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Dear readers,

Welcome to the March 2020 issue of *Global Cement Magazine* - the world's most widely-read cement magazine! This issue will be distributed at the *Global GypSupply Conference & Exhibition* in Brussels, Belgium, on 18-19 March 2020. The event will delve into the future supply trends of this vital mineral, most of which ends up in cement. It will provide valuable insight into the myriad factors that affect gypsum supply and demand in key world regions. Turn to Page 12 for a sneak preview of the event from OneStone Consulting's Joe Harder, who will present aspects of his company's extensive report on the subject in Brussels. There is still time to register. Visit: www.gyp-supply.com for more information.

In this issue we also speak to Ad Lighthart from Cement Distribution Consultants about cement sector trade trends. As cement overcapacity grows, more and more countries will attempt to export their surplus production. North Africa is the latest region to join this trend, already partly displacing established European providers. Ad expects this trend to accelerate in the coming years as the costs of the EU Emissions Trading Scheme (ETS) come to bear on the sector in Europe. Turn to Page 8 to read more.

Elsewhere, this issue has technical contributions on conveying (Pages 16 & 20), lime (Page 22), packing (Page 24) and silos (Page 26). There is also an expanded concrete section looking at how cement quality affects concrete (Page 29) and expansion at Cemex UK's Northfleet Wharf (Page 32). This issue's regional report returns to Central Asia with an in-depth look at the cement industries of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan (Page 50).

Enjoy the issue!

P. Edwards

Peter Edwards
Editor

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Features

8 In discussion: Global cement trade trends

Cement Distribution Consultants' Ad Ligthart outlines the latest cement trade patterns.

12 Gypsum Industry Focus 2030: A focus on gypsum supplies for the cement sector

OneStone Consulting looks at how gypsum supply trends will affect cement producers over the next decade.

Technical

16 Controlling conveyor belt carryback: Cost versus payback

The costs of not properly cleaning belts can be significant, even when material value is low.

20 Göltaş Çimento enjoys belting success with Beumer Group

A conveyor case-study from Turkey.

22 Lime focus with Maerz

Maerz Ofenbau provides an update on its latest lime sector projects.

24 60 years of the ROTOPACKER®

The origins, development and future of HAVER & BOECKER'S ROTO-PACKER® range.

26 Multi-compartment silo installation in Erwitte, Germany

Consulting engineering office Peter und Lochner GmbH presents a recent silo construction case-study.

28 Concrete news

29 Ensuring concrete durability and integrity: A cement quality perspective

Dangote Cement's Nohman Mahmud outlines the ways that cement can affect concrete quality.

32 In discussion: Upgrades at Cemex UK Northfleet

Cemex UK outlines the benefits of a new dry discharge system for aggregates at its Northfleet Wharf.





34 Products & Contracts

Europe

35 News

40 Preview: Solids & Recycling Technik Dortmund

41 RUD Ketten's R160 chain at Holcim Intervaz

42 Event Review: 8th Loesche Technical Seminar

Americas

44 News

Asia

48 News

50 Cement in the 'Stans'

Global Cement turns its attention to the rapidly-growing cement sectors of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

Middle East & Africa

61 News

Regulars & Comment

63 Global Cement prices

Cement prices from around the world. Subscribers receive extra information.

64 Subscriptions

65 The Last Word

66 Advertiser Index & future issues



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Contents

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Ad Index

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Interview by Peter Edwards, Global Cement Magazine

In discussion: Global cement trade trends

Cement Distribution Consultants' Ad Ligthart outlines the latest cement trade trends.



Above: Ad Ligthart is one of the founders of Cement Distribution Consultants, a Dutch expert in the field of cement trade, transportation and terminals.

Opposite page: A ship unloads bagged cement in Indonesia, one of several countries that have increased domestic seaborne shipments of cement.

GC: How have cement and clinker trade volumes changed over the past few years?

Ad Ligthart (AL): There has been a gradual increase in seaborne cement and clinker trade in recent years. Our figures for 2015 show that 110Mt of cement and clinker was traded internationally by sea in that year, with a further 93Mt transported by sea domestically. That gives a total of 203Mt of seaborne cement and clinker movements.

Fast-forward to 2019, our preliminary data shows that seaborne trade has risen to 131Mt, with a further 105Mt of seaborne domestic shipments. The seaborne cement total has grown to 236Mt, a rise of around 16% compared to 2015. We estimate that ~38Mt of supplementary cementitious materials - slags, fly ash, etc - were traded by ship in 2019.

GC: What is driving the increase?

AL: There is only one factor that really affects clinker and cement trade: Demand. In the light of the huge global clinker overcapacity, countries with shortages have a good selection of exporters. The changes we saw from 2015 to 2019 are due to rising demand. This is particularly noticeable in the US and Africa.

US seaborne imports have increased from around 1Mt in 2014-2015 in the aftermath of the financial crash, to around 11.5Mt in 2019. Texas is a large and

growing export destination, with Houston likely to have imported 3Mt in 2019. New York City likely imported 1.5Mt. San Francisco and Seattle will have imported 1.2-1.3Mt of cement and clinker each.

Africa, particularly West Africa has also witnessed a major increase in demand. Indeed, 28-30Mt of cement and clinker was imported by Africa in 2019 compared to 19Mt in 2015. Only a few places in Africa actually have excess clinker capacity: Morocco, Tunisia, Algeria and Egypt in the north, Nigeria and Senegal in the west and South Africa in the south. The remaining countries all have clinker shortages and a few, for example Tanzania, are about even. African clinker imports are rising fast, while bagged cement volumes to Africa are falling, as each market prefers its home-ground product. The proportion of clinker as a total of all African imports has risen from 55% in 2015 to more than 80% in 2019. There is a trend towards grinding plants in other regions too, for example Central and South America, but not to the same extent as Africa.

There has also been an increase in volumes of clinker and cement exported from and traded within Asia, with an incredible 17-18Mt of cement imported into Bangladesh. There have been noticeable increases in domestic distribution in Indonesia and the Philippines and, of course, a previously unthinkable situation: imports to China. More than 15Mt of clinker moved to China from Vietnam in 2019.

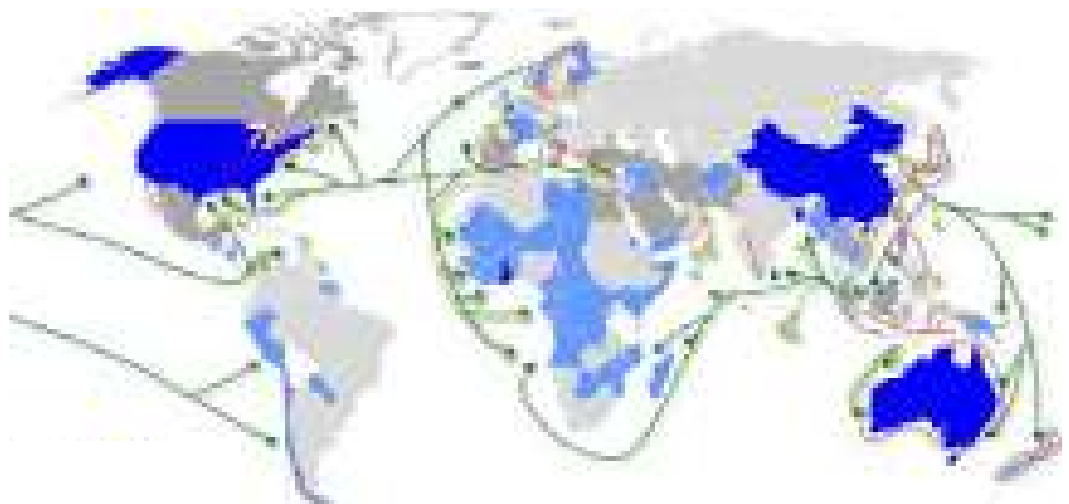
Right - Figure 1: Cement and clinker trade flows in 2018.

Imports

- >5Mt
- 1-5Mt
- In balance

Available clinker & cement

- 1-5Mt
- >5Mt





GC: What limits cement and clinker shipments?

AL: Within the main restriction - demand - without which cement and clinker would not be traded, there are a few other considerations that affect trade patterns. There are some limits on trade due to the size of ships that certain terminals can receive. The majority of ships used to trade cement and clinker are Handysize and Handymax vessels, which can take up to 40,000t. Not many ships of this size are being manufactured these days. Instead they are being replaced with Supermax (50,000-60,000t) and Ultramax (60,000t-70,000t) vessels.

Very few US terminals can receive these large vessels fully loaded, so they are already receiving partly-loaded Supermax vessels, which means cement trade is not efficient in many places at present. This can raise prices. We will have to wait and see whether or not terminals increase their storage capacities and drafts to make the most of the trend towards larger vessels.

Of course, the fact that cement can be transported to virtually anywhere in the world at low cost is very helpful for the sector, especially global operators. The driver behind seaborne trade is not just transportation cost, but its combination with the willingness of producers to export cement and clinker for just a few Dollars above their production costs. Exports are used to increase the utilisation factor of plants. If you can operate, for example, a 1.0Mt/yr integrated plant 'flat out' instead of on a campaign basis by exporting some 0.2-0.3Mt of cement, this can lead to a reduction in production costs of US\$10-12/t over the full production of the plant.

GC: What is happening in the Mediterranean?

AL: Europe has historically been a major cement exporter to West Africa, as well as to North America. However, some of its volumes are now supplemented, and are being partly replaced by, North African suppliers. Turkey also remains a prolific cement and clinker exporter. Between them, the EU, North Africa and Turkey supply around 90% of West Africa's cement and clinker imports. This region has a large and increasing appetite for cement, so a lot of exporting nations can be accommodated at present.

Facing the future

GC: Has the rising EU Emissions Trading Scheme (ETS) CO₂ emission price changed trade patterns?

AL: Up to now, the EU ETS has had a minimal effect on clinker and cement trade patterns. Producers have generally received a

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Right: Cement shipments from the EU to West Africa may be displaced by shipments from North Africa as Phase 4 of the EU Emissions Trading Scheme starts to bite in January 2021.

large number of excess allowances. However, with Phase 4 of the ETS beginning in January 2021, this will start to change. In Phase 4, it looks likely that only ~80% of the cement sector's CO₂ emissions will be covered by free allowances. The remaining 20% will have to be bought on the open market.

With prices such as they are (Euro23.67/t / US\$25.16/t as at 30 January 2020), this will raise EU cement production costs to a point that they will be too expensive for exports to West Africa. Once all factors are considered, this could easily add Euro15-20/t on the import prices. This lost EU material will be replaced with flows from North Africa. However, North African cement will not replace European exports to North America, due to both quality and logistical reasons. The US requires a fairly specific CEM I/II low-alkali cement, which is only made in a limited number of plants worldwide. This product will be more tolerant of price changes, providing EU manufacturers with more headroom on prices.

GC: What other effects could the EU ETS have?

AL: The EU has a cement plant utilisation factor of around 60% at present. It is inevitable that many plants will be closed in the years beyond 2021 in a consolidation drive that is perhaps long overdue. Going forward CO₂ emissions taxes and schemes will have an impact on many world regions, not just the EU.

GC: Will Iran and Pakistan continue to export cement and clinker to southern Africa?

AL: For Pakistan and Iran the whole east coast of Africa is a natural market, but Iran is hampered by sanctions. Countries that lack clinker, for example Tanzania, Kenya and others in East Africa, will likely welcome this. However, there are others, most notably South Africa, where the domestic sector is obviously being damaged by imported cement being sold below fair value. It would be fairly easy to place anti-dumping levies in this situation, but South Africa seems to have chosen not to take this step to date.

GC: What do you think will happen to US imports in the future?

AL: If you look back at the pre-recession seaborne import levels of 30Mt or more, you might conclude that there's a lot of potential for imports into the US to head higher and higher. Others would point out that growth may slow down in the future. I'm afraid we'll have to wait and see. US imports are very much controlled by US manufacturers and, as such, follow demand.



GC: How has the new McNinis Cement plant affected the Eastern Seaboard of the US?

AL: McNinis has definitely had an initial effect on pricing in the North East US. However, its volumes have now been absorbed into the region, perhaps replacing other imports.

GC: How will the new ISO 2020 regulations governing ship SO₂ emissions affect cement trade?

AL: These regulations only came into force in January 2020 and so the full effects are not yet known. Most of the ships used to trade cement have not fitted scrubbers but have instead converted to low-sulphur fuel. This means an increase in fuel cost, which will translate into increased transport costs. For a typical trip from the Mediterranean to the US this might mean an extra cost of US\$2.00-2.50/t.

GC: What will be the largest change in cement trading patterns over the next 1-5 years?

AL: The biggest change in the next few years will be the EU going from a major cement and clinker exporter to a relatively minor one. Much of this lost supply will be replaced by North Africa, but we will also see the Middle East exporting more, as well as Turkey, which will remain a major force. West and Central Africa will be the major importing region to increase in demand. Africa still has enormous unrealised potential in terms of cement demand.

GC: Based on all of the above, where would you build a 'Lighthart Cement' plant if you had to choose a location?

AL: Given the abundance of clinker and relatively low cost of shipping, I would not want to build an integrated plant in any location close to a coast for the foreseeable future. A stand-alone grinding plant is a far more interesting proposition. However, you have to be clever to choose the right location. The market, as always, is the key!

GC: Thank you very much for your time today!

AL: You are most welcome!



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Interview by Peter Edwards, Global Cement Magazine

Gypsum Industry Focus 2030: A focus on gypsum supplies for the cement sector

OneStone Consulting's Joe Harder lifts the lid on his company's most recent multi-client study: *Gypsum Industry Focus 2030* and what it has to say about gypsum supply trends over the next decade...



Above: Joe Harder founded OneStone Consulting, an independent consultancy for building materials and allied sectors, in 1997. He has more than 30 years in the gypsum industry, where he worked for a leading plant supplier and later as an analyst. He has published several articles about market trends in the global gypsum sector, as well as alternative fuels, cement and other building materials.

Above right - Figure 1:

Cement was the largest user of gypsum in 2018.

Source: OneStone Consulting.

Right: Wonder Cement's new 6500t/day greenfield cement plant in Chittorgarh, Rajasthan. India will be a very interesting gypsum market in the period to 2030, with a massive cement sector, growing wallboard demand and a degree of uncertainty surrounding gypsum sources.

Source: Ajitkumar Koshti, entrant to the *Global Cement Photography Competition*.

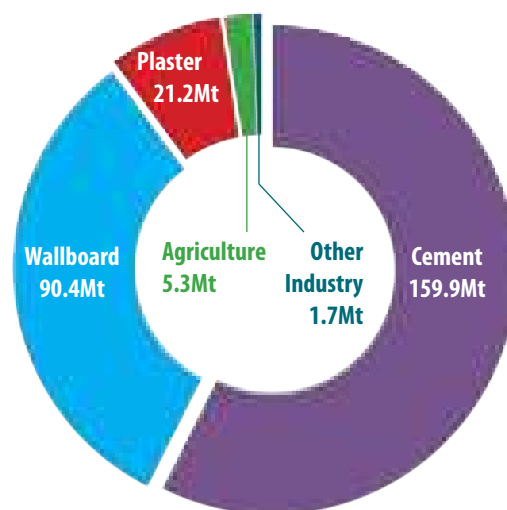
Global Cement (GG): What prompted you to write *Gypsum Industry Focus 2030*?

Joe Harder (JH): I've read many gypsum market reports over the years and have been shocked by what some of them contain. The information can be poor and generally doesn't justify the price. This is why a client asked us to conduct some original research in this area in mid-2019. This acted as the starting point for a much wider multi-client project that morphed into *Gypsum Industry Focus 2030* (GIF 2030).

GC: Who is the intended audience?

JH: *GIF 2030* is intended primarily for anyone who wants detailed and realistic numbers, research and analysis of the existing and future trends in the gypsum sector. There is a major section on gypsum supplies for cement producers, as well as information for wallboard and plaster manufacturers, equipment producers, analysts, traders and others. Market participants can use the data and the analysis to understand the market's dynamics, prepare for future risks and opportunities and plan appropriate growth strategies.

GC: How did you compile the report?

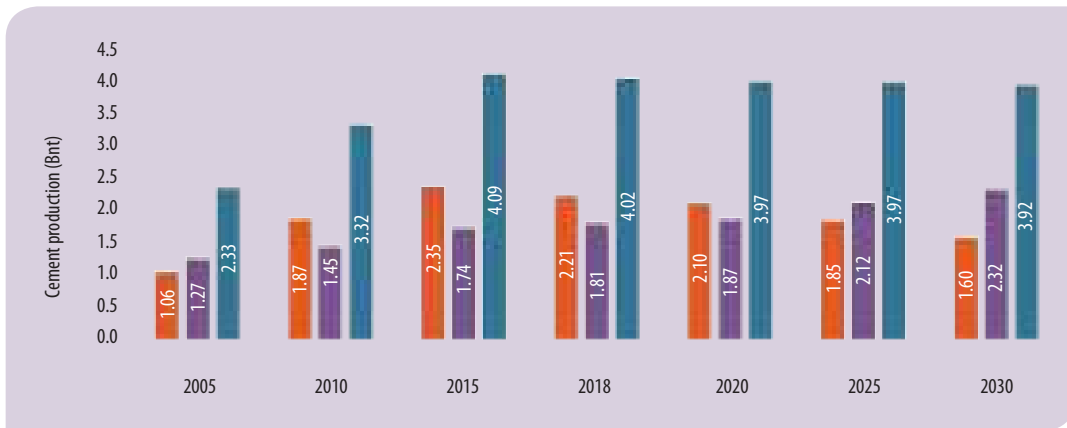


JH: We received information from some of the leading gypsum producers, as well as from industrial and trade associations, other market experts and a very large number of interviews. This was accompanied with a massive online research effort to come to a more rounded view. It was around 6-7 months of intense research and I am very pleased with the information we were able to uncover. I am especially happy that some contacts provided us their confidential information for gross data checking purposes.

GC: What does *GIF 2030* say about the cement sector's gypsum use trends?

JH: There are a lot of different projections for cement production in the coming years and it can be hard to know which is the best. Therefore we have developed





our own projection methods and applied them to the period to 2030. Our figures suggest that there will be a net *decline* in global cement production from 4032Mt in 2018 to 3920Mt in 2030, a drop of 112Mt.

However, this relatively small decline masks a bigger shift in volumes. We estimate that China's cement production volume will fall by 610Mt/yr by 2030. It will still be the dominant market by some margin. In contrast the rest of the world, predominantly on the back of India and the rest of Asia, will see volumes increase by more than 500Mt/yr.

As cement production falls, so will the amount of gypsum per tonne of cement. One reason for this will be a lower emphasis on ordinary Portland cements. Blended cements need less gypsum, or more precisely, they need a lower sulphate concentration to adjust their setting times. Synthetic gypsum will be increasingly favoured due to its higher purity, which means a cement producer needs less of it. Of course the sulphate level varies naturally with different clinkers, depending on the raw material. The sulphate content in cement clinker is generally 0.2-1.2%.

Most people would say that the average gypsum content in cement is around 5%, but they might be surprised to learn that the global average is now below 4%. I don't think that anyone has ever com-

piled a country-by-country list of how much gypsum goes into cement products, so this is a first. The highest we could find in the report was a country with an average of 4.6%. The lowest was 3.8%. By 2030 we expect the range to reduce slightly to 3.7-4.3%.

GC: What will the biggest change in natural gypsum supplies be over the next 10 years compared to the previous 10?

JH: On a global scale, the amount of mined gypsum will be roughly constant at around 170Mt/yr from 2020 to 2030. However, there will be very large regional and national changes.

The main decline will be in China, which mined 39.2Mt of gypsum in 2018. We project this to fall to 19Mt by 2030. This will be due to falling demand from the Chinese cement industry and increased substitution of natural gypsum by synthetic gypsum. In the wider South East Asian region, there will be a significant decline in natural gypsum, mostly due to the continued depletion of Thailand's natural resources. Natural gypsum output will decline in other regions too. For example, South Africa will have similar problems to those seen in Thailand.





The largest increase in natural gypsum output will come from the Middle East, particularly Oman and Iran, due to their favourable resources. Mining in Europe and North America will increase, as a response to falling synthetic gypsum supplies, especially flue gas desulphurisation (FGD) gypsum.

Other than this, a large change between the past 10 years and next 10 will be in attitude. Each country will review its gypsum resources more strategically and, in the case of depleting natural gypsum, will take a considered approach to focus more on imports and natural gypsum substitutes.

GC: What are the implications of all this for international natural gypsum trade?

JH: Natural gypsum trading volumes were 35Mt in 2018, which represents about 20% of all mined gypsum. By 2030 this could increase... slightly. The number of gypsum importers and exporters will increase due to a more and more unbalanced situation between demand and supply.

Oman will underpin its position as the leading exporter. Iran is stymied by sanctions and many other countries rely on infrastructure improvements to realise their potential. These markets may or may not be developed.

Demand for imported gypsum will increase from India, Vietnam, Japan, Indonesia, the UAE and Qatar. These all have no domestic gypsum reserves and also lack the capacity to make sufficient synthetic gypsum. India, currently the largest importer of natural gypsum, is rapidly increasing its FGD gypsum capacity, the exact consequences of which are hard to predict.

GC: Can you expand on your projections for synthetic gypsum trends in 2020-2030?

JH: Synthetic gypsum will see the largest changes of any gypsum type over the next 10 years. On the one hand we will see markets with big declines in output. This will be the case in Western Europe and North America as they close their coal-fired power plants. Another area for change will be India. This is a country where synthetic gypsum production will truly explode. Every week it seems that a new FGD scrubber is coming to an Indian power plant! A forecast for India is not easy, given the play-offs between synthetic gypsum and natural gypsum imports. Another country that will see massive increases in FGD gypsum generation to 2030 will be China.

Of course there are synthetic gypsum sources other than power plants. The most prominent, indeed the most abundant of all synthetic gypsums, is phosphogypsum. However, relatively little of it is used. This will change going forward but growth will not be even. China, for example, might be a good growth market for using phosphogypsum due to FGD gypsum supplies being far from the cement and wallboard plants that need it.

GC: What is the factor / event that could upset the findings of GIF 2030?

JH: We use IMF data for the five year horizon and we have used this as a basis for the subsequent five years. The main potential for disruption to our forecasts is if there were to be a repeat of the late 2000s financial crisis. We never know what might happen next on that front!

GC: Thank you very much indeed Joe.

JH: Thank you once again Peter.



About Gypsum Industry Focus 2030

Gypsum Industry Focus 2030 comprises six chapters: Methodology; Natural and synthetic gypsum; Applications in cement; Wallboard/ other gypsum products; Gypsum plant expansion projects and: The future of gypsum. The report contains more than 150 pages and in excess of 100 charts and tables. The data are presented for 14 world areas, including the 50 major gypsum countries for 2005-2030, mostly in five year intervals. The authors believe that no other gypsum report provides such comprehensive and accurate data. *GIF 2030* will be available in April 2020 at competitive prices.



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R Todd Swinderman, PE, CEO Emeritus, Martin Engineering

Controlling conveyor belt carryback: Cost versus payback

'Carryback' is defined as the material that fails to unload from a conveyor belt, adhering to the belt and typically falling off at some point other than at the intended discharge. The effectiveness of mechanically scraping carryback from a conveyor belt is important in the cement industry because the consequences of not cleaning the belt are significant...

Carryback is one of the main sources of fugitive materials in the cement sector. It is estimated to account for 85% of all conveyor maintenance issues. Accumulations from dirty belts necessitate frequent cleaning and can stop production. This exposes workers to injury and respiratory illness. The fines that adhere to the belt also degrade the life of conveyor components and dirty belts release dust to the environment as they travel over return idlers.

Belt cleaners

It can be shown practically and theoretically that a conveyor belt cannot be cleaned 100%, because the surface of the belt and the blades are not without imperfections and/or damage. However, this doesn't mean operators shouldn't take a proactive approach to keeping belts clean. Virtually every technique and combination imaginable has been tried for cleaning conveyor belts that handle bulk solids, including piano wires, high pressure water sprays, brushes, vibrations and even very small head pulleys to fling carryback from the belt. Like most industries, cement production has gravitated to basic mechanical scraping with a metal or elastomeric blade for flat rubber or PVC belting as the best combination of effectiveness, ease of maintenance and low belt wear to yield the lowest overall cost of ownership.

The effectiveness of belt cleaning varies day to day with changing conditions and the number and type of cleaners applied, as well as the maintenance they receive. Keeping the material in the process is always better than letting it accumulate on components and build up under the conveyor. Whether the cargo is valuable or not, it makes sense to keep as much of it in the process as possible. Without effective belt cleaning, experience has shown that as much as 3% of the total cargo can be lost due to spillage, dust and carryback. World class operators can average less than 0.1% fugitive material loss, reducing direct operating costs. The key to consistent cleaning effectiveness is to control the process through proper selection, installation, inspection and maintenance of the belt cleaning system and establish a safe cleanup routine and schedule.

The use of multiple mechanical scrapers on a belt has been accepted for quite some time as an effective cleaning approach. In some applications, the amount of carryback that can be tolerated is very small, due to fire and explosion hazards when compared to levels that would be acceptable in a limestone quarry, for example. The real question is: How much carryback per hour can the system tolerate and still function safely until the next scheduled maintenance period? In most operations, multiple cleaners are required

Typical carryback cleanup labour requirement calculation

Belt width 1200mm, Speed 2.0m/s, Operating 24/7, Carryback level 100g/m²

Carryback (C_b) = Belt surface to be cleaned x Hours of operation x Carryback level x % falling from belt

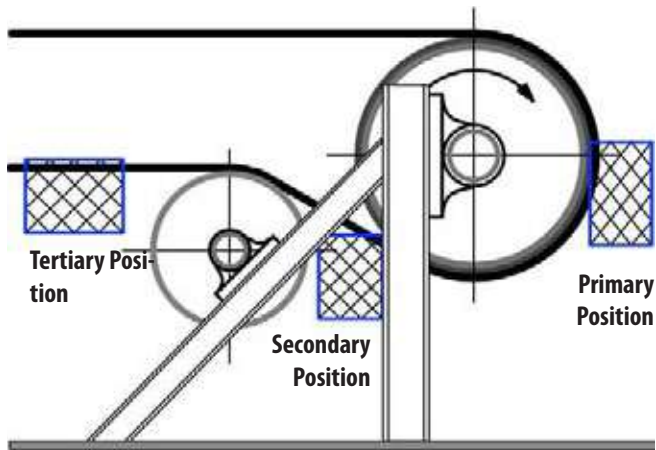
Assuming dirty width of the belt is 0.8m, 50% falling to the ground and converting to t/day:

$$C_b = 0.8m \times 2.0m/s \times 24hr/day \times 3600s/hr \times 100g/m^2 \times 50\% = 6,900,000g/day = 6.9t/day$$

Shovelling at 1t/hr requires 6.9hr = 1 cheap labourer / day

Cleanup with mobile equipment will significantly reduce time taken to clear up the carryback

Right - Figure 1: Typical carryback cleanup labour requirement calculation.



to reduce the carryback to a safe, acceptable level while limiting manual cleanup to weekly or even monthly intervals.

Effectiveness versus efficiency

The undulating action of the loaded belt passing over idlers tends to cause fines and moisture to migrate and compact on the surface of the belt. Quarrying and processing create a large volume of fine particles, many of them just a few microns in diameter, which makes belt cleaning difficult. The carryback that adheres to the belt through a combination of adhesion and electrostatic forces, depending upon the characteristics of the bulk material and the moisture content, is measured in grams per square metre of dry weight material on the carrying side.

The amount of carryback that clings to the belt can range from a few grams to a few kilograms per

square metre. The level of belt cleaning required is a function of the operational schedule and method of collecting and disposing of the carryback that is cleaned from the belt or dislodged by return idlers and collects outside of the conveyor discharge chute. Depending upon the length of the conveyor, the amount of residual carryback that falls along the return or becomes airborne dust after cleaning ranges from 25% for short belts to 75% for longer belts.

When discussing the efficiency of a belt cleaner, it is meaningless to talk about efficiency without stating the initial level of carryback. When

considering the beginning and ending levels of carryback as a measure of improvement, effectiveness is a better term. Some guidelines do exist. The US Bureau of Mines states that an average of 100g/m² of carryback is a reasonable performance level for belt cleaning. At this level the belt may have visible streaks of discolouration or wet bands but not excessive buildup on components or piles on the ground.

A typical manual shoveling rate is 1t/hr or less, depending upon access and disposal methods. At 100g/m² a 1200mm (48") belt travelling at 2m/s and operating 24/7 would create a cleanup workload of about 7t/day. If the conveyor is elevated from the surface at the tail greater than what most standards establish as the minimum clearance of 300mm (12"), cleanup schedules should be manageable.

Left - Figure 2: CEMA belt cleaning positions and a belt cleaner-friendly structure.

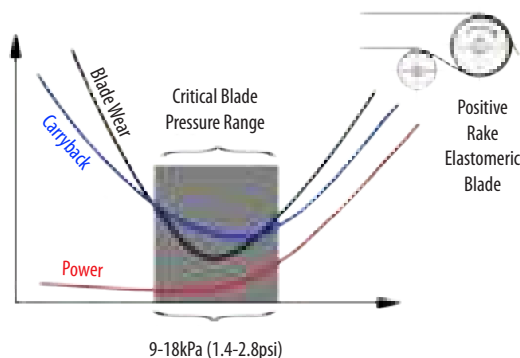


Left - Figure 3: Automatic tensioner.



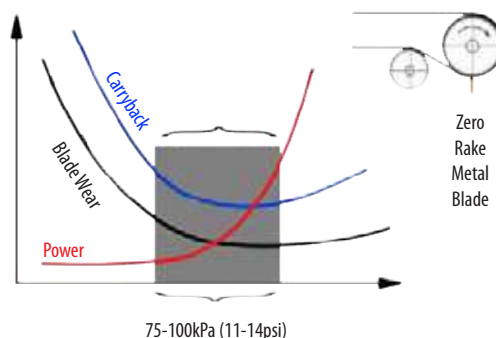
Right - Figure 4:

Elastomeric primary blade pressure at a positive rake.



Far right - Figure 5:

Metal secondary blade pressure at zero rake angle.



The Conveyor Equipment Manufacturers Association (CEMA) Standard 576 is a rating system based on belt and bulk material conditions and level of desired cleaning for specifying belt cleaner performance. The standard uses belt attributes and material characteristics to develop its ratings, using CEMA Standard 550 to assign values for the material categories. The factors include the conveyor speed, belt width and splices, as well as the material's abrasiveness and moisture content. Each is scored individually and then totalled, to arrive at the class rating for the application. The final score is divided into five application (Class) levels that should be considered when cleaners are being selected. Appropriate cleaners should have a rating that meets or exceeds the calculated application class score.

Carryback level determines the cleanup schedule. In reality, a typical belt cleaner loses effectiveness over time due to lack of inspection, cleaning and maintenance. On systems with average or poor maintenance, effectiveness values are more in the range of 40-60%, hence the need for multiple cleaners. Regular cleaning of the blades or the use of water sprays can improve these values by ~15%.

Below - Figure 6: Conveyors are vital to the smooth running of cement plants.



Cleaning location

CEMA has established nomenclature for the location of belt cleaners. Unfortunately, designers often focus on the lowest installed cost of the structure around the head and snub pulleys in an effort to reduce sales prices, without allowing enough space for optimum cleaner installation. Incorrect mounting location from the face of the belt is another common cause of poor cleaner performance, which introduces significant long-term costs that can be mitigated with cleaner-friendly structural arrangements. Access to cleaners restricted by structure or drive components reduces the ability to inspect, clean and service belt cleaners and therefore also contributes to reduced cleaning effectiveness.

Figure 2 shows the clear areas needed on a discharge chute for installation of belt cleaners in the optimum positions. The installations should be at an ergonomic height above the work platform to encourage proper inspection and service. Consideration in the design stage for locating cleaners in the optimum locations will lead to more effective inspections, maintenance and belt cleaner performance. A large enough discharge pulley ($\varnothing > 600\text{m}$ (24 inches)) can often accommodate two precleaners, which is desirable since the cleaned carryback will flow with the main stream of cargo and reduce or eliminate the issue of buildup on a dribble chute.

Belt cleaners can be placed anywhere along the return run of the belt, as long as the belt is supported in some fashion. As it is desirable for the carryback cleaned from the belt to be returned to the main material flow, most belt cleaners are installed inside the discharge chute. Cleaning on the head pulley, labelled the 'primary cleaning position,' is preferred. Cleaning the dirty side of the belt before it reaches a snub, bend pulley or return idlers is considered less desirable, requiring a dribble chute for cleaners in the secondary position.

The secondary position is complicated by another fact. The nature of carryback is such that it can adhere to vertical surfaces and not flow down a sloped dribble chute. A tertiary position is sometimes required for critical applications such as conveying over wetlands. In such cases, the tertiary cleaners are often



enclosed in a spray box and the effluent directed to a settling basin. Most cleaners, when located more than a few cm (or inches) from where the belt leaves the discharge pulley, require a backup or hold down roll to maintain stable blade-to-belt contact and to control belt flap (vibration).

Cleaning pressure and blade wear

There have been several studies that indicate optimum cleaning pressures for primary and secondary belt cleaners. Without enough cleaning pressure, the blade cannot stay in contact with the belt, resulting in poor carryback removal effectiveness and increased blade and belt wear. With too much cleaning pressure, the cleaning performance declines due to deflection of the elastomeric blade or metal blade indentation into the rubber belt. Power consumption also increases dramatically with excessive cleaning pressure.

Figures 4 and 5 show the optimum range of cleaning pressures for different cleaner designs and blade materials. Keeping a belt cleaner properly tensioned is critical for maximum effectiveness and lowest cost of ownership. The cleaning pressure usually varies over time, based on the maintenance department's attention (or lack thereof). Some manufacturers have begun to offer automatic tensioners and wear indicators which maintain the optimum cleaning pressure and alert operators when blades are worn.

Final thoughts

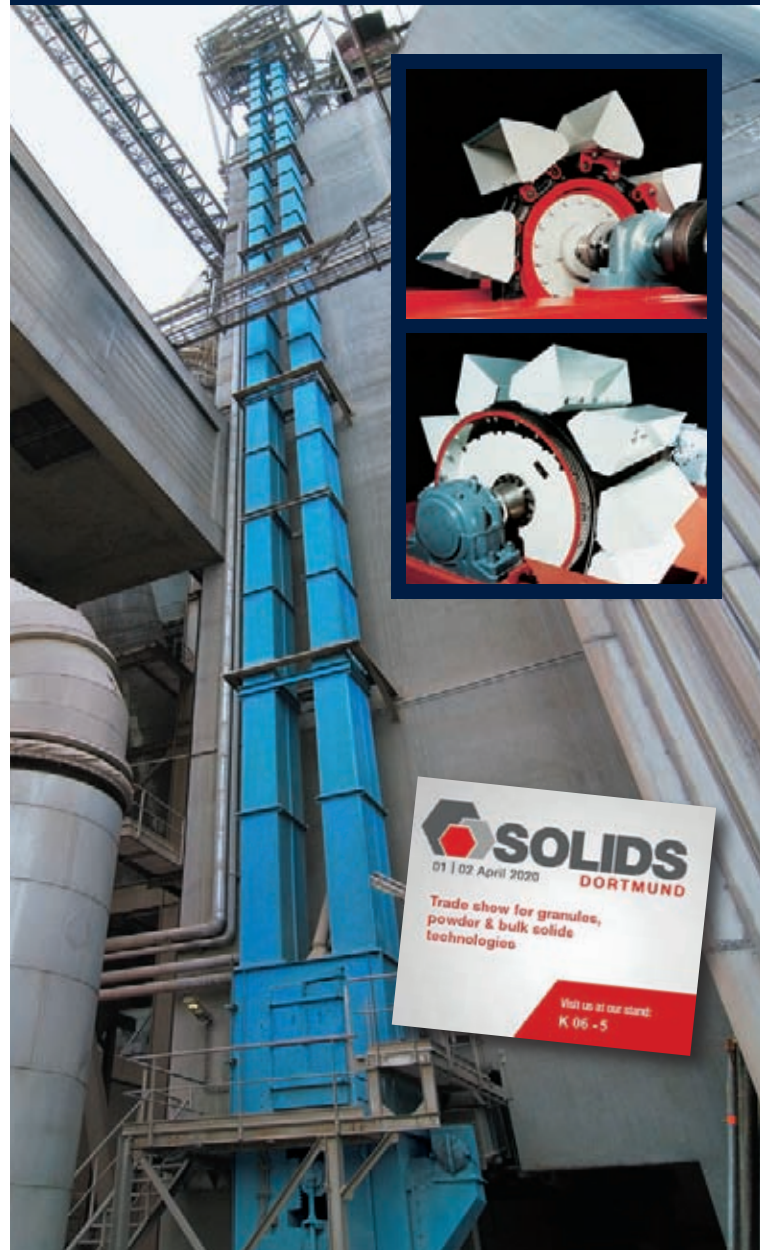
Many belt cleaner systems are installed and forgotten. A survey of technicians indicates that about 25% of all belts have cleaners installed, and of that percentage only about 25% are properly maintained. While the initial cleaning results may be significantly better than the previous performance, lack of inspection and maintenance results in accepting a gradually lower level of effectiveness, higher operating cost and an increased exposure to the hazards associated with cleaning up carryback.

Effective belt cleaning starts in the design stage, with adequate space for cleaners and well-positioned work platforms for ergonomic inspection and maintenance access. Service-friendly designs improve production and prolong the life of equipment. If the cleaners are located in the optimum positions and easy to access, it is more likely that regular inspection, cleaning and maintenance will be performed, resulting in optimum results.

Proper selection, installation, inspection and maintenance of conveyor belt cleaners can provide an immediate return on investment simply from reduced clean-up labour. Further, effective belt cleaning produces often-overlooked savings from reducing wear on belts and components, minimising worker exposure to the hazards of cleaning around a conveyor and maintenance in hard-to-access locations.



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André Tissen, Beumer Group

Göлтаş Çimento enjoys belting success with Beumer Group

From kiln cooling system to silos, the safe and economical transportation of hot materials like clinker (500-800°C) is crucial in cement plants. Reliable plant operation requires a robust conveying system. Using a belt instead of a chain as the traction element, the Beumer belt apron conveyor (GSZF) incorporates a slimmer design and a higher top speed than other apron conveyors, while delivering the same level of performance. This makes it especially suitable for modernisations, as in the case of Turkish cement producer Göлтаş Çimento's upgrade of its integrated Isparta plant.

Right: Beumer Group supplied a GSZF belt apron conveyor to Göлтаş Çimento.

Right: The narrow and weight-reduced design of the GSZF reduces the costs for steel structure and freight.

Beumer belt apron conveyors are in operation for nearly 150 companies. One of them is Göлтаş Çimento. Its Isparta plant lies 130km north of Antalya. In the wake of a building boom in Turkey and growing demand for cement, the producer opted to modernise its kiln and increase production. This necessitated an increase to the capacity of the chain conveyor that transports clinker from the kiln cooling system to the silo to 400t/hr from 250t/hr.

For economical production, Göлтаş Çimento has increasingly opted for alternative fuels (AFs) in recent years. As is common with high-AF fuel mixes, the content of fine particles in the clinker had increased continually. The existing conveyor transported high quantities of material and the process had become extremely dirty, with personnel constantly having to perform cleaning work.

Göлтаş Çimento decided to upgrade its conveyor technology. The project phase began mid-2015 and the contract was awarded to Beumer Group, which has previously supplied Göлтаş Çimento with two clinker transport systems and four belt bucket elevators, in early-2016. Installation and commissioning followed in late-2016. For the installation work, Beumer Group provided the supervisor, while the assembly was carried out by client personnel.

With a more powerful chain apron conveyor, Göлтаş Çimento would have had to take down the entire system, including the building structures and the concrete tunnel. This wasn't necessary when opting for the belt version. It conveys at twice the speed, so Beumer Group engineers could design the system for an increased capacity while keeping the same width. Göлтаş Çimento was able to reduce costs and quickly put the system into operation.

The silo is 50m high. In order to overcome an inclination of 40°, Göлтаş Çimento installed a steel box conveyor. It releases almost no material into the environment, despite the high content of fine particles, creating a cleaner working environment.



Blazing the trail in reliability

Cement plant operators are still unable to ensure with 100% certainty that the temperature of material leaving the clinker cooler is below 800°C. A raw meal flash, caused by breaks in the kiln outlet sealing, can cause several tons of raw meal or clinker to run through the cooler. This cannot be completely avoided. Unable to cool down, the material then arrives on the conveyor at an extremely high temperature.

The design of Beumer's apron conveyors' cells allows safe, low-friction transportation of any hot material. Sealed and overlapping side walls and bottom plates in the cells prevent the clinker from exiting and minimises the escape of dust. Beumer's SZF apron conveyor and GSZF belt apron conveyors are available with cell width gradations of 500-2000mm, centre distances of more than 250m and conveying capacities of over 1300m³/hr.



The angles of inclination on the SZF and GSZF are adjustable to the height of the silo and conveying distance up to an incline of 60°.

The systems come in three different designs. Firstly, an open-celled design transports bulk material at an angle of up to 30° without it rolling back. The cells on the second design are equipped with baffle plates, and inclinations of up to 45° are possible. The third design, based on a steel box conveyor, allows extreme inclinations of up to 60°. As well as steep inclines and small curves, this is well-suited to transporting clinker with a high content of fine particles.

The conveyor's usual traction element is a single or double strand sprocket steel-bushed roller chain with a pitch of 315mm. Finely regraded versions ensure optimum adaptation for break forces ranging between 250kN and 2700kN. The maximum conveying speed is 0.3m/s.

The thinner, lighter design of the GSZF reduces costs for the steel structure and freight and lowers the static and dynamic loads which affect the clinker silo and the foundations. The lightweight design also lowers operational costs.

The entire belt lies with its surface on the drive and return pulley, thus avoiding the unwanted 'polygon effect' on the chain.

The smooth running of the machine reduces noise level to less than half those of conventional SZFs with chains.

The use of the Beumer steel wire belt instead of a chain extends maintenance intervals and lowers costs. With its steel wires, though the belt ages and its rubber becomes brittle, it will never completely break. Lubrication is not required for the belt, mitigating costs, environmental impact and the acceleration of wear and tear caused by clinker accumulations.

Below, far left: Göltaş Çimento employees carry out the installation work with the support of Beumer Group.

Below, centre: The belt apron conveyor (at top right) reaches an inclination of 40°.

Below: The design of the system's cell strand facilitates the clean transportation of the clinker. No clinker can fall out.



Instead of a chain, Beumer also offers the apron conveyors with its steel wire belt extending from the bucket elevator. The cells are attached to the low-wear, steel-wire reinforced belt with a profile in between which prevents the heat of the clinker in the steel cells from being transferred to the belt. Partition plates are attached in the material feeding area below the cooler and can be removed for maintenance, protecting the belt against hot clinker in case of a kiln flash.

At 0.6m/s, the belt apron conveyor can reach double the conveying speed of apron conveyors with a chain. If the operator wants to increase the kiln capacity, it can replace an existing apron conveyor with a belt version of the same size. This doubles the capacity without having to change anything on the steel structure on the conveyor bridge.

Conclusion

The collaboration between Göltaş Çimento and Beumer Group went very smoothly. The assembly was made somewhat trickier by the requirements of working in the very narrow concrete tunnel where the conveyor is located. However the installation was well-prepared and delivered on schedule. Göltaş Çimento and Beumer Group are currently discussing future modernisation projects.

André Tissen is a sales manager in Beumer Group's customer support team.



Maerz Ofenbau AG

Lime focus with Maerz

Switzerland-based Maerz Ofenbau provides an update on its latest lime sector projects...

Tangshan Gangyuan Metallurgical and Furnace Company, China

Maerz is in the process of constructing its largest ever lime plant, for Tangshan Gangyuan Metallurgical and Furnace Company, in Laoting, Hebei Province, China. Tangshan Gangyuan is building a greenfield plant capable of producing 4000t/day of burnt lime, via the construction of five 800t/day Maerz R5S lime kilns that will be fired on lean gas. Local contractors are carrying out the erection of the buildings, steel structures and auxiliary installations, while Maerz is delivering key equipment. The plant is expected to commence production of burnt lime during the first half of 2020.

Easternbulk, India

Easternbulk Lime Products set up and commissioned its first lime kiln in July 2019. The plant, located in Tuticorin, Tamil Nadu, is a joint venture between Easternbulk Trading and Shipping and Thailand's Chememan plc, a long-standing Maerz customer. The twin-shaft E2 Maerz lime kiln has a capacity of 150t/day and uses coal as its fuel. Maerz supplied technical assistance and experienced Chememan personnel as well as the kiln, which entered commercial production in July 2019. A second 150t/day E2 kiln will be commissioned by Maerz and Chememan in India later in 2020.

Right: Easternbulk's 150t/day E2 Maerz kiln was commissioned in July 2019.

Below: Construction work at the largest ever Maerz plant, a 4000t/day five kiln facility. The plant is being built in Laoting, Hebei Province, China, for Tangshan Gangyuan Metallurgical and Furnace Company.

Mexicana de Cobre, Mexico

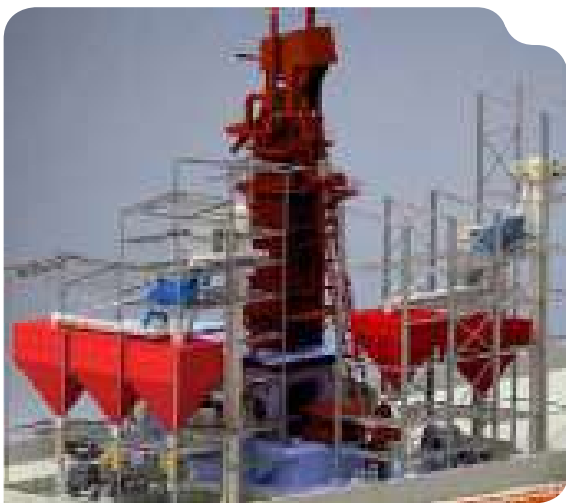
Mexicana de Cobre is preparing the ground for a circular Maerz R4S lime kiln that will produce 600t/day of burnt lime (60-110mm) at its plant in Agua Prieta, Sonora. The partners previously commissioned two kilns at the plant in 2009 and 2014. The kiln will help the company cope with the increasing demand for lime from its mining business. It is the largest copper producer in Mexico and the fourth-largest globally.



The order includes the supply of engineering, license, know-how and equipment, as well as technical assistance services during erection, commissioning and start up of the Maerz PFR lime shaft kiln, which will be fired using natural gas. The scope of supply includes: suspended cylinders; process air blowers with electric motors; electrical, measurement and control systems; firing system for natural gas, including start-up burner equipment; hydraulic equipment; limestone skip hoist winch, including pertinent electrical measurement and control equipment; air blast units; and refractory materials. Maerz technicians will assist with the hot commissioning and acceptance test runs on the kiln and associated equipment.



Left: Mexicana de Cobre's two existing Maerz lime kilns, with ground cleared for the third kiln in the foreground.



Abinsk Electric Steel Works, Russia


Abinsk Electric Steel Works, located in Krasnodar Region, Russia, has placed an order for the supply of engineering, license, know-how, equipment and technical assistance services during commissioning and start up of a Maerz PFR lime shaft kiln. It has also ordered limestone and lime handling systems from Turkey-based Parget Makina.

The rectangular E2 double shaft lime kiln will calcine limestone with gradings of 20-40mm and 55-100mm respectively at a rate of more than 160t/day. It will be fired using natural gas and will be commissioned in mid-2020.

Left: Computerised rendering of the new Maerz E2 kiln being built for Abinsk Electric Steel Works in Russia.

Daesung MDI, South Korea

Maerz has reported the successful installation of two Maerz PFR lime kilns with a capacity of 200t/day and 300t/day at Daesung MDI's Gangwon-Do Limechem Center plant in South Korea. The kilns were officially

inaugurated on 19 October 2019 at a ceremony with some 200 guests, including local officials, other Korean lime manufacturers, the project's contractors and other involved parties. 

Below: Daesung MDI's Gangwon-Do Limechem Center plant in South Korea.





Haver & Boecker OHG

60 years of the ROTO-PACKER®

The origins, development and future of HAVER & BOECKER'S ROTO-PACKER® packing machines...

HAVER & BOECKER traces its history back to a wire weaving mill founded in Oelde, Germany, in 1887. In addition to woven wire cloth, it also produced wire bag closures that were used in the cement industry. In the 1920s Erich and Fritz Haver, the second generation of the company, recognised the potential of glued paper bags and so developed a row packing machine based on an American model.

As cement plants became larger and larger, demand for faster and higher capacity packing machines also grew. In the late 1950s Rudolf Haver and designer Paul Schwake were contacted by Phoenix Cement in nearby Beckum. Schwake was a visionary, who combined the well-known idea of a rotating packing system, to that point primarily used with jute bags, together with HAVER & BOECKER's filling technology. This was an ideal combination for paper bags, which were only just being established on the market. He designed these features in a machine that could also cope with the changes of the future and could be expanded. This combination and its associated operating cost advantages gave HAVER & BOECKER a decisive edge. The first ROTO-PACKER®, as it became known, was commissioned at Phoenix Cement in April 1960.

Wolfgang Haschke, Sales Manager at HAVER & BOECKER for nearly 40 years and affectionately known

as 'Mr. ROTO-PACKER' within the company, describes the moment that he saw the machine in operation for the first time in April 1960. "I remember the commissioning of the first round packer at Phoenix," says Haschke. "I thought *'What a wonderful machine it is!'* when I saw the bags on the conveyor belt filled at regular intervals. For the employees who loaded the bags manually onto the trucks, this regularity was a great benefit in terms of safety and occupational health. Investors from HeidelbergCement recognised its potential during a visit to our production facility without even seeing it in action. They ordered three machines on the spot."

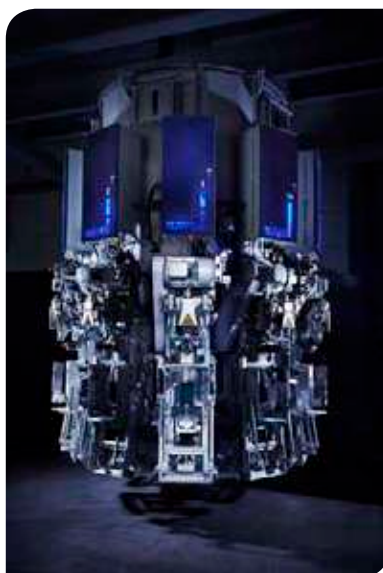
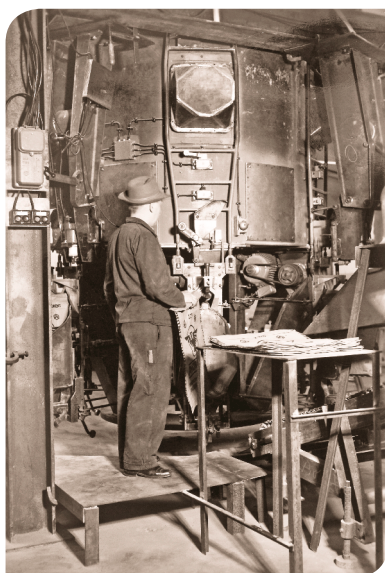
"We had the right machine at the right moment," continues Haschke. "This was evident by sudden growth that the Oelde plant had not been prepared for. Without hesitating, Rudolf Haver arranged for a new plant to be built. The ROTO-PACKER® enabled HAVER & BOECKER to rise from a relative unknown to a global player in a very short time. The enquiries from all over the world quickly led to expansion. By expanding its subsidiaries, HAVER & BOECKER secured market access in China and Brazil, among other countries."

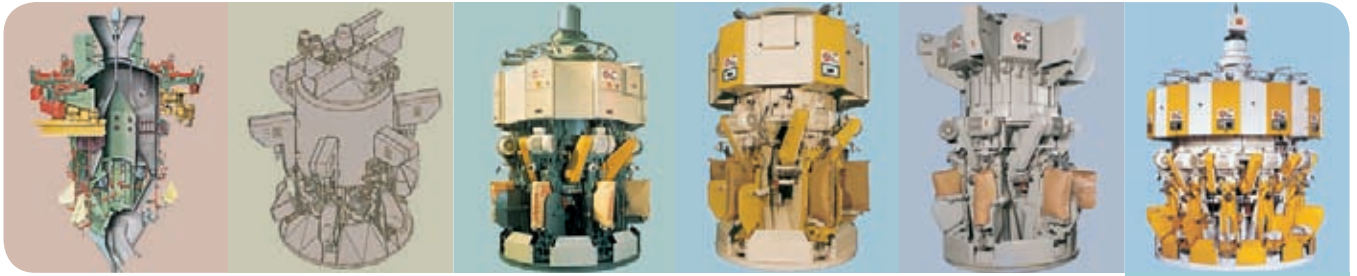
Alois Combrink succeeded Paul Schwake as Technical Manager in the Strategic Product Development department. He is keen to point out that the ROTO-PACKER® has come a long way. "The technology of the first generation led to sleepless nights. It was unclear how the scale would react to centrifugal force, especially when the scale's beam was not in balance. The interface between the rotating system and the stationary periphery also gave us headaches. At that time, we did not have the options that electronics and pneumatics offer today. We had to solve most of the problems by using mechanical systems. The system benefited from many clever and creative minds."

"Since those days, advances in pneumatics and electronics have brought immense improvements," expands Combrink. "We were able to use the new technology to increase the level of automation in the second-generation machine. This has since led to a complex and balanced composition of mechanical systems, electronics and pneumatics."

Below: The first ROTO-PACKER® entered operation at Phoenix Cement in 1960.

Below right: The RVT is the latest generation of the ROTO-PACKER®.





This trend has now been extended to the ROTO-PACKER® RVT for packing bulk materials into paper or PP valve bags. It was launched in 2016 after extensive development by Christian Böhner, a leading developer, and his team.

“The change from a purely mechanical machine with an electric motor over to one that has a mechatronic, fully automated system is enormous,” explains Böhner. “The current version of the ROTO-PACKER® is the first to be planned by the mechatronics department. Before this, the electronics always followed the mechanics. The RVT is a prime example of successful cooperation between all the technical fields involved, from mechanical, electrical and mechatronic to software development. Each step was planned and developed together as a team. With the RVT and the new low-maintenance ROTO-LOCK® dosing unit, we jointly set an important milestone for the ROTO-PACKER®.”

In combination with other units such as the RADIMAT® automatic bag applicator, a palletiser or a truck loader, the ROTO-PACKER® ensures smooth product flows and regular output.

Vincent Delatour, who has worked at HAVER & BOECKER for 32 years and has headed the Mechatronic Design Department since it was created in 2015, interjects, “A rethink is currently taking place in society. Products are being given a new value. Waste is viewed more critically and consumers are asking how to reduce their ecological footprint through sustainably manufactured products. We have to respond to this market demand.”


Willi Vollenkemper, the current head of research and development, adds, “We are working hard to ensure that the ROTO-PACKER® maintains its pioneering role. Climate change and environmental protection are currently dominating our developments. We are already well positioned in terms of dust-free, loss-free as well as energy-saving filling. It is important to optimally coordinate the filling technology with a future-oriented and climate-protecting packaging.”

Asked what such packaging looks like, Vollenkemper answers, “A sustainable bag should protect the product well against moisture, be robust and tear-resistant, require only a small amount of packaging material and be recyclable (or contain a high proportion of recycled material). Our answer to this

is our ADAMS® technology for filling powdery bulk materials into tight PE containers. However, paper valve bags can also meet at least some of these requirements if the ROTO-PACKER® is equipped with our SEAL technology and the bags are securely sealed.”

When asked about the company’s digitisation efforts, Vincent Delatour responds, “Digitisation naturally plays a dominant role in the further development of the ROTO-PACKER®. An important step is the HAVER QUAT²RO monitoring system, which enables the customer to monitor the current status and performance data of the plant from anywhere in the world. It can also plan maintenance operations in advance and thus carry out tasks more effectively. That means the predictive and proactive maintenance of the system according to actual demand. This also contributes to the conservation of resources, as parts are not replaced after a fixed period of time, but after actual wear and tear. The data and its evaluation enable the plant to optimise itself and react to external influences. Of course, the security and stability of these systems are very important to us.”

Partner Dr Reinhold Festge elaborates on the future of the ROTO-PACKER®. The secret, as before, will be the machine’s high degree of adaptability. “The same adaptability that led the ROTO-PACKER® through its first 60 years will continue to be an important feature in the future,” he explains. “Market demands are becoming more short-lived and our customers will have to rely increasingly on flexibility. The ROTO-PACKER® can be adapted to suit production halls with low ceilings or to variable product characteristics, depending on the situation. This individualisation supports many companies in the cement and wider building materials sectors to package and present their own products to the highest standards and, by doing so, meet the demands of their own markets.”

After 133 years HAVER & BOECKER continues to bring its developments forward. This is highlighted by the continuous improvement of the ROTO-PACKER®, which shows how the vision and drive of individuals, when combined with insightful collaboration, can bring major developments for the cement sector, the built environment and society as a whole. 



Above: A selection of images reflecting the ROTO-PACKER® ‘through the ages.’

Christoph Wentz, Peter und Lochner GmbH

Multi-compartment silo installation in Erwitte

Silo construction expert Peter und Lochner GmbH presents a recent silo construction case-study from German cement producer Spenner GmbH and Co. KG's Erwitte plant...

Spenner GmbH & Co. KG has selected a new multi-compartment silo to store different cement products at its Erwitte plant in North Rhine Westphalia, Germany.

The outer diameter of the silo is 20.7m and it is 62.35m high. The circular cross section is a ring silo with the annular compartment divided into five cells, each of which has a volume of 1770m³, with one inner silo cell of 1500m³. The structural design of the silo is arranged so that each cell can be filled and emptied entirely independently of the others. The cone was built with the use of prefabricated reinforced concrete segments supplemented with in-situ concrete.




Above: Construction of the silo cone began in October 2019.





Above: The new silo was constructed next to an existing one.

The silo conception was engineered by IBAU Hamburg. The structural design and the execution drawings for the reinforced concrete works and the associated steel structural works have been elaborated by the civil engineering company Peter und Lochner GmbH, based in Stuttgart.

The civil works began in September 2018 and were finalised at the end of July 2019. The erection of the steel structures inside the silo below the central cone and outside the silo started in October 2019 and was finished at the end of November 2019. The silo was commissioned on 6 December 2019, only 15 months after start of construction. 

Left and Below: The new silo has six compartments, five of 1770m³ and one of 1500m³.



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UK: CMA to probe Breedon / Cemex deal

The Competition and Markets Authority (CMA) has issued Initial Enforcement Orders (IEOs) to Breedon Group and Cemex over the former's acquisition of a minority of UK ready-mix and aggregates operations, as well as a cement terminal, belonging to the Mexican cement giant, for Euro211m. Breedon Group said that the IEO was expected and would govern, among other things, the 'form and scope of the information that can be shared between Breedon and Cemex' in defence of customers' interests.

UK: CemFree used for M25 viaduct

CemFree cement-free concrete has been applied volumetrically for the first time in a 52m³ repair to the Woodford West Viaduct on the M25 London orbital motorway in Essex, England. The reason behind the choice of method was the unavailability of batching plants at night, which was the only time that a team comprising members of Jackson, DB Group and Axtell employees, working jointly on behalf of Connect Plus, were permitted to perform the work on the UK's busiest road.

CemFree said that CO₂ emissions were cut by 94t compared to carrying out the same project with OPC-based concrete. Jackson's director of highways Paul Watson said, "We hope this marks a turning point on the M25 and the wider Highways sector for using low carbon alternatives."



UK: I.tech Ali-Na binder used for first time in UK

InterBulk Group delivered a batch of Italcementi's I.tech Ali-Na sulphaaluminate binder produced at its 0.3Mt/yr Guardiaregia cement plant in Molise, Italy, to fellow HeidelbergCement subsidiary Hanson's concrete plant in Hull, UK, on 28 January 2020. Hanson will use the low-environmental-impact binder in the production of fast-setting premixes for the UK market.

Germany: 'Net-Zero CO₂' concrete

Holcim Deutschland has announced the successful development of Holcim EcoPact Zero, a 'net-zero-carbon' concrete. It says that it is in talks with customers in Germany and will make the first deliveries of EcoPact Zero in early 2020.

Holcim Deutschland CEO Thorsten Hahn said, "The use of clinker-reduced cements and the optimisation of the binder content play a central role. The still unavoidable CO₂-footprint is fully offset with the support of various certified environmental projects."



CemFree uses 95% ground granulated blast furnace slag (GGBFS) and a 5% alkali activator, removing the need for cement. This gave CO₂ emissions of 114kg/t, which the company says is 77% lower than conventional solutions.

France: LafargeHolcim launches FastCarb CO₂

Following a successful trial that began in December 2019, LafargeHolcim has inaugurated a FastCarb CO₂ absorption accelerator into concrete production at its Val d'Auzergues cement and concrete plant (integrated capacity 0.4Mt/yr) in Lozanne. The technology involves the capture of CO₂ from the plant's cement kiln for reinjection into concrete produced with recycled aggregates.

François Petry, LafargeHolcim France's managing director, said the installation "fits perfectly into our Lafarge 360 approach for more responsible construction." The five-pillar approach consists of alternative fuel substitution and development, power consumption reduction, formulation of new cements, cooperation with Airium insulation solutions and assistance with low-CO₂ building design.

Nohman Mahmud, Dangote Cement

Ensuring concrete durability and integrity: A cement quality perspective

Dangote Cement's Quality Assurance Manager Nohman Mahmud looks at how the chemical and physical properties of cement affect concrete properties, good and bad...

Concrete is a composite material composed of cement, aggregates (coarse and fine), admixtures and water. It is the second most consumed material in the world, behind only water. Indeed, twice as much concrete is used in construction projects as all other building materials combined. Its popularity is primarily due to its:

- **Flexibility** - Concrete can be moulded into virtually any shape;
- **Low cost** - Especially compared to steel, aluminium and glass;
- **Availability** - The raw materials for cement are ubiquitous, as are aggregates and water;
- **Durability** - It is durable and long lasting.

The durability and structural integrity of concrete can be adversely affected by the chemical and physical properties of cement if it is not manufactured to (inter)national standards. In general, cement integrity can be considered to be a resistance to, or the lack of, any swelling, cracking, or disintegration resulting from an expansive chemical reaction such as the hydration of free lime (CaO) or crystalline free magnesia (MgO) or any other factor in cement paste, mortar, or concrete. Major contributors to concrete disintegration from a cement quality perspective include:

1. Low compressive and flexural strength;
2. High free lime;
3. High free crystalline MgO (Periclase);
4. High alkali content;
5. High C3A content;
6. High sulphate content;
7. Coarse cement;
8. High heat of hydration (for massive pours).

1. Low compressive and flexural strength

One of the most easily understood properties of concrete that can lead to structural failure is low compressive and flexural strength of concrete, which in turn depends upon concrete mix design as well as cement quality, particularly cement strength.

Cement with low compressive and flexural strength lacks the ability to act as a binder in the concrete matrix, hence leading to an inability to bear loads that may lead to structural failure of the concrete.

2. High free lime

Free lime is the lime (CaO) that remained uncombined in the pyroprocessing process in the kiln. Upon hydration, the free lime slowly reacts with water to form Ca(OH)_2 . The volume of Ca(OH)_2 is much higher than the initial volume of the individual reactants, hence stress and cracks will develop, potentially leading to structural failure.

The test most commonly used to determine expansion caused by free lime is the Le-Chatelier test. The limit, as per international standards, is maximum expansion of 10mm in the Le-Chatelier apparatus for a product to be considered suitable.

However, the Le-Chatelier test is a mild test that can only detect expansion due to free lime. Any other factor that causes the cement to expand will not be detected by the test. Free lime levels can be determined using wet analysis methods. However such approaches are prone to analysis bias and inaccuracy if the cement is partially hydrated. The most accurate method is to use XRD or microscopy.

The maximum safe limit of free lime in clinker depends upon the clinker reactivity, type of cement produced, i.e.: the types and dosage of additives, as well as storage conditions and duration. General practice is to control clinker free lime at $\leq 1.5\%$ in order to avoid Le-Chatelier expansion. However, this should be reduced when using the autoclave expansion test, since this is a rigid test that captures all the factors that lead to cement expansion.

3. High free crystalline MgO (Periclase)

Another component that causes concrete to expand is the hydration of free crystalline MgO (Periclase). The hydration reaction is very slow, meaning that, once the concrete has gained its strength, the production of Mg(OH)_2 will lead to stress and cracking over a period of years. The volume of Mg(OH)_2 is 118% that of the initial reactants.



Above: Massive concrete structures such as dams require cements with low heat of hydration.

To avoid periclase expansion, cement standards generally limit total MgO in cement to $\leq 6\%$. However, it must be understood that it is not the total MgO that leads to expansion, only the hard burnt free crystalline MgO produced during the pyroprocessing stage. Expansion due to MgO cannot be detected by the Le-Chatelier test and can only be detected by autoclave tests. It is thus possible that a cement may conform to the Le-Chatelier test limits but still be unsound when tested in an autoclave test. As per ASTM standard C 150 the limit of autoclave expansion is 0.8%.

Clinker produced with slow cooling of clinker will be more prone to expansion due to large size free crystalline MgO, whereas rapid cooling limits the opportunities for it to form, instead leading MgO to be trapped in amorphous / glassy form, as well as the periclase formed will be much smaller in size. Total MgO levels can be tested by chemical analysis and XRF. However, free crystalline MgO can only be detected using XRD.

4. High alkali content (Na_2O equivalents)

If the cement contains high levels of alkalis, most often expressed as sodium equivalents ($\text{Na}_2\text{O}_{\text{eq}} = (\text{Na}_2\text{O} \% + 0.658 \times \text{K}_2\text{O} \%)$), it can react with certain reactive silica-containing aggregates to form an alkali silica gel via the alkali silica reaction (ASR). The gel expands over a period of time by absorbing moisture. This causes stress, which may be sufficient to cause expansion and ultimately destructive cracks within the already formed concrete structure over a period of time.

The reaction happens with a number of minerals, including opal, chalcedony, micro and cryptocrystalline quartz, cristobalite and tridymite, as well as volcanic glasses. The ASR has also been observed with aggregates such as quartzite, greywacke, argillite, hornfelsed shale, phyllite, granite, and gneiss. The ASR reaction requires three factors to proceed:

1. Sufficient moisture in the pore structure of the concrete: ASR damage is unlikely to occur when the

equilibrium internal relative humidity in the concrete is less than 75%.

2. Sufficient alkali in the pore solution: Alkalis can be supplied by cement and other binder constituents, chemical admixtures and/or the aggregate;

3. Reactive minerals in the aggregate: Some reactive aggregates will only cause significant expansion if they are present in a critical amount known as a pessimum proportion. This is the proportion of reactive aggregate at which greatest expansion occurs.

If any one of these three above factors is absent, ASR will not proceed. Once all available water or alkali is used up, the reaction will stop, but it may recommence if the condition 1 and/or 2 are again satisfied.

Once ASR has started in a structure, there is no way of stopping it if sufficient moisture remains in the concrete. It will continue until the alkalinity of the pore solution falls below the required level for reaction, or until the reactive component of the aggregate is exhausted.

If the aggregates used contain reactive silica minerals, one way to avoid ASR is low alkali cement ($\text{Na}_2\text{O}_{\text{eq}} < 0.6\%$). Other approaches include using supplementary cementitious materials (SCM) like pozzolans, fly ash, blast furnace slag or silica fume blended with OPC at an appropriate ratio.

5. High tri calcium aluminate (C_3A)

C_3A has the highest reactivity of all clinker phases. Indeed gypsum is added in order to slow its reaction down. However, in areas where sulphate is readily available from the soil/water in the form of sulphate salts, particularly magnesium sulphate and sodium sulphate, the sulphate reacts with excess C_3A to form tri calcium sulfoaluminate hydrate, which is 227% higher in volume than the initial reactants. This causes internal stress within the concrete structure that may lead to structural failure.

To get around this, projects may use sulphate resistant cement (SRC), which has a low C_3A content. As per ASTM, High Sulphate Resistant Cement is classified as one with $\text{C}_3\text{A} \leq 5\%$, whereas as per European Standard EN 197, C_3A content in clinker can vary from 0% to $< 3\%$ to $< 5\%$, according to the three main Sulphate Resistant Portland Cement types. SRC is not recommended to be used with soil / water that is rich in chloride. This is because C_3A binds chloride in calcium chloroaluminate. High chloride can cause steel corrosion in the concrete. In such a scenario it is better to use Portland cement blends containing pozzolans, fly ash, slag or combinations of these.

6. High sulphate content

Gypsum, a source of sulphate, is essential in cement

as a set retarder. However, in excess, gypsum can also contribute to structural failure of concrete by causing slow expansion once the concrete structure has set and gained strength. For this reason international standards limit the SO_3 content in cement to 2.3-4.5% and 3.5-4.0% as per ASTM C 150 / EN 197 standards respectively.

7. Coarse cement

Coarser cement will contribute to higher expansion. Increasing cement fineness is a good way to ensure that the cement will conform to autoclave expansion tests, as well as better field performance with regard to structural integrity and durability.

8. High heat of hydration for mass concreting

The hydration of cement compounds is exothermic. As the thermal conductivity of concrete is comparatively low, it acts as an insulator. In the interior of a large concrete mass like a dam, hydration can result in a large rise in temperature. At the same time, the exterior of the concrete mass loses some heat so that a steep temperature gradient may be established within the structure. During subsequent cooling of the interior, serious cracking may result.


For this reason, it is necessary to limit the rate of heat evolution of the cement used in this type of structure. A greater proportion of the heat can then be dissipated and a lower rise in temperature results. Cements with a low rate of heat development are known as low heat Portland cements or low heat of hydration cements. Another approach during construction of mega structures is to use blended cements instead of Portland Cement to avoid the issue of high heat generation and subsequent cracking and disintegration.

Don't forget... partial hydration

If the clinker / cement is partially hydrated then the cement expansion will be low. The rationale is that the free lime will react with water to form $\text{Ca}(\text{OH})_2$ before the actual concreting work and will not contribute to cement / concrete expansion later on. However, this partial hydration leads to many other problems, including lower compressive strength, high setting times and higher chances of a false set.

This is one route to ensure conformance with expansion tests. However, this approach needs a proper balance between high free lime (partially hydrated) and low free lime clinker (fresh).

Conclusion

The durability of concrete can be ensured by carefully optimising the cement properties during the cement manufacturing process as highlighted above. This will ensure that concrete structures are well suited for use over long time periods in an economical and safe manner. 

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Interview by Peter Edwards, Global Cement Magazine

In discussion: Upgrades at CEMEX Northfleet

CEMEX UK and the Port of London Authority recently invested Euro4.1m in a new dry discharge system for aggregates at its Northfleet Wharf on the River Thames. *Global Cement* visited the site, where Laurence Dagley, Managing Director for UK Materials (Southern), was keen to discuss the benefits of the new system...

Global Cement (GC): Please could you introduce the CEMEX Northfleet site?

Laurence Dagley (LD): The Northfleet site is a long-standing CEMEX facility on the Thames Estuary near London, UK. Its functions include ready-mix concrete production and processing of marine aggregates and sand. It is also home to CEMEX UK's largest concrete block plant.

GC: Where does the wharf source its aggregates?

LD: The site has a license from the Crown Estate to dredge for aggregates in specific areas of the English Channel and North Sea. Extraction is carried out by CEMEX's ships in areas that were home to former river beds from when the UK was connected to mainland Europe. The CEMEX Go INNOVATION, CEMEX UK's first new ship for 20 years, will join the fleet soon.

GC: What prompted the Euro4.1m investment in new dry discharge facilities?

LD: The Northfleet wharf was the last CEMEX UK aggregate operation to use the wet discharge process, which pumps fluidised aggregates ashore through a pipe. It is an older process that suffers from several drawbacks, the worst of which is blockages in the

pipe that takes the material to shore. Blockages of this type can mean many weeks of delays, which is very expensive indeed. They had become frequent at Northfleet. This was particularly a problem when pumping larger aggregate, which meant we tended to avoid bringing these types of materials to shore. This adversely affected the concrete block plant.

Additionally, there was a mismatch between the ship capacity (~10,000t) and the wharf's reception pit (5000t). This was inefficient, so the decision was taken to invest.

GC: How has the new investment helped?

LD: The dry discharge facilities allow a 10,000t ship containing the right type of aggregate to be unloaded in 4-5hr, by allowing the ship to discharge dry aggregate directly to the new conveyor. The ships contain a conveyor under their hoppers that discharges to stockpiles on the quayside. The system, installed by Duo and rated at 2200t/hr, has zero risk of blockage. The aggregate intake will rise from 0.5Mt/yr to 0.8-1.0Mt/yr, which will increase sales from all of the site's activities. For example, we are now aiming to double concrete output from the plant during 2020.

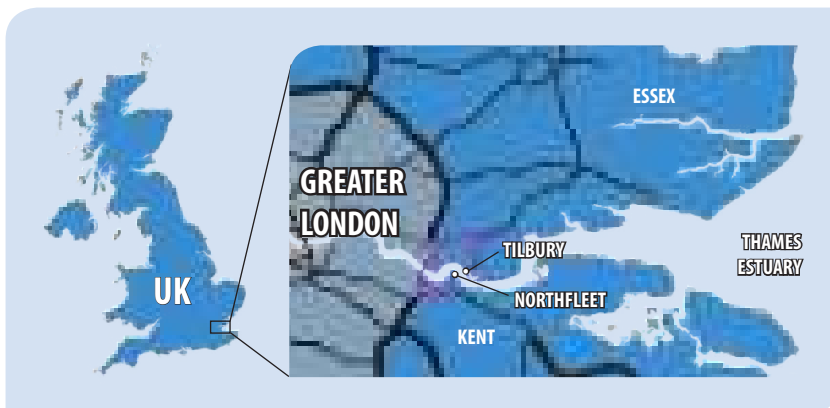
GC: What obstacles had to be overcome during construction?

LD: The main challenge was that the equipment had to be installed on an existing jetty with the pipe from the previous system still in place. Another challenge was more on the supply chain side. Before the installation we stocked up Northfleet with as much material as possible (~35,000t). During installation we relied on our wharves at Dagenham and Angerstein (Greenwich), both further into London. This ensured that we could maintain supplies to our clients.

GC: From where does the concrete plant source its cement?

Below: Location of CEMEX's Tilbury grinding plant and Northfleet concrete plant / aggregates wharf. The circuitous route between the two sites is highlighted.

— Motorway
— Major road
— CEMEX's transit route





LD: Cement for the ready-mix and block plants is supplied from our Tilbury grinding plant on the north side of the Thames Estuary. It receives surplus clinker from the CEMEX integrated plant in Rugby and from CEMEX España. Cement also reaches Northfleet directly from Rugby.

GC: How is cement transported between Tilbury and Northfleet?

LD: Unfortunately the cement has to be taken by truck from Tilbury, along the estuary, over the Queen Elizabeth II Bridge and back along the south side of the estuary. This is a 25km trip to move cement just 1.5km. It's a congested route and can take almost an hour in bad traffic. Ideally we would be able to transport cement on the water, but that is not possible with the site layouts we have at present.

GC: Where are Northfleet's products supplied to?

LD: The concrete blocks travel the furthest, to locations all around London and south east England. Ready-mix concrete is a local product, with a limit of around 25-30km to local sites. The ready-mix plant is quite rare, as it produces concrete, Supaflo (self-levelling liquid screed), Readyscreed (traditional hand-laid screed) plus pigmented sands for the housing and roofing sectors. The aggregates are

used within the site. We also have one customer, Gills, bagging and reselling aggregate on site. Northfleet also backs up aggregate supplies into the wider London market.

GC: CEMEX UK recently sold some of its ready-mix and concrete assets to Breedon Group. Has this affected Northfleet's operations at all?

LD: The divestments of a number of UK concrete and aggregate sites was in line with CEMEX's global 'Stronger CEMEX' programme, which has seen the group commit to Euro1.36-1.80bn of divestments in non-core areas by the close of 2020. There is a strong focus on metropolitan markets throughout CEMEX's markets. Urbanisation will only accelerate in the 2020s.

The recent UK divestments were predominantly in more rural areas, including sites in Scotland, Wales and East Anglia that were good fits for Breedon's business. CEMEX will focus on the 'spine' of England from London, up through Birmingham to Liverpool and Manchester. These are major metropolitan areas that will continue to provide growth in the future. Northfleet is part of that strategy for long term.

GC: Laurence, thank you for your time today.

LD: It was good to talk with you - Many thanks! 

Above left: The Northfleet site's new dry discharge system for aggregates.

Above: The new facility was officially inaugurated on 30 January 2020. Left to right: Robin Mortimer (Chief Executive, Port of London Authority), Adam Holloway (Member of Parliament for Gravesham) and Laurence Dagley (CEMEX's Managing Director for UK Materials (Southern)). Laurence has been in his current post since 2018, taking care of its ready mix concrete and aggregate operations south of the group's integrated plant at Rugby. He has worked for CEMEX since 2007, with roles in cement, building materials and marine aggregates.

Below left: The new equipment was installed by UK-based Duo.

Below: The Queen Elizabeth II Bridge across the Thames Estuary.




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Togo: Interchem to build 2.5Mt/yr grinding plant

Germany's Interchem Engineering has been awarded a contract by CimMetal Group to build a 2.5Mt/yr cement grinding plant in Lomé, with production due to start in early 2021. No value for the order has been disclosed.

The order includes a 1000t/hr truck unloading station, a 25,000t storage facility for additives, a 1000t/hr truck loading station, two 50,000t clinker silos, four packing machines, eight truck loading stations, 10 truck scales and laboratory equipment. The steel construction, the entire sheet metal fabrication, the subsystems, the electrical equipment, the complete engineering, the supervision of erection and commissioning are also included in the scope of supply and services.



India: Slag cement mill order for Gebr. Pfeiffer

Gebr. Pfeiffer has announced that it has received an order for one MVR 6000 C-6 vertical roller mill for Chettinad Cement's upcoming 2.0Mt/yr granulated blast-furnace slag (GBFS) and slag cement grinding plant in Vishakapatnam, Andhra Pradesh. Gebr. Pfeiffer said the mill will grind slag and cement to a fineness of 3000-3800cm²/g, according to Blaine, at a rate of 235-340t/hr. It says that the mill improves plant availability by the active redundancy of the grinding rollers, enabling mill operation with reduced rollers in the event of maintenance work or a malfunction.



Russia: New conveyor at Yakutcement

Yakutcement has commissioned a crushed stone conveyor to circulate crushed stone of a 200 - 400mm fraction for secondary crushing at the 0.4Mt/yr Yakutcement plant in Mokhsogolokh.

Russia: Eurocement continues with PIK

Eurocement has announced the continuation of its cooperation agreement with construction company PIK Group in 2020. The 30.7Mt/yr-capacity cement producer, Russia's largest, sold 0.2Mt of cement to PIK Group in 2019, bringing the total volume exchanged in the course of their cooperation to 0.8Mt.

UK: New Cemex distribution agreement

Cemex UK has agreed a new partnership with Turners, a privately owned transport company that will see Turners operate 20 bulk cement tankers for Cemex across the country. No value for the deal has been disclosed.

"We are always looking for ways to improve our logistics operation," said David Hart, Cemex's Supply Chain Director for the UK and France. "This partnership with Turners will create new flexibility in our service, thanks to its large fleet of safe and efficient heavy goods vehicles."

Japan: Kawasaki WHR plant for Taiheiyō plant

Kawasaki has announced that its Vega class of boiler will be used in Taiheiyō Cement's 8MW waste heat recovery (WHR) power plant at its 1.4Mt/yr integrated Saitama cement plant. Kawasaki says that the advantages of the Vega boiler are a compact design, a shorter installation time, reduced induced draft (ID) fan power consumption and excellent dust-removal performance.





Germany: Von Achten becomes HeidelbergCement Chairman

Dominik von Achten has become the new chairman of HeidelbergCement, effective 1 February 2020. He was previously deputy chairman of the managing board since 2015. He succeeds Bernd Scheifele, who has retired.

Achten, aged 54 years, has been a member of the managing board of HeidelbergCement since 2007. His area of responsibility included the group areas of North America and Western and Southern Europe as well as the Competence Center Materials. He worked on the integration of both Hanson and Italcementi. As Chief Digital Officer, he was responsible for the areas of digital transformation and digital ventures.

After a statutory two-year 'cooling-off' period has expired, Scheifele will stand as a candidate for the supervisory board of HeidelbergCement in 2022.



© Matthias Müller

Germany: HeidelbergCement on CDP's Climate Change A-List

Global not-for-profit organisation CDP has included HeidelbergCement on its Climate Change A-List 2019 for environmental transparency and performance aimed at facilitating a zero-net-carbon economy. Only a handful of industrial producers achieved inclusion on the list, including the German steel sector's Thyssenkrupp and French gypsum wallboard producer Saint-Gobain.

Italy: Buzzi sales 12% up in 2019

Buzzi Unicem's consolidated sales rose by 12% year-on-year to Euro3.22bn in 2019 from Euro2.87bn in 2018. The company saw a rise in cement sales volumes of 4.3% year-on-year to 29Mt from 28Mt. The company attributed the boost to its 0.9Mt integrated Testi plant in the Veneto region of Italy, which it commissioned on 1 July 2019, and two new grinding plants, in Italy and Germany.



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Russia: Production rises in January 2020

Russian producers sold 2.4Mt of cement in January 2020, up by 9.6% from 2.2Mt in January 2019. This is in line with Unioncement's optimistic forecast of 6% year-on-year demand growth. It says that the coming construction season promises sustained growth due to the planned renovation of housing stock, the implementation of integrated development projects and an increased share of roads built using concrete, in line with the country's 2020 Housing and Urban Environment programme and President Putin's social initiatives.

Spain: Consumption rises

Spain's cement consumption in 2019 was 14Mt, up by 5.9% from 13Mt in 2018. Exports fell by 23% to 6.2Mt from 5.0Mt in 2018.

President of Oficemen, the national cement association, Víctor García Brosa, attributed the demand growth to homebuilding but said that the housing market had a long way to go towards providing a reliable base for domestic cement production. "The 110,000 new homes that have started in 2019 represent half of the homes that were built annually before the global financial crisis," he said, adding that cement consumption growth would slow to 2.0% year-on-year in 2020.



Poland: Increase in non-EU imports

The Association of Cement Producers in Poland estimates that cement production reached 19Mt in the country in 2019, around 1% more than in 2018. According to estimates, imports from Belarus and Turkey, the producers of which do not have to purchase EU Emissions Trading Scheme (ETS)

permits, grew by 0.25Mt and 50,000t respectively. The Association expects that sales will remain at a similar level in 2020.

Polish electricity prices rose by about 35-40% during 2019, caused to a large extent by the surge in ETS permit prices. This, said Xavier Guesnu, CEO of Lafarge Polska, is leading to a marked increase in imports from outside of the EU. There are concerns that, if unchecked, this could adversely affect domestic cement producers.

Belarus: Production rises to 4.7Mt in 2019

Belarusian cement producers recorded production volumes of 4.7Mt in 2019, corresponding to capacity utilisation of over 100%. Volumes increased by 4.6% from 4.5Mt in 2018. Belarus imported 0.5Mt of cement with a value of US\$28m, the majority of which, around 64%, came from Russia.

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France: Couvrot plant to get Euro30m upgrade

HeidelbergCement subsidiary Ciments Calcia has announced a planned investment of Euro30m of upgrades in early 2021 to its 1.0Mt/yr integrated Couvrot plant in Marne department. L'Union Ardennes newspaper has reported that the upgrades will be 'process improvements' to grinding and energy consumption rather than expansions to the plant's capacity.

HeidelbergCement's Didier Faure said the group wants to turn the Couvrot plant into its 'leading site in Western Europe.' Faure also called for improvements to safety procedures after three people were injured on site in 2019, up from two in 2018.

Denmark: Cement sector sales increase for FLSmidth

FLSmidth has increased the sales from its cement division despite 'challenging' marketing conditions. Its revenue grew by 3% year-on-year to Euro1.13bn in 2019 from Euro1.10bn in 2018. Its earnings before interest, taxation, depreciation and amortisation (EBITDA) rose by 28% to Euro65m from Euro51m. It achieved this despite its order intake falling by 16% to Euro1bn from Euro1.19bn. It attributed its revenue increase to high order backlog conversion and positive currency exchange effects. Internal efficiency measures and a 'selective' approach to large projects were also said to have helped.

"We were pleased to see that the financial performance of our Cement business showed a positive development despite challenging market conditions," said FLSmidth Group chief executive officer (CEO) Thomas Schulz. He added that sustainability and digitalisation would be key differentiators in the coming years and that the engineering company was 'well-positioned' in both areas.



Earlier FLSmidth announced details of the 'business improvement initiative' it gave forewarning of in late 2019. The cement technology supplier is releasing 500 staff. Its most recent Annual Report stated that it had 11,368 staff at the end of 2018, meaning that around 4.4% of employees will lose their jobs. 80 of these redundancies will affect employees at its Copenhagen headquarters, with the remainder impacting personnel at operations across the globe.

"Despite a healthy pipeline, this is an unfortunate yet necessary action given the weakening market for large capital investments in 2019 and our ongoing efforts to improve internal efficiency," said CEO Thomas Schulz.

Sweden: Slite licence extended

The Land and Environmental Court has ruled in favour of Cementa for the renewal of its extraction licence for its quarry near the 2.5Mt/yr integrated Slite plant in Gotland. The company says that the decision ensures the continued operation of the cement plant. "We see this as confirmation that it is possible to continue limestone extraction without jeopardising water security or harming protected areas or species," said CEO Magnus Ohlsson.

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UK: MPA member CO₂ emissions rise in 2018

The Mineral Products Association (MPA) Cement's five members, Breedon Cement, Cemex UK, Hanson, Lafarge Cement and Tarmac, saw their direct CO₂ emissions per tonne of cement rise by 0.6% year-on-year to 633kg in 2018 from 629kg in 2017. The alternative fuel thermal substitution rate was 43.2% in 2018, down by 0.5% from 43.8% in 2017. The industry achieved its seventh consecutive year in which producers sent zero process waste to landfill. MPA member cement sales fell by 1.0% year-on-year.



Greece: Titan digital centre

Titan Cement has opened the Group Digital Centre of Competence, a facility which it says will consolidate its digital and advanced analytics capabilities. Titan says the Centre 'accelerates its digital efforts' set out under its Group Digital Initiative. "This is an essential part of efforts to increase operational efficiency and competitiveness," it reported.

Russia: Topkinsky starts making Mita slag cement

Sibirsky Cement Holding (Sibtsem) subsidiary Topkinsky Cement has announced that it has entered commercial production of its new Mita slag Portland cement using granulated blast furnace slag (GBFS) at its 2.7Mt/yr integrated plant in Topki, for which it received a certification of conformity with 'cement for general construction' standards on 16 January 2020.

Nina Poputnikova, Topkinsky Cement's laboratory and quality department head, said that the product was launched due to increased interest in cement that can be used in reinforced, precast concrete in monolithic structures such as buried and hydraulic structures.



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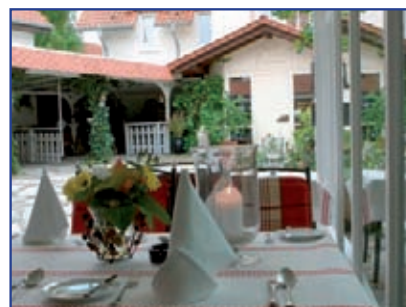
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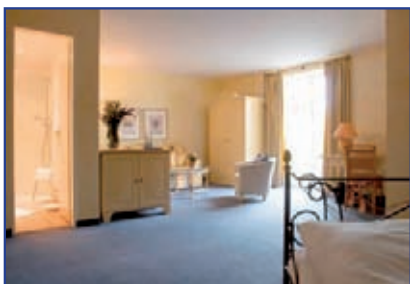
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Helmut Stichling and family look forward to your visit in the near future.





Germany: Ralf Dörner retires from Venti Oelde

Ralf Dörner has retired as the managing director of Ventilatorenfabrik Oelde following a 50-year career with the company. Following his apprenticeship as an industrial manager, he took over a vacant position in the commercial administration division. Subsequently, he was given the job of assuring total data management integration within the company. In 1982 he was granted power of attorney and appointed commercial manager of the company. He became managing director in 2000. Dörner (below centre) handed over the Commercial Managing Director position to his successor, Nabil Abou Lebdi (below left). The company will now be managed by Thomas Gandt, the Technical Managing Director (below right).



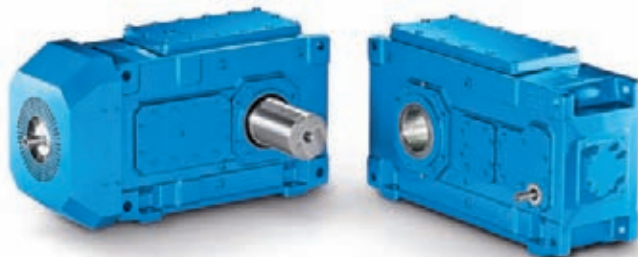
UK: New Commercial Director for Hanson

Hanson Cement has appointed Andy Murphy as national commercial director. He reports directly to chief executive officer (CEO) Simon Willis and assumes commercial responsibility for the cement division as well as Hanson's major projects and commercial excellence teams. Murphy holds experience in sales and marketing roles in the construction sector, including at LafargeTarmac, Jewson and building materials supplier SIG Distribution.

Germany: '50% of cement and steel used could be replaced with wood'

Germany: Research from the Potsdam Institute for Climate Impact Research (PIK) has suggested that wood, including fast-growing bamboo, could supplant 50% of cement and steel used in construction, cutting global CO₂ emissions by up to 880Mt/yr and providing a carbon sink for close to 700Mt/yr of CO₂ emissions. Assuming a no-change scenario in cement production practices, PIK fellow Galina Chakina said, "The shift to timber would make quite a difference for achieving the climate stabilisation targets of the Paris agreement."

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Easyfairs

Solids & Recycling-Technik: Leading-edge technology for bulk solids

Bulk material processing companies can no longer afford to focus simply on process and resource efficiency. Given the ubiquitous shortage of skilled workers, it has become critical to fortify processes in order to protect people, the environment and production plants. Solids & Recycling-Technik Dortmund will address these and other challenges faced by the industry at Messe Dortmund on 1-2 April 2020.

The primary issues facing decision-makers in the bulk materials industry are: how to position oneself efficiently and sustainably in the market and how to defend and maintain that position in future.

"It is of great importance to us that both the exhibition and our lecture programme cover the latest core themes affecting industry and that they inspire visitors to address those challenges concretely," says Sandrina Schempp, Event Director for Solids & Recycling Technology.

One of the best-known industry meeting places for experts from the powders, granules and bulk solids sector, the show always focuses on the latest issues. Whether it is safe storage, dosing, mixing or separation, visitors can discuss their technical challenges and the opportunities afforded by automation and digitalisation, as well as forge new - or deepen existing - business relationships.

Workshops, lectures and explosions

For those who need to get a grip of current and future tasks, the lectures and workshops on the stages of the Innovation and Solution Centers will provide

numerous opportunities to exchange ideas with experts. On 1 April 2020, the audience can look forward to contributions from the Institute for Applied Building Research (IAB) Weimar on the subject of practice-oriented bulk solids simulation using the 'discrete element' method.

Another topic under discussion will be how companies can protect themselves against explosions. Alongside lectures on legal requirements, Prof. Dr. Ing. Uli Barth of the Steinbeis Transfer Center Integrative Safety in Wuppertal will give a presentation on assessing explosion and fire hazards. Furthermore, visitors can once again look forward to live explosion demonstrations in the open-air area of the fairground.

Outfitted for the future

On 2 April 2020 a special sub-theme called 'From law to practice' will see experts demonstrate how to smoothly implement occupational safety and health regulations in real life. The subject of safety also figures prominently in other presentations, for example in lectures on the safe handling of hazardous bulk materials. Besides the essential aspects of solids technology, topics from the recycling industry will also be illuminated on the lecture stages.

With these and many other in-depth activities taking place on both days of Solids & Recycling-Technik in Dortmund, trade visitors can prepare themselves to meet the increasing expectations placed upon their industries.



Below: A large exhibition will once again see numerous live demonstrations.



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RUD Ketten – Rieger & Dietz GmbH & Co KG

RUD Ketten's R160 chain at Holcim Intervaz

RUD Ketten was founded in 1875 by Carl Rieger and Friedrich Dietz in Aalen, Germany. Now part of the globally-active RUD Group, the company produces easy-to-assemble lifting points, hoist chains and conveyor systems with guaranteed quality, innovation and safety. It has extensive references in the global cement sector, now extending to its RUD R160 chain quality range.

“We decided to switch to RUD R160 quality chains at our plant in 2016,” explains Robert Ott, Head of Maintenance at the Holcim Intervaz plant in Switzerland, part of LafargeHolcim. “We were looking forward to extending our service life when we switched to the R160. Today we can say that our expectations have been more than met. Wear measurements performed during annual inspection intervals showed minimal wear on the chain. With the R160, we have already been able to extend the previous service life by 25%.”



The R160 range features a heat-treated chain steel that significantly improves wear and tear, keeping the chain breaking strength unchanged. With a 400N/mm^2 breaking strength designed for particularly rough, heavy-duty application scenarios, the R160 quality category can extend standard service life compared to other chain quality types. This significantly increases the runtime cycle of the complete system. Many plants have indeed doubled their service lives compared with the

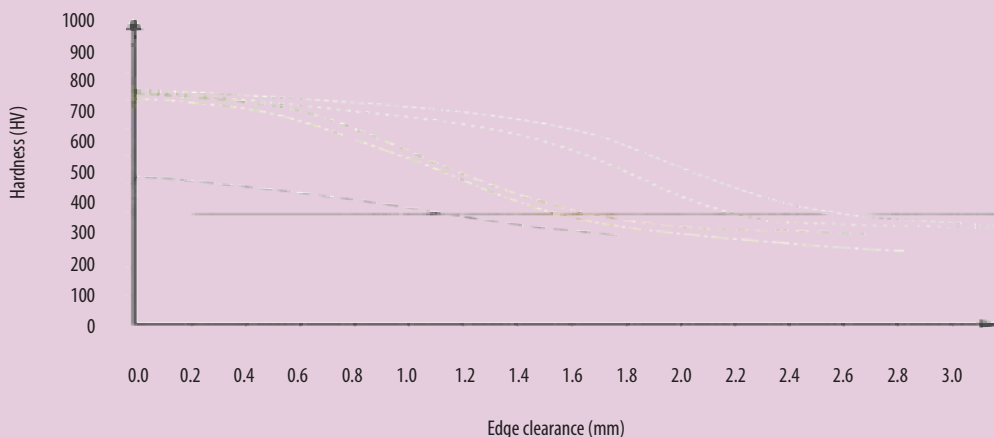
previous 40cG standard chain, which was the benchmark for many years.

“The service life of a bucket elevator is always of great importance for a cement plant,” continues Ott. “With a view to increasing the capacity of our plant, we invest a lot of time and money in overhauling our systems. The longer we can run our equipment without downtime, the more cement we can produce.”

The RUD R160 chain offers improved technical features that contribute to higher operational efficiency and safety. In conjunction with other products in its portfolio,

RUD provides its customers with innovative solutions tailored to their needs.

“The R160 acquisition costs were certainly higher, but considering the total cost of ownership, the investment has definitely been worth it,” concludes Ott. “All plant owners will be keen to increase their production capacity levels while reducing costs at the same time. This is definitely possible with the R160 chain.”



Left: Edge clearance profiles of various RUD case-hardened chains.

R160
 R140
 R100
 R80
 R2B
 R2*

* Tempered and quenched.



Regina Krammer, Loesche GmbH

Review: 8th Loesche Technical Seminar

The Loesche Training Center in Düsseldorf, Germany, played host to 65 delegates from 22 countries, including North Macedonia, Burkina Faso, India, Saudi Arabia and Syria, on 13-14 November 2019 for the company's 8th Technical Seminar. The event's motto was 'resource-efficient strategies in cement production' and was aimed primarily at process and maintenance personnel in the cement industry...

The first day of the event began with a presentation on CO₂ capture and storage / utilisation (CCSU) and possibilities for its use in the global cement sector, by Christina Fleiger from the VDZ. This was followed by contributions on: the use of alternative fuels in cement production (Dr Erwin Schmidl, WhiteLabel-TandemProject); Loesche's experiences with waste conditioning plants in the US (Taís Mazza Joudeh, Loesche); a proposal for waste-free reworking of bypass dust (Stefan Kern, A TEC) and; coal mill safety (Dr Roland Aeckersberg, Loesche). The first day's presentations concluded with a keynote speech on grinding of innovative composite cements using vertical roller mills by Loesche's Dr Winfried Ruhkamp.

After a sumptuous dinner at the 170m-high Rhine Tower in Düsseldorf, on the first evening, delegates reconvened for presentations on a diverse range of topics on 14 November 2019. Topics included: Wear repairs and management of spare parts (Hans-Georg Stengel, Loesche); An introduction to the basics of process technology in grinding plants and measurements and control loops (Stefan Tübergen, Loesche); How grinding efficiency is improved by proper understanding of wear dynamics (Dr Dorival Tecco, Loesche) and; Mill overhauls (Robert Koert, Loesche). As on the first day, the second day's programme concluded with a keynote presentation, this

time on state-of-the-art digital maintenance planning from Ralph Viebrock, Loesche's Chief Digital Officer.

Following the presentations, Loesche held an edition of its 'World Café' forum. The interactive workshops, held under the theme 'everyone's an expert,' provided the opportunity to discuss the topics and themes raised during the Seminar in a relaxed and supportive atmosphere. These short discussions allowed for an equal exchange of personal experiences and knowledge.

Delegates reported that they were pleased with the level of technical expertise offered, as well as the event's organisation and hospitality. A delegate from the Cement Company of Northern Nigeria (CCNN) said, "The seminar on innovations for vertical roller mills was a great help. We'll come back with more engineers and technicians in the future!"

Organisers Theodora Bruns and Dr Regina Krammer reported that this 8th running of the Seminar was the most successful ever. "On top of interesting lectures and the chance to bring in personal experiences, we were also able to discuss solutions together and make a great many contacts," said Krammer. "The quality of the seminar wasn't just down to the expertise of the speakers but also the active participation of all those who attended the programme. We're already looking forward to the upcoming Loesche Seminars in 2020."



Right: Participants pose for a group photograph at the 8th Loesche Technical Seminar.





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US: Sullivan reveals 2020 forecasts

On 4 February 2020, PCA Senior Vice President and Chief Economist Ed Sullivan (right) forecast that US cement demand would rise by 1.7% in 2020 and may rise by as much as 2.7% if residential construction exceeds expectations. Sullivan stated that demand would maintain moderate growth through at least to 2022. "As long as the economy continues to grow and create jobs, the economy will remain on solid ground and continue to support cyclical portions of the cement market," he said.



US: PCA launches 'Shaped by Concrete' campaign

The Portland Cement Association (PCA) has launched a campaign called 'Shaped by Concrete,' which aims to educate the public about how concrete made with cement 'shapes the world to make our communities, cities and country better' by telling stories based on the themes of 'sustainability, resilience and durability.'

"We are excited to share bold, compelling stories of how we can make the world a better place, shaped by concrete," said PCA president and CEO Mike Ireland.

US: Cemex opens Wampum discussions

Residents of Shenango, Pennsylvania, attended a public hearing regarding Cemex USA's plan to begin limestone mining at a 593 acre site in the township. New Castle News has reported that the proposal is part of a planned reopening of the company's 0.9Mt/yr integrated Wampum plant, decommissioned in 2010 after 136 years' operation, located nearby in Lawrence County. Cemex USA director of cement resources Mark Davies said that Cemex has plans that would generate 'as much as US\$109m' for Lawrence County and Pennsylvania. Cemex's legal staff advised residents that 100 new jobs and at least US\$100m was at stake.

Mexico: Cemex to boost Tepeaca

Cemex has announced that it will expand its 7.2Mt/yr integrated Tepeaca plant in the state of Puebla in 2020 into 'the largest Cemex plant in the world and one of the largest on the entire American continent.' It did not disclose the capacity of the upgrade, which will cost a total of US\$530m.

Visiting the plant on 24 January 2020, Mexican President Andrés Manuel López Obrador expressed hope in a boost in private investment in the Mexican economy, which fell by 12% year-on-year in 2019, in the wake of the new Free Trade Agreement between Canada, Mexico and the US. Cemex said that its planned investment 'indicates its trust in the country.'



Mexico: Cemex helping youths

Cemex is currently helping 45,000 young people across 11 countries to improve their employability through such initiatives as its New Employment Opportunities (NEO) initiative, which provides industry training to disadvantaged Caribbean and Latin American youths. The company says it aims to positively impact more than 65,000 youngsters by 2022.



US: Summit Materials profit rises 74%

Summit Materials recorded a profit of US\$59.1m in 2019, up by 74% from US\$33.9m in 2018. Summit Materials' CEO Tom Hill attributed the growth to 'sustained public sector demand coupled with improved pricing.' The Colorado-based construction materials company's cement section contributed sales growth of 3.5% year-on-year to US\$291m from US\$281m in 2018, with a 2.8% growth in cement volumes and a 1.7% price increase.



US: Ragland upgrade kicks-off

National Cement has broken ground on a US\$250m upgrade to the Ragland plant in Alabama. City, county and state officials attended the ceremony. The subsidiary of France's Vicat is building a second kiln at its 1.9Mt/yr plant in Alabama. The project is expected to be completed in 2022.

Spencer Weitman, National Cement of Alabama's president, said the project would establish the company in Alabama for some time. "It will ensure that our employees and our Ragland facility can continue to be

competitive for years to come by upgrading our plant with the latest technology and equipment," Weitman said. "We have enjoyed a long, successful partnership with the Ragland community and look forward to that continuing for many years to come."

The Ragland plant ships manufactured cement products to a diverse customer base across Alabama, Georgia, North Carolina, South Carolina, Tennessee, Mississippi and Florida.



Colombia: Green Bags initiative saves resources

Cementos Argos has announced that its Green Bags initiative has seen the production of over five million bags from recycled paper, of which 808t was saved from going to waste. Cementos Argos supply chain manager David Restrepo said that the initiative provides an alternative to 'the felling of over 8000 trees and use of 64,000m³ of water, the same as 26 Olympic swimming pools.'



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Mexico: Science-based CO₂ targets for GCC

Grupo Cementos de Chihuahua (GCC) says it will commit to setting greenhouse gas reduction targets in line with climate science by joining the Science Based Targets initiative (SBTI). GCC will set science-based emission reduction targets in line with the level of decarbonisation required to keep global temperature increase well below 2°C compared to pre-industrial temperatures, as described in the latest Special Report of the Intergovernmental Panel on Climate Change (IPCC).



"By joining the SBTi, GCC will ensure that the company's low-carbon transformation is aligned with climate science and is a further reflection of our unwavering commitment to implement global best practices related to sustainability," said Enrique Escalante, GCC's CEO.

Colombia: Sika moves additives plant

Switzerland-based construction materials producer Sika has invested an undisclosed sum in relocating production from a concrete admixture and mortar plant in Colombia to a larger facility in Barranquilla. Sika Americas regional manager Christopher Ganz said, "Our latest investment in Barranquilla will help us capture the potential of the dynamic construction market in the Caribbean region. Our aim is to grow more quickly than the construction market in this region." The market grew by 15% in 2019.

Sika also manufactures building products for the Colombian market at facilities in Bogotá, Medellín and Duitama.



Above: Lafarge Canada's Exshaw plant in Alberta, Canada.

US: RHI Magnesita buys Missouri Refractories

RHI Magnesita has acquired Missouri Refractories for an undisclosed sum. The refractory producer operates a plant at Pevely, Missouri. It produces over 400 high-quality monolithic mixes, which serve industries, including cement, lime, steel and glass.

"With its more than 45 years of experience in fulfilling the needs of demanding, highly loyal and satisfied customers, Missouri Refractories perfectly fits into RHI Magnesita's strategy to strengthen our position in the North American refractory market," said Stefan Borgas, CEO of RHI Magnesita.

US: Wallboard producer launches cement board product

National Gypsum has launched Permabase WP Waterproof Cement Board, a 1.3cm-thick cement board with a waterproof core, reinforced edge and smoother surface and stronger tile bond than previous Permabase boards for mould and moisture resistance and ease of cutting and installation. National Gypsum product manager for Permabase Tony Fuller said that "National Gypsum was committed to creating innovative products with performance benefits" for construction.

Canada: New VP at Lafarge Canada

Tina Larson has been appointed as Vice President, Saskatchewan and Manitoba by Lafarge Canada. She first joined Lafarge in 2010 as General Manager, Pipe in the Greater Calgary Area following a 16-year career with Weyerhaeuser Canada where she held various management positions. In 2015, Tina was promoted to the country level role of Director, Health and Safety for Western Canada. Larson holds an undergraduate and graduate degree in Chemical Engineering from the University of Alberta.

US: Bradley Pulverizer bought out

Curt Snyder, owner of Lancaster Products, has acquired cement grinding technology supplier Bradley Pulverizer. Snyder said, "Bradley Pulverizer's line of pulverizers and mill classifiers complement Lancaster Products' mixing, granulating and crushing capabilities," to provide complete solutions and services to the cement industry.



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Vietnam: Vicem and FLSmidth in sustainable cement tie-up

The Vietnam National Cement Corporation (Vicem) and Denmark-based supplier FLSmidth have announced a cooperation agreement with the aim of radically reducing the greenhouse gas emissions from cement production and improving air quality. The cooperation will consist of Vicem implementing solutions pioneered by FLSmidth. FLSmidth said that a key focus of the cooperation will be Vicem's use of 'municipal and other waste streams as alternative fuel sources,' with the aim of achieving 100% substitution using FLSmidth solutions, in accordance with FLSmidth's ambition 'to enable cement companies to operate with zero emissions by 2030.'



India: Nirma wins Emami bidding war

Nirma Ltd's subsidiary cement producer Nuvoco Vistas has announced that it has entered into an agreement with Emami Group for the acquisition of the latter's 8.3Mt/yr-capacity cement business, including a 2.5Mt/yr integrated plant in Chhattisgarh and three grinding facilities. The company says that with the completion of a capacity expansion to its 4.6Mt/yr Jojobera, Jharkhand, plant in early-2020 it will have a total installed cement capacity of 23.5Mt/yr. Nuvoco Vistas managing director Jay Krishnaswamy said, "This is a momentous development for us, and in line with our long-term ambition to become a leading building materials company delivering superior performance."

India: Udaipur applies for 5Mt/yr plant

Udaipur Cement Works has applied for environmental clearance to the government of Rajasthan for the construction of a 5.0Mt/yr integrated cement plant in the state. It plans for the plant to have an additional 2.0Mt/yr grinding capacity, a 30MW waste heat recovery power plant and a 25MW coal-fired power plant. Project Today has reported a conjectured value for the project of US\$224m.



India: New mill for JK Cement

JK Cement has successfully commissioned a 1.0Mt/yr grey cement grinding mill at its integrated Mangrol cement plant in Chittorgarh, Rajasthan and 1.5Mt/yr of new cement grinding capacity at its Aligarh integrated plant in Uttar Pradesh. Both of the units have also commenced commercial dispatches.

Vietnam: Exports 'critical' in 2020

Maintaining exports will be critical for the Vietnamese cement industry amid rising production output and anticipated sluggish domestic sales in 2020, according to Nguyễn Quang Cung, President of the Vietnam Cement Association (VCA).

Cung also reported that two new cement plants will go into operation during 2020: a 2.5Mt/yr plant in Tân Thắng Commune in the central province of Nghệ, and a 4.6Mt/yr plant in Bim Sơn Commune, Thanh Hóa. These new facilities will give the domestic cement industry a total production capacity of more than 100Mt/yr, with local demand estimated to be closer to 70Mt/yr. "Maintaining exports will be critical for the cement industry this year," said Cung, who added that domestic projects are likely to remain 'sluggish,' in part due to stagnant infrastructure projects.

Over the medium term, Cung said that cement exports would fall to 25Mt in 2021 from 34Mt in 2020, based on an expectation that domestic sales will increase.

Vietnam: Local SCG revenue falls

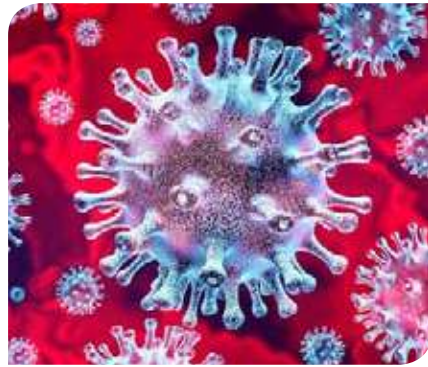
Thailand-based Siam Cement Group (SCG) said its revenue from sales in Vietnam dropped by US\$64.7m in 2019, a fall of 5.8% year-on-year to US\$1.27bn. The figure accounted for 9.0% of SCG's total revenue of US\$14.1bn for the year. In the fourth quarter of 2019, SCG earned US\$319m in revenue in the Vietnamese market, a fall of 11% year-on-year, appearing to indicate acceleration in the rate of decline. A possible contributing factor to the lower sales is Vietnam's huge cement overcapacity, although SCG operates across a wide range of other sectors in addition to cement production.



China: Outbreak hits cement demand

The China Commodities Watch 2020 Outlook and Health Check has forecast a 'one-off impact on operating cash flow' for Chinese construction materials producers, including cement producers, due to reduced demand during the on-going coronavirus outbreak. "After the outbreak, the government may increase investment in infrastructure," in order to boost the economy, according to the report.

The outbreak has already caused the CementTech 2020 event to be postponed. The event had been due to be held in Hefei, Anhui Province on 25-27 March 2020.



Australia: CRH linked to Boral deal

National press in Australia has reported that the Irish building materials giant CRH has approached Boral regarding a possible takeover. CRH snapped up US\$6.5bn of assets from Lafarge and Holcim in 2015 following their merger to become LafargeHolcim, and it consequently became the third-largest building materials supplier by market value internationally.

The speculation comes amid market expectations that Boral could be broken up if a takeover does not unfold soon. Suitors have looked at Boral before but a deal has never transpired. The company's market value is US\$3.9bn, so it could be within the grasp of a cash-rich strategic player or private equity firm from overseas. Three years ago Boral was worth more than US\$4.8bn.

Meanwhile, Australia's devastating recent bushfires have affected Boral's Berrima plant in New South Wales, likely leading to lower production and margins. This was due to extended leave for staff and road closures.



Pakistan: Unlucky Lucky as sales slump by 10%

Lucky Cement's sales and profits have fallen in the first half of its financial year as gas, fuel and transportation costs of input materials have risen. Its sales fell by 11% year-on-year to US\$201m in the six months to 31 December 2019 from US\$226m in the same period in 2018. Its cement sales volumes dropped by 9.5% to 3.17Mt from 3.50Mt. Its profit after taxation more than halved to US\$12.5m from US\$35.6m. It also blamed lower sales volumes on price pressure due to low demand and higher transport and logistics costs.

The cement producer started operating a 2.8Mt/yr upgrade to its Pezu plant in Khyber Pakhtunkhwa at the end of December 2019. Construction work on a new 1.2Mt/yr plant in Samawah in Iraq is underway, with contracts in place for a cement grinding mill, packing plant and power generation unit. The new plant is expected to start commercial production in late 2020.

Japan: Taiheiyo tumbles 10%

Taiheiyo Cement recorded a net profit of US\$278m in the nine months to 31 December 2019, the first three quarters of the Japanese 2020 fiscal year. This corresponds to a 10% fall from US\$310m in the nine months to 31 December 2018. Its nine-month sales fell by 4.3% year-on-year to US\$6.04bn in the first three quarters of the present financial year, compared to US\$6.31bn one year previously.

Taiheiyo Cement revised its forecasted full-year (to 31 March 2020) net profit down from US\$570m, published in its six-month results on 12 November 2019, to US\$364m.



Japan: Sumitomo Osaka profit falls by a third

Sumitomo Osaka Cement's nine-month net profit over the period ending 31 December 2019 fell by 35% year-on-year to US\$45.6m from US\$70.3m over the corresponding period of 2018. Nine-month revenues were US\$1.66bn, down by 3.3% year-on-year from US\$1.71bn. Sumitomo Osaka Cement predicted revenues in the fiscal year ending 31 March 2020 of US\$2.23bn, which would give it an estimated net profit of US\$97.5m for the whole year, down by 27% from US\$134m in the 2019 fiscal year.



Jacob Winskell, Global Cement Magazine

Cement in the Stans

The 'Stans' are five varied and vibrant nations - Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan - embarking on their fourth decade of independence. Here, *Global Cement* looks into this region where oil and ideology, technology and tradition and East and West meet and mix - with no small volume of cement.

Since *Global Cement* last wrote about Central Asia in January 2016, its five republics have been through a period of dynamic growth that has affected their cement industries in numerous ways. Some characteristic trends are:

1 - Increased geopolitical prominence: As China fulfils its long-expected economic potential, Central Asia has emerged as a political and economic centre-ground between East and West. Besides Russia and China, Iran, Turkey and Japan are all major investors in the region and India and the US retain military bases in Kazakhstan and Tajikistan respectively. A five-way 1997 agreement declaring the region a nuclear-free zone typifies the nations' unwillingness to become stepping stones for either side of any future conflict. With the decline of Russian influence, the Stans have been increasingly able to exploit their medial position in line with Kazakh President Kassym-Jomart Tokayev's strategy of 'balancing' foreign powers. Economically, the region's energy reserves provide a basis on which to proceed with good international relations, offering European nations in particular a reliable alternative to politically-charged Russian gas and oil.

2 - Political stasis: In spite of some tentative signs of change in the offing, the Global Freedom Index paints a bleak picture for the Stans. Kyrgyzstan, with a score of 38%, is 'partly free' and all four others are 'not free,' with Turkmenistan ranking the lowest at just 2%.¹ In 2018, Kyrgyzstan, Central Asia's only democracy, saw corruption trials against senior officials regarding Chinese energy contracts and the end of exemption from prosecution for former Presidents. As a result, former President Almazbek Atambayev was charged with murder, organising mass unrest and hostage-taking. An economic crisis in Turkmenistan led the country to tighten measures preventing citizens - and young men in particular - from leaving the country, while Tajikistan has practically banned the wearing of the hijab.

3 - Integration: Significant steps have been taken towards greater regional interconnectedness. Beginning on 24 August 2018 with a summit on saving the Aral Sea from environmental ruin, all five countries' leaders have continued to cooperate in the spirit of a resolution, approved by the United Nations on 22 June 2018, to 'strengthen regional and international cooperation to ensure peace, stability and sustainable development in the Central Asian region.'² Real progress came on 29 November 2019 when all five countries' leaders agreed to seek to establish 'forms and mechanisms for the development of cooperation in the areas of trade, economy, investments, transport and transit, agriculture, industrial cooperation, protection of environment, energy, water resources, tourism, science and culture.' This may mean that March 2019's 'Silk Visa' open borders agreement between Kazakhstan and Uzbekistan is just the start of European Union (EU)-style free movement of goods between the five economies, in which cement will have a major part to play.

Below: The Stans are Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.



This last development notwithstanding, the heterogeneous nature of the Kazakh, Kyrgyz, Tajik, Turkmen and Uzbek cement industries necessitates an evaluation of current production and the latest projects on a country-by-country basis, as we travel alphabetically through the region, starting - at the top - with Kazakhstan.

Kazakhstan

Kazakhstan (population 18.3m) changed President for the first time in its history on 20 March 2019 when Kassym-Jomart Tokayev replaced Nursultan Nazarbayev. Astana, the capital city, was renamed Nur-Sultan in his honour. The nation is Central Asia's economic powerhouse. In 2018, its per-capita GDP rose by 5.9% year-on-year to US\$9810 from US\$9250 in 2017.³ Kazakhstan's major cash generator is its energy sector, and one energy source in particular: crude oil. Kazakhstan's 3.9Bnt recoverable reserves are under constant exploration for new extraction points. Where there are oil wells, there's cement. Domestic demand grew to 8.9Mt/yr in 2019 (57% of production capacity) - up by 3.5% from 8.6Mt (58%) in 2018.

Consumption of Kazakh cement has a broader basis than just oil wells. Domestically, infrastructure development is a large and growing contributor to Kazakhstan's 8.9Mt/yr demand. President Nursultan Nazarbayev introduced his 'Bright Path' strategy towards sustainable economic growth on 11 November 2014. Massive infrastructure developments are planned under the US\$9bn investment policy, including housing for 77,000 families and modernisation of transport and industry that includes 48,000km of new roads. Funding comes from the Kazakhstan National Fund, which in February 2018 had US\$22.6bn of its approximately US\$606bn assets frozen by a Belgian court for a non-payment to a foreign businessperson. Whether - and if so to what extent - this will hold up cement uptake remains to be seen.

Kazakhstan also exports cement. In the first half of 2019 Kazakhstan exported 0.87Mt of cement. 0.45Mt of this (52%) went to Uzbekistan - down by 5% year-on-year from 0.92Mt in the corresponding six months of 2018. In 2018 as a whole Kazakhstan's cement exports were 1.90Mt.²

One market to which Kazakhstan has special access compared to the other four 'Stans' is Russia. In 2011, Kazakhstan exported 4000t of cement to Russia and received 0.648Mt in cement imports, giving a net exchange of 0.644Mt/yr to Kazakhstan from Russia. By 2016, the figures had grown to 0.240Mt of cement exported to and 0.921Mt imported from Russia, with a net exchange of 0.681Mt/yr to Kazakhstan from Russia. The story, clearly, is one of regional growth - but growth that favours Russia. The imposition of import

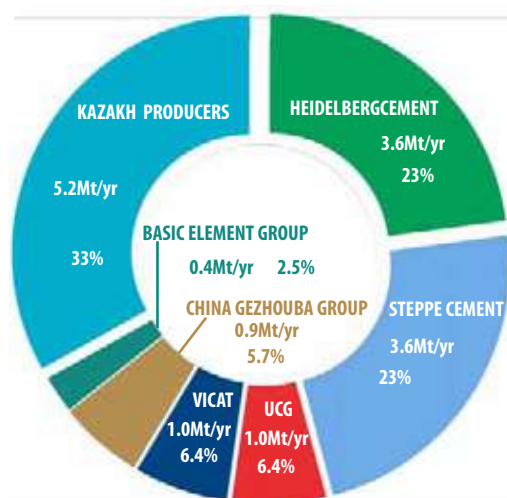
tariffs on Russian cement in Ukraine in May 2019 may lead Kazakhstan to become an increasingly attractive export target for its northern neighbour, which has in the past been accused of 'cement dumping'.

In spite of growing production and export volumes, domestic demand growth would appear to be implacable. Kazakhstan was foremost among the 36 countries that imported cement from Iran, importing 11.4Mt during the eight months to 21 November 2019. In June 2019, Azerbaijan-based Norm Cement targeted Kazakhstan for 0.1Mt of its cement exports. This is probably only a small chunk of the domestic consumption that continues to evade Kazakhstan's producers. The reason for this is the vastness of the country and the unsuitability of its transport infrastructure. The country's largest city, Almaty (population 1.78m), is located 400km from the nearest cement plant. One side effect of Bright Path may be that it brings Kazakhstan's cement producers and consumers closer together, realigning supply and demand along the new improved road and rail networks and away from the country's borders and Caspian Sea ports.

Producers

Kazakhstan's cement production capacity grew by 6% year-on-year to 15.7Mt/yr in 2019, shared between 12 plants, compared to 14.8Mt/yr between 11 in 2018. All are integrated and, as in the other four Central Asian former Soviet socialist republics, all pre-1991 plants were built and operated by the Soviet state.

Each one of Kazakhstan's 12 cement plants is privately owned. Foreign-based companies, of which there are six, share a 67% majority of production capacity across eight plants. The remainder is controlled by four Kazakh firms with one plant each.



Left - Figure 1: Production capacity shares of Kazakh cement producers. **Source:** Global Cement Directory 2020.

Germany-based HeidelbergCement is the leading producer in Kazakhstan and in the region as a whole. Its 3.6Mt/yr active capacity consists of three plants.



HeidelbergCement entered the market in November 2005 with its acquisition of the 1.5Mt/yr integrated Bukhtarma plant in Eastern Kazakhstan. In 2013 it succeeded in bringing the plant's emissions in line with EU regulations following extensive modernisation across its four lines.

HeidelbergCement took over the 1.3Mt/yr integrated Shymkentcement plant in South Kazakhstan from 45% subsidiary Italcementi Group in August 2015, as part of the first stage of its acquisition of the latter which ended in total takeover on 20 October 2016. The plant - first commissioned in 1958 - has been capable of producing oil well cement since 2003. In early 2016, HeidelbergCement completed the replacement of the plant's four active wet lines with a single dry line of the same capacity, at a total cost of US\$80m.

Mangistau region in coastal western Kazakhstan hosts HeidelbergCement's 0.8Mt/yr integrated CaspiCement plant; the only plant that HeidelbergCement itself built. The facility is unique in more ways than one. It is the only plant in Kazakhstan and one of only very few in the world to produce clinker from chalk, which it does in the same way as with limestone using the dry method. The US\$220m facility is the only cement plant in western Kazakhstan, where it serves the oil and gas industries of all five nations on the Caspian Sea.

One producer in particular regularly puts Kazakhstan in the global cement news headlines. Steppe Cement - Kazakhstan's largest endemic cement producer - is not incorporated in Kazakhstan, nor even Central Asia, but in Malaysia. It owns Central Asia Cement and Karcement, which jointly operate the 3.6Mt/yr-capacity integrated Karaganda plant in Karaganda region. The plant was commissioned in 1953 with two wet lines and now also has two dry lines as a result of a 1998 upgrade. The wet lines were mothballed in October 2014, since which time cement

production has not risen above 1.8Mt/yr. Steppe Cement's target for 2020 is a new packing plant capable of packing and palletising cement in 50kg or 1000kg bags at a rate of 1000 bags/hr, which it says will help realise production volumes of 2.0Mt/yr.

Steppe Cement's 2019 revenues rose by 7.7% year-on-year to US\$80.2m from US\$74.4m in the corresponding period of 2018. Volumes fell year-on-year: down by 0.3% to just over 1.7Mt, corresponding to a pricing increase of 8.0% to US\$46.7/t from US\$43.3/t. In a country with apparent surplus and real capacity underutilisation, it will be interesting to see just how long this cement trend can continue.

The *Global Cement Directory 2020* lists Standard Cement's Karatau plant's integrated capacity as 2.0Mt/yr, of which it utilised 1.0Mt in 2019. Standard Cement opened the plant in 2010 and commissioned a second dry line in 2015.

Tenir Group, which sold its 1.5Mt/yr Bukhtarma plant to HeidelbergCement in 2005, retains 1.6Mt/yr of capacity across the three wet lines of its Ust'-Kamenogorsk, East Kazakhstan, plant.

Jambyl Cement is another operator with discrepancies between capacity and production figures, though - unlike at Steppe Cement's Karaganda plant - the apparent bottleneck is at the start rather than the end of the production process. The *Global Cement Directory 2020* lists the capacity of its integrated Mynaral plant in Zhambyl region as 1.0Mt/yr. Indeed in 2018 it produced a record 1.1Mt/yr of clinker. However the picture shifts dramatically when we look at its cement production, which rose by 15% year-on-year to 1.5Mt from 1.3Mt in 2017. In its 2018 annual report, France-based majority owner Vicat attributed the increased cement volumes to the 'excellent industrial proficiency of the workforce.' Additionally, 0.4Mt of clinker - possibly purchased from neighbouring Semey Cement - and a grinding mill in reserve facilitated this development.

Right: Jambyl Cement's Mynaral packing plant, where 1.5Mt of cement was bagged in 2018. **Source:** Vicat.





Vicat's 9.2% year-on-year increase in sales in the first half of 2019 in Kazakhstan received a boost from 'strong price growth,' resulting in earnings before interest, taxation, depreciation and amortisation (EBITDA) growth of 50% year-on-year to US\$13.3m from US\$8.64m in the first half of 2018. Vicat holds 60% of Jambyl Cement and the remaining 40% is Kazakh-owned, belonging to Kazkommerts Invest.

Like Steppe Cement, United Cement Group (UCG) is a Central Asian cement producer that is based elsewhere. Headquartered in Nicosia, Cyprus, it joins HeidelbergCement and Vicat as the third EU-based producer that operates in Kazakhstan. UCG subsidiary Semey Cement has supplied the Kazakh market with cement from its Semey plant in East Kazakhstan since 1958 and was one of UCG's first acquisitions following the latter's incorporation in 2005. An upgrade in March 2015 gave the plant a cement capacity of 1.0Mt/yr across four wet lines. In a literal realisation of the Belt and Road Initiative, the Semey plant's cement is mainly used in road construction.

Kazakhcement commissioned its Shar plant near Charsk, East Kazakhstan, with a single 1.0Mt/yr dry line in 2012. In December 2018 Rudnensky Cement entered production at its 0.6Mt/yr integrated plant in northern Kostanay region, fitted with China National Materials Group (Sinoma) and Russia-based StroyMehanika equipment. Lastly, Basic Element Group (BasEl), a Russian conglomerate, operates a 0.4Mt/yr integrated white cement plant with two wet lines in Sastobe, South Kazakhstan via its subsidiary Sastobe White Cement.

Kazakhstan's production capacity received a boost in October 2019 with Chinese government-owned China Gezhouba Group (CGG)'s subsidiary Gezhouba Shieli Cement's inauguration of its 0.9Mt/yr Shieli plant, in which locally-based Danake has a minority stake. The US\$178m plant is in the southern Kyzylorda region. The plant was Chinese-built, by China Triumph International Engineering, and employs a staff of 260 Kazakhs. Its major product is oil well cement. CGG chairman Li Ming thanked the Kazakh government for its current and future support of the plant's construction and operation, saying, "The alignment of China's Belt and Road Initiative and Kazakhstan's Bright Path economic policy brings great prospects for the China-Kazakhstan cement plant." CGC is currently engaged in the construction of a 480MW hydroelectric power plant in eastern Kazakhstan, scheduled for completion by 2024.⁴

Projects

In July 2015, Singapore-based International Cement Group announced its production and distribution joint venture with a local private businessperson, based around an upcoming integrated cement plant in Almaty region. In mid-2018, the company said that the plant would be completed by 2020.

Turkey-based Dal Holding Investments announced a similar undertaking in February 2019. Its joint venture with the Aktobe region Chamber of Entrepreneurs is aimed at the construction of a 1.8Mt/yr integrated plant, a project it valued at US\$270m. Dal Holding Investments, which also holds mining contracts, is a player in Kazakhstan's agriculture sector.

A third long-awaited production facility is Huaxin Cement's 1.0Mt/yr integrated Aktobe plant. Consisting of a single dry line and expected to cost US\$150m, the project last graced the pages of *Global Cement Magazine* in October 2015, when it was scheduled to commence by 2016. In February 2020 no developments have followed, suggesting that China's number 13 producer is focusing on other areas of expansion, including Tajikistan and Uzbekistan.

Other developments to look forward to are Kokshe Cement's 2.0Mt/yr integrated Zaozernoe plant - which will implement FLSmidth technology - and BI-Cement's 1.1Mt/yr integrated Akmola plant, both in Akmola region. Lastly, Nur Cement plans to establish an integrated plant and quarry near Shymkent, South Kazakhstan, for which it has leased sites and contracted Kazakh engineers for installation. On 2 February 2020 Nur Cement said that it had secured 70% of required funding from a local bank and would have the remainder within 28 days.



If all projects come to fruition, Kazakhstan will command 21.6Mt/yr of capacity, all integrated. Plants like Jambyl Cement's Myneral plant give it a grinding capacity in excess of this, if clinker imports can be sourced economically.

Looking forward

Two thirds of cement capacity is foreign-owned and here, as in other industries, foreign investment will underpin future growth. In January 2020 President Tokayev visited the United Arab Emirates, which is a major consumer of cement, including oil well cement.

With the government's 2013 commitment to 50% renewable energy by 2050, Kazakhstan's cement demand is shifting. Oil well cement is also suitable for the uranium industry, but volumes would be limited. Infrastructure developments should continue to demand Kazakh cement.

Left- Figure 2: Map of Kazakh cement plants and projects:

1. Steppe Cement, Temirtau, 3.6Mt/yr.
2. Semey Cement, Semipalatinsk, 1.0Mt/yr.
3. Jambyl Cement, Mynaral, 1.0Mt/yr.
4. HeidelbergCement, Zyrjanovsk, 1.5Mt/yr.
5. HeidelbergCement, Shymkent, 1.3Mt/yr.
6. HeidelbergCement, Shetpe, 0.8Mt/yr.
7. China Gezhouba Group, Shiyeli, 1.0Mt/yr.
8. Sastobe White Cement, Sastobe, 0.4Mt/yr.
9. Tenir Group, Ust'-Kamenogorsk, 1.6Mt/yr.
10. Kazakhcement, Charsk, 1.0Mt/yr.
11. Rudnenskycement, Kostanay, 0.6Mt/yr.
12. Standard Cement, Karatau, 2.0Mt/yr.
- Projects:**
13. International Cement Group, Almaty.
14. Dal Holding Investment, Aktobe, 1.8Mt/yr.
15. Huaxin Cement, Kargaly, 1.0Mt/yr.
16. BI-Cement, Akmola, 1.1Mt/yr.
17. Kokshe Cement, Akmola, 2.0Mt/yr.
18. Nur Cement, Shymkent.

Source: *Global Cement Directory 2020.*



Right - Figure 3: Production capacity shares of Kyrgyz cement producers. **Source:** *Global Cement Directory 2020*.

Both China's Belt and Road Initiative and its own Bright Path appear to lead to the same destination for Kazakhstan: improved living standards and the infrastructure to support these, facilitating the demand for and distribution of an increasing supply of cement.

Kyrgyzstan

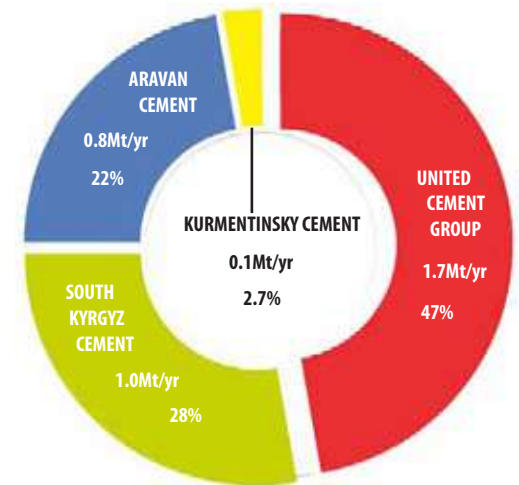
Precious metal and agricultural exports form the bulwarks of the Kyrgyz economy. In spite of the growth of these sectors through Kyrgyzstan's slow transition into a market economy since its accession to the World Trade Organisation (WTO) on 20 December 1998, per-capita GDP in 2018 was just US\$1280 - up by 3.2% year-on-year from US\$1240 in 2017 - with 22% (1.39m) of the 6.32m population living under the poverty line.⁶ Cement is a relatively small contributor to the Kyrgyz economy, but is poised for growth as the country seeks to diversify its sources of income. The Kyrgyz cement industry is partly state-owned, in an impoverished country characterised by corruption.

Much of the cement produced in Kyrgyzstan is for export: 0.15Mt in the first quarter of 2019 out of the 0.35Mt it produced (43%). Due to the country's weak currency, this can be sold at knock-down prices, as in February 2019, when *Global Cement* reported that the Kyrgyz Antimonopoly Agency had intervened in a case of cement dumping across the Tajik border. In May 2019 the Uzbek government announced a ban on imports of Kyrgyz cement.

Kyrgyzstan also imports cement (39,000t in the first quarter of 2019), and it need look no further than Central Asia for a ready supply. In 2018 - when Kazakh consumption declined by 5% year-on-year - Jambyl Cement reported that the Kyrgyz market gave growth to its sales.⁷ On 27 February 2017, after Kyrgyzstan joined the Russian-centred Eurasian Economic Union (EEU), the State Committee for Industry, Energy and Mining blamed high volumes of imported cement from Kazakhstan for making Kyrgyz production 'uncompetitive.' Kyrgyzstan imported 0.1Mt of cement from Tajikistan in 2019.

Producers

Kyrgyzstan's four producers share a production capacity of 3.6Mt/yr across five integrated plants.



Leading cement production in Kyrgyzstan is Cyprus-based United Cement Group (UCG), which operates two integrated cement plants with a total capacity of 1.7Mt/yr.

The larger of the two is the Kant Cement plant in Chui region, which can produce up to 1.3Mt/yr. State-owned Novorosgirocement established the plant with five lines in 1964 and it has undergone numerous upgrades both before and after its 2005 acquisition by UCG. Most recently these included the installation of a Unitherm Cemcon combination burner from Austria on 5 July 2018 and of a Russian Vselug Turbo K8 filling machine as part of a new packing plant on 1 October 2019. As a result the three types of cement produced at the plant can now be bagged in 25kg and 50kg bags. Kant Cement is planning the addition of a big-bag packing line and the modification of kilns to also burn coal as an alternative to natural gas.

Kirgizgropromproject built the 0.4Mt/yr TechnoLin in Kant, Chui, in 1975 and its two lines underwent a decade's downtime prior to the plant's acquisition by UCG in 2005. The company invested

Right: A fuel conveyor at United Cement Group's 1.3Mt/yr Kant Cement plant. **Source:** *United Cement Group*.



US\$8m modernising the plant, which now produces several cements, including oil well cements and a sulphate-resistant cement. The plant is undergoing an upgrade, which will enable its kilns to switch between gas and coal fuel in the space of five hours. Currently both kilns burn gas.

South Kyrgyz Cement (YKC)'s 1.0Mt/yr Tashkumgyr, Osh, plant entered operation in May 2010 with a total investment value of US\$90m, two thirds of which came from the state coffers. The China-based Tianjin Cement Industry Design & Research Institute (TDI) was responsible for the development and installation of the single line's dry kiln. On 8 February 2019 the Kyrgyzstan Antimonopoly Agency fined YKC for exporting cement for sale at a price below local market value. The choice of location for the plant and the 550 jobs it provides near the second city of Osh was not without controversy due to the relative wealth of the region. On 13 September 2018 a minister from the ruling Social Democratic Party (SDPK) spoke in parliament in favour of establishing a cement plant in the neighbouring Batken region.

The Osh region also hosts Aravan Cement's 0.8Mt/yr Aravan plant, which entered production in September 2008 with a capacity of 0.2Mt/yr and had its second line officially opened by Kyrgyz President Sooronbai Jeenbekov on 5 November 2018 following a US\$88m upgrade. The plant uses the semi-dry method across both of its lines.

The 0.1Mt/yr Kurmentinsky plant in Issyk-Kul region dates back to 1956 and still uses the wet method of cement production. It has two lines.

Projects

Zeth Cement, a 58:42 joint venture between China-based Tongling Shangfeng and Zhu Rongjun, had the commissioning of its 1.0Mt/yr integrated Kemin plant in Chui region, which has been under construction since mid-2014, delayed in January 2019 when no power supply for the US\$120m plant could be secured. The investors had proceeded with construction without first contracting with an energy company to supply electricity to future operations. On 23 January 2019, *Global Cement* reported that construction of the Kemin plant was complete. In response to the problem, the Kyrgyz government formed a working group in December 2018.

Issyk-Kul region is the proposed location of a 0.8Mt/yr single-line integrated cement plant belonging to Jinglong Group, to which end the China-based company has formed a subsidiary called Yatai Cement. When it announced the project on 1 September 2015, Jinlong Group valued it at an investment of US\$65m, for US\$50m of which it sought extra project financing. The plant promises 400 jobs to the region.

The region of Osh was tipped to receive its third cement plant on 27 May 2015 when China-based Gansu Qilianshan Cement and the Metallurgical Corporation of China signed a memorandum of

understanding with a Kyrgyz company for the construction of an integrated cement plant in Aravan. Ownership was to be shared between the Chinese and Kyrgyz parties on an 80:20 basis. Given the US\$130m proposed investment, we may assume that such a plant, should it one day materialise, is likely to be integrated.



Looking forward

The projects discussed above would augment Kyrgyzstan's cement production capacity with at least an extra 2.8Mt/yr, bringing it to over 8.2Mt/yr. This would make it a significant cement producer and one with a capacity vastly in excess of its construction sector's needs.

This situation may change in the near future due to a policy-led increase in domestic demand. State Agency for Architecture, Construction, Housing and Communal Services deputy chair Mirbek Akmatallyev announced a 10-year construction industry development strategy on 23 January 2020, which aims to reduce corruption and attract foreign investment by increasing state funding and reforming licencing procedures.

Exports are another way in which capacity expansion may be proven a timely investment by Kyrgyz cement producers. Kyrgyzstan has options beyond just its four fellow EEU members (Armenia, Belarus, Kazakhstan and Russia).

One possible partner, currently revising its trade networks due to US sanctions, is Iran. The value of Kyrgyz-Iranian trade was US\$20m/yr in 2019. Kyrgyz Prime Minister Mukhammedkalyi Abylgaziev called this figure 'not satisfactory,' noting the diversity of the Iranian economy, the lynchpin of which - the oil industry - generates a huge demand for cement. Iran's infrastructure and access to the Persian Gulf and Sea of Oman moreover make it an obvious means by which Kyrgyz cement can establish itself on the global market.



Left- Figure 4: Map of Kyrgyz cement plants and projects:

1. Kant Cement, Kant, 1.3Mt/yr.
2. TechnoLin, Kant, 0.4Mt/yr.
3. Aravan Cement, Aravan, 0.8Mt/yr.
4. Kurmentinsky Cement, Tyupsky, 0.1Mt/yr.
5. South Kyrgyz Cement, Kyzyl-Kiya, 1.0Mt/yr.

Projects:

6. Gansu Qilianshan Cement, Osh.
7. Zeth Cement, Kemin, 1.0Mt/yr.
8. Yatai Cement, Issyk-Kul, 0.8Mt/yr.

Source: *Global Cement Directory 2020.*

Left: Palletised cement bags at the Kant Cement plant.
Source: Alan Sau/Shutterstock.



Tajikistan

Central Asia's smallest country by area has a population of 9.10m and a per-capita GDP of US\$827. Tajikistan's population is largely rural and impoverished and an estimated 1.0m Tajiks live and work abroad, predominantly in Russia, on a temporary basis, contributing some 47% of Tajikistan's per-capita GDP in remittances.⁸

Tajikistan's economy is centrally controlled. In 2019 it produced 4.2Mt of cement, up by 11% year-on-year from 3.8Mt in 2018. It exported 1.55Mt, up by 11% year-on-year from 1.4Mt. In 2018 Uzbekistan received 64% of Tajikistan's cement exports (0.89Mt). Afghanistan received 41% (0.58Mt) and Kyrgyzstan received 5.8% (80,000t).

Tajikistan's installed cement capacity is 3.4Mt/yr. Three integrated plants have a total capacity of 2.1Mt/yr and a single grinding plant has a capacity of 1.2Mt/yr. A significant volume of Tajik building materials is currently tied up in the construction of more cement plants: six integrated plants with a total capacity of 5.5Mt/yr are expected to raise the country's capacity by 163% to 8.9Mt/yr.

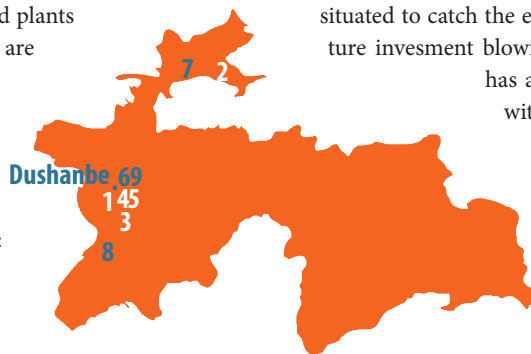
Producers

Before 2013 Tajikistan had just one integrated cement plant: Asbestos Pipe Factory's 1.1Mt/yr Dushanbe plant in the capital city of Dushanbe in the central Districts of Republican Subordination (DRS) region. Tajikcement took over the plant, which has four 600t/day and two 300t/day wet lines, in 2012.

Tajikistan's growing cement demand from such infrastructure projects as Roghun hydroelectric power plant in the DRS region led to the construction of the 0.1Mt/yr B. Samadov cement plant in Sughd region.

When Chinese President Xi Jinping launched the Belt and Road Initiative in September 2013, one Chinese company was already active in Tajik cement production. Huaxin Cement subsidiary Huaxin Zhongya Investment formed a 75:25 joint venture with Tajik construction materials company Gayur LLC and entered production at the 1.0Mt/yr Yovon cement plant in Khatlon region in August 2013 following an investment of US\$110m. Huaxin Cement says that plant created 1000 jobs for locals.

Huaxin Cement and Gayur LLC's subsidiary Toj-China entered production at its Vahdat grinding plant in April 2015 with a capacity of 0.6Mt/yr, while the installation of a second mill brought this to 1.2Mt/yr shortly thereafter. Of the US\$30m invested in the project, 77% (US\$23m) came from the Chinese partner and 23% (US\$7m) from the Tajik.



Right- Figure 5: Map of Tajik cement plants and projects:

1. Tajikcement, Dushanbe, 1.1Mt/yr.
2. B. Samadov Cement, Isfara, 0.1Mt/yr.
3. Huaxin Gayur Cement, Yovon, 1.0Mt/yr.
4. Toj-China, Vahdat, 1.2Mt/yr (grinding).
5. Huaxin Gayur Cement, Ghafur, 0.6Mt/yr.

Projects:

6. Huaxin Cement, Ghayurov, 1.0Mt/yr.
7. Shangfeng Cement, Kurganqiu, 1.2Mt/yr.
8. Vahdat Cement, Vahdat, 0.5Mt/yr.

Source: Global Cement Directory 2020.

Projects

Huaxin Cement and Gayur LLC have two ongoing projects together. They first began construction of the 1.2Mt/yr integrated Chjuntsay-Taboshar Cement plant in Danghara, Khatlon in 2014. When finished, it will be Tajikistan's largest. Also in 2014 it began work on the 0.6Mt/yr, US\$30m Ghafur cement plant in Ghafur, DRS.

Between 2011 and 2016 Tajikistan was the subject of four further new cement plant announcements. Two of these came from Chinese companies. Huaxin Cement announced that it would directly build and operate a 1.0Mt/yr-capacity integrated plant in Ghayurov, Sugdh, in 2015. That same year, China-based Shangfeng signalled an intention to set up a 1.2Mt/yr plant in Kurganqiu, Khatlon region. However in May 2016 it said that the failure to conclude a licencing arrangement with the Tajik government had suspended developments.⁹ The 0.5Mt/yr Vahdat, DRS, plant is the result of a private Tajik-Chinese joint venture and has been in the project phase for six years.

Tajikistan is a developing country ideally situated to catch the east wind of infrastructure investment blowing over the region. It

has augmented its position with tax concessions for large Chinese investors in the cement sector. Seven years on, only Huaxin Cement has invested and it remains to be seen whether others

will follow. Although politically stable, Tajikistan may simply be too resource-poor and undeveloped for producers without Huaxin's resources, as was evidenced in 2012 when natural gas shortages brought cement production to a halt.

Turkmenistan

Turkmenistan had a population of 5.58m and a per-capita GDP of US\$6970 in 2018, up by 5.8% year-on-year from US\$6590 in 2017.

Its economy is notable for its reliance on natural gas, of which Turkmenistan has the world's fourth largest reserves.¹⁰ The country has undertaken huge infrastructure projects in the past 10 years, and the exclusion of foreign competitors to the domestic cement industry has been a policy aim. The government's strategy first showed itself in a ban on Iranian cement imports in early 2013. On 8 July 2013 President Gurbanguly Berdimuhamedov signed a resolution imposing a 100% duty on imported cement, with a minimum tariff of US\$200/t,





into force. Turkmenistan now has a highly active cement industry whose 5.1Mt/yr all-integrated capacity is split between state (2.7Mt/yr) and private (2.4Mt/yr) ownership.

Producers

The Turkmen cement industry consists of two producers. Former President Saparmurat Niyazov decreed the incorporation of state-owned Turkmentcement on 4 March 2005 following an increase to the country's wealth due to improved oil and gas prices, increased exports and the completion of its short-term debt repayments.

Turkmentcement's initial production capacity was 1.7Mt/yr across two integrated plants in Ashgabat region: its 1.0Mt/yr Bezmeinskiy plant in Bezmein and its 0.7Mt/yr Kelete plant in Kelete, both of which produced cement using the wet method.

The government's 'Programme for Development of Construction and Industrial Sectors in 2012 - 2016,' under which it established 220 industrial facilities including a gas pipeline spanning Turkmenistan, Afghanistan, Pakistan and India, intensified demand on existing cement plants and led to the construction of an entirely new one. Turkmentcement commissioned the 1.0Mt/yr integrated Lebab plant in Koytendag, Lebab region in mid-2015, bringing the company's installed capacity to 2.7Mt/yr.

Although visas are practically impossible to obtain for tourists, Turkmenistan is more welcoming to foreign businesses seeking investment opportunities. One such business is Turkish construction giant Polimeks. The company holds a monopoly on construction of state monumental architecture and used its cement in such projects as the Arch of Neutrality, the Television Tower, the Monument to the Constitution and the base of the Ashgabat Flagpole, as well as government buildings and national sports facilities. It entered Turkmen cement production in 2011 with the commissioning of two plants: the 1.4Mt/yr integrated Lebab plant in Garlyk, Lebab region, and the 1.0Mt/yr integrated Jebel plant in Jebel, Balkan region.

Polimeks' Lebab plant produced over 0.7Mt of cement in the first half of 2019 it, putting it on track for full capacity utilisation of 1.4Mt in 2019, up by 49% from its 2018 production total of 0.94Mt. Over the six months to 30 June 2019 Polimeks exported 27% (0.2Mt) of the cement produced at the plant, primarily to Uzbekistan.

The Jebel plant is the only cement plant in Turkmenistan's western Balkan province, from which it serves the entire Caspian Sea region with ordinary Portland cement (OPC) and oil well cement. The plant recently diversified its products, producing its first batch of sulphate-resistant cement on 25 January 2020.



Left-Figure 6: Map of Turkmen cement plants:

1. Turkmentcement, Bezmein, 1.0Mt/yr.
2. Turkmentcement, Koytendag, 1.0Mt/yr.
3. Turkmentcement, Kelete, 0.7Mt/yr.
4. Polimeks, Garlyk, 1.4Mt/yr.
5. Polimeks, Jebel, 1.0Mt/yr.

Source: Global Cement Directory 2020.

Looking Forward

On 21 November 2019 Turkmen President Gurbanguly Berdimuhamedov instructed the Ministry of Industry and Communications that foreign investment must be found for three new integrated cement plant projects. Berdimuhamedov explained that the undertaking would jointly aim to meet domestic demand and increase exports.

The discovery of between 70Mt and 75Mt of iron ore in Balkan province on 25 November 2019 may provide a ready local source of clinker constituents that will reduce production costs for Polimeks by as much as US\$10m/yr.

Turkmenistan is a country with all the resources to sustain cement production growth for a long time, provided its economy remains in good health. This will depend on the global fossil fuels market.

Uzbekistan

Uzbekistan's 2018 population of 33.0m - up by 1.8% from 32.4m in 2017 - exceeds that of all four other 'Stans' put together. At 12.9Mt/yr, it has the second-smallest cement capacity proportional to population size: 3900kg/capita compared to 9100kg/capita in Turkmenistan, 8600kg/capita in Kazakhstan, 5700kg/capita in Kyrgyzstan and 3700kg/capita in Tajikistan.



Uzbek President Shavkat Mirziyoyev is a reformer who since coming to power in December 2016 has sought to tackle such issues as slavery and child labour and released a majority of dissidents and journalists imprisoned under previous President Islam Karimov. Mirziyoyev's 'Revolution from Above' also consists of economic reforms aimed at better enabling the country to profit from its extensive natural resources.

Uzbekistan has a healthy construction sector, which completed projects worth US\$61.4bn between 1 January 2019 and 30 November 2019 - an increase of 12% year-on-year from US\$51.2bn in the first 11 months of 2018. On the whole, Uzbekistan is a net cement importer, importing US\$150m-worth



in January - November 2019, up by 12% from US\$130m over the corresponding period of 2018.

Currently, cement importers receive tariff concessions, but on 9 May 2019 the Ministry of Investment and Foreign Trade advised the government to abolish this arrangement to support domestic producers. This coincided with the announcement of several cement plant projects and the entry into the Uzbek market of more than one major global cement player. Uzbekistan is the fastest-growing cement production capacity in the region and is transitioning into 100% private ownership.

The State Committee of Uzbekistan for Ecology and Environmental Protection implemented air pollution monitoring stations at all 13 of Uzbekistan's cement plants on 22 January 2020 at the expense of producers. Five plants exceeded international dust emission norms. Based on the results, the committee drafted a government decree on strengthening environmental controls over cement plants.

Producers

Uzbekistan's 12.9Mt/yr installed capacity is shared between 10 producers across 13 cement plants. These vary in size between 3.4Mt/yr and 0.02Mt/yr.

Qizilqumcement operates Central Asia's largest cement plant: the 3.4Mt/yr integrated Qizilqum cement plant in Navoi, Bukhara. A clinker capacity-increasing upgrade worth US\$110m has been underway since 28 March 2019 and is due to be finished in 2020. On 2 May 2019 President Mirziyoyev approved the sale of the government's 40% stake in Qizilqumcement to a private foreign investor.

Almalyk Mining and Metallurgical Complex (AMMC) operates two 1.5Mt/yr integrated plants: the Jarkurgan plant in Surkhondaryo region and the Zafarabad plant in Jizzakh region. The latter has a grey cement capacity of 1.0Mt/yr, with the remaining 0.5Mt/yr dedicated to white cement production. White cement is increasingly an export product. In the first half of 2019 AMMC shipped 1600t of white cement to Tajikistan, 1280t to Kyrgyzstan, 512t to Kazakhstan and 147t to Turkmenistan. On 28 March 2019 the Zafarabad plant shipped a trial consignment of 1000t of OPC by rail to Afghanistan, where it was received by construction company Hamid Company in Mazar-i-Sharif. Following the successful trial, AMMC announced that it would commence with the dispatch of 0.5Mt/yr of cement to Afghanistan. Both plants together exported 28,000t of cement products in the period, at a total value of US\$1.60m.

Russia-based Eurocement's subsidiary Akhangarancement's Akhangaran cement plant has a capacity of 2.0Mt/yr across its two wet lines, however this is

all set to change in 2020. Eurocement has announced that construction is underway on a new 3.0Mt/yr plant consisting of two dry lines, for which 4500t of machinery has been delivered to the site, including Wikov gearboxes for the rotary kilns and three Gebr. Pfeiffer mills: two MVR 5000 C-4 clinker grinding mills and an MVR 5000 R-4 raw materials grinding mill. Upon opening in 2020, the 5.0Mt/yr plant will form the basis of a 'building materials cluster,' according to the company.

Two UCG subsidiaries operate integrated plants in Uzbekistan. Quvasaycement operates the 0.9Mt/yr integrated Quvasay cement plant in Fergana region, which dates to 1932. It produces six different cements across its four wet lines, in addition to gypsum wall-board and ceramic tiles. Bekabadcement's 0.7Mt/yr integrated Bekabad cement plant in Syrdaryo region predates the Quvasay plant by six years. Founded in 1926 with a capacity of 25,000t/yr, it is Uzbekistan's oldest industrial enterprise. It underwent expansion to three wet lines before being acquired by UCG in 1995. Its raw materials come from Tajikistan and it sells its cement of four different grades in Tashkent and Tashkent region, Uzbekistan, and Kazakhstan. It is undergoing a packaging plant upgrade to enable it to bag cement in 1000kg as well as 50kg bags.

UCG also operates Uzbekistan's sole dedicated grinding plant, the 1.0Mt/yr Yangi-Yul grinding plant in Tashkent, which it commissioned in July 2010. The plant is fitted with China CAMC Engineering equipment, installed by local contracting firm Parma.

Surkhoncementinvest, a multinational based outside of Uzbekistan, announced on 18 October 2019 that it had commissioned a 1.1Mt/yr integrated cement plant in Surkhondaryo region worth US\$144m and installed with Austrian, Chinese, German and Russian equipment. It will produce cement mostly for export. Surkhoncementinvest says that a second development phase will follow in 2020.

The newest addition to Uzbekistan's cement production capacity is Shaanxi Xiangsheng's 0.9Mt/yr single-line integrated plant in Fergana region, commissioned on 15 January 2020 as part of a US\$113m project. The Chinese company scheduled project completion for May 2020 with the completion of a second line of the same capacity.

Karakalpak Cement has a capacity of 0.5Mt/yr at its integrated Karakalpak plant in the Karakalpakstan republic. This is the result of the first of three planned stages of a 1.2Mt/yr integrated cement plant project consisting of three dry lines, due for completion in 2018. The Uzbek-Chinese joint venture, which

Right- Figure 7: Map of Uzbek cement plants and projects:

1. Almalyk Mining and Metallurgical Complex (AMMC), Zafarabad, 1.0Mt/yr.
2. AMMC, Jarkurgan, 1.5Mt/yr.
3. Surkhoncementinvest, Surkhondaryo, 1.1Mt/yr.
4. Shaanxi Xiangsheng, Fergana, 0.9Mt/yr.
5. Karakalpak Cement, Karakalpakstan, 0.5Mt/yr.
6. Akhangarancement, Akhangaransky, 2.0Mt/yr.
7. Bekabadcement, Bekabad, 1.0Mt/yr.
8. Qizilqumcement, Navoi, 3.4Mt/yr.
9. Kuvasaycement, Kuvasay, 0.9Mt/yr.
10. Uzquillishmateriallari, Angren, 0.2Mt/yr.
11. SingLida, Ahtachi, 0.1Mt/yr.
12. Keer, Andijan, 0.02Mt/yr.
13. Turon Eco Cement Group, Margilan, 0.1Mt/yr.

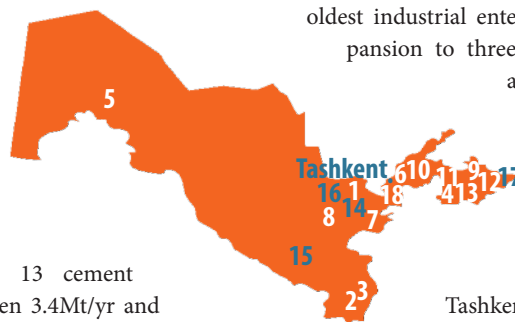
Projects:

14. Huaxin Cement, Jizzakh, 1.5Mt/yr (due March 2020).
15. Qarshi Conch, Qarshi, 1.2Mt/yr (due late 2020).
16. UTD Cement, Farish, 5.0Mt/yr (due 2021).
17. Shangfeng Cement, Andijan, 1.2Mt/yr (no due date).

Grinding:

18. United Cement Group, Tashkent, 1.0Mt/yr.

Source: Global Cement Directory 2020.





produces Titan brand cement, has yet to advance to phase two of the development.

Uzqirillishmateriallari has a capacity of 0.2Mt/yr across both wet lines of its 0.2Mt/yr integrated UZ-Angren Building Materials plant in Angren, Tashkent.

Two smaller-capacity plants commissioned in 2015 were SingLida's 0.12Mt/yr Achtachi plant and Keer's 0.02Mt/yr Andijan plant, both in Andijan region.

On 28 March 2016 Turon Eco Cement Group launched its 0.1Mt/yr Shursuv plant in Margilan, Fergana, complete with a dry line of Chinese design.

Projects

Uzbek-German partnership UTD Holding is set to enter Uzbek production as the market leader with the completion of its 5.0Mt/yr integrated Farish, Jizzakh, plant, scheduled for 2021. UTD Holding subsidiary UTD Cement will use limestone from its quarry in nearby Almaz to produce up to 4.0Mt/yr of grey cement and 1.0Mt/yr of white cement.

Shangfeng Cement announced on 30 September 2015 that it would invest US\$137m from a non-public share offering in the construction of a 1.2Mt/yr integrated plant in the Andijan region. The plant, which is to have a clinker capacity of 3200t/day, has not materialised in mid-February 2020.


Two new Chinese players entered the country in 2019. Anhui Conch subsidiary Qarshi Conch announced on 14 May 2019 that it had begun work on a 1.2Mt/yr integrated cement plant in Kashkadarya region in early 2019. The plant will enter production in December 2020 and cost US\$150m. Meanwhile Huaxin Cement is also investing US\$150m in the construction of a 1.5Mt/yr integrated cement plant in Zafarabad, Jizzakh region. Work began on 17 May 2019 and is scheduled for completion in March 2020. On 5 February 2019 *Global Cement* reported that the government granted full tax exemption to Huaxin Cement in order to attract its investment.

Uzbekistan's cement production growth typifies developments in the region. Development and population growth are driving a cement demand which will soon be outstripped by production. Given that some plants already produce the majority of their cement for export, the question of what Uzbekistan will do with all this cement is pertinent.

Looking forward

In January 2019 Reuters suggested that China was 'exporting overcapacity.'¹¹ A cause of this in the cement industry in particular is the polluting nature of its work. China's pollution regulations are now tighter than those of Central Asian countries. Chinese producers seeking to save on carbon credits and avoid a China Cement Association (CCA) overcapacity crackdown aimed at closing 400Mt/yr of production capacity between 2016 and 2020 (which in mid-February 2020 has not yet happened) are naturally compelled to cross the country's western borders. While some cement firms, notably Chinese producers, are happy to operate in the Stans, the relative difficulty of doing business currently deters many others.

Integration will be a key theme for the Stans in the coming decade, but there are several possible obstacles. Kyrgyzstan's cement exports to Uzbekistan will have been blocked for a year in May 2020. Kyrgyzstan and Kazakhstan already have a trading bloc: the EEU. Events in the bloc, such as the tightening of fellow EEU member Belarus' import licencing laws, may have a knock-on effect on competitiveness.

Given the speed of change in this region, the picture painted here can only be a snapshot, especially in Kazakhstan and Uzbekistan. Massive foreign investment is the driving force behind cement production growth but the question is increasingly: where will be found a demand to match? 

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Below: HeidelbergCement's 0.8Mt/yr integrated CaspiCement plant, Kazakhstan.
Source: Kryzstof Burek, HeidelbergCement.



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South Africa: LafargeHolcim rumoured to be looking to sell

LafargeHolcim is planning to sell its South African operations as the world's largest non-Chinese cement manufacturer continues to streamline its portfolio, according to sources close to a deal who spoke to Bloomberg. The Swiss company is working with adviser Credit Suisse Group to seek a buyer for the business. It has apparently already reached out to local competitors, Chinese cement producers and buyout firms, but may struggle to attract interest for the unit due to challenging dynamics in the country's cement industry. South Africa is Africa's most mature cement market but it is hampered by decreasing demand, old production facilities, tight domestic competition and cheap imports from the Middle East. A representative for LafargeHolcim declined to comment.



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Cameroon: Port of Kribi to receive 0.5Mt/yr plant

The Chinese-based Afcham China National Consortium Material Company has signed a memorandum with the Kribi Industrial Cement Plant Company (CmlKri) for the construction of a 0.5Mt/yr clinker grinding plant

in the Port of Kribi. The plant will have the capability to be expanded to 1.5Mt/yr. The US\$60m installation will span 30 hectares and include shipping facilities, as well as an 18,000t clinker silo.

Ghana: No new plants and possible import ban

The Ghanaian Department of Trade and Industry has declared a moratorium on the construction of new cement plants in response to chronic cement overcapacity in the domestic market. Chamber of Cement Manufacturers executive secretary George Dawson-Ahmoah said that consumption stands at 6.5Mt/yr nationally. Ghana's eight producers are only using 50% of their total installed capacity of 12Mt/yr.

Carlos Ahenkorah, Deputy Minister of Trade and Industry, later announced that the government was considering a temporary ban on imports on cement. However, he added the catch that it would only do this if local producers could ensure 'fair' pricing, according to the News Statesman newspaper.





Maldives: Raysut mulls majority terminal stake

Oman-based Raysut Cement has announced that it is seeking a 75% stake in a cement terminal in the Maldives, as part of its long-term global expansion strategy. In a disclosure filed with the Muscat Securities Market in Oman, Raysut stated, "Raysut Cement Company wishes to inform that it is in discussions with Cementia AG of Zurich to acquire its 75% shareholding in LH Maldives Ltd, a cement terminal located at Thilafushi Island, Maldives." Both Cementia and LH Maldives are controlled by LafargeHolcim.



Oman: Raysut revenue falls

Raysut Cement's revenue fell by 7.6% year-on-year to US\$223m in 2019 from US\$241m in 2018. However its profit for the year before tax rose five-fold to US\$13.8m and its expenses fell by 12% to US\$208m.

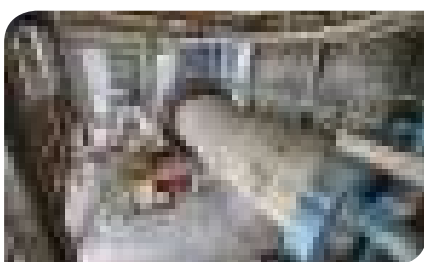
Saudi Arabia: New Tabuk chairman

Tabuk Cement has appointed Saoud Bin Solaiman Al-Juhni as the chairman of its board of directors. Abdulaziz Bin Abdelrahman Alkhamis has been appointed as the deputy chairman and the cement producer has also announced the composition of its executive and audit committees.

Kenya: Devki launches second plant

Devki Group subsidiary National Cement has launched its second Kenyan plant in Salgaa, Nakuru County, at a cost of US\$58.0m. Business Daily News has reported that the 0.75Mt grinding plant will supply cement to Kenya, South Sudan and southern Ethiopia.

Devki Group chairman Narendra Raval said that the completion of a 0.75Mt/yr second line at National Cement's 1.2Mt/yr Kajiado County plant would bring the group's total capacity to 3.5Mt/yr in July 2020, in a speech in which he lobbied the government to ban clinker imports. "We are gearing towards fixing the country's clinker gap and making Kenya a regional market for raw material in cement production," said Raval. The group also produces its Simba brand cement in Uganda.



Above: Ball mill at Cemenco. Source: Cemenco website.

Liberia: Cemenco commissions cement plant

HeidelbergCement subsidiary Cemenco has commissioned a 0.3Mt/yr cement plant in Liberia following an investment of US\$14m. The Daily Observer newspaper has reported that the plant is equipped with a 2000t silo, bulk truck unloading equipment and a bagging line, in addition to four Samson Eco Hoppers for dust-free delivery in the Port of Monrovia. Cemenco also operates a 0.8Mt/yr grinding plant on Bushroda Island in Monrovia.

Qatar: QNCC profit more than halves

Qatar National Cement Company (QNCC) has recorded a profit of US\$47.3m in 2019, a fall of 51% from US\$95.5m in 2018. This was caused by a 17% year-on-year fall in earnings to US\$193m from US\$233m in 2018 due to a 24% fall in production year-on-year. Production declined from 2.9Mt to 2.2Mt. Meanwhile, the completion of the fifth line at the company's integrated plant, as well as the diversification of its products to include white as well as grey cement, increased QNCC's outgoings.





Here *Global Cement Magazine* presents its monthly review of global cement prices, in US\$ for easy comparison. Additional price information is only available to subscribers to *Global Cement Magazine*. Subscribe on Page 62. In this issue subscribers receive extra price information from Algeria, Burundi, India, Pakistan and Cameroon.

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

Mexico: Cement is being distributed at discount prices to 60 families to improve their homes in San Buenaventura by the Municipal Presidency's Social Development Fund. Cement is being sold at US\$7.21/bag (50kg), against a market price of US\$10.76/bag. This is a saving of nearly a third.

China: All-China 42.5 grade cement prices from sunsirs.com. 18 January - 14 February 2020 = US\$77.31/t. This price is only around US\$1.29/t lower than those seen during December 2019 and January 2020, although the remarkable stability over the past month indicates a loss of appetite for construction in the world's largest market. This is likely to be an effect of the coronavirus outbreak.

Malaysia: Checks on cement prices by the Domestic Trade and Consumer Affairs Ministry (KPDNHEP) found no price hikes at the manufacturing level.

Its minister, Datuk Seri Saifuddin Nasution Ismail, said in a statement that the inspections had been made after complaints received from the Johor Master Builders Association (JMBA) and via social media over an alleged cement price increase of 20-50%.

An MP in Petaling Jaya had earlier 'highlighted' that cement prices had escalated from US\$43.48/t in October 2019 to US\$55.55/t, while contractors and construction companies had complained of a 44% surge in cement prices over the same timeframe.

EU ETS: CO₂ emissions permits cost Euro24.35/t on 13 February 2020, a 0.6% week-on-week fall from Euro23.50/t on 6 February 2020, a 1.2% month-on-month rise from Euro24.06/t on 5 November 2019 and a 16.9% year-on-year rise from Euro20.83/t on 13 February 2019.

Egypt: Ordinary Portland Cement prices as at 13 February 2020: Arabian Cement Co (Al Mosalah) = US\$51.61/t; Arabian Cement Co (Al Nasr) = US\$49.56/t; Cemex (Al Fahd) = US\$48.41/t; Minya Portland Cement (Minya) = US\$49.38/t; Minya Portland Cement (Horus) = US\$48.94/t; El Nahda Cement (Al Sakhras) = US\$48.75/t; Lafarge (Al Makhrous) = US\$49.70/t; Medcom Aswan Cement (Aswan) = US\$48.72/t; Arish Cement (Alaskary) = US\$49.04/t; Sinai Cement (Sinai) = US\$48.91/t; Suez Cement (Al Suez) = US\$49.87/t; Helwan Cement (Helwan) = US\$50.20/t; Misr Beni Suef = US\$51.15/t; El Sewedy Cement = US\$51.92/t; Misr Cement Qena (Al Masalah) = US\$48.75/t; Al Watania Company for Cement (Beni Suef) = US\$49.26/t.

White cement prices as at 13 February 2020: Sinai White Cement (Alabid Elnada) = US\$159.30/t; Sinai White Cement (Super Sinai) = US\$156.75/t; El Menya Cement (Super Royal) = US\$152.26/t; El Menya Cement (Royal Elada) = US\$154.80/t; Menya Helwan Cement (Alwaha Alabiad) = US\$154.49/t.

Blended cement prices as at 13 February 2020: Sinai Cement (Al Nakheel) = US\$45.23/t; El Menta Cement (Al Omran) = US\$44.91/t; Helwan Cement (Al Waha) = US\$45.74/t. Sulphate-resistant cement prices as at 13 February 2020: Cemex (Al Mukawem) = US\$52.43/t; Minya Portland Cement (Asec Sea Water) = US\$51.79/t; Lafarge (Kaher Al Behar) = US\$53.19/t; Suez Cement (Al Suez Sea Water) = US\$51.92/t; El Sewedy Cement (El Sewedy Al Mukawem) = US\$53.19/t.

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Ever tried 'stone soup'?

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



One of my New Year's Resolutions was perhaps a strange one: If there is a moment at which I could either shake someone's hand, or not, then I should default to shaking their hand. We have all been in such situations, where it could go either way - either a nod of the head or an actual contact. Furthermore, and it might be going a bit far, but if I'm alone and someone else is alone, then let's try to be less alone, together. Despite the Coronavirus outbreak, I'm opting for contact.

One reason for my resolution is my favourite story in a book of folk tales that I used to read to my small children at bedtime (that ship has now sailed - they are young ladies now and stay up later than me). The story was that of 'Stone Soup,' and it's a story that you may have heard before, in one of its many forms, since it seems to mutate with geography and with time. In 'my' version, it goes like this:

A man, down on his luck, approaches a village just as dusk is falling. He knocks on the first door that he comes to, but there is no answer. He tries a few more, but the villagers, suspicious of unknown callers at such a late hour, avoid even opening the door to him. Finally, as the cold starts to bite, an old lady heeds his knock, opening her door just a crack. "What do you want?" the old lady asks, eying him suspiciously. "Good evening, madam," replies the traveller, aware that his shabby clothes have looked better and that his muddy shoes are in want of a polish. "I wonder if I might beg a little warmth from your hearth, on this cold night?" Despite herself, she welcomes him in, and has him sit by the fire, since she can smell the coming snow in the wind.

After a while, the gentleman asks if the old lady might like to try some of his famous 'stone soup.' Intrigued, she asks for the recipe. The man digs into his pocket and brings out a polished stone that does, indeed, smell of a rich soup. "With just this stone, madam, and just a little seasoning, I can concoct a magnificent soup that would be fine enough for a king." The old lady doesn't believe him, but his suggestion piques her interest and, besides, she is starting to get hungry herself. "All I need," he says, "is a big pan of boiling water and some salt and pepper." She eyes him, and says "Well, you'd better take your coat off if you are going to make a decent job of this 'stone soup.'"

She put the pan on to boil, fetching rock salt and cracked black pepper from the pantry. Once the pot had boiled, the man plopped the stone into the water, and added a generous pinch of both salt and pepper.

"Give it a moment," he said, "and you shall taste the richest soup of your life." Doing so, he took a spoonful of the broth, blew on it and tasted it himself. "Ah, madam," he said, "it is already delicious, but I feel that it lacks a little something. Do you, by any chance, have any carrots that might add yet more flavour to this fine provender?" She happened to have a few old carrots in her store room, which she quickly chopped and added to the pot. "Mmm, madam, it is fit for a princeling, if not yet fit for a king. It will be improved by the addition of just an onion or two. Might you oblige?" She sighed and found three part-shrivalled onions at the bottom of the vegetable basket, chopped them and added them to the carrots. He tasted again, and found it delicious but "lacking just a soupçon of red wine, a few beans or lentils, potatoes and maybe just a teeny bit of meat."

The old lady listened to him open-mouthed, realising that his 'stone soup' was not quite what she had thought it was going to be. "On the other hand," she thought to herself, "that broth is starting to smell very good, and I have a few of those ingredients - and more - around the house in any case. It's a cold night and I haven't the heart to turn him out, so let's share a pot of his 'stone soup' together." She gathered more ingredients, set him to preparing them as well, added some red wine to the steaming pot, and brought two glasses to the kitchen table. As they prepared the soup, he told her of his tramping ways, and she told him of the olden days in the village and of her happy life with her late husband, the village carpenter.

Before long, the soup was ready, and what a soup it was. Rich, redolent, thick, nourishing, warming and - really - fit for a king. With crusty bread, they had bowls of 'stone' soup together, lit by the fire in the hearth, while the snow fell outside and the frost set in. Finishing the wine, the old lady opened a bottle of her late husband's home-made pear brandy, and they laughed and told stories together late into the night. Before he retired to his rough but warm straw bed by the fire, he took the spoon and carefully fetched his stone from the bottom of the pot. It did indeed smell like a stone that could magically make soup fit for a king. He took his leave from the old lady the next morning, both of them having enjoyed their mutual company of the night before. As he set out for the next village, or the one after that, he felt the stone in his pocket. "I might need that later," he thought to himself.

In 2020, let's share stone soup *together*.





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