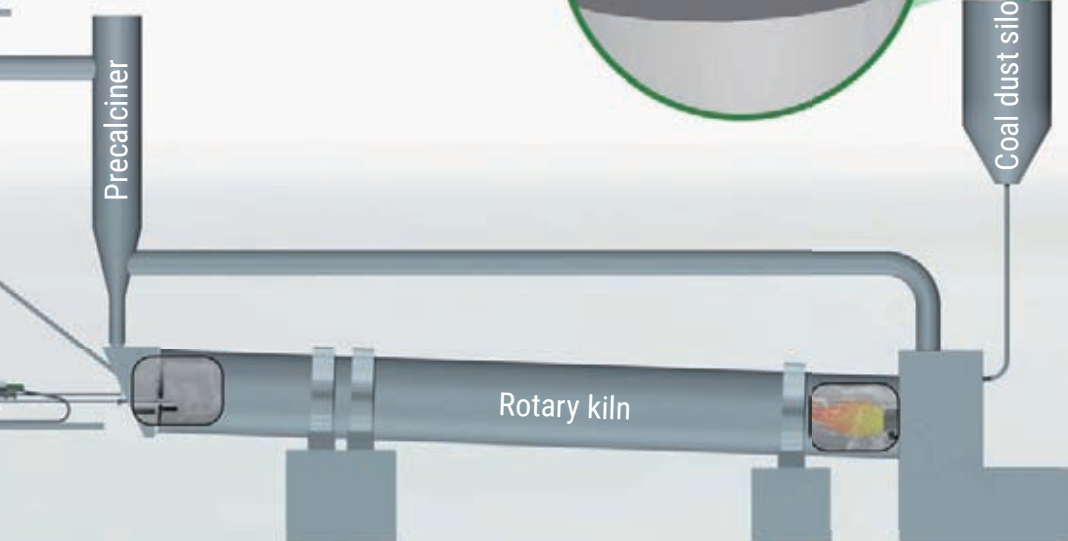
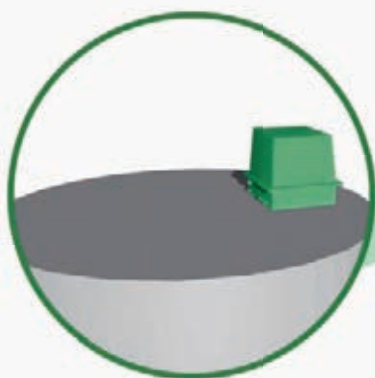
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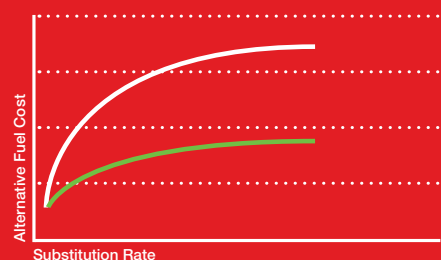
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Peter Edwards, Global Cement Magazine

Sustainability in cement: Who's on top?

We compare and contrast major cement producers' sustainability performances...

Many articles in these pages begin by stating that the cement industry is under increasing pressure to improve its sustainability credentials. This is certainly clear. What is less clear, however, is how different cement producers are rising to the challenge of meeting the higher standards necessary for the future. A tendency for each producer to rush forth with its most flattering facts and figures muddies the water and presents barriers to making fair comparisons.

In an attempt to assess their relative progress towards a number of sustainability goals, this article compares the largest multinational players, which collectively account for ~30% of global cement capacity. Chinese producers are notable by their absence. *Global Cement* would like to thank John Kline at Kline Consulting for allowing us to use Table 1, which he collated for his presentation at the IEEE-IAS/PCA Cement Industry Technical Conference in St Louis in 2019. More recent data has since become available for some producers but for the sake of a fair comparison data from 2017 has been used. The 12 companies will be compared using six sustainability indicators taken from the Cement Sustainability Initiative's (CSI) Roadmap to 2050. These are:



1. Thermal energy consumption (GJ/t of clinker);
2. Electrical intensity (kWh/t of cement);
3. Alternative fuel use (%);
4. Biomass fuel use (%);
5. Clinker factor (%), and;
6. CO₂ emissions (kg/t of cement).

The 12 producers will be ranked against each other and compared to the CSI's 2 Degree Scenario (2DS) Target value. The six indicators will then be combined into a single ranking.

Below - Table 1: Key sustainability parameters for 12 non-Chinese cement producers, as listed by the *Global Cement Directory 2020*.

Note: Eurocement is included as one of the largest non-Chinese producers, although it did not report these parameters for 2017.

Source: Collated by John Kline, Kline Consulting, from company sustainability reports.

| CSI Roadmap Indicator | Report Year | Capacity (Mt/yr) | Sales (Mt) | Thermal energy consumption (GJ/t Clinker) | Electrical intensity (kWh/t of cement) | Alternative fuel use (%) | Biomass fuel use (%) | Clinker factor (%) | CO ₂ emissions (k/t of cement) |
|-----------------------|-------------|------------------|------------|---|--|--------------------------|----------------------|--------------------|---|
| 2DS Target | 2050 | | | 3.1 | 79 | N/A | 30 | 60 | 370 |
| | | | | | | | | | |
| LafargeHolcim | 2017 | 345.2 | 209.5 | 3.498 | 99 | 16.5 | 6.3 | 73 | 581 |
| HeidelbergCement | 2017 | 185.4 | 125.7 | 3.62 | | 13.1 | 7.8 | 75 | 609 |
| Cemex | 2017 | 91.6 | 66.8 | 3.913 | 120 | 15.9 | 10.3 | 78.4 | 636 |
| Ultratech Cement | 2016-17 | 91.4 | 59.3 | 2.966 | | 1.9 | 0.4 | 73.8 | 632 |
| Votorantim | 2017 | 70.8 | 33.3 | 2.667 | 111.5 | 14.8 | | | 652 |
| Inter cement | 2017 | 53.5 | 15.4 | 3.698 | | 17 | 6 | 73 | 580 |
| CRH | 2017 | 50.5 | 40.7 | 3.668 | | 27.5 | 11.1 | 77.5 | 572 |
| Buzzi Unicem | 2017 | 49.2 | 26.2 | 4.121 | 124 | 20.3 | 5.7 | 80.2 | 696 |
| Eurocement | 2017 | 47.2 | | | | | | | |
| Dangote Cement | 2017 | 43.8 | 21.9 | | | | | | 664 |
| Siam Cement | 2017 | 40.3 | 22.5 | 3.3742 | | 5 | 6.1 | 75.6 | 662 |
| Taiheiyo Cement | 2017 | 39.8 | 33 | 3.303 | 103.4 | 11.6 | 1.8 | | 679 |

1. Thermal energy consumption

The thermal energy consumption per tonne of clinker is an unusual metric among these six, as two producers, Votorantim and Ultratech Cement, already exceed the CSI 2DS target for 2050. By comparison, in none of the other five metrics does any producer even come close to hitting the target. These two ‘winners’ predominantly operate in Brazil and India respectively, both markets well known for new significant addition of efficient production capacity in the past decade. Two East Asian giants, Taiheiyo Cement and Siam Cement, also come close to the 2050 2DS Target for 2050.

The largest multinationals, LafargeHolcim, HeidelbergCement and Cemex, appear lower in the rankings. It is likely that each of these is weighed down by their relatively large proportions of older capacity, much of it in Europe. While their plants will have been upgraded since they were built, many are now of advanced years. Thermal energy efficiency is rarely a strong suit with such historic plants. However, these producers perform more strongly in other areas.

2. Electrical energy consumption

Electrical energy consumption primarily points to the efficiency of grinding processes within the cement plant, mostly raw meal and clinker grinding. Given the advances in the efficiency of such process so far in the 21st Century, it is surprising that only five producers in this study were able (or willing) to actually report a figure for electrical intensity in their Sustainability Report. Indeed, this is the metric for which we have the least information.

LafargeHolcim comes out top at 99kWh/t of cement, although this is 25% higher than the 2DS target for 2050 (79kWh/t). None of the other producers that report a figure dips below 100kWh/t. However, an important aside for this metric is that we don’t know how much electrical energy each produces ultimately derives from renewable sources, such as wind and solar power. Indeed, as national power supplies decarbonise, a target specifically targeting electrical energy use may become redundant.

3 & 4. Alternative and biomass fuels

The use of alternative fuels is fantastic from the perspective of waste management. However, the use of many alternative fuels, particularly plastics, is not inherently ‘sustainable.’ This is because many plastics simply represent an intermediate step when a fossil resource is used before being burned. This explains the lack of a 2050 2DS target value for alternative fuels, as a higher alternative fuel rate does not necessarily make cement production any ‘greener.’

However, biomass fuels - waste wood, food waste, sewage sludge, meat and bone meal, crop byproducts - have recently absorbed CO₂ from today’s atmosphere. Burning these simply releases that absorbed

| Rank | Producer | Thermal energy consumption (GJ/t Clinker) | Difference to Best Performer | Ratio to 2DS target |
|------|-------------------|---|------------------------------|---------------------|
| | 2DS Target | 3.100 | +0.433 | 1.00 |
| 1 | Votorantim | 2.667 | - | 0.86 |
| 2 | Ultratech Cement | 2.966 | +0.299 | 0.96 |
| 3 | Taiheiyo Cement | 3.303 | +0.636 | 1.07 |
| 4 | Siam Cement | 3.374 | +0.707 | 1.09 |
| 5 | LafargeHolcim | 3.498 | +0.831 | 1.13 |
| 6 | HeidelbergCement | 3.620 | +0.953 | 1.17 |
| 7 | CRH | 3.668 | +1.001 | 1.18 |
| 8 | Intercement | 3.698 | +1.031 | 1.19 |
| 9 | Cemex | 3.913 | +1.246 | 1.26 |
| 10 | Buzzi Unicem | 4.121 | +1.454 | 1.33 |



Above - Table 2: Comparison of multinational cement producers’ thermal energy consumption relative to each other and CSI 2DS Target.

Below - Table 3: Comparison of multinational cement producers’ electrical energy consumption relative to each other and CSI 2DS Target.

| Rank | Producer | Electrical intensity (kWh/t of cement) | Difference to Best Performer (kWh/t of cement) | Ratio to 2DS target |
|------|-------------------|--|--|---------------------|
| | 2DS Target | 79.0 | -20.0 | 1.00 |
| 1 | LafargeHolcim | 99.0 | - | 1.25 |
| 2 | Taiheiyo Cement | 103.4 | +4.4 | 1.31 |
| 3 | Votorantim | 111.5 | +12.5 | 1.41 |
| 4 | Cemex | 120.0 | +21.0 | 1.52 |
| 5 | Buzzi Unicem | 124.0 | +25.0 | 1.57 |



Note for Tables 2-7: Companies are only included in Tables if they reported for that category. (See Table 1).



| Rank | Producer | Alternative fuel use (%) | Difference to Best Performer (%) |
|------|-------------------|--------------------------|----------------------------------|
| | 2DS Target | N/A | N/A |
| 1 | CRH | 27.5 | 0 |
| 2 | Buzzi Unicem | 20.3 | -7.2 |
| 3 | Intercement | 17.0 | -10.5 |
| 4 | LafargeHolcim | 16.5 | -11 |
| 5 | Cemex | 15.9 | -11.6 |
| 6 | Votorantim | 14.8 | -12.7 |
| 7 | HeidelbergCement | 13.1 | -14.4 |
| 8 | Taiheiyo Cement | 11.6 | -15.9 |
| 9 | Siam Cement | 5.0 | -22.5 |
| 10 | Ultratech Cement | 1.9 | -25.6 |

Above - Table 4: Comparison of multinational cement producers' alternative fuel use relative to each other.

Below - Table 6: Comparison of multinational cement producers' clinker factor relative to each other and the CSI 2DS Target.

carbon back to the atmosphere. There will, of course, be a net increase in CO₂ due to transport and processing, so even biomass fuels are not 100% sustainable.

The top performer for both metrics is CRH, with 27.5% alternative fuels and 11.1% for biomass fuels.

| Rank | Producer | Clinker factor (%) | Difference to Best Performer (%) | Ratio to 2DS Target |
|------|-------------------|--------------------|----------------------------------|---------------------|
| | 2DS Target | 60.0 | -13.0 | 1.00 |
| 1 | LafargeHolcim | 73.0 | 0.0 | 1.22 |
| 1 | Intercement | 73.0 | 0.0 | 1.22 |
| 3 | Ultratech Cement | 73.8 | +0.8 | 1.23 |
| 4 | HeidelbergCement | 75.0 | +2.0 | 1.25 |
| 5 | Siam Cement | 75.6 | +2.6 | 1.26 |
| 6 | CRH | 77.5 | +4.5 | 1.29 |
| 7 | Cemex | 78.4 | +5.4 | 1.31 |
| 8 | Buzzi Unicem | 80.2 | +7.2 | 1.34 |



| Rank | Producer | Biomass fuel use (%) | Difference to Best Performer (%) | Ratio to 2DS target |
|------|-------------------|----------------------|----------------------------------|---------------------|
| | 2DS Target | 30 | +18.9 | 1.00 |
| 1 | CRH | 11.1 | 0.0 | 0.37 |
| 2 | Cemex | 10.3 | -0.8 | 0.34 |
| 3 | HeidelbergCement | 7.8 | -3.3 | 0.26 |
| 4 | LafargeHolcim | 6.3 | -4.8 | 0.21 |
| 5 | Siam Cement | 6.1 | -5.0 | 0.20 |
| 6 | Intercement | 6.0 | -5.1 | 0.20 |
| 7 | Buzzi Unicem | 5.7 | -5.4 | 0.19 |
| 8 | Taiheiyo Cement | 1.8 | -9.3 | 0.06 |
| 9 | Ultratech Cement | 0.4 | -10.7 | 0.01 |

Above - Table 5: Comparison of multinational cement producers' biomass fuel use relative to each other and the CSI 2DS Target.

This represents slightly more than a third of the 30% target set under the 2DS for 2050. Behind CRH in the alternative fuel rankings come Buzzi Unicem and Intercement, both medium-sized players. Of the largest producers, LafargeHolcim comes out on top (16.5%), just ahead of Cemex (15.9%). HeidelbergCement, renowned for its high technology solutions, ranks only seventh by this metric, with 13.1%. The weakest performers are all based in Asia, with the weakest performer UltraTech Cement (1.9%).

In terms of biomass, only CRH (11.1%) and Cemex (10.3%) use more than 10% across their operations. HeidelbergCement is third, indicating that a large portion of its alternative fuels is likely biogenic. Ranks 4-7 are separated by only 0.6%, with Taiheiyo (1.8%) and Ultratech (0.4%) bringing up the rear. Votorantim did not present a biomass figure.

5. Clinker factor

Reducing the amount of clinker in a cement blend is a fairly large 'lever' to lower overall CO₂ emissions, and hence to produce a more sustainable product. Slags and fly ash have traditionally been the main supplementary cementitious materials (SCMs) of choice, due to high availability and low cost. However, the falling prevalence of blast furnaces and coal-fired power plants, coupled to higher SCM demand means these no longer present 'easy' solutions. Limestone, calcined clays and natural pozzolans are becoming increasingly popular as a result.

Clinker factor use was the most tightly grouped category of the six in this study. The best performers were LafargeHolcim and Intercement, each with an average of 73% (27% non-clinker components). Close behind was Ultratech Cement with 73.8% clinker. Those with the highest clinker factors, Cemex (78.4%) and Buzzi Unicem (80.2%), only used 5-8% more clinker on average than the best performers.



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| Rank | Producer | CO ₂ emissions (kg/t of cement) | Difference to Best (kg/t of cement) | Ratio to 2DS Target |
|------|-------------------|---|--|------------------------|
| | 2DS Target | 370 | -20.2 | 1.00 |
| 1 | CRH | 572 | 0 | 1.55 |
| 2 | Inter cement | 580 | 8 | 1.57 |
| 3 | LafargeHolcim | 581 | 9 | 1.57 |
| 4 | HeidelbergCement | 609 | 37 | 1.65 |
| 5 | Ultratech Cement | 632 | 60 | 1.71 |
| 6 | Cemex | 636 | 64 | 1.72 |
| 7 | Votorantim | 652 | 80 | 1.76 |
| 8 | Siam Cement | 662 | 90 | 1.79 |
| 9 | Dangote Cement | 664 | 92 | 1.79 |
| 10 | Taiheiyo Cement | 679 | 107 | 1.84 |
| 11 | Buzzi Unicem | 696 | 124 | 1.88 |

Above - Table 7: Comparison of multinational cement producers' CO₂ emissions relative to each other and the CSI 2DS Target.

6. CO₂ emissions


The five preceding 2DS targets ultimately affect the sixth: CO₂ emissions. These are, after all, what the CSI 2DS targets are intended to reduce. However, it is also the metric where the major cement producers appear to be furthest from their goals. The best performer, CRH (572kg/t), is currently 55% above the level required under the 2DS target (370kg/t). The worst performer, Buzzi Unicem (696kg/t), is 88% above the target. In between, Inter cement and LafargeHolcim run a close second and third, both with specific CO₂ emissions under 600kg/t of cement. Ultratech Cement also performs fairly well due to its high thermal efficiency and relatively low clinker factor. Cemex is not far behind, with smaller producers filling the lower positions. This trend towards higher emitters being smaller does at least mean that the average emissions per tonne among the group of 11 producers are likely significantly lower than the mean.

Below - Table 8: Comparison of multinational cement producers across the six categories. Producers are ranked 1-12 based on performance, with an automatic 12 in cases where no figure is reported.

Overall rankings

For each of the six categories, the 12 cement producers have been ranked from 1-12, with 1 being the best performance in that category. In cases where no figure is reported, the producer is automatically awarded 12. These individual ranks have been added together to provide an overall score, which has been used to order the producers according to how sustainable their operations are.

This results in LafargeHolcim being crowned the 'most sustainable' of the major producers analysed here, with a score of 18. It was in the top five across all categories, with the lowest positions in electrical energy use and clinker factor. CRH is second with a total score of 28. It used the most alternative and biomass fuels and came out with the lowest CO₂ emissions. However, a relatively high thermal energy consumption and clinker factor, plus no reported value for electrical energy use kept it off the top spot. Third was Inter cement, which was joint top in clinker factor, second in CO₂ emissions and third in alternative fuel use. It also did not report its electrical energy use, like six of its peers. Excluding Dangote Cement and Eurocement, which reported on only one category between them, the three weakest performers - Taiheiyo Cement, Siam Cement and Buzzi Unicem - were all tied on scores of 43.

This summary has highlighted some interesting comparisons in sustainability performance between different global cement producers. There is clearly a lot of work to do, not least in reporting data. Only three producers - LafargeHolcim, Cemex and Buzzi Unicem - reported figures for all six categories. Given this, it has to be asked: Is this a list of the most sustainable cement producers or simply a list of the most *transparent* cement producers? Famously, 'what gets measured, gets managed,' and in a world where specifiers, architects, users and the general public are calling for sustainable solutions, those not forthcoming with sustainability data may get left behind. 

| OVERALL RANK | Producer | Thermal | Electrical | AF use | Biomass use | Clinker factor | CO ₂ emissions | COMBINED |
|--------------|------------------|---------|------------|--------|-------------|----------------|---------------------------|----------|
| 1 | LafargeHolcim | 5 | 1 | 4 | 4 | 1 | 3 | 18 |
| 2 | CRH | 7 | 12 | 1 | 1 | 6 | 1 | 28 |
| 3 | Inter cement | 8 | 12 | 3 | 6 | 1 | 2 | 32 |
| 4 | Cemex | 9 | 4 | 5 | 2 | 7 | 6 | 33 |
| 5 | HeidelbergCement | 6 | 12 | 7 | 3 | 4 | 4 | 36 |
| 6 | Votorantim | 1 | 3 | 6 | 12 | 12 | 7 | 41 |
| 7 | Ultratech Cement | 2 | 12 | 10 | 9 | 3 | 5 | 41 |
| 8 | Taiheiyo Cement | 3 | 2 | 8 | 8 | 12 | 10 | 43 |
| 9 | Siam Cement | 4 | 12 | 9 | 5 | 5 | 8 | 43 |
| 10 | Buzzi Unicem | 10 | 5 | 2 | 7 | 8 | 11 | 43 |
| 11 | Dangote Cement | 12 | 12 | 12 | 12 | 12 | 9 | 69 |
| 12 | Eurocement | 12 | 12 | 12 | 12 | 12 | 12 | 72 |

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John Kline, Kline Consulting

Optimising SCM use in cement and concrete

We need to pay more attention to how and why SCMs are used...



Above: John Kline, Kline Consulting.

The Cement Sustainability Initiative (CSI) road map shows how CO₂ emissions should be improved by 2050 (Figure 1) and has appeared many times in these pages before. Substitution of clinker is the second-largest contributor to reduced emissions, at 37%, after ‘innovative technologies’ - read ‘carbon capture’ - which will be responsible for nearly half of the reduction to the 370-420kg of CO₂ per tonne of cement target.

However, many producers are still quite far from the 60% clinker factor required by the CSI’s 2 Degree Scenario (2DS) (See more on Page 12). But what if we could push the clinker factor down below 60%? This would likely be far more economical than relying so heavily on ‘innovative technologies,’ as important as these will be. It would also help reduce ongoing production costs per tonne of cement via the optimal use of byproduct materials.

A study by CEMCAP estimates that the leading capture technologies would add at least Euro40/t to the cost of clinker. That is before adding the cost for CO₂ compression and pumping for sequestration. If

we can make that clinker go further, it will reduce production costs, lower emissions and possibly create happier customers.

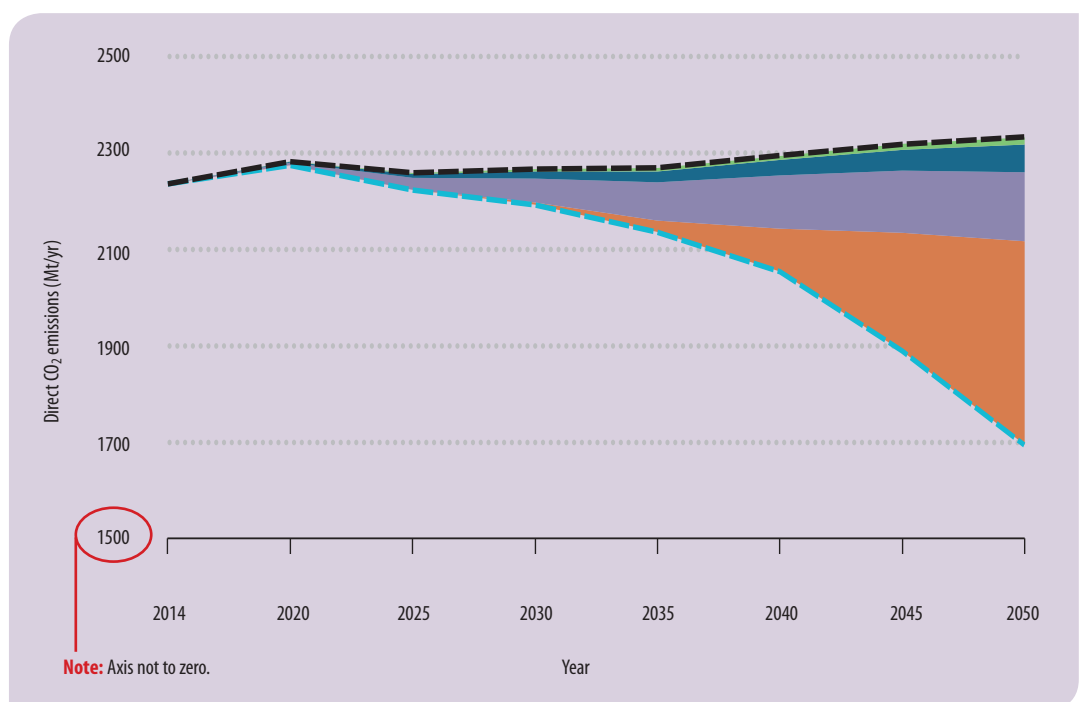
How cement works

When looking at how best to use SCMs and non-cementitious fillers, it is important to go back to basics and look at how cement actually works. The active ingredient is calcium silicate hydrate (C-S-H). It’s the glue that holds concrete together. Both the calcium oxide (C) and silica (S) need to be in a reactive form. Different SCMs and fillers bring different chemical elements to the cementitious mix. The traditional focus of SCMs has been to contribute either the C or the S. Slag and type C fly ash add calcium with some silica. They contribute to the formation of C-S-H and contribute to rapid initial hydraulic reactions. Low-calcium fly ash and clays such as metakaolin, are higher in silica, with some alumina. These materials contribute silica to the pozzolanic reactions. These are slower than hydraulic reactions and thus contribute primarily to later strength development.

Right - Figure 1: Global direct CO₂ emissions reductions between the reference technology scenario (RTS) and the 2°C scenario (2DS) by mitigation lever.

Source: CSI-IEA Technology Roadmap: Low-Carbon Transition in the Cement Industry, 2018.

- Reference Technology Scenario (RTS)
- Thermal energy efficiency (3%)
- Fuel switching (12%)
- Lower clinker ratio (37%)
- Innovation (inc. CO₂ capture) (48%)
- 2°C scenario (2DS)





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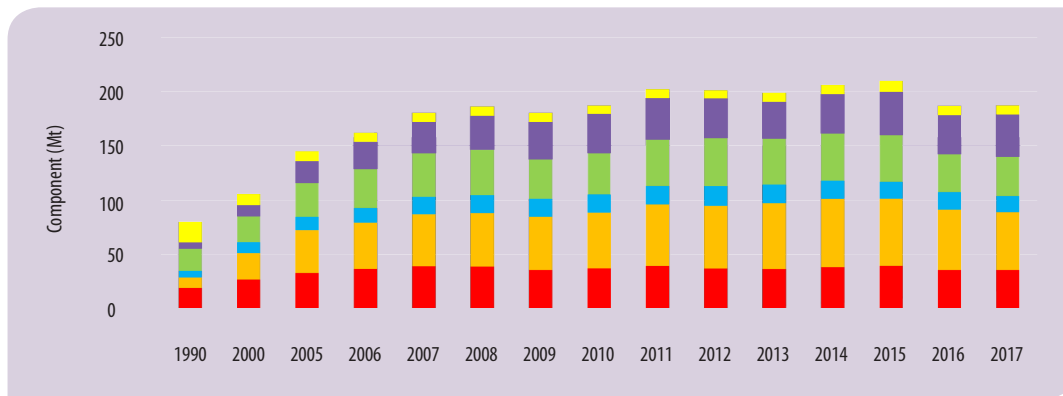
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Left- Figure 2: Prevalence of SCMs and other additives in cement over time.

Others
Fly ash
Slag
Pozzolana
Limestone
Gypsum

Source: The Global Cement & Concrete Association's Getting the Numbers Right (GNR) database - which combines data from self-selecting cement plants - shows that the overall proportion of clinker used was actually at its lowest in 2015 and has since risen. This is likely due to reductions in slag and fly ash supply. Limestone is the most utilised non clinker component, with slag and fly ash taking up around 40% between them.

Maximising SCMs in concrete

60-75% plus of the overall mass of a concrete mixture is aggregates. Water accounts for 15 -20% by mass, with cement / SCMs taking up to 15% and there are also some 5% air voids. At the end of setting the vast bulk of the cement and SCMs have become hydration products, primarily C-S-H, but there can also be a portion of unreacted cementitious material, plus excess water in capillary pores. This can happen even when the cement and SCM chemistry is optimal.

Optimising the particle size of clinker

So, how can we reduce the amount of unreacted cementitious material? We need to pay close attention to the particle size distribution of the ground clinker component, starting with the elimination of clinker particles with diameters greater than 30µm. Particles larger than 30µm will not react fully and thus do not add as much to the strength of concrete as an equivalent weight of smaller particles.

We also need to pay close attention to the very fine material less than 3µm. This material is very reactive, but it needs more water to cover the greater surface areas of these fine particles, thus driving up the water demand of the concrete. While some excess water is needed to separate the particles for flow, it is beneficial to have minimal water left once the reaction to form C-S-H is complete. The more excess water in the cementitious paste, the more voids there will be in the hardened concrete and thus lower strength.

So, both the unreacted, coarse and water hungry, fine clinker particles can reduce overall concrete strength, which is bad for both production costs and CO₂ emissions. Both can be replaced with SCMs and other materials.

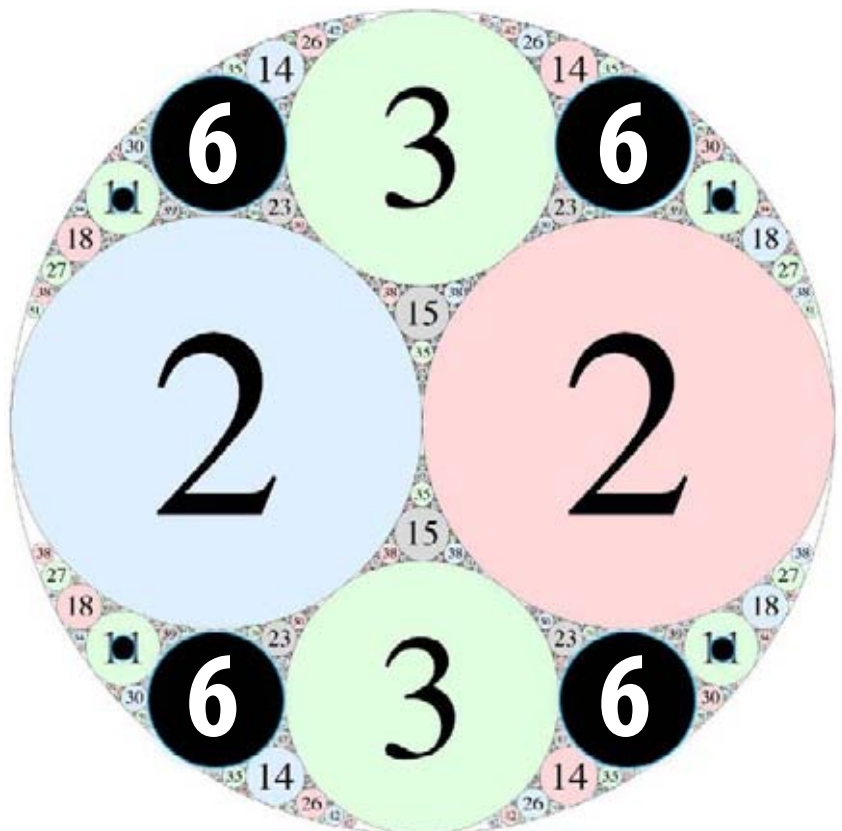
Optimising the particle packing density

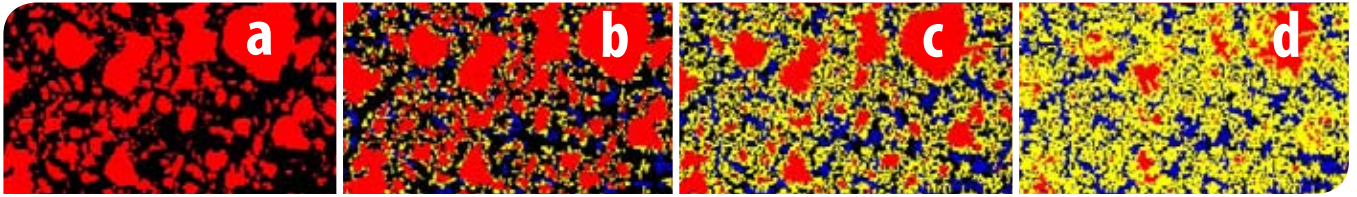
In concrete the largest particles are the aggregates, followed by sand and then cementitious materials. There is a gap between the coarsest cement particles (45µm) and the finest sand (150-200µm). We can visualise the inter-particle voids that must be filled by SCMs by looking at Figure 3. The number in each circle shows the ratio of its diameter to the outside

circle. Those labelled 2 would typically be fine aggregate and 3 would be sand. However, without optimisation there are no particles corresponding to those labelled 6. Without a fine aggregate to fill this gap, these spaces will be filled with the cementitious paste. There is no strength to be gained from doing this, as the concrete strength is determined by the thinnest layers between aggregates.

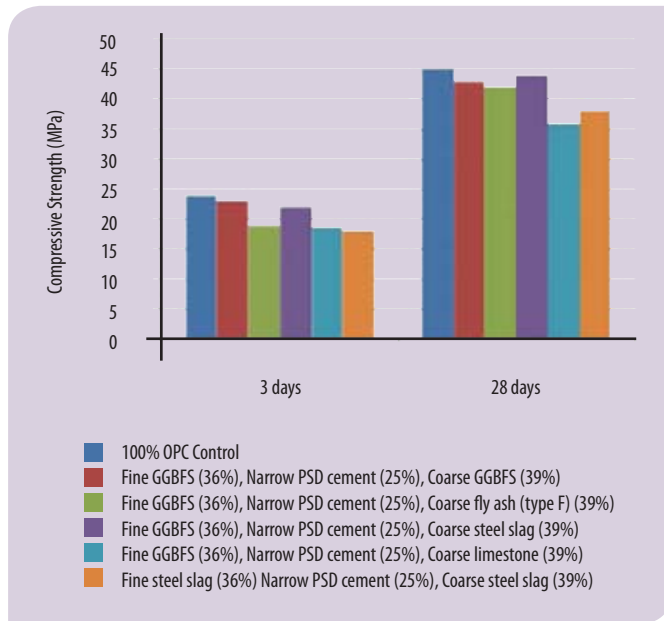
Also, if the circles labelled 11 are cement, at around 45µm in diameter, their centres will not react as shown by the black circles. Again, this is a waste of cement, as we will have to rely on smaller cement particles to hold everything together. An ideal situation would be to replace the particles labelled 6 and 11 with a fine aggregate material. By doing this it is possible to reduce the amount of cementitious paste needed.

Below- Figure 2: Ideal packing density, as defined by the Fuller Distribution. Number shown in circle is ratio of that circle's diameter to outer circle.



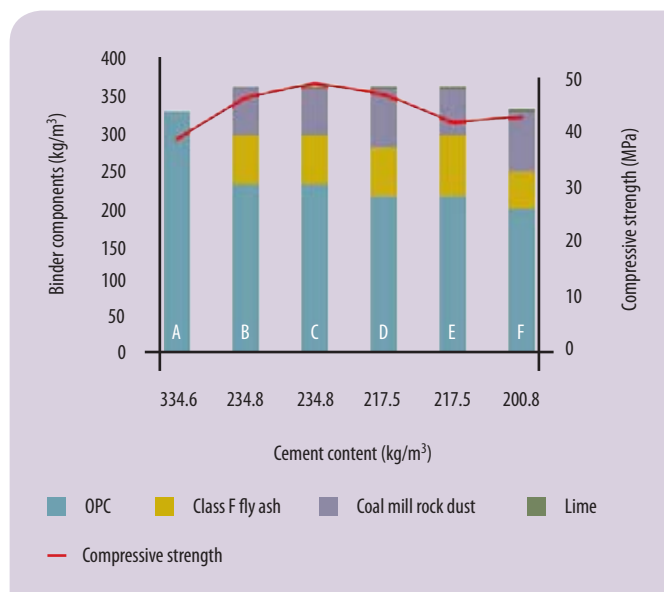


Above - Figure 4: Scanning electron microscopy images showing cement particles during hydration. Note that full hydration is not possible due to presence of oversized particles, the cores of which cannot react with the water. a = 0% hydrated; b = 20% hydrated; c = 50% hydrated; d = 87% hydrated. **Credit:** Bentz, D.P.; Coveney, P.V.; Garboczi, E.J.; Kley, M.F.; & Stutzman, P.E. Modelling and Simulation in Materials Science and Engineering 2, 783-808, 1994.

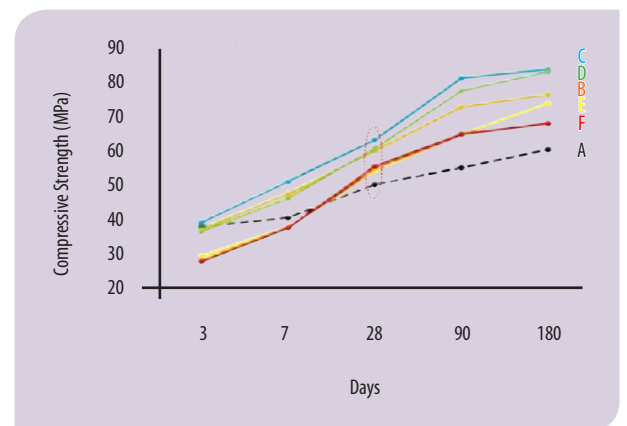


Above - Figure 5: Three and 28 day compressive strengths of mortar cubes containing fine and coarse SCMs and cement with a narrow PSD. **Source:** Maximizing SCM content of blended cements, Gynn & Kline, 2015.

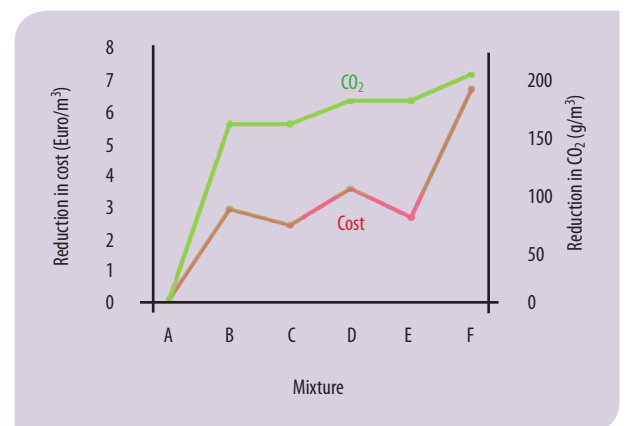
Below - Figure 6 & Right - Figure 7: 28 day compressive strengths of various low-cement concrete mixes and strength development to 180 days. **Source:** Roman Cement.



Research at South China University showed that we can achieve acceptable strength development with just 25% clinker in the cementitious mix (See Figure 5). In many cases it appears that the chemical contribution of the coarser SCM is of marginal importance compared to how it fits into the particle size matrix. This is highlighted by the fact that ground limestone acted as a fine aggregate and did not decrease mortar strength appreciably. Meanwhile, the company Roman Cement looked at using coarse fly ash, coal mine rock dust and lime in a number of blends. It was able to reduce the cement content per cubic metre of concrete dramatically (Figures 6 & 7). These mixes showed higher strength over 180 days than a normal cement, sand and aggregate mix, despite using as little as 60% pure cement in the mix, which translates through to cost savings and lower CO₂ emissions (Figure 8).



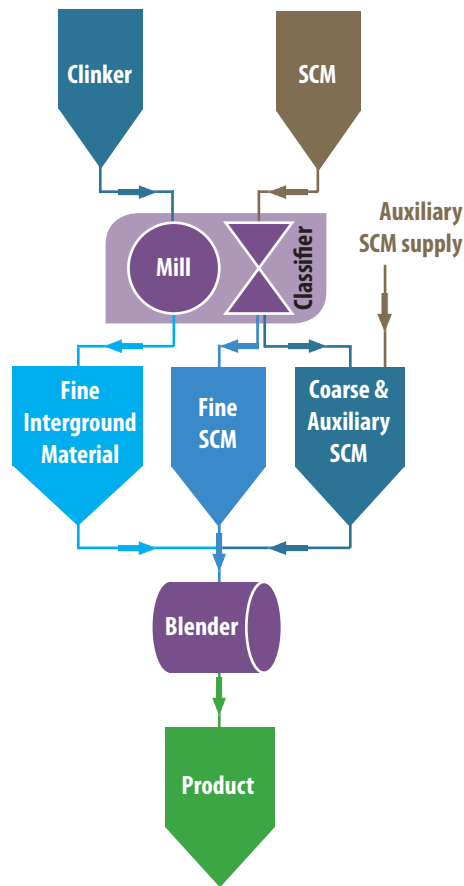
Below - Figure 8: Cost and CO₂ savings achieved using Roman Cement's various low-cement concrete mixtures. Letters correspond to those used in Figure 6 (left).



Separate grinding?

The reactivity of a cementitious material increases with fineness. However, at a given point the extra energy required to grind more finely negates the strength benefits. There exists a sweet spot for each material where the strength improvement versus grinding power is optimised. Crucially, these points do not often overlap for different materials. Therefore, if we seek a high particle packing density, grinding everything together in a single finish mill will not be the best approach. Another way would be to have clinker sent to the finish mill, with the SCM going directly to a classifier. This will enable the separation of a fine and coarse SCM to be mixed with a fine clinker. There is also the option to grind each material in a separate mill, with a blender after grinding to produce the optimum mixture. The possible combinations are endless. Indeed, one cement producer has even added a portion of its raw mix to the finished cement blend because it matched the particle size distribution needed for good packing density. It brought good results and was very inexpensive to do. It is important to understand that the coarser material ($>30\text{ }\mu\text{m}$) is mostly an aggregate that is filling voids in the concrete and does not need to be reactive.

Once any such system is optimised, clinker may become the minor component in the cementitious mix. This may require a new approach to quality control. It could be possible to control this process using the new PGNAA airslide analyser and



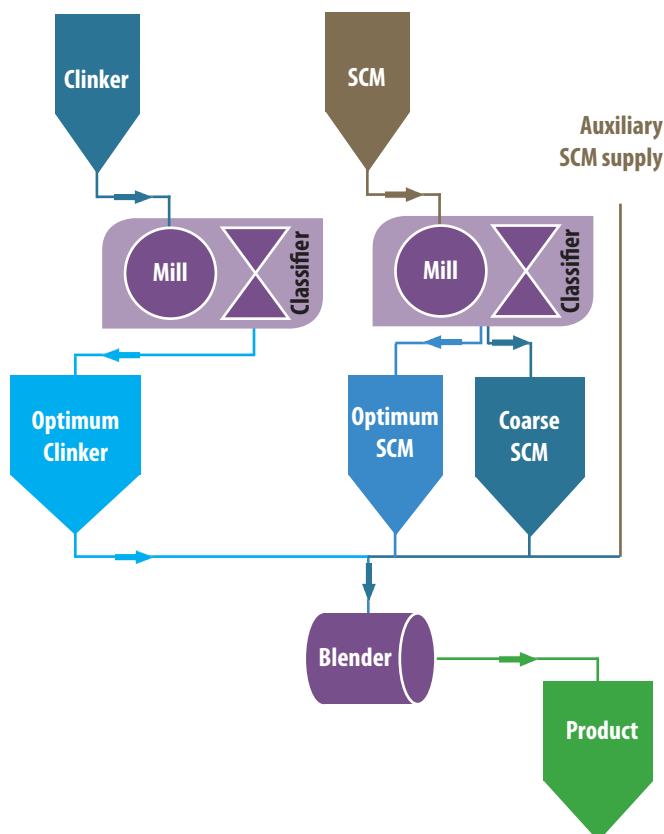
Left - Figure 9: Schematic for a system with greater control over cement and SCM particle size distribution based on interground clinker and SCM material, plus additional fine, coarse and auxiliary SCM feeds.

continuous particle size analyser to ensure the right chemistry and particle size distribution of the blended materials.

Conclusion

Reducing the amount of clinker in cement and concrete mixtures represents a low-cost and relatively low-research option to lower overall CO₂ emissions, compared to other technologies. Just by looking at the fundamentals of the reactive particle sizes and packing density allows us to reduce clinker in cement use to levels far below the 60% target given by the CSI 2DS. This may, however, require a far more analytical approach to the grinding and blending of the final cementitious mixtures, with the same level of precision required on the finish side as we currently have on the raw feed side.

Left - Figure 10: Schematic for a system with greater control over cement and SCM particle size distribution based on separate grinding of clinker and SCM materials, plus additional auxiliary SCM feed.





Lukas Steiner, Wikov Industry, with interview by Peter Edwards, Global Cement Magazine

Refurbishment pays off: Gear renovation with Wikov

The question of whether to invest in new, used or refurbished equipment accompanies us throughout both our private and professional lives. Everyone knows what 'new' and 'used' mean, but 'refurbished' can be trickier to define. 'Refurbished' can mean different things depending on where you buy and the calibre of the chosen supplier, so it's important to perform appropriate due diligence before shelling out your hard-earned cash. The term 'refurbished' can also be a synonym for 'low-cost' and, to a certain extent, it is. It is a low cost way to achieve equal performance as offered by a brand new installation, including for gears in the cement sector.

The increasingly clear effects of global warming has caused many of us to focus on our individual consumption and protection of the environment. By doing so, many have discovered that it is not always necessary to spend and consume more but rather to seek ways to make use of old things, while also spending less money. The recent situation with Covid-19 only helps to accelerate changes in our way of thinking, towards refurbishment.

However, different suppliers will define 'refurbishment' in different ways. As a well-recognised manufacturer of gearboxes for the cement sector,

Wikov would first of all suggest that clients seek out suppliers that have a detailed understanding of the manufacturing process from A to Z. Designing gearboxes and providing service to the equipment is a good prerequisite for repairing existing equipment.

Indeed, the refurbishment of used and obsolete gearboxes at Wikov has a long tradition and it became one of the key product lines within the company. Its refurbishment centre is within its Pilsen factory in the Czech Republic, close to the German border. Although repairs of gearboxes from various industrial applications are carried out, repairs of large gearboxes from cement applications are more frequent. Wikov performs repairs of any gearbox type, helical, bevel-helical, planetary or side drives. The majority of the gearboxes received for a repair or upgrade from the cement sector are drives for vertical mills or side drives for ball mills and kilns.

Right: Wikov always seeks to reuse parts where possible. The images show a single stage parallel shaft gearbox for a ball mill drive for which Wikov found a solution to reuse a worn-out double gearing wheel. This saved costs for the customer, which would normally have had to invest in a new gear.



Refurbishment in real life

After receipt at the Pilsen workshop, the gearbox to be renovated is stripped and visually inspected for completeness or missing parts by Wikov's eight member team. This typically takes 1-2 weeks. The inspection report defines the parts that will be reused and those that must be replaced or further processed through production.

After accepting the offer by the customer and receipt of their order, Wikov orders materials, bearings and other parts that have long delivery times. Before these are received, it performs reverse engineering for parts that must be replaced. This makes use of the waiting time for reverse-engineering and reduces the delivery time of the refurbished gearbox to the end user.

When the materials arrive, the team starts production, which normally lasts about three months. During this time, all cleaning of the gearbox parts and the necessary repairs will be carried out.

After all manufactured, repaired and purchased parts are reassembled, the equipment is tested and preparation for shipment can begin.

Special attention is paid to the gears, the most important components of a gearbox. Even if a visual check of a gear is satisfactory Wikov will perform non-destructive tests (NDT), mostly by magnetic particle inspections (MPI). If the test confirms that the gear is in acceptable condition, it will be reused. If a repair is required and feasible, Wikov will always repair it to maintain cost effectiveness. Cleaning is an integrated part of the process for every gearbox. After assembly the refurbished gearbox is checked for quality by means of final testing. The holistic approach to gearbox refurbishment, deeply rooted in Wikov's large gearbox expertise, sets it apart from general engineering firms that may offer such services.

In discussion: Peter Matejka, Head of Gear Refurbishment

Peter Matejka has been Head of the Refurbishment Department at Wikov since 2019. Prior to this he joined the company as a design engineer for seven years. He earlier worked with Wikov during his university studies.

Global Cement (GC): How important are drive / gear renovations in the cement sector compared to other sectors you serve?

Peter Matejka (PM): Refurbishments for end-users in the cement industry are one of our most important sectors, because in most cases these are huge gearboxes of up to 50t. We specialise in these and have the relevant cranes, machine tools, know-how, especially



the research and development department and production, all under one roof.

GC: What are most common drive / gear failures and how can plants avoid them?

PM: In most cases we see regular operational wear after many years of operation. This includes gears that are damaged by pitting, worn-out bearings, etc. In many cases, however, the gearboxes show signs of unsuitable construction, when the gearbox is not sufficiently dimensioned for its application and operation conditions in the real world. This means that it cannot handle large shocks and other disturbances, resulting in broken teeth, for example. Other times, there are obvious signs of overloading of the gearbox by the end-user. Avoiding these errors is quite simple. It is about providing detailed and sufficient input information to the supplier of a new gearbox or refurbishment services. A selection of the gearbox supplier plays an important role in the life of the gearbox too. There should be no need to mention that following and keeping the operating manuals is essential for long trouble-free operation.

GC: How do you proceed when one or more components of the gearbox delivered for refurbishment are actually missing?

PM: It depends on the particular case but we can usually find a solution. If only one part is missing, Wikov will design a new part based on the parameters of its counterpart(s). Should more parts be missing, the design department becomes involved. In such cases, customer cooperation is essential to provide operation parameters for the drive. This will ensure that the missing parts can be replaced with parts that are capable of performing as the client requires.

Above: A 2100kW vertical roller mill gearbox for an overseas customer after an overhaul at Wikov's factory in Pilsen.



Above: Nevzat Oezcan, General Manager Flender Customer Service (left) and Antonín Růžička, Managing Director of Wikov (right) after signing the contract of cooperation in 2019.

GC: In which regions are cement sector gear retrofits most common at present?

PM: For our company it is the Middle East, Russia, Northern Africa and Mexico, as well as other markets. This is most likely because cement plants in these markets already have positive experience with our brand. Don't forget that Wikov, formerly Škoda, was well established in many 'eastern' regions and developing markets in the past. However, refurbishment applies to any cement plant in any country because it is cost efficient or, in the case of breakdown, a fast way to get equipment back up and running.

GC: Product warranty is important to any customer. It can be a powerful argument in favour of new equipment. What is Wikov's response?

PM: Wikov provides a warranty for all of the items that are a part of the repair, mainly parts and labour. Where we see a critical point is the *installation* of the gearbox once it is refurbished. Incorrect gearbox alignment leads to failures further down the line. Therefore, we recommend that customers install and commission the gearbox with the assistance of Wikov's engineers to ensure smooth operation of their equipment.

GC: What differentiates a Wikov refurbishment from those of other companies?

PM: Firstly, we aim to satisfy our customers through our individual approach and finding a solution that brings them savings. This is not a mere proclamation, it is our mindset. For example, if there is a part that is only partly worn, other suppliers may simply make a new one. However, we will always look for ways to utilise it. This saves money for the customer, while of course maintaining the necessary mechanical properties of the part for reliable operation.

Secondly, we are not afraid of repairing or upgrading gearboxes from other brands and provide warranty for such repairs. Final testing of a refurbished gearbox is automatically included in

the production process. Third, Wikov is used to customising its own gearboxes for individual clients. This means we rarely reject enquiries. Fourth, Wikov has a strong background as a manufacturer of gearboxes, with complete machine tools, know-how, designing capability, test benches and so forth.

GC: What are the cost benefits of upgrading, as compared to buying new components?

PM: If it is repairable or usable, we do not replace it with a new part, but we professionally repair it or remanufacture it. In case of large diameter gears or pinions we can save tens of thousands of Euros for our customers. For example, we recently refurbished a single-stage parallel shaft gearbox with a double gearing for a horizontal ball mill drive. During the gearbox inspection, we found out that a large gear wheel ($\varnothing = 2500\text{mm}$) had extensive pitting on the meshing side of the toothing. This could no longer be repaired, as the defects were so deep that they cannot be removed by grinding. The customer did not want to invest in a brand new gear wheel. So we decided to turn the gear, which, while maintaining the same direction of rotation, brought the other, undamaged, side of the gear into mesh. We measured the gear and made a new pinion for it exactly to the required dimensions.

GC: Since 2019, Wikov has a partnership with Flender for multi-brand gearbox refurbishment. What does it mean in practice?

PM: Flender is a very well established gearbox brand with a global presence and large customer portfolio. Wikov has decent experience with customised gearbox design, repairs including reverse-engineering of other brand gearboxes, plus available capacity. The advantages of both brands have been combined to repair any other brand's gearboxes.

GC: How has the coronavirus pandemic changed how you operate? Is there more focus on renovations due to a lack of capex?

PM: Several previously-agreed projects have been cancelled or postponed by our customers due to the Covid-19 situation but it will not affect us so much during 2020. We will wait to see what 2021 brings. Due to a lack of capital and a certain reticence in the sector to invest in new machines, we expect that there will be a greater demand for repairs in 2021. From this point of view my department may benefit from this 'crisis'.

GC: Thank you for your time.

PM: You are very welcome.



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Interview by Peter Edwards, Global Cement Magazine

In discussion: Thomas Kristensen, Plant Supervision

We speak with one of the founders of Plant Supervision, a consultant that is disrupting the process of installing and commissioning equipment in the cement sector...

Global Cement (GC): Please could you introduce Plant Supervision and what it does?

Thomas Kristensen (TK): Plant Supervision is a Danish consulting company that specialises in supplying site supervisors for the installation and commissioning of cement plant equipment on behalf of OEM suppliers. The company was established in 2011. It provides its clients with site supervisors that can install and commission equipment using only the client's drawings.

While on site and travelling they act on behalf of the OEM, which pays Plant Supervision for their service and time. When the site engineer is not at or travelling to / from the site, Plant Supervision takes care of them. For the OEM, this transfers a former fixed cost that was relatively high into a lower variable cost. There is no need to hire and then lay-off people as the business cycles come and go. This has been particularly useful to our clients during the coronavirus crisis.

GC: For what reasons would an OEM use Plant Supervision?

TK: There are different reasons for different clients. Some only use us in peak periods, when their own pool of supervisors cannot satisfy demand. Some use us to avoid fixed costs and, instead, allocate all supervisor costs directly to specific projects. Some will use our experience of working in difficult regions. For example, we have worked on their behalf at cement plants in Yemen, Libya and Syria, where our clients have difficulties sending their own people.

This is all part of what we call our 'turnkey supervisor' approach. We will arrange flights, accommodation, visas and local transport – at cost price. This dramatically lowers the administrative burden for the client.

GC: What prompted you to set up the company?

TK: The founders have a combined 45 years of experience working for FLSmidth. When we set up



the company we had to decide if we would work for the cement producers or equipment suppliers, but the choice came rather naturally. Plant Supervision only works for the OEM. Otherwise, we would be in competition with the segment most in need of our services.

Plant Supervision founders and management in Denmark and India are all former site supervisors/managers. We noticed over the years that certain competences could be difficult to find internally, as the pool of available supervisors was always kept at a minimum to save salary cost. It became natural to think, "What if a company had a pool of staff that could cover the gaps that naturally occur?"

By growing a large network of OEMs, the freelancers could approach us as we had the network with the jobs. The OEMs would over time, approach us as well, as we have the network of supervisors.

GC: How did the company grow?

TK: The first year was a mix of approaching clients and ensuring jobs for the supervisors we already had within our network. We trusted that we had a business model that worked.

While our first clients were German, we now service a large variety of equipment suppliers within

Right: Plant Supervision's Danish team. Left to right: John Anderson (Managing Partner), Jacob Petersen (Project Director) and Thomas Kristensen (Managing Director).



the cement industry. We have clients in Italy, France, the UK, Austria, Denmark and elsewhere. Nowadays we have a network of more than 50 site supervisors constantly travelling the world for our European clients. Around 25 of them are of European nationality, the rest from India and the Philippines. When the supervisors are on site for our clients, they are dressed in the client's uniform and represent the client only.

In the beginning, we supplied a few mechanical supervisors but the portfolio of supervisors has since expanded to cover from civil to mechanical, electrical, programming and process.



GC: Where do you source your engineers from? Are they on a payroll, contractors themselves or a mixture?

TK: We source them from our many years of networking in the industry. In the beginning, we had network from our own on-site careers. Today we often source via co-workers. Some are freelancers and some are on a fixed payroll.

GC: Can you think of a disadvantage of the Plant Supervision approach?

TK: Obviously, the knowledge surrounding each project is not retained directly within Plant Supervision. When a supervisor is finished, they leave for another project. It is up to our client and the supervisor to hand over gained knowledge when the project concludes. We do, however, encourage this by having our supervisors write weekly reports.

GC: Which world regions are your clients most active in at the moment?

TK: Most cement plants are built in the developing world and that is also where local competences are mostly under development and need external support. We also expect to see a rising market in areas where ordinary companies hesitate to go for corporate social responsibility reasons.

GC: How has the Covid-19 pandemic changed demand for your services and the types of request received?

TK: Overall, we have the same number of requests for our service as before the virus hit, but it is obviously more complicated to allocate supervisors internationally due to the travel restrictions and expensive quarantines. Due to the severe travel re-

strictions during the outbreak, we have been asked to find supervisors already within the country where the project is located. This has expanded our network locally in many countries and we have managed to find the skills required.

For those supervisors that are still travelling internationally, we are using significantly more time investigating travel options, given the number of restrictions in place at present. Travel is still possible, highlighted by the fact that we have recently sent European supervisors to projects in Rwanda, Burkina Faso and Chile. The procedure is more demanding as airlines and countries now demand a recent negative Covid-19 test and, in many cases, a work permit. Before Covid-19 we could often send supervisors to short term jobs on business visas only.

GC: What areas of the cement plant has Plant Supervision worked on mostly so far?

TK: We have supervisors who are specialised in all areas of the plant, from the quarry, to raw meal preparation, homogenisation, pyro-processing, coolers, grinding, dispatch and more. What motivates us is being a part of the project and helping our customers fill gaps in their workforce. In this respect, we jump when we're asked to. All areas of a cement plant offer interesting challenges and we are ready to meet all of them.

GC: What part(s) of the plant will OEMs want more assistance with in the future?

TK: We believe there will be a greater need to supply individual specialists from our side. For example, engineers who can do a hot kiln alignment but only have 7-8 months of travel a year. In such cases, it could benefit the OEM to hire the engineer through Plant Supervision and have the cost, as we invoice per

Above: Plant Supervision allows simplicity and flexibility for its OEM clients in the complex world of cement plant projects.



Above: Plant Supervision's supervisors are all experienced in the cement sector, with a range of areas of expertise.

calendar day, allocated directly on the project. We have seen many examples of our customers asking to hire a specialist and who they then rehire through us. A sale and lease back model.

GC: Do clients like to keep Plant Supervision's involvement in a project 'on the downlow' or are they up front with their cement customer clients?

TK: Plant Supervision and its supervisors work loyally for the client when on a project. It is up to the client if they let the end user know that Plant Supervision is involved. Plant Supervision's administration team is never technically involved in the project, only helping the supervisor to do their job in terms of flights, accommodation and so forth, as I mentioned earlier.

GC: What does Plant Supervision do that a general plant contractor cannot do?

TK: While other consultancies like Plant Supervision exist, Plant Supervision is the only such company that works exclusively for the cement sector.

All of the founders have strong cement backgrounds within construction and commissioning. We know the challenges of being on site. We have large networks from our own site careers, so, when we send a supervisor on site, we know them.

GC: Don't general plant supervisors from other sectors, for example steel or oil and gas, have the ability to help the cement sector?

TK: No, because the cement industry has a lot of rotating equipment that demands specific experience. We don't see much rotation in steel / oil and gas so the equipment is very different. This is the reason that Plant Supervision only works with experienced supervisors who have a background and long

experience within cement. This is also a demand from our clients.

GC: Cement plant projects can already be laden with clients, general contractors, sub-contractors, etc... What are some of the most complicated projects your supervisors have worked on?

TK: Almost every project is complicated, but in a different way to all the others. It's a part of the job! A common challenge is when a contractor jeopardises quality for a quick finish, where our supervisor's job is to ensure long lasting quality.

GC: How does Plant Supervision avoid conflicts of interest and industrial espionage?

TK: We are very happy to sign a Non-Disclosure Agreement (NDA) with the client. Indeed this is part of our standard framework agreement. We have never seen examples of espionage among our employees. We do not think it is an issue within cement when it comes to construction and start up. Furthermore we have an NDA in all of our employment contracts with our supervisors. We believe the big secrets are in the design centres, not on the construction and start up side.

GC: Has Plant Supervision ever branched outside of the cement sector?

TK: We have worked outside of the cement sector, but mainly when customers contact us. Allied fields we have worked in include lime kilns, which can be part of wider steel or pulp and paper plants. We have participated in captive power plants when used for cement production. However, our knowledge is best in cement and when our clients call to discuss a project we can discuss on the client's level.

GC: How / when do you think the global economy will recover post Covid-19 and what does that mean for your business?

TK: We trust that we will have a bull market for the next 15 years, starting from whenever we have a vaccine for Covid-19 or governments recognise that the virus is 'the new normal' and lighten travel restrictions. In the future, we believe the labour market will be more flexible and a freelance culture working under the umbrella of a service provider like Plant Supervision will be widely used. The model of using flexible freelancers is already seen within IT and consultancy in many industries.

GC: Thank you for your time today.

TK: Thank you too!





Chris Landers, Jeff Shelton & Marina Silva, Integrated Global Services (IGS)

Technology catches up to air cannons

Air cannons have been used for many years to solve blockages and build-up issues within cement plants, be it in the cooler, preheater towers, cyclones or burner pipes: Snowmen, Christmas trees and rhino horns can be easily removed with a sudden blast of air. However, the design for releasing this powerful blast has remained virtually unchanged since the early 1970s. Until now...

IGS, headquartered in Virginia, US, blasted onto the air cannon market in 2011 with a goal to introduce new and improved approaches to cleaning build-ups within cement plants. Its Big Blue Air Cannons have introduced innovative designs that address the need for better cleaning solutions. The company's recent patent-pending innovations offer: improved production levels; reduction of unscheduled downtime; reduced maintenance and air requirements; no need for high-pressure water washing; improved refractory life and; increased accessibility for maintenance.

Adjustable Force Air Cannon

Jeff Shelton, the creative mind behind IGS Environmental, says, "Right now, all air cannons have one thing in common. They blast each time at 100% of their capability, regardless of the power that is actually needed for optimum cleaning. Too high a force and you clean only the area of the air blast. This leads to 'swiss cheese' build-up, which is not what the plant needs. Striking this build-up with a lower force results in knocking it down in chunks and doubling the cleaning area, a much more favourable result."

IGS has introduced the Adjustable Force Air Cannon, the only cannon that is designed to vary its cleaning force for the best possible cleaning outcome. The key is to design an air cannon with a significant increase in cleaning force, enough so that the maximum cleaning force is not always required. Cleaning is possible with only 25% of the installed force.

MEGA Blast

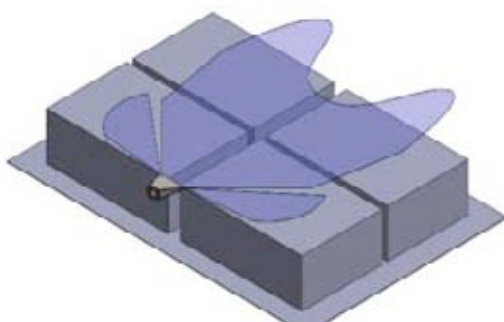
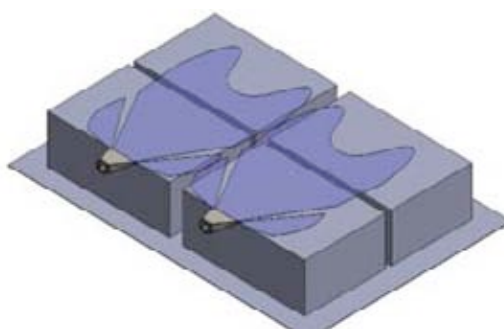
Cement plant process changes will affect the amount, type and properties of build-up, which will affect air cannon performance. Sometimes the build-up may become too difficult for the air cannon to handle or the air cannon will be out of service. This may allow the build-up to become too large or too strongly attached for the air cannon blast. "This is why IGS has developed the MEGA Blast," explains Shelton. "We have discovered the path to increasing the cleaning effectiveness of air cannon blasts by up to five times, using a simple and safe method. Regular air cannons

can control the build-up on a daily basis, but when trouble needs to be controlled, call in the MEGA Blast. It will blast away the toughest blockage in less than an hour."

The MEGA Blast has recently been tested side-by-side with a standard air cannon, where it was shown to be more than five times as effective. It can thus eliminate unscheduled plant stops and the need for high-pressure water blasting, with associated labour cost savings and safety benefits.

Monster Nozzle

The Monster Nozzle is designed to be operated with the Biggest of the Big Blue Cannon and will clean a greater area than two industry standard fan jet nozzles. The Monster Nozzle, when applied with the IGS Multiplier, can replace as many as eight air cannons and nozzles with only one cannon and four nozzles. The total cost is almost 50% lower, but with improved performance.



Left: Effective cleaning area of two standard air fan jet nozzles (above) and the Monster Nozzle (below).



Brad Pronschinske, Martin Engineering

Go with the flow: Preventing accumulation in cement production

Efficient material flow is a critical element of cement manufacturing, as accumulation or blockages can reduce profitability. Hang-ups in storage systems and build-up in process vessels can impede material movement and cause bottlenecks that interfere with equipment performance and reduce process efficiency. Poor material flow also raises maintenance expenses, diverting manpower from core activities and in some cases introducing safety risks for personnel. There are a number of ways to avoid these pitfalls...

Opposite: Air cannons can help prevent accumulation, while minimising the need for downtime and manual labour.
Source: Martin Engineering, 2020. ©

Even well-designed cement plants can experience accumulation of material, which can have a significant impact on output and profitability. Changes in process conditions, raw materials and even the weather can affect material flow. Even small amounts of accumulation can grow into a serious blockage.

Build-up can occur in many places and in several forms, with varying amounts of moisture. It can be found as dry material that clings to the walls of the pre-heater towers, or to selective catalytic reduction (SCR) units and vessels. Accumulation often appears in riser ducts, feed pipes, cyclones, transfer chutes and storage bins, as well as kilns and coolers. In extreme cases, massive build-ups can suddenly break loose and suffocate the process, potentially causing significant damage to equipment.

Lost production is probably the most conspicuous cost of these flow problems, but the expense can become apparent in a variety of other ways. Shutdowns cost in terms of downtime and maintenance and restarting the plant wastes energy. Refractory walls can be worn or damaged by tools or cleaning techniques. When access is difficult, removing material blockages also introduces safety risks. Scaffolds or ladders might be needed and staff risk exposure to hot debris, dust or gases when chunks of material are released.

Many of the most common problem areas for accumulation are classified as confined spaces, requiring a special

permit for workers to enter and perform work. The consequences of inexperienced or even untrained staff entering a silo or hopper can be disastrous, including physical injury, burial and asphyxiation. If disrupted, material adhered to the sides of the vessel can suddenly break loose and fall on a worker. If the discharge door is open, material may suddenly evacuate, causing unsecured workers to get caught in the flow. Cleaning vessels that contain combustible dust, without proper testing, ventilation and safety measures, could even result in a deadly explosion.

Some larger facilities choose to purchase their own equipment to clean process equipment and storage vessels, as well as train their personnel, while others find it more appropriate to schedule regular cleanings by specially-trained contractors, which, for smaller plants, can often be accomplished for less than the total investment of in-house cleanouts.

At one plant, for example, there was a silo blockage so severe that it had been out of use for several years. While it took the outside contractor almost two weeks to fully evacuate the vessel, the process restored 3500t of 'live' storage capacity. At another facility, a crew was able to remove enough 'lost' product that the value of the recovered material actually paid for the cost of the cleaning. In short, regular cleaning of storage vessels can quickly turn into an economic benefit, not an expense. It is an investment with a measurable ROI.



Right: Safe, effective cleaning requires tools that work inside the silo from the top, controlled by personnel outside.
Source: Martin Engineering, 2020. ©

Seeking solutions

There are a few types of equipment used for this purpose. One operates like an industrial-strength weed whip or trimmer, a rotating a set of flails that strike the material. This approach eliminates the need for confined space entry and hazardous cleaning techniques, typically allowing the material to be recaptured and returned to the process stream.

Technicians lower the device all the way down through the topside opening, then start at the bottom of the buildup and work their way up, undercutting the wall accumulation as it falls by its own weight. In extreme cases, a more extreme 'bin drill' can be used to clear a 30cm pathway as deep as 45m in order to begin the cleaning process.



Flow aids

Flow aids can reduce or even eliminate the need for cleaning. One method is through industrial vibrators designed for bin and chute applications. Electric vibrators are generally the most efficient and deliver the longest life, lowest maintenance and lowest noise. The initial cost for an electric vibrator is higher than for pneumatic designs, but the operating cost is lower. Turbine vibrators are the most efficient and quietest of the pneumatic designs, making them well suited to applications in which low noise, high efficiency and low initial cost are desired.

Air cannons are another approach to maintaining good material flow, particularly in larger vessels. Air cannon technology has been used in cement manufacturing for nearly 50 years, helping to improve material flow and reduce maintenance. The timed discharge of a directed air blast can prevent accumulation or blockage. By facilitating flow and minimising build-up, air cannons help bulk material handlers minimise the need for process interruptions and manual labour.

The two basic components of an air cannon are a fast-acting, high-flow valve and a pressure vessel (tank). The device performs work when compressed air (or some other inert gas) in the tank is suddenly released by the valve and directed through a nozzle, which is strategically positioned in the tower, duct, cyclone or other location. Often installed in a series and precisely sequenced for maximum effect, the network can be timed to best suit individual process conditions or material characteristics.



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US: Cemex supplies world's busiest airport

Cemex has supplied 15,000t of cement to the Hartsfield-Jackson Airport in Atlanta, Georgia, for the construction of a 3770m runway and taxiway by McCarthy Improvement Company. Replacing an existing runway, the new runway is the longest at Hartsfield-Jackson, the world's busiest airport.

Cemex USA president Jaime Muguero said, "Infrastructure in the US needs improvements and updates so that Americans can remain connected and get where they need to go quickly, safely and efficiently. At Cemex, we are proud to securely support essential infrastructure projects that help achieve those goals and provide products that will enhance the experiences of travellers for years to come."

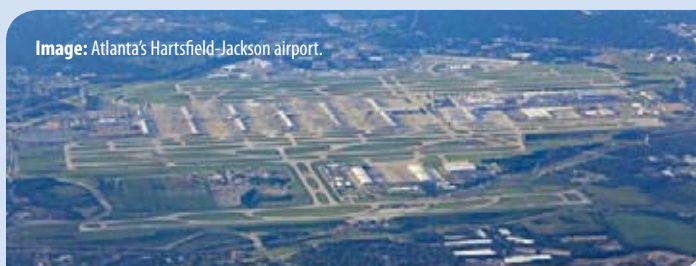


Image: Atlanta's Hartsfield-Jackson airport.



Mexico: Cemex supplies 10,000 car garage

Cemex says that 70,000t of its concrete has been used in the construction of Park Garage, a 10,000 vehicle-capacity multi-storey car park in Heroica Veracruz, Veracruz State. The company used a 500m³/day Vince Hagan batching plant and 12 mixing trucks to distribute concrete throughout the complex.

Cemex's regional president for Mexico Ricardo Naya said, "We supplied specialised high-resistance concrete to counteract the severe salinity conditions that prevail due to the edifice's proximity to the sea. Park Garage is yet another example of our ability to offer the highest quality products and services designed to meet our customers' most demanding requirements."

Philippines: Waste ash concrete for Aboitiz

Aboitiz Group food and agriculture subsidiary Pilimico Foods says that it has developed a waste ash-based concrete mix that contains 20% less cement than its previous mix and that 'can be used for all of the company's construction needs.' The Manila Bulletin newspaper has reported that the ash is sourced from burnt rice husks, a fuel source for Pilimico's food production and itself a by-product of its operations.

Central Maintenance Department mechanical supervisor Michael Cayabyab said, "When we started using our biomass boiler almost two years ago, we saw process improvements and reduced costs. But in Pilimico, we know that the challenge does not stop there." The company has yet to commercialise the concrete, however it hopes to inspire others with its 'demonstration of the circular economy demolishing the divide between industries.'



US: Plant explosion

A container at the Jobe Materials concrete plant in El Paso, Texas exploded early on 9 August 2020, causing damage to communication wires at the plant. KVIA News has reported that there were no injuries, nor any damage to buildings, resulting from the explosion. Fire services are investigating the cause of the incident.

Australia: New CEO for SmartCrete

The SmartCrete Cooperative Research Centre (CRC) has appointed Warren South as its incoming CEO. He will join the cement and concrete research organisation in mid-September 2020 and lead the consolidation of its central services function, initially supporting the 'Fast Start' and Round 1 research projects. South joins the SmartCrete CRC following nine years as Director – Research and Technical Services with Cement Concrete and Aggregates Australia (CCAA).

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Germany: ThyssenKrupp launches HPGR Pro

ThyssenKrupp has announced the launch of the HPGR Pro, a high-pressure grinding roll for raw materials processing that it says "offers up to 20% more throughput, 15% lower energy consumption and 30% longer-lasting rollers" than previous models.

HPGR global product manager Frank Schroers said, "We used our experience, and what we learned from conversations with customers, to introduce improvements that are unique in this market and make grinding much easier." Laser monitoring keeps users constantly informed about the roller surface and helps predict the best possible time for roller replacement. "Our customers need no longer stop the machine as a precautionary measure, saving them valuable time. What's more, as our specialists collect and process machine data, our customers can continually improve their HPGR's operation and optimise throughput, energy consumption or machine availability in line with their specific targets," added Schroers.



India: Solar panel cement board patented

Sustainable roofing specialist Visaka Industries has acquired a 20-year patent for production of ATUM, a roofing system consisting of cement boards with integrated solar panels. The company says that the product, which has been in development since 2016, is both insulative and capable of generating up to 28W/m² of power.



Russia: FLSmidth to align hot kilns

Teploozorsky Cement has engaged FLSmidth to complete two hot kiln alignments at its integrated Teploozorsky Cement plant in Oblu, Khabarovsk Krai following inspections. Teploozorsky's parent company Vostokcement said that the plant's second and third rotary kilns will need to undergo the process of adjustments to their axis and axial balance, in order to eliminate stresses within the kiln body.

India: Mangalam completes WHR project

Mangalam Cement has fully commissioned an 11MW waste heat recovery (WHR) unit at its integrated Morak plant in Rajasthan. About half of the capacity of the unit was previously commissioned in January 2020. Completion of the remaining portion was delayed from early 2020 due to the coronavirus outbreak.

Pakistan: Schneider to electrify Hub plant

Schneider Electric will provide a 'comprehensive electrification solution' to improve the efficiency and sustainability of cement production at DG Khan Cement's 3.2Mt/yr integrated Hub cement plant in Karachi, Balochistan. The Nation Newspaper has reported that the supplier's ECOStruxure product will give operators 'a full view of energy use across the plant,' according to the company. Additionally, "artificial intelligence (AI)-powered software will help the company to take a predictive approach to maintenance," it said.

Hub cement plant general manager Arif Bashir said, "Our goal is to monitor and manage power across our infrastructure efficiently, find electrical faults sooner, fix issues quicker and achieve a faster return on investment. Schneider Electric's energy efficiency solutions will improve our performance."

India: JK rebrands white cement as WhitemaxX

JK Cement says that it will sell its white cement, formerly JK White Cement, under the new name 'WhitemaxX.' This reportedly 'strengthens JK Cement's core commitment to delivering the maximum to its consumers and partners with a focus on consistent and premium product quality.'

JK Cement is the world's third largest white cement producer. It exports WhiteMaxX to 43 countries.



AUMUND Group

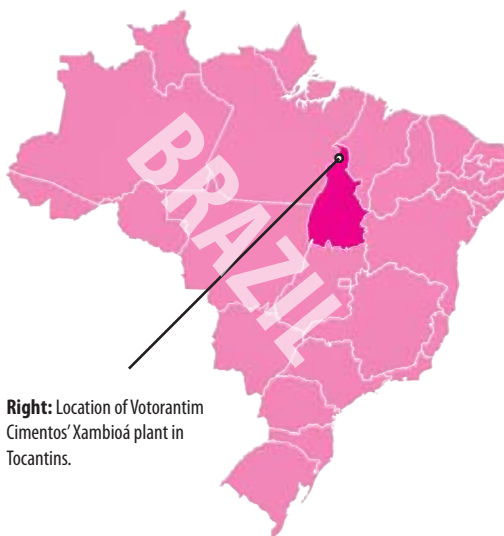
Reducing dust at a Brazilian cement plant

The conversion or replacement of existing AUMUND conveying equipment, as well as non-AUMUND equipment, has been an integral part of the technological expertise of the AUMUND Group for more than 30 years. The largest Brazilian cement producer, Votorantim Cimentos, has repeatedly placed its trust in this specialised know-how, including recently at its Xambioá plant in Tocantins, Brazil.

Votorantim Cimentos recently awarded a contract to AUMUND Ltda, based in São Paulo, Brazil, for the replacement of a pan conveyor at its Xambioá plant in the state of Tocantins. A BZB Type AUMUND Bucket Apron Conveyor was chosen in this case to replace the pan conveyor used to transport clinker from the cooler to the silo. It has a centre distance of 92m and a conveying capacity of up to 170t/hr.

The most significant technological improvement presented by the AUMUND Bucket Apron Conveyor in this project is the reduction in dust at the plant site. The BZB is the ideal solution for conveying on a steep incline. Its customised buckets, with a width of 510mm, efficiently prevent wasteful spillage of dusty material to the environment. Supply and commissioning of the new Bucket Apron Conveyor in Xambioá is to take place in October 2020.

Votorantim selected this AUMUND solution due to an already successful experience with a similar project at its Vidal Ramos plant in the state of Santa



Right: Location of Votorantim Cimentos' Xambioá plant in Tocantins.

Catarina. Over the years, AUMUND has supplied more than 300 machines to Votorantim for many different applications in its plants.



Left: An AUMUND Bucket Apron Conveyor will be used to replace the highlighted conveyor at Votorantim Cimentos' Xambioá plant.
Source: AUMUND.®



UK: GCCA publishes 2050 Climate Ambition

The Global Cement and Concrete Association (GCCA) has published its 2050 Climate Ambition, a joint industry commitment to net-zero carbon dioxide (CO₂) emissions by 2050. The association's 40 members have committed to, "eliminating direct energy-related emissions and maximising the co-processing of waste from other industries, reducing and eliminating indirect energy emissions through renewable electricity sources, reducing process emissions through new technologies and deployment of carbon capture at scale, reducing the content of both clinker in cement and cement in concrete, as well as more efficient use of concrete in buildings and infrastructure, reprocessing concrete from construction and demolition waste to produce recycled aggregates to be used in concrete manufac-



turing and quantifying and enhancing the level of CO₂ uptake of concrete through re-carbonation and enhanced re-carbonation in a circular economy, whole-life context."

GCCA President Albert Manifold said, "The 2050 Climate Ambition represents our industry's commitment to further reducing emissions and ensuring that the vital product we provide can be delivered on a carbon-neutral basis by 2050. There is a significant

challenge involved in doing so, and achieving alignment across our industry on a sustainable way forward is an important first step. We cannot however succeed alone and in launching our ambition statement we are also highlighting the need for our industry to work collaboratively with other stakeholders in support of our ambition for a more sustainable future."

Czech Republic: Record cement production

The Czech Republic produced a record 4.57Mt of cement in 2019, a 3.2% year-on-year increase from 4.43Mt in 2018. There was a corresponding increase in domestic sales, up by 1.5% to 3.84Mt from 3.78Mt. Exports rose by 1.9% to 761,000t from 747,000t. Of these, Slovakia received 380,000t (50%), Germany received 221,000t (29%), Austria received 114,000t (15%) and Poland received 68,500t (9%). Imports fell by 15% to 490,000t, of which Slovakia supplied 245,000t (50%), Poland supplied 122,000t (25%), Germany supplied 98,000t (20%) and Austria supplied 39,200t (8%).



Germany: VDZ forecasts flat production in 2020

The Verein Deutscher Zementwerke (VDZ) has forecast domestic cement consumption of 28.7Mt in 2020, consistent with the level seen in 2019. The impacts of the coronavirus lockdown were offset by "a good start to the year, not least due to the weather conditions" and "the continued operation of construction sites in March thanks to the quick actions of politicians."

The organisation said that the situation was unprecedentedly unpredictable with orders and building permits currently in decline. It expects demand to partly tail off in the fourth quarter of 2020, falling by between 3-5%, as companies postpone or discard planned developments in the face of restricted budgets. It said, "Nonetheless, the government's economic stimulus pacts will undoubtedly provide a positive impetus through such initiatives as public infrastructure and multi-family housing projects."

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Denmark: FLSmidth restates position as 2020 bites

FLSmidth has announced the reinstatement of its 2020 guidance. The guidance predicts full-year sales of Euro2.28bn, down by 18% year-on-year from Euro2.77bn. Earnings before taxation, interest, depreciation and amortisation (EBITDA) margin is expected to decline to 6.0% from 8.1%. The company said that the guidance is “subject to higher uncertainty than usual” and conditional upon “no further escalation of Covid-19, no further extensive lockdowns or travel restrictions occurring before year-end, a gradual improvement in business sentiment for the remainder of 2020, and business improvement implementation of around Euro28.2m, of which Euro18.8m relate to the previously communicated improvement activities and around Euro9.40m relate to further improvement activities in cement.” It added, “The cement industry has been severely impacted, and the timing and extent of a rebound remain uncertain. Our goal for the cement business is to generate more stable, higher-margin earnings.”

Ireland: CRH profit drops by a third in first half

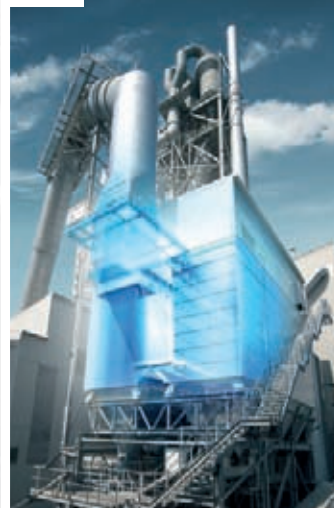
CRH recorded a profit of US\$406m in the first half of 2020, down from US\$602m in the first half of 2019. Sales fell by 4.9% year-on-year to US\$12.2bn from US\$12.8bn. Price rises in many markets offset the general reduction in cement volumes caused by coronavirus lockdown, while volumes grew in Germany, the Benelux countries, Brazil and the US.

CRH's CEO Albert Manifold said, “We took swift and comprehensive action in response to the Covid-19 crisis, and our ability to flex our cost base and deliver improved profitability, margins and cash generation in a rapidly evolving environment demonstrates the strength and resilience of our business. The outlook for the rest of the year and into 2021 remains uncertain and is dependent on an improving health situation across our markets.” Though the group provided no full-year guidance for 2020, it said, “The longer-term prospects for CRH remain positive, benefiting from significant financial strength and resilience together with a portfolio of high-quality assets in attractive markets.”

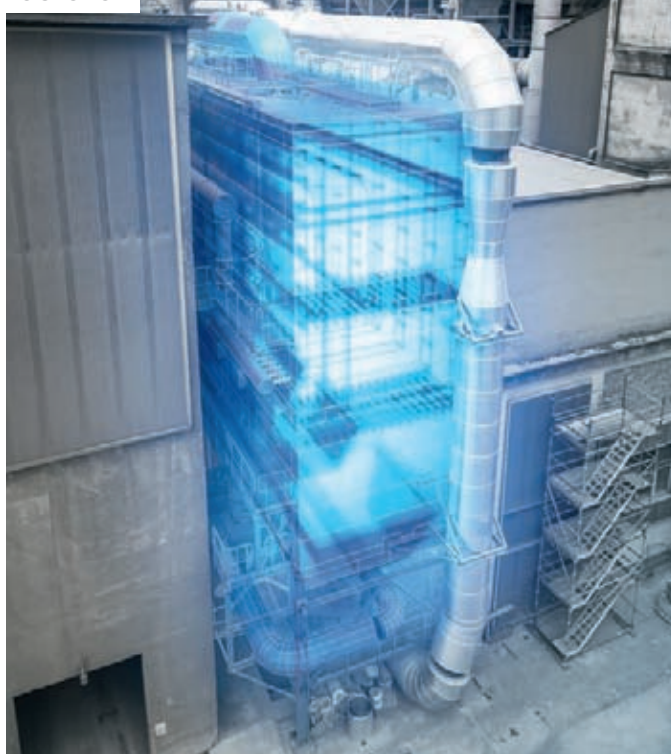
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UK: Breedon acquisition faces test by competition authorities

The Competition and Markets Authority (CMA) has said that Breedon Group's acquisition of a minority of Cemex UK's ready-mix and aggregates operations "may lead to a substantial lessening of competition in the supply of ready-mixed concrete, non-specialist aggregates or asphalt in 15 local markets across the UK" in a letter to the group. The Herald newspaper has reported that the potentially affected markets are in localities where Breedon Group is already dominant, such as eastern Scotland and the East Midlands. CMA senior director Colin Rafferty said, "As consumers source the majority of these materials locally, it's vital to ensure that enough competition will remain at the local level so there's enough choice and prices remain fair."



UK: Cemex confirms logistics job losses

Cemex has published plans for the redundancy of its entire South Ferriby, Lincolnshire logistics team. A total of 26 jobs are at stake. The Lincolnshire Today newspaper has reported that 'it is no longer financially viable for Cemex to continue to operate the fleet at South Ferriby' following the mothballing of its 0.8Mt/yr integrated South Ferriby cement plant, according to the company. Its Rugby, Warwickshire fleet, Tilbury, Essex fleet and Hull, East Riding of Yorkshire fleet will pick up the remaining footprint.

France: LafargeHolcim denies Seine pollution

LafargeHolcim has said that Lafarge Béton is not responsible for a discharge of 'particles of cement, treatment liquids and plastic microfibres' from its Bercy concrete plant in Paris Département into the River Seine.

The La Télégramme newspaper has reported that the plant has been under environmental inspection since late August 2020. The company says that the pollution resulted from a single incident 'caused by malicious parties' who knew of the on-going investigation. The mayor of Paris has contacted the public prosecutor to request a criminal action against the firm.

UK: New Cookstown manager

Lafarge Cement, part of Aggregate Industries and LafargeHolcim, has appointed John Mulgrew as the new plant manager of its Cookstown integrated cement plant in County Tyrone, Northern Ireland. He succeeds Russell Larmour who is to retire after 40 years within the company. Mulgrew will report to Barry Hope, Head of Cement on the Executive Committee at Aggregate Industries.

Mulgrew joined the LafargeHolcim Group as a quality co-ordinator in 2001, holding almost 20 years of experience in the cement industry. He became production manager at the Cookstown plant in 2016. The company says that the plant achieved its best results to date in 2019 after being ranked in the top 10 of LafargeHolcim's European cement plants when evaluated against industrial benchmarks.

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Contact: paulgeebrown@hotmail.com

Estonia: Production falls 31%

Cement producers achieved a total output of 129,000t of cement in the first half of 2020, down by 31% year on year from 187,000t in the first half of 2019. Eesti Statistika has reported that the sharpest decline was in June 2020, by 41% year-on-year to 25,800t from 43,700t. Clinker production in Estonia came to an end on 27 March 2020 with the closure of Kunda Nordic Cement's 0.8Mt/yr integrated Kunda cement plant in Lääne-Viru County.

Russia: Kavkazcement makes more

Eurocement subsidiary Kavkazcement produced 0.89Mt of cement in the first seven months of 2020, up by 10% year-on-year from the corresponding period of 2019. General director Nikolay Muradov said, "Despite the difficult epidemiological situation in the region and in the country, Kavkazcement ensured the stability of production processes and increased production. This was made possible by product quality control and systematic work aimed at increasing efficiency at all stages of production, introducing advanced technologies and the high-quality servicing of equipment."



Sweden: Second biogas truck for CEMENTA

Cementa says that it has added a second biogas-powered Volvo FH460 LGB truck to its logistics fleet. Based at the 0.6Mt/yr Skövde cement plant in Västergötland, the company says that the truck will supply customers in western Sweden with cement. Finland-based Gasum will fuel the trucks with biogas, which it says emits 90% less nitrous oxides (NO_x) than diesel.



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Colombia: Argos weathers Covid-19

Cementos Argos says its sales volumes in the first half of 2020 were affected by coronavirus-related lockdown measures in Colombia and some countries of Central America and the Caribbean. These markets have since recovered gradually as quarantine measures have been eased. Its revenue fell by 4.6% year-on-year to US\$1.14bn in the first half of 2020 from US\$1.20bn in the same period in 2019. Cement and ready-mixed concrete (RMC) sales volumes declined by 15% to 6.79Mt and 19.9% to 4.05Mm³ respectively. Earnings before interest, taxation, depreciation and amortisation (EBITDA) dropped by 9.5% to US\$200m.

By region the group reported growing RMC sales and earnings, both on an adjusted basis, in the US in the second quarter of 2020. Cement volumes fell in the country, mainly due to lower cement sales volumes in the north east, due to lockdown measures and reduced demand from the wholesale segment. In Colombia a complete national lockdown from the start of the second quarter reduced sales significantly. A mixed picture was presented in the Caribbean and Central America due to differences in government lockdown policy, although overall sales and earnings were down.



Image: Cementos Argos' Roberto plant in Alabama, US.
Source: Cementos Argos' website.

Colombia: Innovation recognition for Argos

The National Association of Entrepreneurs and Dinero Magazine have named Cementos Argos fourth among 242 of Colombia's most innovative companies. CEO Juan Esteban Calle said, "This recognition fills us with pride and motivates us to continue to advance. We are convinced that it is possible to help materialise the dream of housing and a better infrastructure for millions of people."

Uruguay: Cement sales falls slightly

Cement producers sold 166,000t of cement in the second quarter of 2020, down by 3.9% year-on-year from 173,000t in the second quarter of 2019. The country exported 5600t of cement (3%), up by 3.9% from 5380t. Domestic sales fell by 4.1% to 160,000t from 153,000t, corresponding to 84% of domestic consumption of 190,000t, which fell by 4.2% from 200,000t. Imports rose by 8.8% to 30,000t from 27,400t.

Brazil: Loss for Votorantim

Votorantim Cimentos recorded a loss of US\$94.0m in the first half of 2020, up by 99% year-on-year from US\$47.2m in the first half of 2019. Sales fell by 8% to US\$680m from US\$739m. During the period Votorantim Cimentos and its subsidiary St Mary's Cement increased the balance withdrawn from credit facilities by US\$247m, in order to "strengthen liquidity as protection within the current crisis context due to the Covid-19 pandemic and to cope with the seasonality that recurrently affects North America." The group says that it will reduce the value of its 2020 investments by 25% to US\$545m from a planned US\$726m, down by 6.3% year-on-year from US\$581 in 2019.

US: Two Energy Stars for Argos

Grupo Argos subsidiary Cementos Argos has said that the Environmental Protection Agency (EPA) has awarded Energy Stars to its 1.1Mt/yr Harleyville, South Carolina cement plant and its 1.7Mt/yr Roberta, Alabama cement plant. This signifies that both plants are in the top 25% of US integrated cement plants for energy efficiency.

Legal and sustainability vice president María Isabel Echeverri said, "We are delighted to be granted these certifications again, which reaffirm our commitment to sustainability and to give value to our society. The responsible use of energy is an essential pillar of our company and we work every day in the development and implementation of technologies that enable efficient use and strategic management of this resource."





Canada: McInnis could be sold to Votorantim

Brazil-based Votorantim Cimentos is reported to be in discussion with Caisse de dépôt et placement du Québec (CDPQ) over the possible acquisition of CDPQ's majority stake in McInnis Cement. The stake has been on sale since January 2020. Votorantim already owns St Marys Cement, which operates cement plants in Canada and the United States.

Separately, Canada's Béton Provincial has already registered for a government grant of US\$115m in order to acquire CDPQ's stake in McInnis, but this appears to have stalled. The Quebec government has already invested significantly in the plant and Quebec Premier François Legault wants it to remain in Canadian hands.

"Quebecers have already invested a lot in the cement plant," said Legault in the Journal de Montreal. "For nationalism reasons, I would like a Quebec company to be ready to invest." The use of public money to fund a new cement plant has been controversial in some quarters. Granting Béton Provincial a further US\$115m may prove even more unpopular.



Source: McInnis Cement website.

Dominican Republic: Production falls by a quarter

Domestic cement production declined by 24% year-on-year to 2.1Mt in the first half of 2020 from 2.8Mt in the first half of 2019, corresponding to 62% capacity utilisation. Domestic consumption over the period also fell, by 20% year-on-year.

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Argentina: Loma Negra profit slumps...

Loma Negra's first-half net profit declined by 68% year-on-year in 2020 to US\$14.2m from US\$44.4m in the 2019. Sales fell by 30% to US\$215m from US\$306m. The company said that business was 'impacted by the increasing complexities of the Covid-19 pandemic,' but that a strong recovery in bagged cement sales beginning in May 2020 was an indicator of general growth to come in the second half of the year.



Image: Loma Negra's L'Amalí plant.
Source: Diego Hall, Intercement.

Paraguay: ...as it offloads Yguazú stake

Argentina-based Loma Negra has sold its 51% stake in Yguazú Cementos. The El Cronista Comercial newspaper has reported that the proceeds of sale of the 0.8Mt/yr installed cement production capacity subsidiary will go towards paying off Loma Negra's debts. The company said, "Loma Negra's objective is to seek and execute projects with high potential. For this reason, after having started marketing operations in Paraguay in 2000, built and operated the factory since 2013 and reached high standards of production and profitability, we have finally decided to finalise its sale."

Yguazú Cementos sold 260,000t of cement in the first half of 2020, down by 6.8% year-on-year from 267,000t in the first half of 2019. This generated revenues of US\$25.4m, up by 39% from US\$18.3m and constituting 12% of Loma Negra's total sales of US\$212m over the period. The company valued the asset at US\$80m on 30 June 2020. The buyer is a Paraguayan company reportedly connected to remainder shareholder Intercement.

El Salvador: New composition for LafargeHolcim subsidiary

LafargeHolcim subsidiary Holcim El Salvador has announced an alteration to the composition of its flagship product, Cuscatlán cement, developed in laboratories in France and Mexico. Strategic marketing manager Amalia Palacios said, "The new formula offers the end user higher quality and less waste, that is to say a yield of around 20% more for the same price. We are improving quality without an impact on the customer's pocket."

Honduras: ECO Multipurpose product launched by Argos

Argos Honduras has announced the launch of ECO Multipurpose, a general use cement with 40% lower CO₂ emissions. It is produced with energy from the company's 8.5MW solar power plant at its 1.0Mt/yr integrated Piedras Azules cement plant in Comayagua, Comayagua Department. The product is 'the first environmentally-friendly cement in Honduras,' according to the cement producer.

US: Mercury fine for National Cement

National Cement has received a fine of US\$148,000 from the Alabama Department of Environmental Management (ADEM) for exceeding mercury emissions regulations over a 123-day period between May 2019 and February 2020 at its integrated Ragland plant in Alabama. The Daily Home newspaper reported that unexpectedly high mercury levels in coal and other raw materials burned as fuel during that time caused the breach, which the company immediately reported to ADEM.

Peru: Pacasmayo opens up Amazon shipping route

Cementos Pacasmayo subsidiary Cementos Selva has begun shipping 2550t/yr of cement produced at its 0.4Mt/yr integrated Rioja, San Martín plant to the city of Iquitos via the Huallaga, Marañón and Amazon rivers following refurbishment of its Port of Yurimaguas cement terminal. The company said, "The facilities provided by the Port of Yurimaguas with its modern infrastructure and equipment, together with a coordinated logistical operation with the Rioja plant, has made it possible to considerably reduce reception and shipment times, demonstrating that good practices in the jungle are possible," according to the Diario Gestión newspaper.





China: Anhui Conch first half profit rises

Anhui Conch Cement has recorded a profit of US\$2.33bn in the first half of 2020, up by 5.3% year-on-year from US\$2.21bn in the first half of 2019. Revenues rose by 3.3% to US\$10.7bn from US\$10.4bn. The company attributed the increases to the resumption of construction across Asia after the coronavirus lockdown and increased sales in western China throughout the period.

China: CRC sees 11% rise in profit

China Resources Cement (CRC)'s first-half net profit increased by 11% year-on-year to US\$541m in 2020 from US\$481m in 2019. This was in spite of a 3% fall in revenues to US\$2.18bn from US\$2.25m. CRC said, "The gradual stabilisation of infrastructure construction and the real-estate market - as well as the steady progress of urbanisation and rural construction - will be conducive to the stable development of the cement industry."

China: Huaxin profit slumps

Huaxin Cement's sales and profit fell in the first half of 2020 due to the coronavirus outbreak. It said that the health situation, 'resulted in grave insufficient demand in the markets of main products and rapid slump in prices, coupled with restrictions on personnel flow and traffic.' It also reported that equipment maintenance plans were severely affected. The cement producer disposed of medical waste for free at its Yangxin, Wuxue and Yichang plants before the market recovered in the second quarter.

Huaxin's sales revenue fell by 12.7% year-on-year to US\$1.84bn in the first half of 2020 from US\$2.11bn in the same period in 2019. Its net profit dropped by 29% to US\$330m from US\$463m. Cement sales and concrete volumes declined by 8% to 32.7Mt. The company also started clinker production at its 2Mt/yr Jizzakh cement plant in Uzbekistan in June 2020.

China: Tangshan Jidong profit dives by a third

Tangshan Jidong's net profit in the first half of 2020 was US\$140m, down by 33% year-on-year from US\$210m to US\$246m. Cement sales fell by 14% to US\$1.58bn from US\$1.83bn, while clinker sales fell by 11% to US\$218m from US\$246m. The Hebei Province-based group attributed the sales fall to the effects of the coronavirus lockdown in early 2020.



China: West China suffers

West China Cement has announced that its profit attributable to owners of the company was US\$108.8m in the six months to 30 June 2020, a year-on-year decrease of 5.2%. The company's revenue fell by 9.1% year-on-year to US\$440m.

Malaysia: CMS profit nosedives

Cahaya Mata Sarawak recorded a profit of US\$8.72m in the first half of 2020, down by 63% year-on-year from US\$23.4m in the first half of 2019. Total sales declined by 40% to US\$117m from US\$196m. Cement sales also declined, by 31%, to US\$46.8m from US\$68.1m. The company attributed this to the impacts of the coronavirus lockdown.

Azerbaijan: Production falls slightly

Azerbaijan produced 1.56Mt of cement in the first half of 2020, representing a 2.7% year-on-year decline from 1.60Mt in the half of 2019. Concrete sales increased by 6.5% to 0.83Mt from 0.78Mt, while the total value of construction materials sales fell by 4.8% to US\$251m from US\$264m.





Australia: Adelaide Brighton bounces back

Adelaide Brighton has recorded a net profit of US\$21.1m in the first half of 2020, compared to a US\$13.0m loss in the first half of 2019. Revenues fell by 7.3% to US\$508m from US\$548m due to a 12% construction decline over the period, according to the company. Residential construction fell by 16% but mining and infrastructure activity remained consistent with levels seen in the first half of 2019. Adelaide Brighton said, "Cement demand is likely to continue to benefit from a strong production outlook for gold, nickel, and iron ore in particular, and stable demand from the alumina sector."

Australia: Quarry secured to 2090

Adelaide Brighton has extended its lease over its Sellicks Hill quarry in South Australia until 2090. The Advertiser newspaper has reported that the signing of the lease, which secures the company's local supply of limestone, "coincides with a rise in local cement consumption due to the government's South Australia HomeBuilder building and renovation subsidy scheme." In August 2020 Adelaide Brighton signed supply contracts with BHP and OZ Minerals for infrastructure projects in the state.



Adelaide Brighton Ltd

Vietnam: SGC donates mobile test chambers

Siam Cement Group (SCG) has donated four mobile pressure chambers for use by medical staff to collect samples without coming into contact with patients at the Da Nang Centre for Disease Control in Da Nang, South Central Coast Region. Viet Nam News has reported that the equipment has already been successfully used for mass sample collection in Thailand.

China: First Tibetan plant for Anhui Conch started

Anhui Conch has announced the start of production at its subsidiary Basu Conch's 0.9Mt/yr-capacity clinker line, its first in the Tibet Autonomous Region. Anhui Conch Sichuan and Chongqing regional director Zhang Laihui said, "Thanks to its mature corporate management, Basu Conch has built an industrial plant in the wilderness in 468 days – that's 'Conch speed.' Our group mission of 'industrial aid to Tibet' stands as an example of good management, development and efficiency in public-private cooperation."

Pakistan: Un-Lucky Cement results

Lucky Cement's profit for the 2020 financial year that ended on 30 June 2020 was US\$19.9m, down by 68% year-on-year from US\$62.4m in the 2019 financial year. The company recorded a 13% sales drop to US\$249m from US\$285m, which it said was due to the impacts of the global pandemic.

North Korea: Sunchon helps flood renovation

The state-run KCNA news agency has announced that cement, iron and steel and timber production units throughout North Korea are 'pushing forward' with production to supply building materials to flood-ravaged areas, including in Unpha County (North Hwanghae Province) and Ichone County (Kangwon Province). It stated that the Sunchon Cement plant had provided 10,000t of cement to reconstruction sites in 'a short span of time.'

Kazakhstan: Steppe stake bought

Private businessperson Azmi Wan Hamzah has increased his stake in Steppe Cement to 31% of issued share capital, from 29%.

Japan: Taiheiyo ramps up battery recycling

Taiheiyo Cement is starting large-scale recycling of large lithium-ion batteries at its integrated Tsuruga plant. It has been developing the process with Matsuda Sangyo since 2011 using exhaust gases from clinker production as part of dismantling, crushing and sorting processes to extract precious metals from the batteries. Taiheiyo Cement, its subsidiary Tsuruga Cement and Matsuda Sangyo started a recycling business in April 2020 following certification by the Japan Auto Recycling Partnership (JARP).





India: Ultratech to spend big

Ultratech Cement has announced that it will spend US\$200m in capital expenditure during the 2021 financial year, which ends on 31 March 2021. The plans consist of a capacity expansion to 118Mt/yr, including the completion of the 4.0Mt/yr Bara grinding plant in Uttar Pradesh and 1.2Mt/yr-worth of brownfield projects in Bihar and West Bengal. Solar and wind power capacity will increase to 350MW from 95MW, while waste heat recovery (WHR) capacity will increase to 185MW from 118MW.

The company said that, "While 2021 will be a challenging year, Birla remains confident that the economy will revert to a 6 - 8% growth trajectory in 2022."



India: JK Cement's profit slides 62%

JK Cement's profit in the three months ended 30 June 2020, the first quarter of the 2021 financial year, was US\$6.85m, down by 62% year-on-year from US\$18.1m in the first quarter of the 2020 financial year. Revenues fell by 28% to US\$138m from US\$191m. The company said, "The operations and business performance of the group during the quarter ended 30 June 2020 was adversely impacted by the shutdown of the group's plants at various locations due to the lockdown announced by the government after the outbreak of the Covid-19 pandemic in March 2020."

Uzbekistan: New plants and projects continue

State-owned Uzpromstroyaterialy has announced the start of cement production at a new 0.1Mt/yr integrated cement plant, called the Qurilish Ashyo Sifat Servis cement plant, in Fergana Region following a total investment of US\$25.0m. The company has reported that the new plant represents part of the country's efforts to increase its installed cement capacity by 60% to 20.0Mt/yr in 2020 from 12.5Mt/yr in 2019.

Meanwhile, Uzpromstroyaterialy and South Korea-based Caris have formed an 80:20 public-private partnership for the establishment of a 1.5Mt/yr integrated cement plant in Berinuy region at a cost of US\$350m.

Vietnam: Government acts against overcapacity

The Vietnamese government has adopted a cement industry development strategy under which all plants below 0.9Mt/yr capacity must make investments to improve their productivity, product quality, energy saving and environmental protection by 2025. In order to facilitate this, the government says it will improve institutions and policies and improve the efficiency of raw materials exploitation, scientific research and industrial application, promoting domestic consumption, increasing available training and tightening environmental protections, according to Viet Nam News. Plants which fail to increase productivity in the specified ways will face closure.

The government says that the strategy aims to "Develop the cement industry to an advanced and modern level, to produce cement of international standard quality with economical and efficient use of energy, giving high competitiveness in the international market, while meeting the needs of the domestic market, completely eliminating out-dated, natural resource-consuming and polluting technology for production." The measure specifically targets the country's

overcapacity issue in its efforts to develop demand and its emphasis on product quality.

Cement producers increased the total domestic output of cement by 3.9% year-on-year to 64.2Mt in the first eight months of 2020 from 61.8Mt over the corresponding period of 2019. Continuing at this rate, Vietnam will produce 96.3Mt of cement in 2020, down by 0.2% from 96.5Mt in 2019.



Image: Ho Chi Minh City street scene.
Source: xunhuongho/Shutterstock.com.



Contents

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Ad Index

Cement in Cambodia, Laos and Myanmar

Global Cement explores three small cement sectors in mainland South East Asia...

Cambodia, Laos and Myanmar are three contiguous nations in mainland South East Asia. Their populations represent a vast array of cultures, sandwiched between better known and more powerful neighbours such as China, India and Thailand.

Each of the three has a colonial past, with independence gained between 1948 and 1953. However, all three have since been marred by political instability and / or oppression. In 2020 the three have low indices for press freedom and human development.

Introductions

Cambodia

The Kingdom of Cambodia covers 181,035km² in the south of the Indochina Peninsula. It borders Thailand to the west, Laos to the north and Vietnam to the east. For 600 years its territory was the base of the Khmer Empire from 800 to the mid 1400s, after which it saw its powers decline. Cambodia was under French control from 1863 to 1946, with full independence gained in 1953.

Upon independence the new country's leaders adopted a policy of neutrality in the ongoing Cold War proxy conflicts in the region. However, parts of its territory were used as bases to supply Communist North Vietnamese forces. This resulted in a series of air-strikes by the US that gave rise to significant anti-US sentiment and support for Communist policies.



This ultimately led to the Khmer Rouge regime led by Pol Pot in 1975. The regime was extremely nationalistic and took communism to its extremes. It demanded that all towns and cities be abandoned, with everyone sent to work as farmers in rural areas. Many were poorly equipped for the transition and thousands died before the first harvests. All indications of Cambodia's former civil, religious and military were to be eradicated, with death for those that stood in the way. 'Crimes' worthy of the death penalty included wearing glasses, speaking foreign languages and crying over the death of loved ones. After a rebellion close to the Vietnamese border, Pot ordered the deaths of around 1.5 million 'Cambodians with Vietnamese minds.' In 1979 the Vietnamese army and rebel forces overthrew the Khmer Rouge, with Vietnam occupying until 1993. Around 1.5-2.0 million are thought to have perished in just four years between 1975 and 1979.

Today, Cambodia is unusual in that its Monarch is elected rather than succeeding via bloodline. The country is also one of several in the region that enshrines Buddhism as the state religion. Its constitution officially places power in an elected Prime Minister. Despite this the country's politics have been dominated by Prime Minister Hun Sen and the Cambodian People's Party (CPP) since the early 1990s. In its 2018 elections, deemed flawed by external observers, the CPP won all seats in parliament. Political opposition remains oppressed and the press is restricted, with a Press Freedom rank of 144 of 189 in 2020 according to Reporters Without Borders.

Below: Angkor Wat, a Buddhist Temple complex in Cambodia and the largest religious monument in the world.



Laos

The land-locked territory that constitutes today's Lao People's Democratic Republic has come under the control of numerous empires and external forces over the centuries, including by Siam (Thailand) and Vietnam. In the late 1800s the French, who already controlled Vietnam and Cambodia, sought to expand their influence in the region. The Protectorate of Laos was established in 1893, under control of the French from Vietnam.





Far Left: The Patuxay Monument in Vientiane remembers those that died fighting for independence against France.

Left: Aung San Suu Kyi, Myanmar's State Chancellor and 1991 Nobel Peace Prize Winner.
Credit: 360b/ Shutterstock.com

The French continued the exploitation of Laos that had become well established under the Siamese and Vietnamese periods before the Second World War. During the 1940s Lao nationalism gained in prominence. The French were first successful in regaining control over the country after a declaration of independence in 1945, but a full transition to independent rule was made by 1953.

In the second half of the 20th Century, Laos attempted, like Cambodia, to maintain a neutral stance with respect to ongoing events in neighbouring Vietnam. Two coalition governments collapsed in the 1950s and early 1960s, before incursions by the North Vietnamese forces led, as in Cambodia, to massive US bombing and an embrace of communism. Following the end of the war in 1975, the Lao government regained control of its borders, but was heavily influenced by Vietnam. Support from Vietnam and the USSR remained until the latter's collapse in 1991. Since then, Laos has become more independent, with some market reforms. However, the Communist Lao People's Revolutionary Party (LPRP) remains dominant in national politics. The press and internet are severely restricted, with Laos ranked 172 out of 192 countries in the Press Freedom Index of 2020. Its Human Development Index rank was 140 out of 189 in 2018.

Myanmar

Myanmar, formerly known as Burma, is a large nation in the west of the Indochinese Peninsula, centred around the Irrawaddy River and its Delta. Its location at the crossroads between China, India and South East Asia is borne out by periods of war with both Siam (Thailand) and China. In a search for further expansion, Burma headed west in the late 1800s, engaging in wars with Britain, which controlled India and Bangladesh at that time. This backfired, with Britain adding Burma to British India in 1886.



The British violently crushed remaining dissent in the north by 1890 and systematically undermined Burmese culture. Dominance was given to British and Indian companies, with Burmese businesses forced out.

The onset of the Second World War disrupted this undesirable status-quo, with rising anti-British sentiment and increased support for Communism. The Communist Party of Burma was established by Aung San in 1938. The Communists sought an alliance with those in China but received a counter offer from Japan in support of a national uprising, followed by independence. The defeat of Japan at the end of the war led to the formation of an independent Burma in 1948, following three years of talks with the British. The 1950s and early 1960s were an unstable time for Burma, with successive insurgencies by rival factions. A coup established a socialist state in 1962 leading to nearly three decades of ongoing political disputes and material and food shortages, with the military taking control of the country in 1988. In 1989 it changed the name of the country to Myanmar.

Free elections in 1990 were overwhelmingly won by the National League for Democracy, but the military prevented the new government from being established. It placed Aung San Suu Kyi (the daughter of Aung San) and Tin Oo, the leaders of the NLD, under house arrest as the military hung on to power for 26 more years. Aung San Suu Kyi was released in 2010, taking up the position of State Chancellor (similar to Prime Minister) in 2016.

However, Myanmar's transition to a full democracy has not been secured due to ongoing political disputes, economic hardship and ethnic clashes. The most notable example of this is the continued oppression of the Rohingya Muslim population, who are formally denied citizenship of Myanmar, with restrictions on movement, jobs and education. Myanmar ranked 139th in press freedom in 2020, and was ranked 145 out of 189 countries for human development in 2018.



Cement sector

The three nations in this review have small cement industries in global terms, sharing a modest 24.3Mt/yr across 35 plants and 77.1 million inhabitants. This works out at 315kg/capita, around half the level commonly seen in rapidly-developing economies. Production facilities are generally small by international standards, with many also somewhat dated. Most plants are domestically owned, although regional players, notably from Thailand and China, have entered the market in recent years as strategic joint venture partners. Most capacity is now at least partly owned by Chinese or Thai interests.

Right - Figure 1: Cement capacity in Cambodia, Laos and Myanmar is owned by local, Chinese and Thai producers.

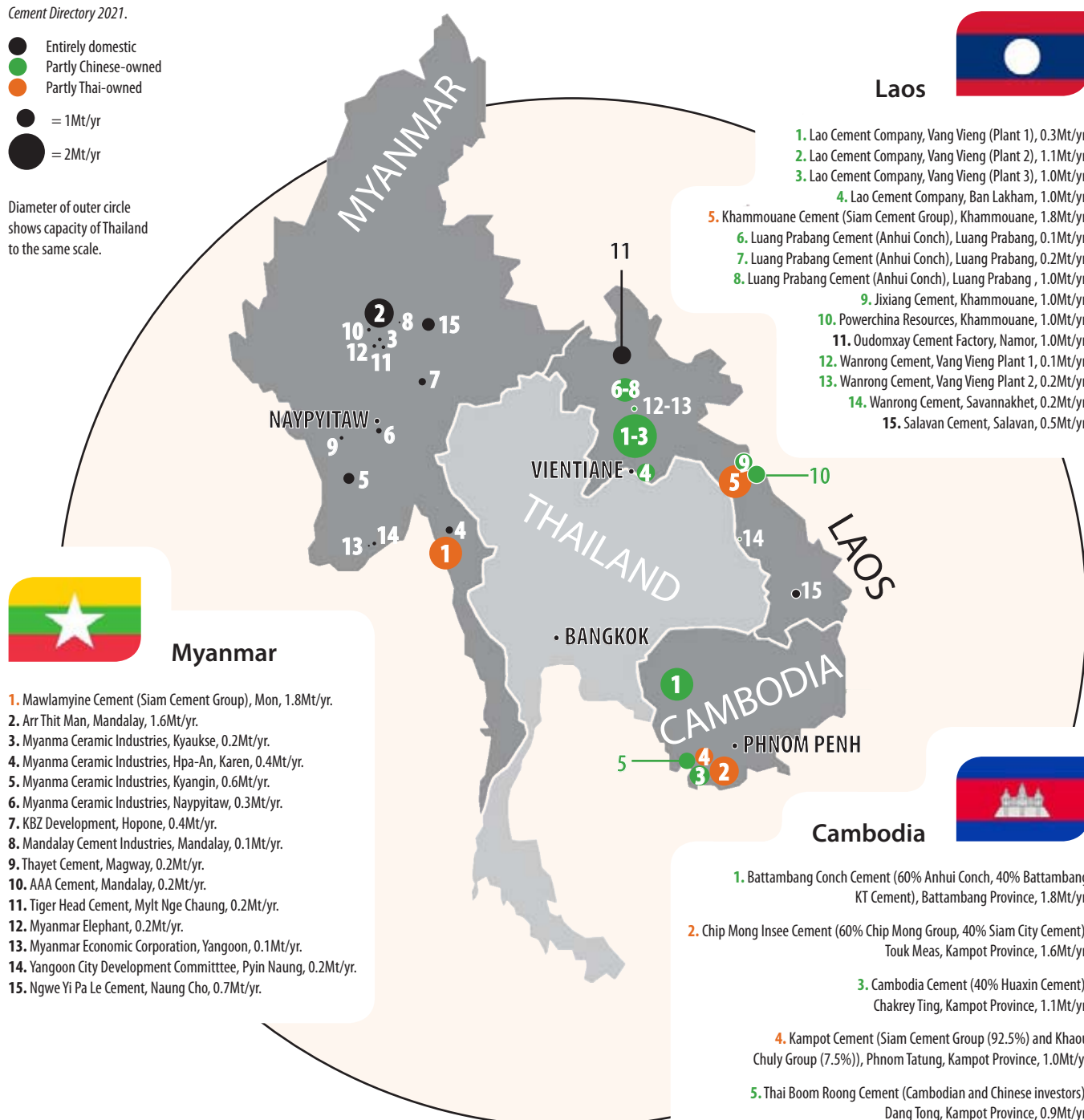
Below - Figure 2: Cement plants in Cambodia, Laos and Myanmar in 2020. Capacities shown by diameter of circle.

Source: *Global Cement Directory 2020* and research conducted towards *Global Cement Directory 2021*.

- Entirely domestic
- Partly Chinese-owned
- Partly Thai-owned

- = 1Mt/yr
- = 2Mt/yr

Diameter of outer circle shows capacity of Thailand to the same scale.



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Above: Chip Mong Insee Cement plant at Touk Meas, Kampot Province.
Source: Chip Mong Insee Cement website.

Cement in Cambodia

There are five integrated cement plants in Cambodia, which share a capacity of 6.4Mt/yr. Each is partly or fully owned by a foreign producer. The relatively young age of the country's cement production infrastructure means that it is arguably the most developed among the three industries considered here.



The largest cement plant is a 1.8Mt/yr Chinese-built facility at Phum Sdao. It is operated by Battambang Conch Cement, a joint venture owned by Anhui Conch (60%) and Cambodia's Battambang KT Cement (40%). Established in 2016, the company held true to its promise to construct and commission its project within two years, first firing the kiln in July 2018. The company now supplies cement to Pursat, Pailin, Banteay Meanchey and Siem Reap provinces.

The second-largest cement producer by installed capacity is Chip Mong Insee Cement, which oper-

ates a 1.6Mt/yr plant at Touk Meas, 125km south of Phnom Penh. The plant is a US\$260m joint-venture between Chip Mong Group (60%), one of Cambodia's largest construction firms and the Thai cement maker Siam City Cement (40%). It fired up its kiln for the first time on 30 September 2017 and has since installed a waste heat recovery system from China's CITEC Heavy Industries. As part of its ongoing environmental efforts, the plant commissioned a 9.8MW solar power system provided by Cleantech Solar in February 2019. The system includes a 2.8MW floating solar power plant deployed on the plant's reservoir and 7MW installed across multiple rooftops of

the site. The deployment of the floating solar system will shield the reservoir from wind and the direct hot midday sun which is expected to reduce water loss through evaporation, contributing to water conservation efforts.

The third-largest producer by installed capacity in Cambodia is Cambodia Cement, which has been 40% owned by Huaxin Cement since 17 June 2014. It operates a 1.1Mt/yr integrated plant at Chakrey Ting. The plant, the first cement plant to be built in Cambodia, traces its history back to an investment by Huaxin Cement in 1961, first as the Liu Shaoqi Cement Factory in honour of the Chinese Chairman at the time. The plant was extensively overhauled with a US\$100m investment in the early 2010s, with production restarting in 2015.

The fourth largest producer, also in Kampot, is Kampot Cement, a joint venture between Siam Cement Group (92.5%) and Khaou Chuly Group (7.5%). It was established in 2005 and has a capacity of 0.9Mt/yr.

The fifth and final cement plant is operated by Thai Boon Roong Cement, a joint venture between local and Chinese investors. Despite the name, there is no Thai involvement. At the plant's opening on 14 November 2019, Cambodian Prime Minister Hun Sen, said that its opening would ensure that Cambodia's cement demand could be met entirely by domestic production.

One further plant, from Southern Cement Cambodia, is under construction. The company was established in 2017 but the current status of the project is unclear.

Below: Battambang Conch Cement in Phum Sdao.
Source: Khmer Times / AKP.



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Right: Kiln at Lao Cement.
Source: Lao Cement website.



Vientiane, Xiengkhuang, Luangphabang and others surrounding the capital.

The second-largest cement producer by installed capacity is Khammouane Cement, a 100% subsidiary of Thailand's Siam Cement Group. Its 1.8Mt/yr plant at Khammouane was built in 2017.

The third-largest producer in Laos is Luang Prabang Cement, a joint venture by Anhui Conch and local investors. It operates three cement plants, all at Luang Prabang (0.1Mt/yr,

0.2Mt/yr and 1.0Mt/yr). The third and largest plant is the most recent. It fired its kiln for the first time in December 2019.

There are three companies in Laos that have 1.0Mt/yr of capacity. Jixiang Cement was built by Yunnan Energy Investment Corporation in 2015 following a three year project. Powerchina Resources operates a plant at Khammouane and Oudomxay Cement Factory operates a 1.0Mt/yr plant in Namor.

There are two companies in Laos that are fifth-largest in terms of cement capacity: Wanrong Cement and Salavan Cement, both with 0.5Mt/yr of capacity. Wanrong Cement is another Chinese joint venture and is Laos' oldest producer of cement. It began its Wanrong Cement Plant 1 at Vangvieng, Vientiane in 1994. The company's Golden Bull cement brand is popular in the country, emphasised by the inclusion of the first Wanrong cement plant on Laos' 5000 Kip banknotes issued in 1997. Wanrong started a second plant, also at Vangvieng in 2002, before the addition of a third in Savannakhet, in 2003.

Cement in Laos

Laos has 15 integrated cement plants. Due to the fact that most are fairly small, they only combine to give a capacity of 10.7Mt/yr.



The largest producer by installed capacity is Lao Cement Public Company, which operates 3.4Mt/yr of capacity across four plants. Three are in the capital Vientiane and one is in Khammouan Province. The company is jointly operated by China Yunnan Corporation for International Technological & Economic Cooperation and the Lao State Agriculture Industry Development Enterprise for Imports, Exports & General Services via a loan from China. It is controlled by the government. The company's major product is 'Kating Thong Portland cement clinker and 'Kating Thong High grade portland cement. This is classed as a Type I cement based on ASTM C-150, ISO 9001:2015 and 32.5 based on the GB175-1999 test standard. It supplies mainly to the capital Vientiane, as well as the Provinces of

Right: A 5000 Kip banknote from 1997 featuring Wanrong Cement Plant No. 1, Laos' first cement plant.
Source: Banknoteworld.it.





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Above: Arr Thit Man produces Double Rhinos brand cement.

Cement in Myanmar

There are 15 active integrated cement plants in Myanmar, which share a total capacity of 7.2Mt/yr.

The largest producer by installed capacity is Mawlamyine Cement, a subsidiary of Siam Cement Group from Thailand. It has a capacity of 1.8Mt/yr but, as of 21 July 2020, was reported to be not producing cement due to a 'lack of raw materials.' Local press reported that some workers thought the plant would close for good, due to a dispute over limestone mining. Others reportedly insisted that it would restart production soon. The plant began production in 2017.

The second-largest cement producer in Myanmar is Arr Thit Man, which operates a 1.6Mt/yr plant in Mandalay. It earlier stated that it would increase its capacity to 3.2Mt/yr via the installation of a new line but this appears not to have transpired to date.

The third-largest producer is Myanma Ceramic Industries, the only producer in the country to



operate more than one plant. It has four, with a combined 1.5Mt/yr of capacity. A further 10 cement producers each operate a single plant, as shown in Figure 2.

New plants have constantly been in the offing in Myanmar in recent years. Semen Indonesia was in the process of setting up a joint venture in 2015 but eventually shelved the project when it could not find a suitable partner.

In July 2020, Young Investment Group Industry Company Limited (YIGICL) entered into a joint venture with China-based China Gezhouba Group Cement (CGGC) and China Gezhouba Group Overseas Investment (CGGOI) with the aim of establishing an integrated cement plant in Mandalay, Mandalay region. The joint venture, which is held 30:70 by YIGICL and the Chinese partners respectively, will also set up a limestone mine.

Also in the summer of 2020, U Aung Kyaw Thu, a representative of Mon State Parliament and chairperson of the Public Budget Scrutiny, Finance Planning and Economic Matters Review Committee warned that cement plant projects granted licences by the Myanmar Investment Commission (MIC) that had not implemented their plans will not be granted permission to extend their licences.

For example, during a meeting with legislators, local farmers from Kaw Won Village, Kyaikmaraw Township in Mon State complained that the Myanmar-Korea Cement Group should not be allowed to extend its permit, as they had not implemented anything yet, according to the Mons News Agency. Normally companies that have received a permit are allowed to build at the site for three years. They can then extend this by up to three years if they provide a 'legitimate reason.'

The June Cement Industry project has reportedly finished 15% of its construction and the Myanmar-Korea Cement Group project has finished 10% of its construction. The companies have blamed operational difficulties on the delays. They were granted permits by the MIC in 2016 and 2017 respectively.

Elsewhere, Switzerland-based LafargeHolcim says it is liquidating its subsidiary in Myanmar. The group says it decided to exit its operations in Myanmar in 2017. Subsequently, it wound the company down in 2018, with no local employees and no product sales. Its cement repacking plant in Thilawa special economic zone originally opened in 2014.



Below: Skyline of Mandalay, Myanmar.
Source: Tony Wu Studio / Shutterstock.com





Senegal: Upgrade for Ciments du Sahel

Sinoma subsidiaries Sinoma International Engineering and Sinoma Construction have signed a contract with Les Ciments Du Sahel for the upgrade of its 3.0Mt/yr Kirene cement plant in Dakar Region.

The Euro245m contract stipulates that a new 6000t/day capacity cement production line will replace the plant's old third line. Sinoma says that the new line will grind its first batch of cement from clinker in February 2022 and produce its own cement and clinker from October 2022. The group said, "We believe that the contract ought to present no significant challenge for the company."

Rwanda: New plant Primed

Prime Cement has inaugurated its new 0.6Mt/yr grinding plant in Musanze, Northern Province, Rwanda. It also announced the start of commercial production at the US\$40m unit, according to the Rwanda New Times newspaper. It plans to ramp up production to 1.2Mt/yr by mid-2022. Germany-based Loesche installed a Loesche Jumbo CCG (Compact Cement Grinding plant) with type LM 30.2 mill at the site.

The cement plant is owned by Milbridge Holding, a group of companies involved in manufacturing and distribution of construction materials in Angola, the UAE, Rwanda and South Africa. It employs 110 workers directly.

Namibia: Exports suffer

Ohorongo Cement, Namibia's only integrated cement producer, has reported a steep decline in demand for cement due to the economic effects of the Covid-19 pandemic. Frankleen Alberts, Manager of Customer Relations and Public Affairs said that, while domestic sales had suffered from a slowdown in public works and lower private construction levels, the closure of Namibia's borders had all but eliminated opportunities for exports. It had also hampered the company's supply chains.

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Tunisia: Polypropylene bags for increased competitiveness

The Tunisian Ministry of Industry and Small and Medium-Sized Enterprises has issued a decree authorising the use of polypropylene cement bags, a cost cutting measure that aims to increase the competitiveness of Tunisian cement against Turkish products on the Libyan market. The Economiste Maghrebin newspaper has reported that the loss of a valuable export market upon Algeria reaching cement self sufficiency in cement led the ministry to enact the cost-cutting policy. In January 2020, Algeria enacted a progressive prohibition on this type of packaging with a view to a blanket ban from 1 January 2021.

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Image: Manufacturing woven polypropylene bags.



South Africa: PPC delays annual results for second time

PPC delayed the publication of its annual results for the year to 31 March 2020 for a second time in August 2019 due to a 'restructuring and refinance project.' It now expects to publish the results by late September 2020, after this issue goes to press. It previously delayed reporting its financial results when the Johannesburg Stock Exchange allowed it to delay the figures because of the challenges created by the coronavirus pandemic. The cement producer also said it has found errors in its financial reporting for the year that ended in March 2019 due to mistakes made in valuing operations in Ethiopia and Zimbabwe and a miscalculation of the accounting of a foreign-exchange transaction in the Democratic Republic of Congo (DRC).

The group expects that revenue for the year to 31 March 2020 will decline by no more than 5% year-on-year from US\$605m in the same period in 2018-2019. Earnings before interest, taxation, depreciation and amortisation (EBITDA) are expected to fall by up to 20% from US\$113m.

In an operational update for April to July 2020 the group said that it ramped up cement operations in May 2020 following the relaxation of coronavirus-related

lockdowns in most of its territories. It attributed strong growth in cement sales volumes in June and July 2020 to a reduction in imports as well as pent-up demand. Similarly, sales volumes were strong outside of South Africa, particularly in Zimbabwe and Rwanda, and in the DRC to a lesser extent.

PPC had earlier announced that it may issue a rights offer for US\$68.7m-worth of shares in order to raise funds to 'repay and restructure debt locally and in other African markets, and to refinance after the economic effects of the Covid-19 pandemic.'



Zimbabwe: Dust warning for Lafarge Harare

The Environmental Management Agency (EMA) has ordered Lafarge Cement Zimbabwe to stop operations at its integrated Harare plant due to abnormal dust emissions. As part of the order the plant has been requested to notify local stakeholders and the community of any new developments or incidents that may affect them, according to the NewsDay newspaper. It will also be required to report daily dust emissions readings to the EMA every two weeks.

The cement producer said it experienced an unexpected surge in dust emissions during a trial of using sawdust as an alternative fuel at the plant between 30 July and 1 August 2020. It added that immediate action was taken to control and contain the emissions and the incident was reported to EMA in line with regulatory requirements.

Mozambique: Workers allowed to leave site after five months of enforced 'quarantine'

China-based International Cement Group (ICG) finally released builders that had been constructing its integrated Salamanga cement plant in Maputo Province from the project site on 23 August 2020 following the intervention of a local lawyer. BBC News had earlier reported that 60 Mozambicans had been living in temporary accommodation without being able to leave the site 'in order to prevent possible transmission of coronavirus from workers,' according to ICG.

DRC: Worker killed in attack

Police are investigating the murder of a Chinese worker at the quarry of a cement plant that is being built near Kolwezi, the capital of Lualaba province in the Democratic Republic of Congo. The Carrilu employee was killed in an attack on the site by intruders from outside the worksite, according to the Agence France Presse. Two other people were also assaulted in the incident. Armed attacks against businesses and residents have been reported regularly in the region.

The Lualaba Carrilu cement and lime plant is a project being managed by China-based Zijin Mining Group. It is expected to start operation in autumn 2020.



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VIRTUAL

Ait Baha Cement Plant, Morocco,
by Ottavio Tomasini, Turboden SpA





Interview by Peter Edwards, Global Cement Magazine



Plant report: Sinai Cement, Egypt

Global Cement speaks with Bassam Abdrassoul, Technical Director at Sinai Cement...

Above: Bassam Abdrassoul joined Sinai Cement in January 2015 as a Deputy Technical Manager. In September 2015 he became General Plant Manager and in February 2020 he took the position of Technical Director. He previously worked for Arabian Cement Company, Algerian Cement Company and ASEC.

Global Cement (GC): Please could you introduce Sinai Cement for our readers?

Bassam Abdrassoul (BA): Sinai Cement Company was established in 1997 following a project by the regional government to develop the middle of the Sinai Peninsula. The concept was to establish integrated industries that were capable of supporting a growing population by creating suitable job opportunities and a high quality of life in the region. Initially with a capacity of 1.4Mt/yr, Sinai Cement increased its capacity to 1.9Mt/yr incrementally over the years. It then constructed a second line to double its capacity to 3.8Mt/yr by the end of 2008.

GC: How was the plant's location chosen?

BA: From a geological standpoint, the surrounding Lebni Mountains are endowed with continuous layers of excellent raw materials of limestone, clay and sand. These premium materials represent fantastic

ingredients for cement manufacture and allow the plant to supply high quality finished cement to the market at reasonable prices.

GC: Who owns Sinai Cement Company?

BA: Since the inception of the plant in the mid 1980s, the project was driven by Sama Group, an Egyptian company. On 27 March 2003 Vicat Group became the major shareholder. Today Vicat owns 40.78% of the company. Vicat believed in the pioneering activities of the company, led by Dr Hassan Rateb, and the principle of developing this virgin land in the Sinai. It was a powerful endorsement to secure an investor as prominent as Vicat, which has more than 200 years of experience in the cement industry.

Sama Group now owns 6.75% of Sinai Cement following the sale of part of its stake in 2019. Various insurance and pension funds, 300 minority shareholders and ~30,000 public shareholders own the remaining 52.47% of the company.

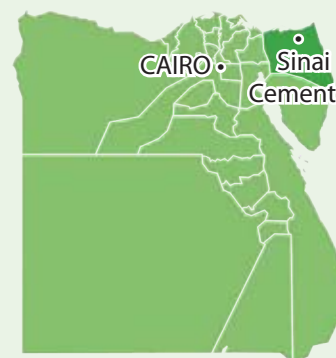
Below: Overview of the Sinai Cement plant.





Plant profile: Sinai Cement Company

| | |
|--------------------------|--|
| Location: | 50km South of El Arish, North Sinai, Egypt |
| Established: | 1997 |
| Line 1: | FLSmidth kiln, 5-stage preheater and inline calciner |
| Initial capacity: | 1.4Mt/yr (1997) |
| Upgraded to: | 1.9Mt/yr (2008) |
| Line 2: | FLSmidth kiln, 5-stage preheater and inline calciner |
| Capacity: | 1.9Mt/yr (2008) |



Plant and process

GC: Please could you outline the production process at Sinai Cement Company?

BA: Sinai Cement has access to high quality natural material reserves: three limestone quarries, a clay quarry, a sand quarry and a gypsum quarry. Once extracted and homogenised, these materials are ground in two Atox 40 raw meal mills from FLSmidth, each with a capacity of 340t/hr. They are subsequently fed to the plant's two grey cement production lines. Both of these were supplied by Denmark's FLSmidth. The strategic decision to select a renowned European provider ensures that the plant meets the latest high standards for cement production, especially in terms of environmental standards and product quality.

Both of the lines have short kilns, preceded by five stage preheaters and inline calciners. The coolers are both from FLSmidth, one Cross Bar Cooler, one Controlled Grate Flow Cooler. Between them, the two kilns can produce 3.3Mt/yr of clinker.

There are four 125t/hr FLSmidth ball mills for clinker grinding, two on each line, which provide the capacity to make 3.8Mt/yr of cement. To package the final products, the plant is equipped with six FLSmidth Ventomatic packing machines. There are also systems for packing big bags and loading silo trucks.

GC: What fuels are used at the plant and how has this changed in the recent past?

BA: Like many plants in Egypt, Sinai Cement had a long history of using heavy fuel oil. We also used natural gas until 2013 but repeated explosions and sabotage of the main natural gas line rendered this completely unreliable.

In September 2015 we switched to coal because of reductions in government subsidies on heavy fuel oil and furnace oil. At this point, we started to use our two Atox-25 coal mills, each with a capacity of 50t/hr. These now grind petcoke and imported coal.

In late 2015 we also started to feed waste oil to the calciner of kiln 2. We also started to feed solid fuels such as RDF, waste wood and olive wastes, through feeding system to calciner kiln 1 at a low rate using triple flaps. Both of these systems are fairly simple in-house designs. The handling and transportation of these materials required quite some coordination considering the security situation in this area.

GC: What emissions abatement systems are used at the plant?

BA: Each line has an electrostatic precipitator for the kiln, an electrostatic precipitator for the clinker cooler, a bag house for the bypass, a bag house for the coal mill and a bag house for the cement mills. There are an additional 55 secondary dedusting filters in the plant at different locations and transfer points and a road sweeper for cleaning the site of the dust that does escape. All of the plant's stacks have been equipped with the monitor instrumentations required by Egyptian environmental law and they are connected to the national network.

GC: When was the last maintenance shutdown and what work was conducted?

Below: One of the plant's FLSmidth ball mills for cement production.





Above: A container ship convoy traverses the Suez Canal. The expansion of the canal represents a large opportunity for Sinai Cement in the coming years.

BA: The most recent shutdown was on kiln 1. It finished in April 2020. A number of major tasks were performed. These included changing the kiln outlet section, reversing the kiln girth gear and changing the pinion bearings, changing the kiln fire hood completely, changing all the grate linings in the clinker cooler and changing kiln refractories and castables. We also changed the kiln inlet and outlet seals, the inner pipes of cyclones 4 and 5, the roof of cyclone 5 and the rotor of the limestone crusher.

We installed hardfacing on the table and rollers of both the raw mill and coal mill and completely overhauled the main kiln electrostatic precipitator. As well as all of this, we renovated the electrostatic precipitator on the cooler, including changing the damaged discharge and collecting electrodes and inlet screen.

We completely overhauled the clinker conveyor, closed all the false air openings in both the raw mill and preheater and changed all the expansion joints. We also undertook major repairs on the tertiary air duct and repaired the dust transport system under all the filters. Finally, we upgraded the dust transport system under the electrostatic precipitator of the clinker cooler and increased the capacity of the clinker conveyor.

GC: Have there been any recent changes to the plant aside from maintenance? What about future projects?

BA: There are several longer-term projects that we are currently carrying out. We are digging water wells inside the plant and increasing the capacity of our captive water desalination facility. We are also replacing the damaged capacitor banks for the ID fan motor to improve efficiency. We will install further continuous measuring and monitoring instruments for all stacks and will upgrade the cleaning system for the separator bag filter on the cement mills. In the future we will upgrade the control system for line 1 with FLSmidth, upgrade the weigh feeders with new ones from FLSmidth Pfister and upgrade the FLSmidth Ventomatic packing machines on line 1.

GC: What one thing would you change about the plant if you had an infinite budget?

BA: I would install an alternative fuels handling system capable of raising our thermal substitution rate to 12%.

Right: Inside the plant's control room.



Markets & Future

GC: Where are the plant's main markets within Egypt and how does it supply them?

BA: Our main market, as per the original intention of the plant, is the Sinai Peninsula and area around the Suez Canal. It is dispatched entirely by truck, either in bags or bulk silo tankers.

GC: Does the plant export cement?

AB: We do not export cement at present, but have the ability to do so if the need arises. Sinai Cement is characterised by its premium quality, which exceeds the European Specification EN 197-1-CEM I 52.5 N. Moreover, the EC-Certificate of Conformity is also obtained. The company is therefore allowed to export its products to the European Union. Cement may also be exported to other markets, including to countries as diverse as Brazil, Djibouti, Eritrea, Ghana, Iraq, Jamaica, Jordan, Lebanon, Libya, Saudi Arabia, Senegal, Sudan, Turkey, the UAE and Yemen.

Excellent quality, modern technology and the experienced technical management jointly ensure that the product is produced in accordance with the optimum international quality specifications. Sinai Cement meets the requirements of these markets in terms of both quality and price.

Coronavirus effects

GC: How did the coronavirus outbreak affect the plant?

BA: We saw a significant effect as our cement demand and sales slumped dramatically. Production fell to as low as 1000t/day, less than 10% of our capacity. At present we are averaging at around 4500t/day.

GC: What are the biggest threats and opportunities for Sinai Cement over the next 1-5 years?

BA: Unfortunately the security situation is not ideal and requires a lot of coordination, as I mentioned with reference to alternative fuels. Ongoing curfews restrict our ability to manufacture and distribute our products.

However, on the other side, we have continued demand for our cement from national projects in the Sinai region, including a major expansion of the Suez Canal.

GC: Thank you for these interesting insights into Sinai Cement Company.

BA: It was great to speak with you.



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China: All-China 42.5 grade cement spot prices from sunsirs.com. 3 September = US\$64.38/t; 4-7 September 2020 = US\$64.70/t; 8 September 2020 = US\$64.91/t. The price has now risen by around 6.9% from US\$60.19/t on 4 August 2020, which was the lowest price seen in 2020.

EU ETS: CO₂ emissions permits cost Euro26.78/t on 8 September 2020, a 3.4% week-on-week fall from Euro27.72/t on 1 September 2020, a 1.5% rise month-on-month from Euro26.37/t on 7 August 2020 and a 7.1% rise year-on-year from Euro25.01/t on 8 September 2019.

Egypt: Ordinary Portland cement prices as at 9 September 2020: Arabian Cement Co (Al Mosalah) = US\$46.25/t; Arabian Cement Co (Al Nasr) = US\$43.98/t; Cemex (Al Fahd) = US\$43.30/t; Minya Portland Cement (Minya) = US\$44.38/t; Wadi El Nile Cement = US\$45.01/t; Lafarge (Al Makhous) = US\$44.89/t; Medcom Aswan Cement (Aswan) = US\$44.38/t; Arish Cement (Alaskary) = US\$44.38/t; Sinai Cement (Sinai) = US\$43.74/t; Suez Cement (Al Suez) = US\$44.56/t; Helwan Cement (Helwan) = US\$44.88/t; Misr Beni Suef = US\$46.91/t; El Sewedy Cement = US\$45.51/t; Misr Cement Qena (Al Masalah) = US\$44.25/t; Al Watan Cement (Askary Beni Suef) = US\$44.37/t.

White cement prices as at 9 September 2020: Sinai White Cement (Alabid Elnada) = US\$158.47/t; Sinai White Cement (Super Sinai) = US\$155.94/t; El Menya Cement (Super Royal) = US\$151.50/t; El Menya Cement (Royal Elada) = US\$154.03/t; Menya Helwan Cement (Alwaha Alabiad) = US\$153.72/t.

Blended cement prices as at 9 September 2020: Sinai Cement (Al Nakheel) = US\$40.44/t; El Menya Cement (Al Omran) = US\$40.44/t; Helwan Cement (Al Waha) = US\$40.75/t; El Sewedy Cement (Sewedy Tashtibat) = US\$40.75/t. Sulphate-resistant cement prices as at 9 September 2020: Arabian Cement Company (Moqwem Mosalh) = US\$46.90/t; Cemex (Al Mukawem) = US\$47.54/t; Minya Portland

These pages give *Global Cement Magazine's* monthly review of global cement prices - in US\$ for easy comparison. Some price information is only available to subscribers to *Global Cement Magazine*. Subscribe on Page 64. In this issue subscribers receive more information from: India, Bangladesh, Nigeria, Tanzania, Libya and Brazil.

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

Cement (Asec Sea Water) = US\$46.14/t; Lafarge (Kaher Al Behar) = US\$46.90/t; Suez Cement (Al Suez Sea Water) = US\$46.46/t; El Sewedy Cement (El Sewedy Al Mukawem) = US\$46.90/t.

India: Indian cement producers may see squeezed margins in the coming months, as petcoke prices have started to rise. In August 2020, international petcoke prices surged 31% on a month-on-month basis to US\$83/t, according to a Kotak Institutional Equities report. Indian petcoke prices increased less dramatically, by 8% month-on-month in August 2020 to US\$98.87/t. The international coal price also increased marginally, by 1% month-on-month to US\$55/t in August 2020.

The rising prices of ocean freight have contributed further costs for using imported fuels. Indeed, Ultratech Cement has stated that freight costs represent almost 50% of the total cost component of procuring petcoke. Meanwhile, Orient Cement said that it expects the increased petcoke costs to be reflected in its December 2020 quarter performance. Live-mint's latest dealer survey has shown that the All-India cement price is US\$4.96/bag (50kg).

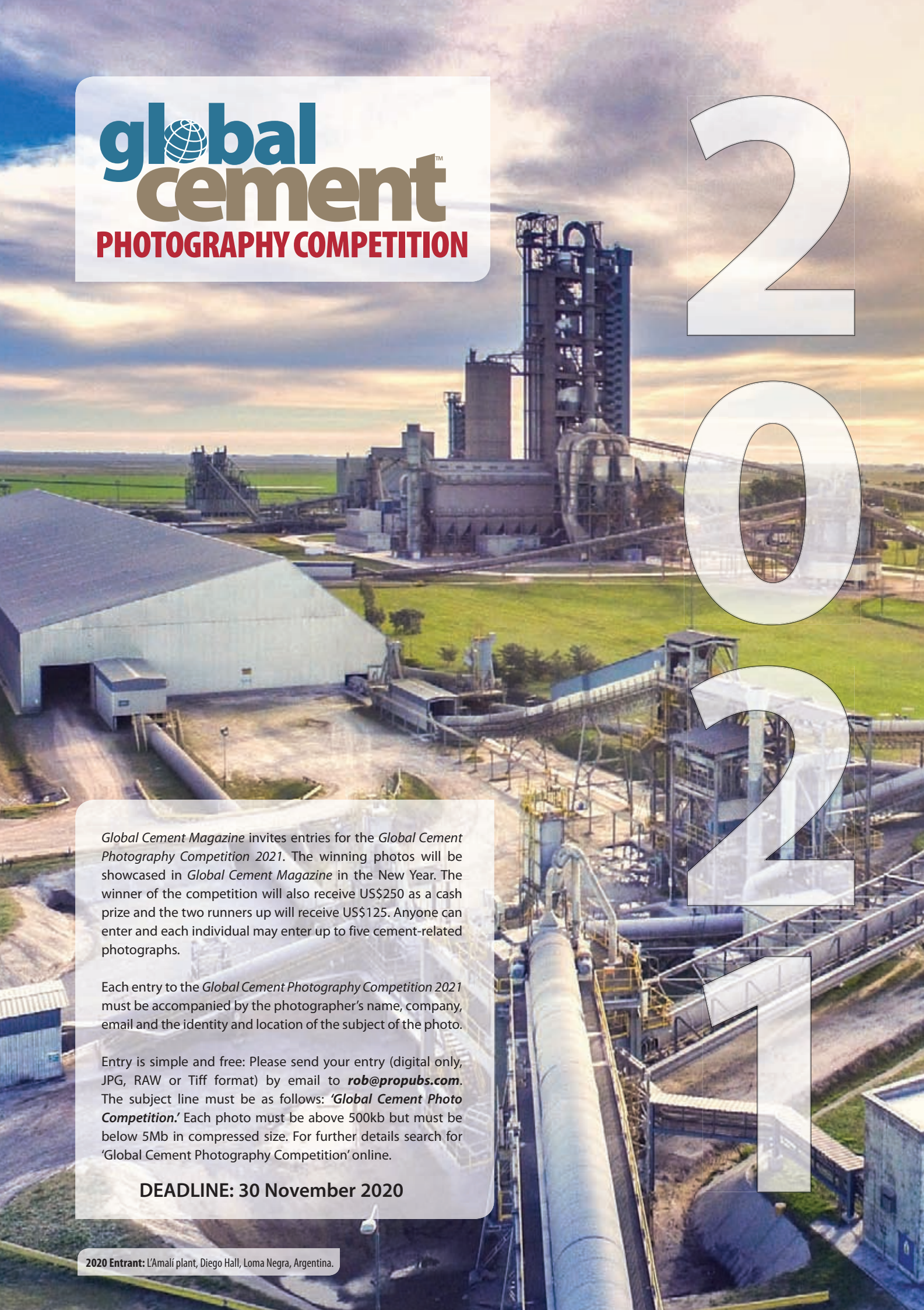
Pakistan: The market price of cement is in the range of US\$3.15-3.60/bag (50kg). Producers have recently asked the central government to cut taxes. They say that, otherwise, they will be 'compelled' to increase prices by US\$0.30-0.45/bag.



Do you have your finger on the cement price pulse where you are?
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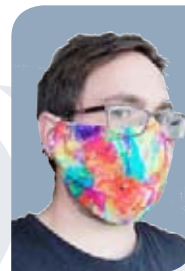
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After months in lockdown, working from home and teaching the kids, life for Family Edwards, as for many, has been slowly groping its way back to 'normal.' For us, there have been two main step changes. Firstly, we were fortunate to have children in year groups that were allowed by the UK government to return to school on 1 June 2020. This meant that the adults in the house could once again work during daylight hours, rather than patching together the work day through a haze of caffeine and poor diet choices - See below.

The second step was the start of the school holidays at the end of July. At this point work hours were once again restricted due to looking after the children, but it's summer. We put together five days of family fun that had been unthinkable to us just a month earlier. Mini golf, the beach, a theme-park based on a porcine cartoon character, a meal outside of the home, my first pint since February... everything seemed extremely normal.

Except, all the time, it was hard to shake the sense that our freedom was a house of cards, one that had been painstakingly constructed over many weeks but could now come tumbling down at any moment. For me, this caused a somewhat paradoxical response over the rest of the summer. From doing nothing for five months, I suddenly wanted to do everything that was allowed and to hell with Peter from May! My personal Covid-19 risk sensitivity went from 'Level 8 - Crossing the road to avoid lone dog walker' to a measly 'Level 2 - Chinking pints with mates (but not sharing chips).'

As a result of letting down our guard a bit, during August the family went back to the beach (three times), went swimming (twice), visited a major London visitor attraction (never again!), took advantage of a generous government incentive to eat in restaurants and somehow ended up at a food festival. I was even allowed by the powers that be (Mrs Edwards) to spend a very enjoyable morning down at the go-kart track. All extremely fun, but note that, replicated across large numbers of people, this kind of relaxation has inevitably caused further cases. There is evidence from a number of countries that greater testing has led to greater detection of cases that previously would have gone unnoticed, but the much maligned government slogan 'Stay Alert, Control the Virus, Save Lives,' maybe has a point to it after all - Keeping a lid on things.

Now that autumn has hit, the mood has changed once more. As I write, all schools in the UK have just returned to full time, socially distant teaching. This is by far the most dramatic relaxation in lockdown rules so far and a critical point for any country that wants life to return to something that looks remotely normal. The economic costs of not opening schools are clear. Without schools, pupils are stuck at home missing out on their education. Their parents are inevitably involved in their care and teaching, which prevents them from working to the best of their abilities. This, goes the conventional wisdom, cannot go on indefinitely in the light of falling numbers of Covid-19 deaths. Indeed, some are keen to point out that a few deaths from Covid-19 every day are inevitable, like heart attacks and the flu, and that we risk becoming obsessed with a single cause of death. After all, the number of deaths from heart attacks, cancer and road accidents are not constantly brought to our attention on the evening news.

On the other side of the coin it is impossible, having seen the gaggles of secondary school pupils (11-18 years) mingling freely on their way back home today, to believe that there will not be further spikes in cases as a direct result of schools reopening. If an outbreak passes from households with kids and parents (under 50 years) to *their* parents (age 60+), we may suddenly be back to square one and a full blown national lockdown.

And that's why I think I was so keen to make use of the freedom we were allowed over the summer. We packed a lot in and perhaps we needed to. So, without trying to be preachy or morbid... If you are willing and able to do whatever it is that you want to do - and it is safe to do so - do it now! A new lockdown may be just around the corner. 🌐



Left: Dolly knows all about working from home with children. Her day adds up to just 3hr:27min, which ain't no way to make a livin'.



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