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**Arab Union for Cement
and Building Materials
(AUCBM)**

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AUCBM's Quarterly Cement and Building Materials Review (CBMR)

EDITORIAL SCHEDULE FOR 2026

Issue: September 2026 - (Bonus Issue) (# 105)		
Deadlines for receiving articles, press releases, or advert materials: 24th September 2026		
THEMES		EVENTS
- Pyroprocessing - Process control and optimization - Cement Process Engineering - Cement Kilns - (Pre-)processing hazardous waste - Flue gas treatment - Digital transformation	- Digitalization in cement industry - Burners and burning processes - Upgrading projects - Modernization and automation - Gas analysis - Testing and analysis - Laboratory equipment	29th Arab International Cement & Building Materials Conference and Exhibition (AICCE29) 23-25 November 2026
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Heidelberg Materials Becomes Majority Stakeholder in Akçansa, Türkiye

Heidelberg Materials AG, Heidelberg, Germany, has recently doubled its stake in Akçansa, Ataşehir, Istanbul, Türkiye. Heidelberg materials took over the shares of Hacı Ömer Sabancı Holding A.Ş., Istanbul, Türkiye, thus becoming majority stakeholder with close to 80% of the shares of Akçansa. The company operates three cement plants, 26 ready-mix concrete plants, 5 aggregate quarries and strategically located terminals/seaports on the Marmara, Aegean and Black Seas.

MVR technology makes its debut in Libya

Gebr. Pfeiffer will supply a vertical roller mill, type MVR 3750 R-4, for grinding cement raw material to Libya. This will be the first MVR mill to be installed in the North African country.

The contract was awarded by Al Abraj Cement Industry Company, a Libyan manufacturer and supplier of cement and other building materials. The company is part of Whiba Holding and is well established in the construction sector.



From its headquarters in Zliten, the company is pursuing clear growth objectives: It plans to increase the production capacity of its plants and to construct additional facilities. At the same time, the use of natural resources is to be further optimised.

We are pleased to support this development with our MVR technology. The ordered raw mill is equipped with an SLS 3750 VR classifier of the latest design and grinds 275 t/h of cement raw material to a fineness of 10% residue on 0.090 mm. At the same time, the cement raw material is dried from a feed moisture content of approx. 8.4% to a residual moisture of less than 1%.

2,350 kW are installed on the mill drive.

The project is being handled by the Chinese general contractor Chengdu Design Institute.

The commissioning of the MVR mill is planned for the second half of 2027.



Modern MVR technology for Libya's cement industry

Another MVR vertical roller mill from Gebr. Pfeiffer is heading to Libya. The order includes the supply of an MVR raw mill of the type 5000 R-4 for grinding cement raw material.

The high-performance mill technology will be installed in Jardinah, in the Benghazi district, and will make a significant contribution to strengthening the cement production of the Libyan Cement Company in the future.

The long-established company is one of the country's leading cement manufacturers and has been supplying the Libyan market reliably with cement for more than 50 years.

Gebr. Pfeiffer is pleased to contribute, with modern technology, to the efficient and sustainable expansion of production capacities at the Benghazi site, which is also the company's headquarters.

The raw mill is equipped with an SLS 4000 VR classifier of the latest design and grinds 450 t/h of cement raw material to a fineness of 12% residue on 0.090 mm. At the same time, the feed material is dried in the same process step from around 8.4% moisture to less than 1% residual moisture.

3,650 kW are installed on the mill drive.

The project is being handled by the Chinese general contractor Chengdu Design Institute.

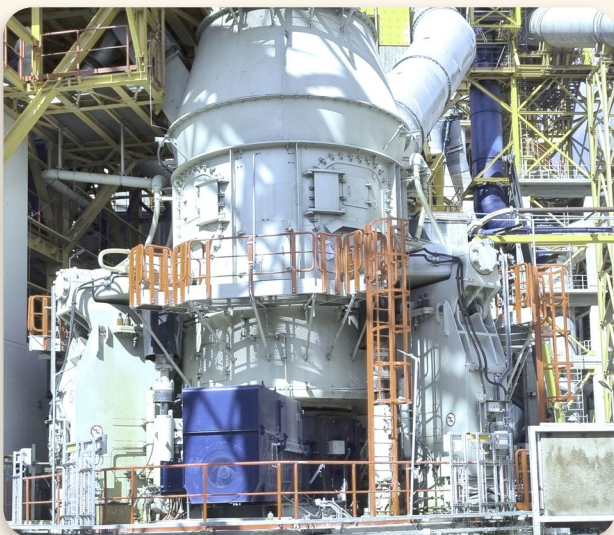
The commissioning of the MVR mill is planned for the second half of 2027.

Another Gebr. Pfeiffer order for Libya

Gebr. Pfeiffer is expanding its presence in Libya with a contract for a raw mill. It is an MVR 3750 R-4 mill.

The client is Al-Bareeq Al-Awal, a company specialising in the manufacture and distribution of building materials, refractory bricks, cement and cement products, which supplies the entire Libyan market.

The raw mill is equipped with an SLS 3750 VR classifier of the latest design and grinds 275 t/h of cement raw material to a fineness of 10% residue on 0.090 mm. At the same time, the cement raw material is dried from a feed moisture content of approx. 8.4% to a residual moisture of less than 1%.



2,350 kW are installed on the mill drive.

The contract is being handled by the Chinese general contractor Chengdu Design Institute.

The commissioning of the MVR mill is planned for the second half of 2027.

Change of leadership at VDZ, the German Cement Works Association:

Dr Dirk Spenner elected as new VDZ president – preparations underway for change in management

On 5 May 2026, the General Assembly of the German Cement Works Association (VDZ) elected Dr Dirk Spenner as its new president. He succeeds Christian Knell of Heidelberg Materials, who has held the post for nine years. At the same time, the VDZ Executive Board has set the course for the succession in the management team: Dr Martin Schneider will retire at the end of October this year. From that point on, Manuel Mohr as Chief Executive and Dr Jörg Rickert as Chief Technical Officer will steer VDZ's fortunes together with the President and the VDZ Board.

Dr Dirk Spenner is the Managing Partner of the Spenner Group, which this year celebrates 100 years of tradition as a manufacturer of cement and building materials.

VDZ was founded almost 150 years ago. Today, it comprises around 20 German cement manufacturers with some 50 sites. At the same time, more than 200 staff in Düsseldorf work on all aspects of cement production and the performance of concrete. In doing so, VDZ has developed into an internationally recognised centre of excellence for the entire cement and concrete value chain. It acts as a service provider for a wide range of issues relating to plant engineering, environmental protection and the durability of concrete. Through its numerous research projects, it consistently sets the agenda and addresses today the issues that will be of significance to the industry tomorrow.

At the same time as electing the President, the VDZ Executive Board has been preparing for the upcoming change in VDZ's management. End of October, Dr Martin Schneider will retire after 35 years at VDZ, 25 of which as Chief Executive. From 1 November 2026, Manuel Mohr will become Chief Executive of VDZ; he has been responsible for the Policy and Economics division at VDZ for 15 years and is also Managing Director of the Concrete Information Centre. He will lead VDZ together with Dr Jörg Rickert, who will serve as Chief Technical Officer. Jörg Rickert has been with VDZ since 1996, currently serving as Managing Director of VDZ Technology gGmbH and Head of the Cement Chemistry Department. Both – the new and outgoing Presidents – emphasise that VDZ is well-positioned for the future and will continue to successfully represent the industry under new management from autumn onwards.



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- Robust design for demanding bulk materials



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Waste Heat Recovery – Powering Saudi Arabia's Industrial Transformation

CTP Team SRL, Italy

The context

Saudi Arabia stands at a pivotal moment. **Vision 2030** is more than a plan: it is a bold commitment to transform economy, diversify energy sources, and build a sustainable, low- carbon industrial sector. For energy-intensive industries, such as cement, this is both a challenge and a enormous opportunity.

The **cement sector** consumes vast amounts of energy and produces significant emissions. But every challenge carries potential: Waste Heat Recovery systems (WHR systems) offer a pathway to turn lost energy into strategic advantage. By capturing heat from kiln exhaust gases and clinker cooler air, WHR systems can generate up to 20% of a plant's electricity needs, reduce tens of thousands of tons of CO₂ per year, and save millions of liters of water - a resource-critical metric in Saudi environment.

CTP is an international engineering and manufacturing company with over 50 years of experience in filtration and heat recovery. We started in the cement sector, providing innovative systems and developing our technology. Over all these years, we have built our know-how, enabling us to offer services up to full turnkey EPC projects, providing our clients with complete support from engineering to installation and start-up of our systems. We operate and have projects worldwide, and our headquarters is located at in Italy.

CTP, in order to leverage its know-how in the best way, is organized into three divisions:

APC: the historical division, which manages new process filter projects and the conversion of electrostatic precipitators into bag filters.

WHR: responsible for projects that recover waste heat to generate energy.

OTP: handles all projects related to system upgrades, retrofits, and performance optimization for systems requiring enhancement.

HPF: a sub-division of OTP, responsible for the production of filter bags.

WHR systems for cement plant. There are actually two available technologies the Organic Rankine Cycle (ORC) and the Steam Rankine Cycle (SRC). Both operate according to the same thermodynamic principle, but the main difference is the working fluid: the ORC uses an organic fluid (typically cyclopentane), while the SRC uses water. This difference determines distinct components in the circuits and different process conditions.

The choice of one technology over the other depends on the process conditions, primarily the quality and quantity of the available heat.



ORC systems use an intermediate heat transfer fluid, typically thermal oil, to convey energy from the process to the power generation unit. As a result, heat is transferred through two successive exchange stages: first from the process gases to the thermal oil, and then from the thermal oil to the organic working fluid. In this configuration, the PH heat exchanger operates at a higher temperature than the AQC exchanger, helping to maintain suitable operating conditions throughout the heat recovery system.

SRC systems, by contrast, use water/steam as the working fluid and therefore allow direct heat exchange between the process and the power generation cycle. This eliminates the intermediate heat transfer loop. However, the water/steam circuit requires dedicated equipment to maintain the appropriate water quality and operating conditions over time.

Comparison of rankine technologies

Both ORC and SRC power generation systems operate according to the same principle and follow the same phases:

- Expansion through a turbine
- Cooling of the working fluid to restart the cycle
- Compression
- Heating, evaporation, and superheating

The difference between the two solutions lies in the required process conditions. Considering ORC, it requires a lower temperature for the organic fluid to vaporize, is slightly more flexible with respect to fluctuations in the available heat, and does not require water. These three aspects generally make it well-suited for the cement process, where there are medium temperatures around 350 °C, gases containing complex dust, and variable heat quantities depending on the kiln production.

As the **Saudi Arabia transition to alternative fuels**, including biomass, refuse-derived fuels, and eventually hydrogen, the characteristics of waste heat streams will change. This is not a limitation, it is a call to innovation and adaptation in fact. Technologies like the Organic Rankine Cycle (ORC) provide the flexibility and resilience needed to capture energy from variable, low- to medium-temperature sources, delivering power, reducing emissions, and improving operational efficiency.

There is no fixed correlation between kiln production capacity and electricity generation. The performance of a WHR system depends on the specific characteristics of each plant, including the quantity and quality of the available waste heat, gas humidity, and overall process requirements. These factors ultimately determine both the configuration of the heat recovery system and its power output.

ORC technology offers a high degree of flexibility, allowing the Rankine cycle to be optimized across a range of operating conditions while relying on a proven and standardized equipment concept. SRC solutions, on the other hand, require a more tailored design approach, with key components adapted to the specific thermal conditions and performance targets of each installation.

Different exhaust gas streams require tailored recovery solutions, and the overall system must be configured to match the characteristics of the available heat source as well as the requirements of the power generation unit.

In general, SRC systems cover a production range from around 1 MW to over 20 MW, while ORC systems are typically best suited for lower output levels, approximately from 0.1 MW up to about 10 MW. In cement applications, where the characteristics of the steam that can be generated are a key factor, steam-based technologies are generally more suitable for power levels above 7–8 MW. Below this threshold, ORC solutions are usually the preferred option.

Flexibility

The turn-down ratio of an ORC system is generally 10:1; the system automatically adjusts power output without interruption and promptly responds when heat becomes available above the minimum. SRC systems also have a good turn-down ratio, but it is difficult to define a general value in advance. Since steam production varies according to available waste heat, this variability should be considered during the design phase to provide the best system setup. The limitation of the steam turbine is determined by the conditions of the supplied steam, which must ensure the absence of water droplets that could damage turbine blades. In specific operating conditions, this can limit efficiency.

Technology limits. As seen, each power generation technology has its own best range of application. In waste heat recovery, where the quality of the available heat, cannot be controlled in general, ORC systems can cover efficiently lower production range, limited by the thermodynamic characteristics of the working fluid, that is, at the end, the capacity to efficiently expand into a suitable turbine.

SRC technology can cover a wider range of power production, but some precaution must

be taken during the expansion phase to not create condensation droplets inside the turbine, specially in the last stages. This is normally controlled by a proper selection of the steam characteristics, in terms of pressure and temperature, admitted to the turbine; moreover, in order to push power production and take profit as much as possible of the steam expansion, the geometry of the turbine should request a proper specific design, introducing some uncertainties on the final performance level.

Case Study: Sonmez Plant

The Sonmez plant is located in Turkey, and the WHR system was commissioned in 2020. It includes two heat exchangers: one for the AQC and the other for the kiln PH. The kiln has a production capacity of 6,000 tpd, and the heat exchangers can handle: the first, 225,000 Nm³/h of air from the clinker cooler at approximately 400 °C, and the second, 345,000 Nm³/h of kiln gas at 305 °C. The total heat available is 38,777 kWt, and the gross electricity production is approximately 8 MWe.



Project goals:

- 57,000 MWe produced per year (already excluding approximately 10% self- consumption of the system)
- 25,000 tons of CO₂ emissions avoided per year
- €4,800,000 saved per year (considering the electricity cost in Turkey) *85 €/mw
- Coverage of 20% of the plant's total energy demand
- No water required and generally environmentally friendly

The results achieved with the WHR system.

The specific feature of this system - and of CTP systems in general - is that, thanks to our deep knowledge of the cement process, our WHR systems are fully integrated into the process without affecting or interfering with it. This provides significant advantages without any impact on cement production (the core activity).

For this reason, we can speak of process optimization, improving electricity and water consumption by recovering the heat already available in the process - using it instead of wasting energy and resources to dissipate it.

This demonstrates that WHR is not just a technical upgrade, it is a strategic partner for industrial sustainability. CTP Team has deployed 11 WHR systems worldwide, achieving about 160.000 tons of CO₂ emissions avoided annually across their projects. Moreover, they generate energy equivalent to the annual consumption of 140,000 households and achieving an environmental benefit comparable to the reforestation of over 20.000 hectares of land.

There are many challenges in the engineering and implementation of a WHR system in an existing cement plant:

- **Integration with existing structures:** Adapting the waste heat recovery system to an existing cement plant requires seamless integration with the current infrastructure.
- **Variable heat sources:** The waste heat from cement production can vary in both temperature and volume. Designing a system capable of efficiently capturing and utilizing this fluctuating heat source is a significant challenge.



- **Selection of suitable materials:** Corrosion-resistant materials must be chosen to ensure the system's longevity and reliability.
- **Optimization of heat exchange to maximize recovery efficiency:** Achieving optimal heat transfer performance is essential for maximizing energy recovery. Designing efficient heat exchangers and ensuring proper fluid dynamics are critical engineering aspects.
- **Proper dust management based on its characteristics:** Cement plants generate considerable amounts of dust and particulate matter. Managing and mitigating their impact on components such as heat exchangers and filters is a key consideration.
- **Operational flexibility:** Designing a WHR system that can adapt to variations in cement plant operation-such as changes in production rates or maintenance shutdowns-requires careful planning to maintain consistent performance.



CTP team remote control system

The WHR system is equipped with a control logic which allow to manage and control the whole system remotely. Key benefits of CTP Team Remote Survey for WHR systems include:

- **Preventive maintenance:** Real-time data allows predictive maintenance planning, reducing unplanned downtime.
- **Reliability:** Our engineers can remotely intervene to correct abnormal conditions or guide adjustments, ensuring consistent performance.
- **Rapid alerts:** Immediate notifications in case of unusual behavior or equipment malfunction, allowing proactive intervention.

Focusing on the ORC unit:

Cyclopentane is used as organic fluid and is heated up and evaporated in the hot modules, increasing temperature and pressure to values suitable to control the turbine.

The organic fluid is expanded through the turbine, which is connected to an electric generator.

The exhaust vapor flows through the regenerator, where it cools down exchanging heat with the recirculated organic liquid, increasing the efficiency of the cycle, and then is completely condensed in the air-cooled condenser, releasing the condensing heat to ambient air.

The organic fluid is then pumped into the regenerator and ORC heat exchanger modules, completing the closed-cycle operation.

STRATEGIC INSIGHTS

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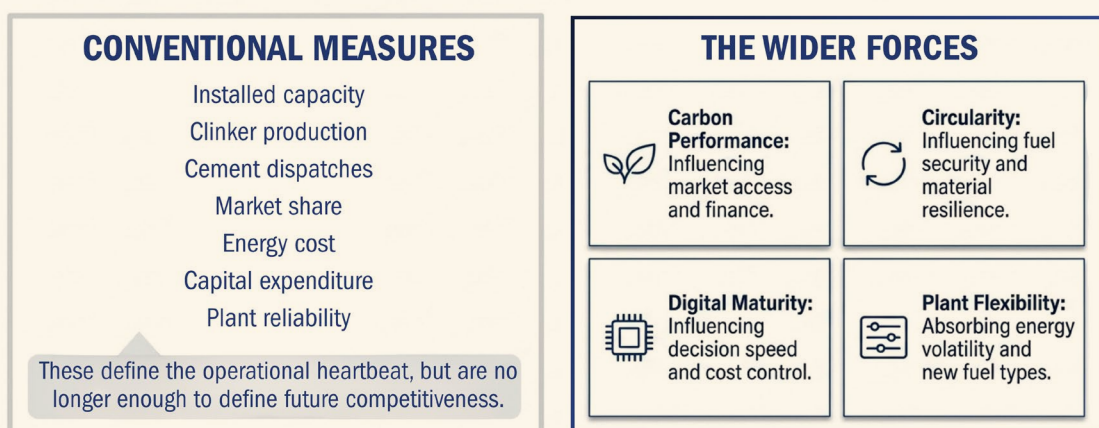
From industrial pressure to executable transformation

A³&Co.[®], UAE

The Arab cement industry is entering a new strategic cycle. For decades, the sector was largely assessed through conventional measures: installed capacity, clinker production, cement dispatches, market share, energy cost, capital expenditure, plant reliability, and sales growth. These indicators remain important. They still define the operational heartbeat of every cement company. But they are no longer enough to define future competitiveness.

The next phase of cement will be shaped by a wider set of forces. Carbon performance will increasingly influence market access and finance. Circularity will influence fuel security, raw material resilience, and social license to operate. Digital maturity will influence decision speed, process stability, quality consistency, and cost control. Plant flexibility will influence whether companies can absorb energy volatility, new fuel types, new product standards, and changing customer requirements.

THE NEW STRATEGIC CYCLE: PRODUCING MORE VS. PRODUCING BETTER



Transformation cannot be a sustainability slogan. It is a commercial, industrial, and strategic necessity.



In this new environment, cement transformation cannot be treated as a sustainability slogan or a branding exercise. It is becoming a commercial, industrial, and strategic necessity.

The core question facing the sector is no longer whether cement companies should transform. The real question is how they can transform without losing competitiveness, without damaging clinker quality, without adding unnecessary cost, and without creating isolated initiatives that fail to scale.

This is particularly relevant for the Arab region. The region combines mature cement markets, high-capacity production bases, energy-sensitive operating models, reconstruction opportunities, export ambitions, fast-growing infrastructure needs and rising expectations from governments, financiers, and construction value chains. It is a region where cement will remain essential, but where the definition of a competitive cement company is changing.

The future cement company will not only be the company that can produce more. It will be the company that can produce better: with lower specific heat consumption, stronger fuel flexibility, higher circularity, better digital

intelligence, more resilient products, stronger carbon visibility and a clearer link between plant performance and market strategy.

The transformation equation

Cement transformation is often discussed through separate topics: decarbonization, alternative fuels, digitalization, supplementary cementitious materials, artificial intelligence, energy efficiency, waste heat recovery, carbon reporting, green finance, EPDs, CBAM readiness, kiln optimization, and plant upgrades.

Each topic matters. But the danger is fragmentation.

A cement company can run a digital project without changing operations. It can prepare a decarbonization roadmap without linking it to the kiln. It can evaluate alternative fuels without solving materials handling, combustion stability, or emissions constraints. It can reduce clinker factor without securing quality consistency or market acceptance. It can produce an EPD without reshaping its product and export strategy. It can announce net-zero ambition without building a credible capital and operational roadmap.



The transformation equation must therefore be integrated.

Transformation pillar	Industrial question	Strategic implication
Competitiveness	How does the company protect margin under market, energy, and carbon pressure?	Transformation must strengthen commercial position, not only reduce emissions.
Operational excellence	How does the plant reduce variability and improve performance?	Kiln, grinding, quality, maintenance and energy systems remain the foundation.
Circularity	How can waste and by-products become reliable industrial resources?	Alternative fuels, SCMs and raw material substitution require technical and regulatory discipline.
Digital maturity	How can data improve decisions, not only reporting?	Digitalization must move from visibility to prediction, optimization, and control.
Decarbonization	How can carbon reduction become executable and bankable?	Roadmaps must be linked to abatement cost, capex, opex, finance, market, and plant reality.
Future-ready plants	How can assets remain flexible under changing market and regulatory conditions?	Brownfield upgrades and greenfield designs must embed flexibility, circularity, and carbon resilience.

“This is the real transformation agenda. Not a single lever. Not a single technology. Not a single report. A structured combination of industrial levers sequenced in the right order.”

Why competitiveness must remain the center.

For cement companies, transformation will fail if it is framed only as compliance. Carbon reduction that destroys margin will not scale. Digitalization that does not improve operational performance will lose credibility. Alternative fuels that destabilize the kiln will be resisted. New cement products that cannot meet customer expectations will remain niche. Capex-heavy roadmaps that do not align with market reality will stay on paper.

This is why competitiveness must remain the center of the transformation model.

In many Arab cement markets, companies face one or more structural pressures: oversupply, fluctuating demand, price competition, high energy exposure, export uncertainty, logistics constraints, product commoditization and increasing customer expectations. In such environments, transformation must answer basic management questions:

- How do we reduce costs?
- How do we protect clinker and cement quality?
- How do we increase fuel optionality?
- How do we reduce carbon without losing reliability?
- How do we make products more attractive to infrastructure and export markets?
- How do we use digital tools to improve decisions?
- How do we build internal capability, so transformation survives beyond individual projects?

The best decarbonization roadmap is not the most expensive roadmap. It is the roadmap that identifies the right sequence of actions, starting with measures that improve both carbon and cost wherever possible.

This is where the philosophy of reducing carbon while reducing cost becomes critical. Energy efficiency, kiln stability, fuel flexibility, lower clinker factor, SCM development, predictive quality, maintenance reliability, and waste valorization can often contribute to both cost and carbon performance when meticulously designed. These should usually come before high-risk or high-cost options.

The numbers behind the pressure

The cement sector is one of the world's essential industrial systems. It supports housing, infrastructure, ports, roads, utilities, industrial zones, and reconstruction. But it is also among the hardest sectors to decarbonize because emissions arise from both energy use and limestone calcination.

The pressure is therefore structural, not temporary.

For the Arab region, the opportunity is to build a pragmatic transformation pathway. The region does not need to simply copy European, Asian, or North American models. It has its own market structure, energy mix, raw materials, waste streams, logistics conditions, regulatory maturity, and investment priorities.

That means the roadmap must be locally grounded.

Fact / Indicator	Meaning for the cement sector
Cement is a complex abatement industrial material	Process emissions cannot be eliminated by fuel switching alone.
Cement demand is linked to infrastructure and urban development	The sector must decarbonize while continuing to supply essential materials.
Carbon performance is increasingly linked to trade and finance	Export strategies, green procurement and financing terms will increasingly depend on credible carbon data.
Digital systems are expanding across industrial operations	Plants with stronger data architecture will make faster and better operational decisions.
Circular economy policies are gaining importance	Cement plants can become strategic platforms for selected waste and by-product valorization.

Circularity: from waste problem to industrial resource strategy

Circularity is one of the most practical levers available to the Arab cement industry. Cement plants can play a powerful role in converting selected waste streams and industrial by-products into fuel, raw material, or supplementary cementitious value. But this must be done with discipline.

Alternative fuels can help reduce fossil fuel dependency and manage energy cost exposure. Biomass fractions, refuse-derived fuel and selected industrial waste streams can support fuel flexibility when properly prepared and controlled. Supplementary cementitious materials can reduce clinker factor and improve the carbon profile of cement. Industrial by-products can reduce reliance on virgin raw materials. Construction and demolition waste can become part of a broader circular built environment strategy.

However, circularity is not a simple matter of “using waste.” It is an industrial system.

CIRCULARITY: FROM WASTE TO INDUSTRIAL RESOURCE



A cement plant must understand calorific value, moisture, particle size, chlorine, sulfur, alkalis, ash chemistry, heavy metals, feeding systems, storage safety, dosing stability, combustion behavior, emissions implications, and final product quality. Waste valorization without process understanding can become a source of operational instability.

A strong circularity strategy therefore requires a structured approach.

This is not only a sustainability topic. It is a competitiveness topic. A plant that can use more fuels and more materials safely has more strategic options than a plant locked into one fuel, one product and one operating model.

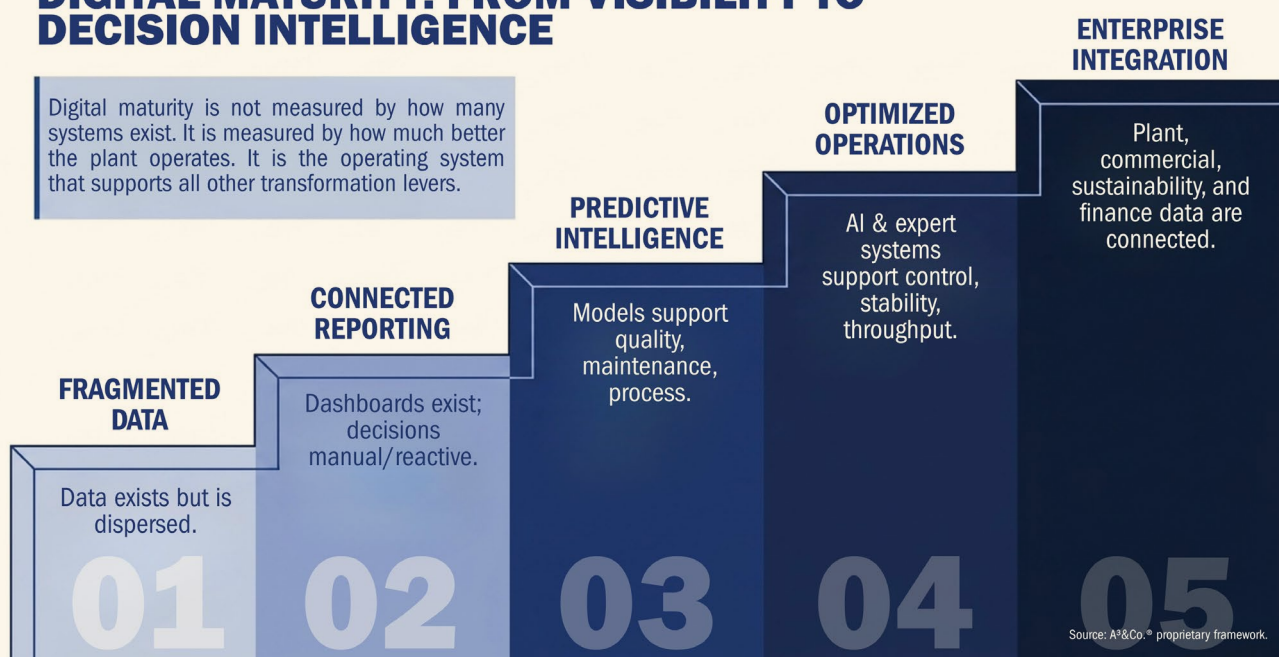
Circularity lever	Key requirement	Cement plant impact
Alternative fuels	Secure supply, preparation, dosing, combustion control, and emissions compliance	Lower fossil fuel exposure and higher fuel flexibility
SCMs	Material mapping, quality testing, standards alignment, and customer acceptance	Lower clinker factor and improved carbon footprint
Industrial by-products	Chemical compatibility, logistics, permitting and long-term contracts	Reduced raw material dependency
C&D waste	Sorting, processing, quality control, and integration with construction value chains	Stronger built-environment circularity
Local content	Regional Sourcing and industrial ecosystem development	Greater supply chain resilience

Digital maturity: from data visibility to decision intelligence

Digitalization is another area where the sector needs sharper thinking. Many cement plants already have automation systems, control rooms, laboratory information systems, ERP platforms, maintenance software, and reporting dashboards. Yet this does not automatically mean they are digitally mature.

DIGITAL MATURITY: FROM VISIBILITY TO DECISION INTELLIGENCE

Digital maturity is not measured by how many systems exist. It is measured by how much better the plant operates. It is the operating system that supports all other transformation levers.



Digital maturity begins when data becomes trusted, integrated, and useful for better decisions.

The next generation of cement performance will depend on the ability to connect data across the value chain: quarry, raw mix, grinding, pyro-processing, fuel management, emissions, quality, maintenance, dispatch, cost, and market requirements. Artificial intelligence becomes valuable only when it is built on reliable data, process knowledge, and operational discipline.

In a cement plant, digital maturity should not be measured by how many systems exist. It should be measured by how much better the plant can operate because of those systems.

This is especially important for fuel flexibility and decarbonization. A plant cannot scale alternative fuels, reduce clinker factor, or optimize energy performance without stronger process visibility and faster decision loops. Digital maturity is therefore not a separate transformation topic. It is the operating system that supports all other transformation levers.

Digital maturity level	Typical condition	Transformation objective
Fragmented data	Data exists but is dispersed across systems and departments	Build visibility and data governance
Connected reporting	Dashboards exist but decisions remain manual and reactive	Improve transparency and performance routines
Predictive intelligence	Models support quality, maintenance, energy, and process decisions	Reduce variability and anticipate problems
Optimized operations	AI and expert systems support control, planning and performance management	Improve stability, cost, throughput, and quality
Enterprise integration	Plant, commercial, sustainability and finance data are connected	Align operations with strategy and value creation

Operational excellence remains the foundation.

The cement industry should not confuse transformation with abandoning the basics. The future-ready cement plant is still built on operational excellence.

Kiln stability, raw meal control, clinker quality, grinding efficiency, refractory management, maintenance reliability, process control, heat balance, fan efficiency, false air reduction, and material handling all remain central. A plant that cannot control the basics will not succeed with advanced transformation.

OPERATIONAL EXCELLENCE: THE FOUNDATION



Operational excellence is also the most credible first step in decarbonization. Lower specific heat consumption, better electrical efficiency, improved reliability, reduced stoppages, stable kiln operation, and consistent quality can reduce both cost and carbon intensity. They also create the stable platform needed for higher alternative fuel substitutions, lower clinker factor, and more advanced digital control.

Operational area	Transformation relevance
Raw material preparation	Supports stable chemistry, lower variability, and better clinker quality
Pyro-processing	Determines energy performance, fuel flexibility, emissions, and clinker formation
Grinding	Influences electrical efficiency, cement performance, and product flexibility
Maintenance	Protects reliability, availability, and asset life
Quality control	Enables new cement types, SCM use and customer confidence
Fuel management	Supports cost reduction, TSR increase and carbon reduction

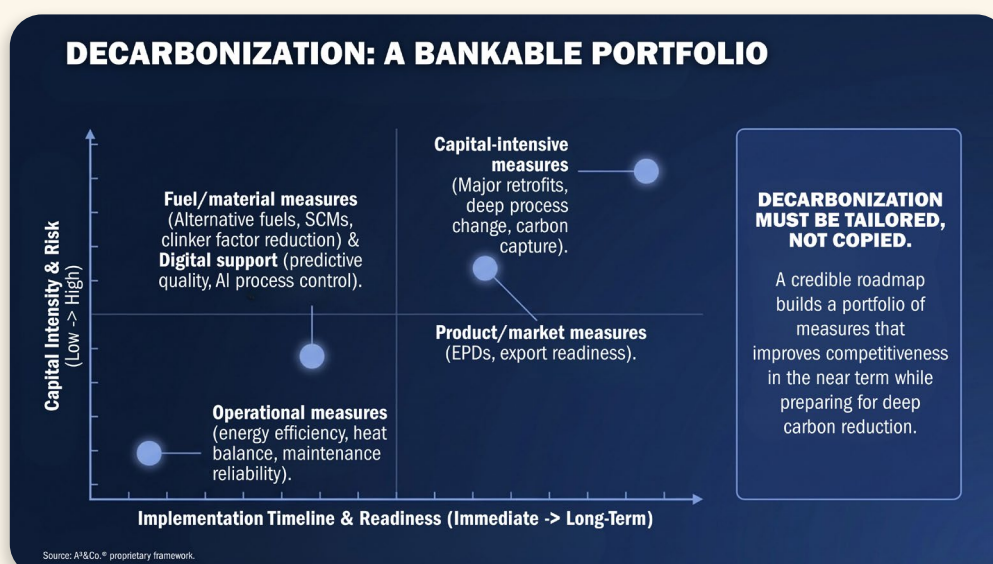
In this sense, operational excellence is not old-fashioned. It is the base layer of the future cement company.

Decarbonization: from roadmap to bankable execution

Decarbonization in cement must be treated as an execution discipline. A roadmap is useful only if it can guide decisions, investment, sequencing, and accountability.

A credible decarbonization roadmap should start from a strong baseline.

It should quantify emissions, fuel use, clinker factor, electricity consumption, product mix, process performance, and market requirements. It should identify abatement levers, estimate impact, assess feasibility, calculate costs, define dependencies, and sequence actions.



The roadmap should also distinguish between diverse types of measures.

Decarbonization measure type	Examples	Strategic priority
Immediate operational measures	Energy efficiency, heat balance improvement, process stability, maintenance reliability	High priority because they often reduce costs and carbon
Fuel and material measures	Alternative fuels, biomass fractions, SCMs, clinker factor reduction, raw material substitution	High priority where supply chains and quality are feasible
Digital support measures	Predictive quality, energy optimization, fuel management, AI-supported process control	High priority as enablers of performance and scale
Product and market measures	EPDs, low-carbon cement portfolio, export readiness, green procurement alignment	Critical for market differentiation and trade access
Capital-intensive measures	Major retrofits, deep process change, carbon capture where viable	Must be sequenced carefully based on economics, policy, and readiness

The industry must be realistic. Not every technology is ready for every market. Not every plant has the same fuel options, SCM availability, grid conditions, customer base, or investment capacity. Therefore, decarbonization must be tailored, not copied.

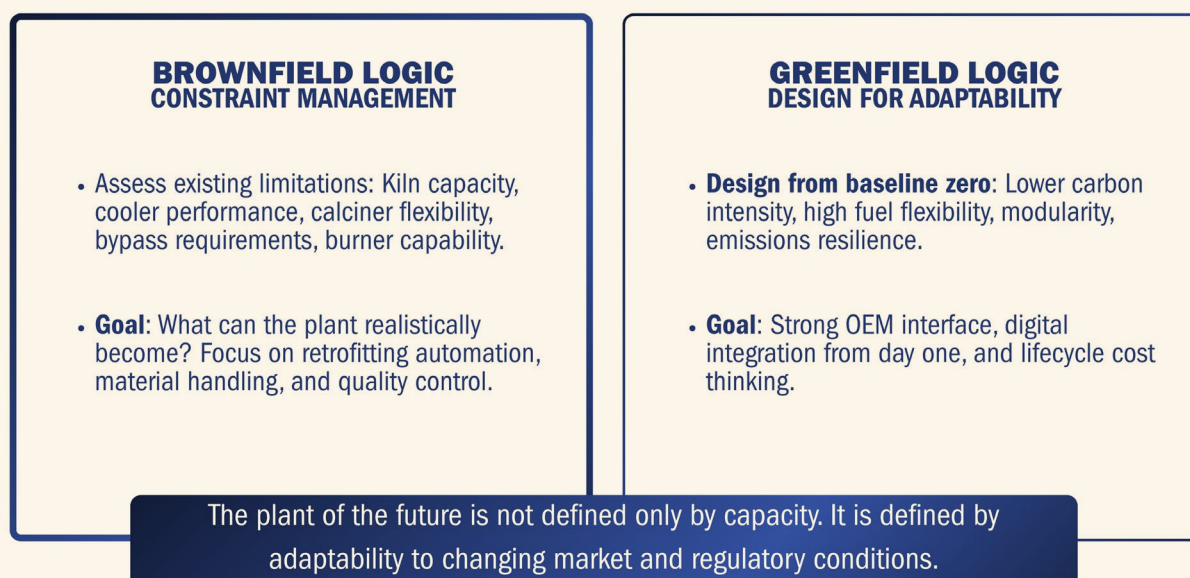
The most effective approach is to build a portfolio of measures that improves competitiveness in

the near term while preparing the company for deeper carbon reduction in the medium and long term.

Future-ready plants: brownfield and greenfield logic

The future-ready cement plant is not only a plant with new equipment. It is a plant designed or upgraded around flexibility.

FUTURE-READY PLANTS: DESIGNING FOR ADAPTABILITY



A brownfield plant must be assessed for what it can realistically become. This includes kiln capacity, cooler performance, preheater condition, calciner flexibility, bypass requirements, burner capability, alternative fuel feeding, storage systems, raw material constraints, automation level, electrical systems, maintenance maturity, and quality control.

A greenfield plant, by contrast, should be designed from the beginning with future requirements in mind: lower carbon intensity, high fuel flexibility, digital integration, lower specific energy consumption, SCM readiness, modularity, maintainability, emissions compliance, and product portfolio flexibility.

Plant dimension	Future-ready requirement
Fuel system	Ability to manage diverse fuels safely and consistently
Pyro line	Stable, efficient, and adaptable to changing fuel and raw material conditions
Grinding system	Product flexibility and energy efficiency
Digital architecture	Integrated plant data, control, reporting and predictive intelligence
Material strategy	Readiness for SCMs, alternative raw materials and circular inputs
Environmental systems	Compliance, monitoring, and emissions resilience
Project delivery	Strong OEM interface, execution discipline, and lifecycle cost thinking

This is why greenfield and brownfield decisions must be connected to the wider strategy. The plant of the future is not defined only by capacity. It is defined by adaptability.

The role of advisory and implementation of architecture

As industry becomes more complex, the value of advisory work changes. Traditional consulting was often associated with reports, benchmarking, and strategy documents. The next phase requires something more integrated. Cement companies need advisory models that can connect boardroom decisions with plant realities. They need support that understands

market dynamics, process engineering, decarbonization, circularity, digital maturity, product strategy, policy trends, finance requirements, and human capability.

This is the space in which A³&Co. has developed its work: helping cement companies and industrial stakeholders organize transformation into executable pathways.

The company's service architecture reflects the needs of the sector:

THE A³&CO.® ADVISORY ARCHITECTURE

INDUSTRY CHALLENGE	A ³ &Co. SERVICE RESPONSE
MARKET PRESSURE & OVERCAPACITY	Market intelligence, competitiveness studies, export strategy, and M&A support
COST & PERFORMANCE PRESSURE	Operational excellence, kiln optimization, grinding improvement and reliability programs
RESOURCE AND FUEL VOLATILITY	Alternative fuels strategy, SCM mapping, circularity platforms, and waste valorization studies
CARBON & TRADE PRESSURE	Decarbonization roadmaps, CBAM readiness, EPD strategy and abatement cost analysis
DIGITAL FRAGMENTATION	Digital maturity assessment, AI readiness, plant intelligence, and integrated reporting architecture
GREENFIELD / BROWNFIELD UNCERTAINTY	Project advisory, technology selection, OEM interface, and future-ready plant design logic
CAPABILITY GAPS	Executive training, technical academies, and cement professional development programs

BRIDGING THE GAP BETWEEN THE STRATEGIC BOARDROOM QUESTION AND THE OPERATIONAL PLANT ANSWER.

The importance of this architecture is that it does not treat transformation as a disconnected set of services. It creates a bridge between the strategic question and the operational answer.

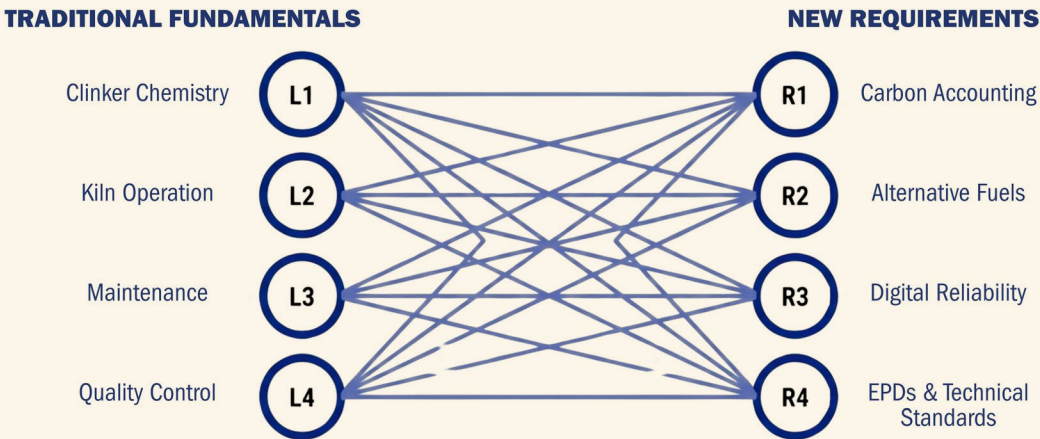
Human capability: the missing transformation lever

Technology alone will not transform the cement industry. People will.

A plant can buy systems, but if engineers do not trust the data, use the models, understand the process implications, or change their routines, the impact will be limited. A company can prepare a roadmap, but if plant teams do not own it, it will remain a document. A CEO can approve a strategy, but if middle management is not equipped to implement it, execution will slow down.

This is why human capability must sit inside the transformation agenda.

HUMAN CAPABILITY: THE MISSING LEVER



TECHNOLOGY ALONE WILL NOT TRANSFORM THE INDUSTRY. PEOPLE WILL.

Capability building is not an HR add-on; it is an industrial transformation lever. If engineers do not trust the data, use the models, or change their routines, impact is limited.

Source: A³&Co.® proprietary framework.

The Arab cement industry needs a new generation of cement professionals who understand traditional cement fundamentals and new transformation requirements at the same time. They must understand clinker chemistry and carbon accounting. Kiln operation and alternative fuels. Grinding and product performance. Maintenance and digital reliability. Quality control and EPDs. Market positioning and technical standards.

Capability building is therefore not an HR add-on. It is an industrial transformation lever.

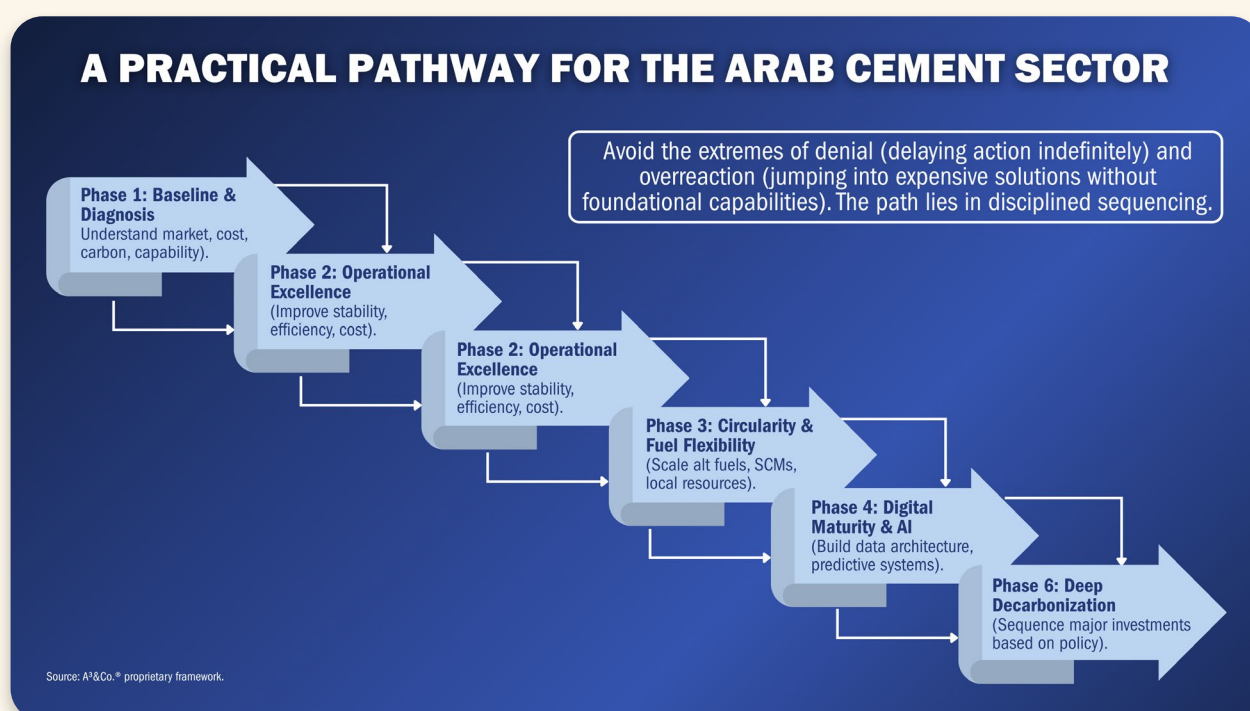
A practical pathway for the arab cement sector

The Arab cement industry can build a strong transformation pathway if it avoids two extremes.

The first extreme is denial: treating decarbonization, digitalization and circularity as external pressure that can be delayed indefinitely. This will expose companies to future competitiveness risks.

The second extreme is overreaction: jumping into expensive or immature solutions without first capturing operational, circularity, digital and product-level opportunities. This can waste capital and weaken confidence.

The practical pathway lies in disciplined sequencing.



Phase	Focus	Expected outcome
Phase 1	Baseline and competitiveness diagnosis	Understand market, plant, cost, carbon, and capability position
Phase 2	Operational excellence and quick wins	Improve stability, efficiency, reliability, and cost
Phase 3	Circularity and fuel flexibility	Scale alternative fuels, SCMs and local resource platforms
Phase 4	Digital maturity and AI enablement	Build data architecture, predictive systems, and decision intelligence
Phase 5	Product and market transformation	Aligning low-carbon products with customers, exports, and procurement
Phase 6	Deep decarbonization and future-ready assets	Sequence major investments based on readiness, policy, and economics

“This pathway does not promise overnight transformation. It provides a realistic way to move.”

Conclusion: the next definition of cement leadership

The Arab cement sector is not simply facing a decarbonization challenge. It is facing a transformation challenge.

The future will reward companies that can combine competitiveness, circularity, digital maturity, and future-ready plant design into one operating model. The next generation of leaders will be those who understand that carbon, cost, quality, reliability, fuels, materials, data, products, and people are connected.

Cement will remain essential. But the cement company of the future will look different from the cement company of the past. It will be more intelligent, more flexible, more circular, more disciplined, and more transparent. It will use data not only to report the past but to manage the future. It will treat waste streams as potential resources. It will treat carbon reduction as a competitiveness strategy. It will treat plant design as a long-term resilience decision. It will treat capability building as seriously as capex.

For the Arab region, this is not only a challenge. It is an opportunity.

THE ARAB CEMENT SECTOR IS NOT SIMPLY FACING A DECARBONIZATION CHALLENGE. IT IS FACING A TRANSFORMATION CHALLENGE.

THE COMPANIES THAT MOVE FIRST WITH DISCIPLINE WILL NOT ONLY COMPLY WITH THE FUTURE. THEY WILL SHAPE IT.

Amr A. Nader
CEO & Co-Founder, A³&Co.

The region has an industrial base, the infrastructure needs, the natural market relevance, and the strategic urgency to build its own cement transformation model. The companies that move first with discipline will not only comply with the future. They will shape it.

The next chapter of cement in the Arab region will not be defined by volume alone. It will be defined by the ability to produce with intelligence, flexibility, circularity, and competitiveness.

That is the real transformation.

MAAG – Cement at the Heart of Innovation

Why Reliability and Replacements Transform Industry Economics

Sławomir Przezdziecki, Global Agent & Reseller Market Development, MAAG, Switzerland

MAAG was honored to participate in the 28th Arab International Cement & Building Materials Conference and Exhibition (AICCE28), held in Dubai, UAE, from November 11–13, 2025. This premier industry event provided a valuable opportunity to engage with participants and clients, refresh key aspects of MAAG products, especially regarding replacements—and continue meaningful conversations at our booth. The experience reinforced the importance of sharing knowledge directly and listening to market needs.



Paper Title: MAAG gears replacement solutions to raise the feed and decrease power consumptions and increase the availability of the mills and replacing old equipments to raise the efficiency

Organization: MAAG

Speaker: Sławomir Przezdziecki



Can you imagine a cement plant where every hour of operation is guaranteed, and every investment delivers maximum return? For over a century, MAAG has answered this challenge by creating gear units that drive processes and form the foundation of plant economics. Since 1913, MAAG has been integral to the cement business. Our global footprint, experience, and innovation make MAAG the trusted partner for heavy-duty gear units. But what does reliability truly mean in a world where every hour of downtime costs thousands of euros?

Reliability: The Foundation of Cement Plant Economics

Downtime is more than a technical issue, it results in financial losses, lost production, and increased energy costs. Gear unit reliability is not a luxury; it is essential. MAAG has embraced this principle from the start. Our replacement solutions minimize—or even eliminate—modernization costs through 1:1 designs that allow old installations, whether MAAG or other brands, to be replaced without expensive structural changes. This approach is not just about savings; it's a strategic advantage. Would you invest in solutions that reduce overhaul time from 21 days to just 7? The answer is clear. Every MAAG gear unit undergoes rigorous no-load testing before leaving the factory, ensuring smooth installation and trouble-free start-up.

- MAAG: Your Partner in Reliability
- Replacements That Change the Game
- Over a Century at the Heart of the Cement Industry
- Innovation Driven by Experience
- Economics Begin with Reliability

Iron Drive: More Than a Gear Unit—A Strategy for Your Cement Plant

Iron Drive is MAAG's response to the market's need for replacement and modernization of gear units in VRM applications. Its uniqueness stems from customer dialogue—end-user feedback shaped by its design.



Iron Drive offers:

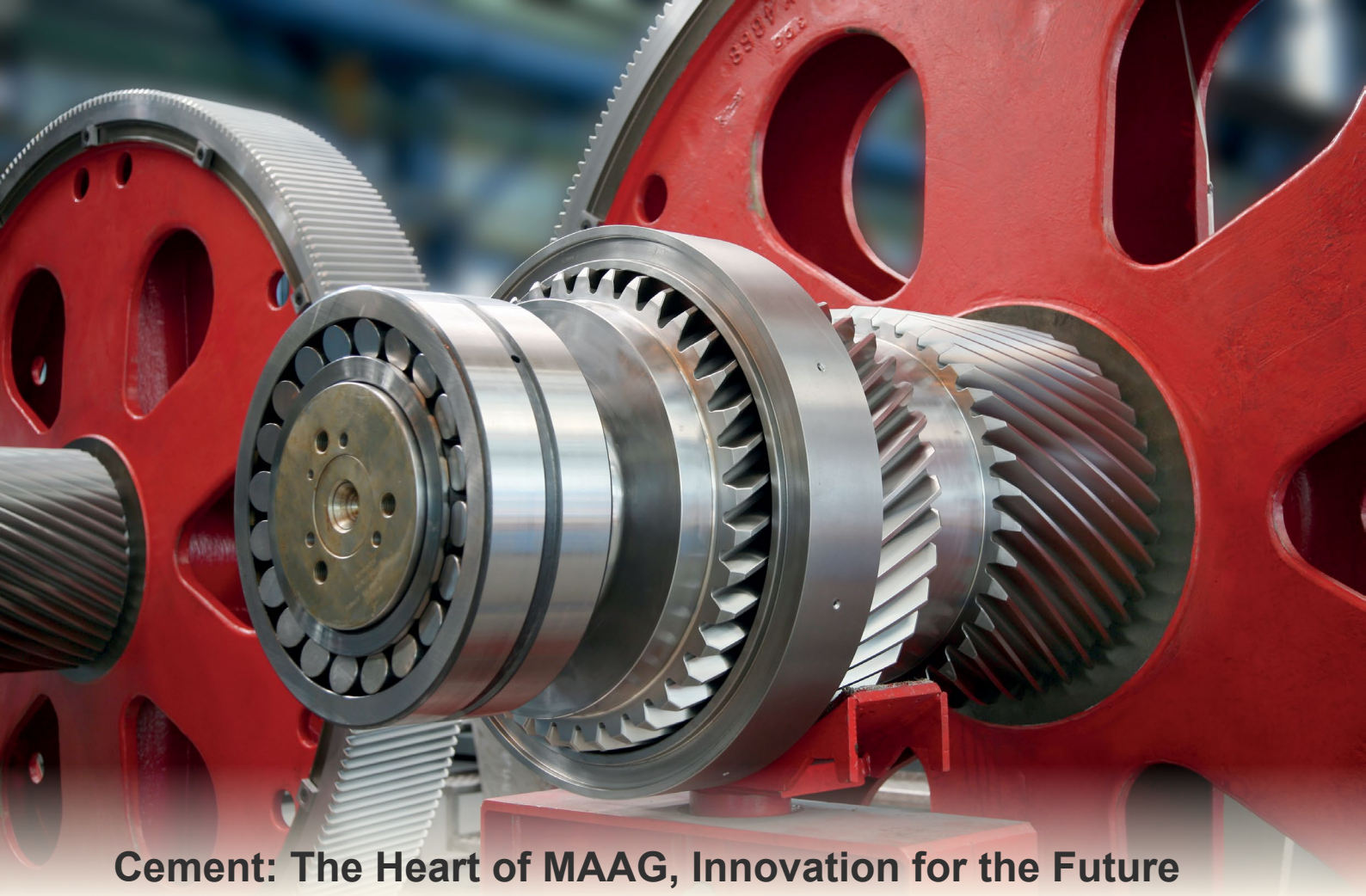
- 1:1 design—no costly structural modifications
- Simple integration with existing lubrication systems
- Service accessibility—larger inspection windows, backlash and tooth contact adjustments without dismantling
- Lifetime exceeding 100,000 operating hours—white metal bearings in IronDrive-3 deliver virtually infinite durability
- Lowest energy losses thanks to an optimized lubrication system





Can a side drive be smart? LGDX proves it can. This solution stands out for reliability and innovative technical features:

- Dual oil system—separates oil for high-speed components, ensuring cleanliness and extending component life
- Reversible gearbox—symmetrical design allows operation on the second flank of the gearing, extending lifecycle without major overhauls
- Higher safety factor compared to industry standards
- Easy servicing and adjustment—access to key components without dismantling the entire unit
- High energy efficiency, resulting in lower production costs



Cement: The Heart of MAAG, Innovation for the Future

While MAAG develops products for various industrial segments, cement remains at the core of our business. This industry demands the highest reliability, and for over a century, MAAG has delivered solutions that meet those expectations. Our replacements are more than technology—they embody a philosophy of reducing downtime, cutting costs, and ensuring continuous production.

For more technical information about our products and solutions, visit the [MAAG Gear website](#)

To learn more or discuss how MAAG can support your cement plant, please contact:

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Requirements for Online Analyzers for Process Control in Cement Manufacturing

Christian Potocan, Head of Sales
SpectraFlow Analytics Ltd., Spreitenbach, Switzerland

Abstract

Process control in cement manufacturing plays a pivotal role in ensuring consistent product quality, optimizing operational efficiency, and minimizing costs. Online analyzers have become essential tools for real-time chemical composition monitoring across various stages of production. This paper evaluates the functional and economic implications of analyzer installations at key process points: the stockpile, raw mill, and cement mill. A comparative analysis of conventional Prompt Gamma Neutron Activation Analysis (PGNAA) and Near-Infrared (NIR) technologies highlights the potential of modern NIR systems, like the SpectraFlow analyzer. The analysis shows that NIR technology can achieve high process stability with lower operational expenditure (OPEX) and a broader application scope than PGNAA. The findings suggest that NIR analyzers offer a robust, flexible, and comprehensive solution for most cement plants, addressing critical technical and commercial requirements.

1. Introduction

Consistent raw material composition control is fundamental for reaching quality targets and increasing efficiency in cement manufacturing. Plants achieve quality targets by either using highly consistent materials from the quarry or by efficiently controlling inconsistent raw materials at the intake. Given the critical importance of operational efficiency, relying solely on consistent raw materials is no longer viable; raw material preselection incurs high costs and significantly shortens quarry lifetime. Therefore, modern cement and mining operations must be designed to manage variable raw materials.



Because variable raw material not properly blended to setpoints causes multiple kiln operation problems, continuous monitoring of raw material intake is imperative. Traditional sampling methods are often inefficient due to several challenges at critical process stages:

- **Stockpile Blending:**

Crusher feed is coarse, and throughput is very high. This makes manual sampling unrepresentative and too slow to compensate for material variations. Controlling these variations via sampling is challenging or impossible, particularly for plants using Vertical Roller Mills (VRMs), which process coarser materials (90% < 90mm), and for high-throughput crushers.

- **Raw Mill:**

High-speed sampling typically yields one composite sample every 40-60 minutes. If the additives used to compensate for stockpile feed variations are inconsistent, it becomes difficult to achieve an LSF Standard Deviation (STDEV) below 2.5. Furthermore, high raw mill throughputs (e.g., > 200 t/h) mean that large batches of off-target raw meal are fed to the homogenization silo, which is both difficult and expensive to correct. Consequently, sampling control is challenging and costly for all large raw mill operations.

- **Cement Mill:**

To meet industry-wide reduction requirements, minimizing clinker usage in cement is crucial. An efficient method involves monitoring the clinker's C3S and C2S content and precisely adjusting the required clinker amount based on the current batch. Larger cement mills typically realize greater clinker savings. However, sampling is an inefficient method for monitoring clinker quality because phase analysis is time consuming, labor intensive and costly.

Online analysis is an established method that overcomes these sampling issues by delivering the following advantages:

- High-frequency analysis results, enabling faster process adjustments.
- Superior analytical representativity.
- Non-contact measurement with the material stream, ensuring low maintenance and high availability.
- Reduced effort for operators and quality personnel.

Increased usage of online analysis for process optimization emphasizes the need for a simple, safe, and easy-to-use method with low OPEX. PGNAA (and its commercial variants, CNA technology) relies on radioactive sources or neutron generators, which introduce numerous challenges, particularly when multiple analyzers are deployed in a single plant.

Challenges of PGNAA/CNA technology include:

- **Licensing and Cost:** Sources and neutron generators require complex import and operating licenses, which are increasingly difficult to obtain and incur high costs.
- **Safety Protocol:** Operation and maintenance require strict safety protocols, resulting in high administrative efforts and costs.
- **Source Replacement:** Replacement, typically required every other year, is difficult and very costly.
- **Lifetime Availability Risk:** Investment offers no guarantee that sources will be available over the analyzer's life span, or that administrative requirements for receiving them will remain fulfillable.

These challenges are amplified by the need for multiple analyzers, driving the market demand for a non-nuclear alternative.

Near-Infrared (NIR) technology has been used for over 50 years for online measurement in the organic industry and for analyzing inorganic raw materials in the laboratory. Starting in 2010, this technology was specifically developed for the online measurement of inorganic raw materials. This development resulted in the SpectraFlow Online Analyzer, which combines the established NIR technique with proprietary hardware and software for continuous inorganic material

analysis. NIR is completely safe, requires no legal licensing, and is simple to operate and maintain, resulting in very low OPEX. These inherent advantages allow for multiple analyzer installations without compounding the regulatory challenges. Furthermore, by measuring the material surface at high frequency, the SpectraFlow analyzer is the only online system applicable to airslides, making it the sole efficient device for post-mill raw meal and final cement control.



Figure 1 - SpectraFlow Online NIR Airslide Analyzer fitted to an airslide in a cement plant.

2. Problem Proposition for Analyzer Installation at the Stockpile

2.1 Technical Requirements

At the stockpile, the primary technical goal is to ensure a stable, controllable feed entering the raw mill. This requires minimizing variations in the Lime Saturation Factor (LSF) to ensure consistent downstream raw meal quality. Effective pre-blending reduces the load on subsequent control systems and stabilizes kiln operation.

2.2 Commercial Requirements

From a business perspective, optimization at this stage aims to:

- Maximize the use of quarry materials while minimizing reliance on costly additives.
- Reduce logistics costs by minimizing material rehandling.
- Maintain the stockpile LSF within a close range of the raw mill setpoint, ideally within ± 10 – 15 LSF.

2.3 Challenges

Control is challenged by material feed variability from the stockpile or clinker storage, especially with large raw and cement mills. Other factors include variability in additives, additive feeder restrictions, and the requirement for control actions to occur more frequently than every hour due to high mill throughput. An “ideal” raw meal must maintain LSF within of the target setpoint, which is achievable only through precise, rapid analysis and feedback control.

2.4 Analyzer Requirements at the Stockpile

An online analyzer installed after the crusher or on the stockpile feed conveyor allows operators to monitor material composition in real time. This capability enables more accurate pre-blending and consistent stockpile chemistry. Since traditional, manual sampling is ineffective at this stage, an online analyzer is the only viable method for monitoring crusher feed quality.

2.4.1. Key Factors Affecting Analyzer Deployment

- **Raw Material Variability:** Plants with multiple raw material sources or high compositional variation benefit most from online analysis.
- **Cost Considerations:** PGNAA analyzers, though analytically suitable, involve substantial capital and operational costs, as well as stringent safety and maintenance requirements. Getting sources on site requires high administrative efforts and these often cause delays in receiving sources and cause down-time of PGNAA analyzers. This is critical, as the online analyzer is normally an integral part of the production process.
- **Operational Simplicity:** Plants often prefer analyzers that are easy to maintain, have low OPEX, and a high availability, giving NIR a clear advantage over conventional PGNAA/CNA technologies.

2.4.2. Requirements and Performance Comparison

Compared to raw mill and cement mill applications, the required analytical accuracy for stockpile applications is lower. This is because the raw material range is broad (CaO 25 –55%, SiO_2 2 –25%, Al_2O_3 0 – 5%, Fe_2O_3 0 – 5%) and the raw material is stacked for homogenization. Additionally, crusher input is coarse and rarely fine-tuned, unlike the highly accurate additive dosing at the mills. Consequently, the minimum performance requirements are easily met by any analyzer:

- **Accuracy:** $\text{CaO} \pm 0.5\%$, $\text{SiO}_2 \pm 0.5\%$.
- **Consistency/Repeatability:** More critical than absolute accuracy, as stable readings enable reliable process control.

As any analyzer regardless of the technology they are working on (PGNAA, CNA or NIR) is suitable for the stockpile application the technical and commercial advantages of NIR technology makes the SpectraFlow Online Analyzer the best solution for the stockpile application. The NIR analyzer provides stable, repeatable data with minimal maintenance, low operating costs, and user-friendly operation. These attributes make the technology particularly suitable for plants seeking cost-effective solutions without compromising on reliability.



Figure 2 - SpectraFlow Crossbelt Analyzer installed over a conveyor belt for raw material measurement.

3. Problem Proposition for Analyzer Installation at the Raw Mill and Cement Mill

3.1 Technical Requirements

At the raw mill stage, the analyzer's objective is to ensure the production of a consistent and high-quality raw meal. This is crucial for maintaining clinker quality and optimizing energy consumption in the kiln. The analyzer data enables direct feedback control of the additive feeders, stabilizing LSF and other moduli in real time, with lower reliance on sampling and laboratory analyses.

For the cement mill, the analyzer is used to measure the clinker mineralogy and SO_3 content in the finish cement. These results allow for the optimization of the clinker factor and gypsum addition.

3.2 Commercial Requirements

Commercially, the analyzer should:

- Minimize the consumption of costly corrective additives and reduce the clinker factor (at the cement mill).
- Reduce the need for extensive homogenization and frequent manual sampling.
- Eliminate the reliance on laboratory results alone for control of the additive weight feeders.
- Facilitate the use of alternative raw materials, enhancing sustainability and cost efficiency.

3.3 Challenges

Control is challenged by material feed variability from the stockpile or clinker storage, especially with large raw and cement mills. Other factors include variability in additives, additive feeder restrictions, and the requirement for control actions to occur more frequently than every hour due to high mill throughput. An "ideal" raw meal must maintain LSF within of the target setpoint, which is achievable only through precise, rapid analysis and feedback control.

3.4. Analyzer Requirements at the Raw and Cement Mill

3.4.1. Functional and Operational Considerations

Placing an analyzer after the mill guarantees measurement of homogeneous, dry raw meal powder/cement which provides the most representative and stable composition for process control. By contrast, an analyzer placed before the mill must measure a layered, wet, and coarse raw material mix, which significantly lowers measurement accuracy. Furthermore,

pre-mill measurements are difficult to correlate with lab samples due to time delay and kiln dust additions (at the raw mill). Post-mill installation, however, allows for automated offset correction. Therefore, the clear technical preference for raw and cement mill control is to install the online analyzer on the airslide after the mill, not on the conveyor belt before it.

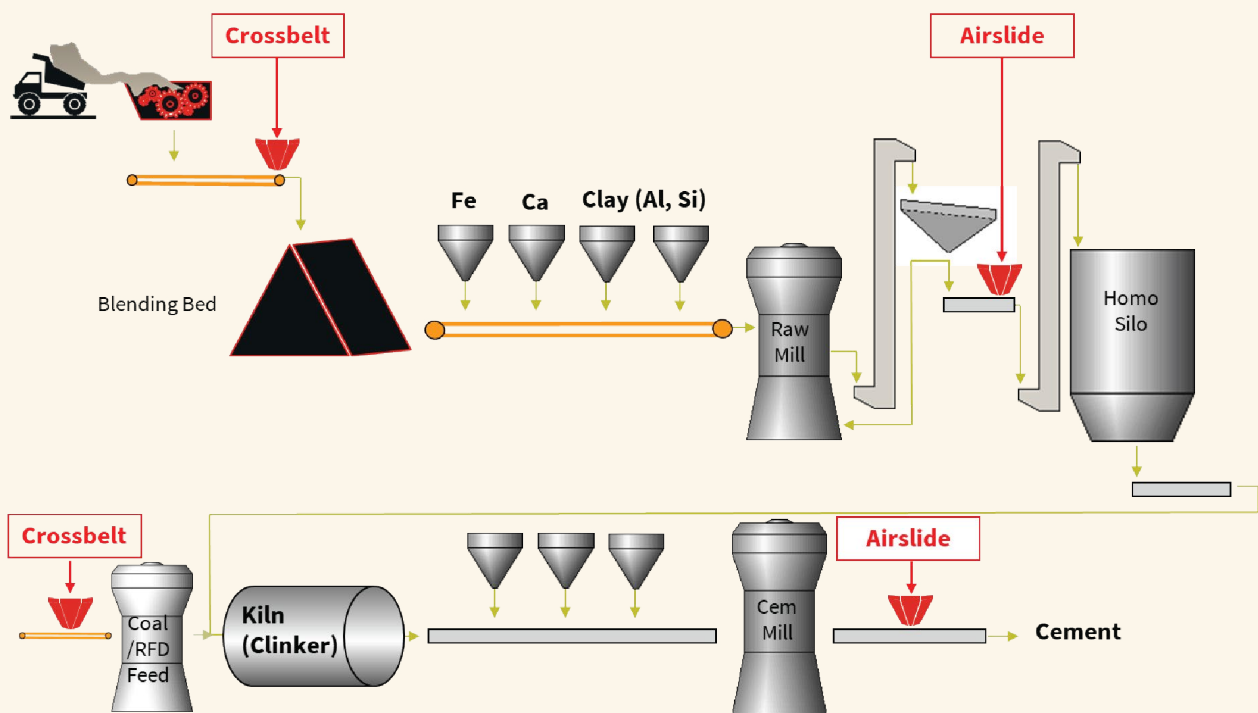


Figure 3 - SpectraFlow Analyzers can be applied at all levels of the process

3.4.2 Technology Evaluation

PGNAA analyzers have not been widely used for raw mill optimization because the technology is limited to conveyor belt applications and can only be installed pre-mill. The measurement range of the raw meal is significantly narrower here (CaO 41.5 -43.5%, SiO₂ 13.5 -15.0 %, Al₂O₃ 3-4%, Fe₂O₃ 2 – 3%) demanding much higher accuracy than the stockpile application. Consequently, PGNAA technology is not suitable for efficient raw mill control. Conversely, NIR-based analyzers can be applied on airslides and are the only efficient way to optimize and automate raw mill control. These systems meet the stringent performance requirements mentioned previously and offer distinct operational advantages:

- Accuracy: Better than CaO $\pm 0.5\%$, SiO₂ $\pm 0.5\%$.
- Consistency: Excellent repeatability with daily automatic offset correction ensures reliable performance vs the laboratory.
- Ease of Handling: Compact design, no radiation hazards, and minimal maintenance.
- Cost Efficiency: Significantly lower OPEX compared to PGNAA systems.

PGNAA analyzers are also not suitable for controlling the cement mill, as the technology is purely elemental and it is not possible to identify and measure the clinker phases. NIR technology is the only solution capable of identifying clinker mineralogy, making it the sole possibility for clinker factor optimization. The SpectraFlow Airslide Analyzer directly measures dry powder on the conveying airslide, providing rapid and precise elemental and mineralogical data suitable for automatic raw mix proportioning and cement control.

4. Conclusion

The integration of online analyzers represents a significant advancement in process control for cement manufacturing. While PGNAA technology has traditionally dominated the market for stockpile applications, it has rarely succeeded in raw mill optimization and cannot be used for cement mill control. Its limited application field, high operational costs, and handling complexity are driving the market toward alternatives.

Near-Infrared (NIR) analyzers are a modern, efficient and flexible solution. They provide reliable analytical accuracy for both elemental and mineralogical composition, with superior consistency, lower operating costs and enhanced ease of use. By enabling real-time control across all three stages, stockpile, raw mill, and cement mill, NIR analyzers support:

- Improved product quality and process and kiln stability,
- CO₂ reduction through optimized clinker usage,
- Reduced energy consumption and additive use, and
- Enhanced operational efficiency and sustainability.

Deployment of NIR-based analyzers, such as the SpectraFlow system, is a practical and cost-effective strategy for comprehensive raw material control in diverse cement plant configurations, opening up a wider range of application fields than conventional PGNAA or CNA technology.

Modular Grinding Plants – Flexible Solutions for Regional Cement Production

**Olaf Michelswirth | General Manager,
Intercem Engineering GmbH, Germany**

In highly industrialised regions, cement production has traditionally relied on large-scale facilities. However, many parts of the world face very different conditions: access to construction materials is limited, transport routes are long, and prices for cement are often high. As a result, smaller, modular grinding units are increasingly gaining relevance. They enable local supply, reduce logistics costs, and shorten supply chains significantly.

A key advantage of modular plants is their compact layout, which allows them to be located closer to infrastructure and end users. This not only reduces transportation distances for raw materials and finished products but also lowers the environmental footprint of the entire delivery chain. Because these plants can typically be implemented within roughly twelve months, they are highly attractive for fast growing or rapidly changing markets.

Requirements for Establishing Local Grinding Plants

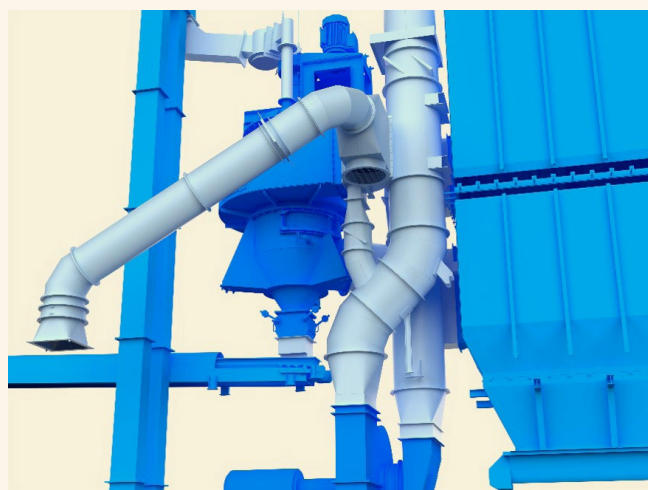
The local demand for cement serves as the primary indicator for setting up a modular grinding unit. Equally important are the availability of suitable raw materials, trained personnel, and local companies capable of manufacturing or installing plant components. Reliable energy supply and functioning transport infrastructure are additional prerequisites. Investors also consider political stability and the overall economic climate before moving forward with such a project.

The InterMod System by Intercem

Intercem has developed a modular grinding concept marketed under the name InterMod, available in various capacity levels. The system is shipped mainly in 40-ft containers and can be erected and

commissioned on site within six to eight weeks. Only proven, robust components are used to ensure high reliability and cost-efficient operation.

Another defining feature of the InterMod concept is its mobility: the entire system can be dismantled just as quickly and relocated to a different site, enabling operators to adapt flexibly to economic, political, or logistical changes.



Example of an InterSep.



Three Product Variants:

► InterMod Bee

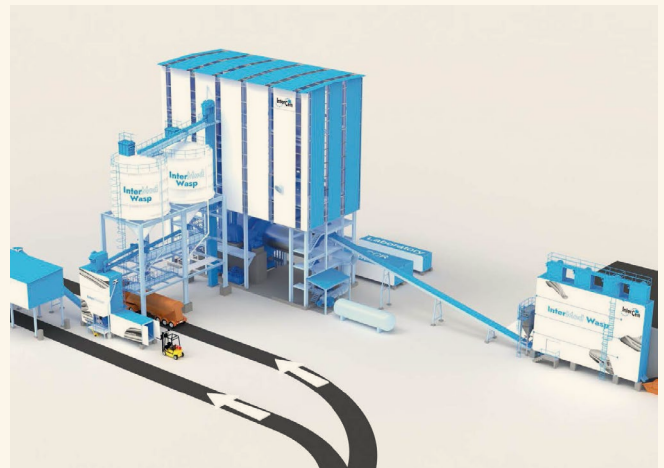
- Rapid assembly and high mobility
- Up to 200,000 tpa
- Ball mill with direct separation through process filter



Intermod Bee

► InterMod Wasp

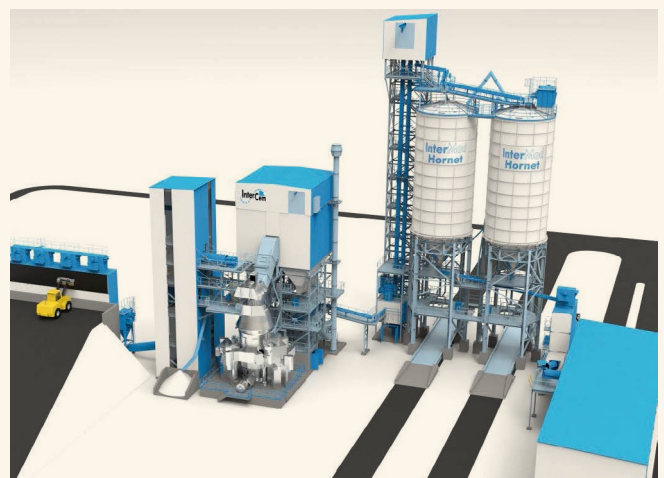
- Higher-capacity configuration
- Up to 350,000 tpa
- Ball mill with direct separation through process filter



Intermod Wasp

► InterMod Hornet

- Largest and highest-output variant
- Up to 500,000 tpa
- Vertical roller mill (VRM) with integrated separator



Intermod Hornet

Core Modules of the System

Separation – InterSep ICS

The highly efficient InterSep ICS separator operates with tangential airflow, enabling accurate separation at low energy consumption.



Example of an InterSep

Grinding – VRM or Ball Mill

Modular plants can be equipped with either vertical roller mills or traditional ball mills. Depending on the size, VRMs offer higher throughput, while ball mills remain a reliable and flexible option. Intercem frequently uses refurbished second-hand mills, providing significant cost savings and supporting sustainable resource utilisation.



Grinding module - InterMod Wasp.

Packing – The InterPacker

Intercem's InterPacker is a compact, 4-spout rotary packer designed to fit inside a 20-ft container. Thanks to its modular structure, the system can be upgraded to eight spouts. It is characterised by low energy consumption, reduced wear, simplified maintenance, and intuitive operation.



Interpacker Intermod Hornet.



Ball mill.

Rapid Project Execution Through Prefabrication

One of the most significant advantages of modular grinding plants is their high degree of prefabrication. Modules are preassembled at Intercem's facility in Oelde and then installed on site. Silos are delivered in containers and erected during the installation phase. This approach results in:

- Very short on-site assembly time (6–8 weeks)
- Seamless integration of existing components
- High plant availability
- Short commissioning phases
- Easy relocation of modules if required
- Overall project durations of around 12 months

Key Benefits of Modular Grinding Plants

- Flexible and compact design
- Minimal civil works required
- Short delivery and installation times
- Low investment costs
- High mobility and reusability
- Modern and proven technology
- Local production in demand-based quantities

This makes modular grinding plants an ideal solution for cement traders or new market entrants aiming to gain independence from established suppliers and react quickly to changing market conditions.

Case Study: Modular Project in France

The concept has also gained momentum in Europe, where compact, flexible grinding units can be installed closer to consumption centres. In France, Intercem was selected to supply a complete grinding module, including engineering, installation, and commissioning. The supplied system features a two-compartment ball mill operating in a closed circuit with a vertical high-efficiency separator. Optimised lifting and classifying liners ensure effective coarse and fine grinding. A specially designed noise-reducing cladding structure ensures compliance with strict local emission limits.



Steel construction of the grinding module.

Conclusion

Modular grinding plants are not a one-size-fits-all solution. Their strength lies in the ability to combine individual modules into tailored systems that meet the specific requirements of each customer. Intercem's InterMod concept offers an economical, flexible, and rapidly deployable approach to regional cement production—particularly in markets with annual demand levels of up to around 350,000 tonnes.

About the Author

Olaf Michelswirth holds a degree in mechanical engineering from Paderborn. After gaining extensive experience within the cement industry, he was appointed General Manager of Intercem Engineering in 2005. Since then, he has contributed his technical and managerial expertise to numerous international projects, with a current focus on developments across the African continent.

Selection of Pavement Type Based on Life-Cycle-Cost-Analysis

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Abstract

This study presents a comparative analysis of the two methods of pavement designs, namely flexible and rigid pavement, for the Amman-Aqaba highway in Jordan. Composite pavement was adopted in this study, which is a rigid pavement topped with an asphalt layer. The pavement sections were designed taking into consideration traffic and soil conditions. Life Cycle Cost Analysis (LCCA) was used to compare between the two alternatives. The LCCA results showed that flexible pavements present a feasible solution in many cases. However, under certain project conditions, composite pavements can be more economical.

Keywords

Flexible Pavement, Composite Pavement, Life Cycle Cost Analysis (LCCA)

I. Introduction

The pavement-type selection has been a topic of interest to practitioners since the availability of the two pavement types (flexible and rigid). In the early days, the issue of cost was not as important as the availability of the resources to construct the pavement. As the traffic loads and the site conditions became important factors, the engineering considerations dominated the selection process. Later on, it was considered

technically appropriate to combine the desirable properties of the two types of pavements, and the composite pavement was conceived. This pavement was anticipated to combine certain desirable properties of both types in order to address site and environmental conditions for some locations where both types of pavement were not expected to perform as good as the composite one.



The increase in construction material and labor costs, the development in the pavement design methodology, and the innovation in field compaction techniques and testing tools have made the issue of pavement type selection a topic of debate. Recently, the rise of sustainability and green concepts coupled by global financial crisis and highway agencies' budget constraints have created an even fiercer debate about the suitability of each pavement type.

Nowadays, several factors come into play on deciding which pavement type to use including the concept of Life-cycle Cost Analysis (LCCA), which has become a dominant factor that determines the least cost-effective alternative for a specific design life. Although this concept has been considered appropriate in some situations, it has been criticized by some as cost-driven, lacking the influence of other factors that are becoming just as important, especially sustainability.

Green road is one of the concepts that is catching the attention of many highway agencies. It sheds light on the importance of environmental impacts, innovation in construction practices, and the pavement sustainability as important components of the roadway. The latter focuses on the longevity of the pavement and its ability to be sustained through the usage of recyclable materials, cost-effective and low-energy/low-emission construction practices. Nowadays, many highway agencies use Reclaimed Asphalt Pavement (RAP) in their newly constructed flexible pavements to reduce the demand on raw materials and some agencies are now adopting the Perpetual Pavement as a durable low-maintenance-cost concept that is anticipated to contribute toward the longevity of the roadways.

In coping with these changes and challenges, the selection of the pavement type for a project shall integrate most of, if not all, of the factors that come into play as part of the decision making process of selecting the pavement type, namely:

1. Life-Cycle Cost Analysis, which is subdivided into: initial cost and maintenance (future) cost;
2. Engineering, which includes subgrade soil strength and heavy vehicles traffic volume/loads;
3. Sustainability, whereby existing pavement materials can be recycled and used in the re-constructed pavement.
4. Environmental impact, normally measured in terms of CO₂ gas emission.

It is noteworthy that the weight for each factor can vary depending on the project conditions and selection criteria. For example, if the CBR (California Bearing Ratio) of a subgrade is low, the impact of this factor on the selection of flexible pavement alternative will be less than when the CBR is relatively high. Similarly, the effect of heavy vehicle traffic volume and axle loads can be crucial according to the selection of pavement type.

Due to the high cost of road construction, the need to apply the most effective alternative solution for long term durable pavement with minimal maintenance becomes an important issue.

The objective of this study is to compare between the two alternative methods of pavement design, namely flexible and rigid, for a major highway in Jordan based on their Life-Cycle-Cost-Analysis (LCCA). The study will also shed lights on how the LCCA changes as certain project conditions change.

The highway of interest in this study is a vital highway in Jordan, which connects the Capital Amman with the port of Aqaba (Figure 1). It is approximately 333 km long with two lanes in each direction. This road exhibits a daily average truck volume of more than 1000 trucks, weighing between 27 to 80 metric tons.

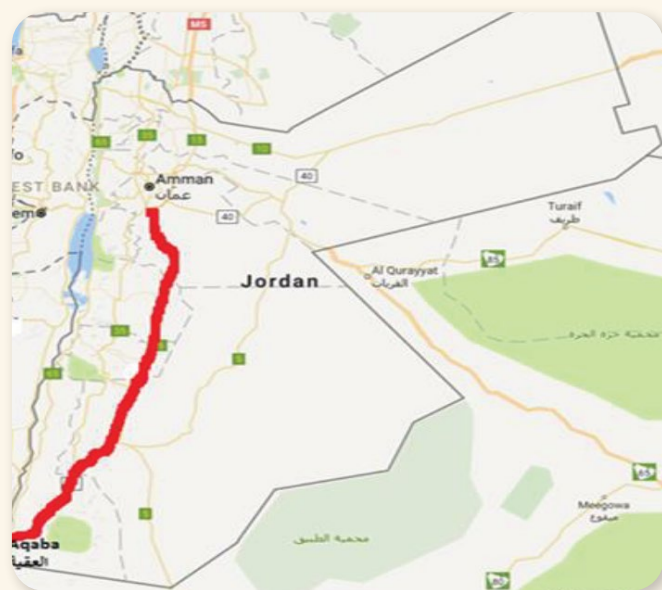
Table 1 summarizes the characteristics of flexible

and rigid pavement. In this study, composite pavement is used instead of rigid for it provides a smoother ride and protects underlying rigid pavement.

Table 1. Characteristics of Pavements

Figure 1. The Amman - Aqaba Major

No.	Flexible Pavement	Rigid Pavement
1	Subgrade deformation is transferred to the upper layers	Subgrade deformation is not transferred to subsequent layers
2	The design is based on load distributing characteristics of the component layers	The design is based on flexural strength or slab action
3	Low flexural strength	High flexural strength
4	The load is transferred by grain to grain contact	No such phenomenon of grain to grain load transfer exists
5	Low initial completion cost, high repair cost	Low repair cost, high initial completion cost
6	Shorter service life (High Maintenance Cost)	Longer service life (Low Maintenance Cost)
7	Surfacing cannot be laid directly on the subgrade. Sub-base is needed.	Surfacing can be directly laid on the sub-grade.
8	No thermal stresses are induced as the pavement can contract and expand freely	The pavement is more vulnerable to thermal stresses as the ability to contract and expand is very low in concrete
9	Expansion joints are not needed	Expansion joints are needed in common practices
10	The strength of the pavement is highly dependent on the strength of the subgrade	The strength of the pavement is less dependent on the strength of the subgrade
11	Rolling of the surfacing is needed	Rolling of the surfacing is not needed
12	A road can be used for traffic within 24 hours	A road cannot be used until 14 days of curing



Highway

II. Pavement design

The design detailing the thicknesses of both pavement types was based on the AASHTO guide (American Association of State Highway and Transportation (1993 & 1998) "Guide for Design of Pavement Structures.

The design was conducted on two sections along the highway with substantially different soil properties. The first one has weak subgrade soil strength while the other one has a relatively good strength. Soil data pertinent to this road were taken from records of the Ministry of Public Works and Housing (MPWH) in Jordan at several stations along the road.

A. Pavement Subgrade

The subsurface conditions were taken from boring test data in two sections. The results of the soil test included CBR values. Corresponding modulus values were calculated as well as the modulus of subgrade reactions (K).

B. Pavement Thickness Evaluation

The truck traffic loads ranged between 27 and 80 metric tons. These trucks have different axle configurations. The classification of these trucks was categorized based on the Ministry of Public Works and Housing (MPWH) system as illustrated in Table 2.

C. Material Properties

The pavement design requires certain material properties in various layers of the pavement. These properties, along with other parameters for flexible and rigid pavement are listed in Table 3 and 4, respectively.

For the design purposes, the average annual truck traffic count was taken from three weight stations (Al-Mdawara/Maan station, Al-Qatranah station, and Al-Qwerah /Aqaba station), which are located on the highway. In 2015, these stations recorder an annual truck volume of 392,745 trucks.

Table 2. Truck Type and Weight According to The MPHWS System

Truck Type and Weight	
MPHW Truck Classification	Total Truck Weight (Ton)
11	21
21	27
22	32
1111	38
211	40
311	44
221	47
321	51
421	55
422	64
422	68

Table 3. Material Properties / Input Parameters for Flexible Pavement Used in Pavement Evaluation

Flexible Pavement		
CBR of Subgrade Soil	Weak Soil	4.86 %
	Good Soil	20 %
Resilient Modulus of Subgrade Soil, MR, psi	Weak Soil	50.2 MPa (7,282 psi)
	Good Soil	207 MPa (30,000 psi)
Elastic Modulus of Subbase		104 MPa (15,100 psi)
Elastic Modulus of Base		169 MPa (24,500 psi)
Elastic Modulus of HMA		3,102 MPa (450,000 psi)

Table 4. Material Properties / Input Parameters for Rigid Pavement Used in Pavement Evaluation

Rigid Pavement		
Concrete Flexural Strength	3.65 MPa (530 psi)	
Concrete Compressive Strength	34.5 MPa (5,000 psi)	
Concrete Modulus of Elasticity	27,579 MPa (4,000,000 psi)	
Effective Modulus of Subgrade Reaction (k), pci	Weak Soil	108580 Kn/m ³ (400 pci)
	Good Soil	271447 Kn/m ³ (1000 pci)
Loss of Support	1	

D. Recommended Minimum Pavement Thicknesses

An evaluation of flexible and composite pavement thickness was performed to determine the required thickness to adequately support the traffic loading according to the AASHTO 1993 & 1998 procedure.

Based on the results of the evaluation, Table 5 shows the minimum required pavement layer thickness for both alternatives, applied to the weak and good soil sections.

Table 5. Minimum Thickness for Flexible and Composite Pavement Alternatives

Pavement Layer	*Weak Soil Section	**Good Soil Section
Flexible Pavement Design Thickness		
Hot Mix Asphalt	25-cm (10 inches)	13-cm (5.0 inches)
Aggregate Base	20-cm (8.0 inches)	20-cm (8.0 inches)
Aggregate Subbase	20-cm (8.0 inches)	20-cm (8.0 inches)
Subgrade	Natural	Natural
Composite Pavement Design Thickness		
Hot Mix Asphalt	3- cm (1 inch)	3- cm (1 inch)
Portland Cement Concrete	28-cm (11 inches)	28-cm (11 inches)
Aggregate Base	20-cm (8.0 inches)	20-cm (8.0 inches)
Subgrade	Natural	Natural

* Weak Soil Section (CBR < 5)

** Good Soil Section (CBR >20)

III. Life cycle cost analysis (LCCA)

LCCA uses principles of economic analysis to evaluate the life-cycle cost between alternative options. It attempts to identify the optimal solution, i.e. the least expensive long-term solution that meets the anticipated objective of the investment.

Net Present Value (NPV) was used to compare between the two alternatives for both the weak and good soil sections. It includes the initial construction and maintenance costs for each alternative design.

In this study, the cost of construction and maintenance of one unit of each section of the flexible and composite pavement was taken based on the current average cost used in Jordan (year 2025). It is noteworthy that these costs are rough estimates and are not to be taken as accurate cost estimates.

Table 6. Summarizes the typical types of maintenance for both pavement types considered in this study.

Table 6. Typical Types of Maintenance for Flexible and Composite Pavement Sections

Pavement Type	Flexible Pavement	Composite Pavement
Maintenance Types	Crack Seals	PCC Joint and Crack Sealing
	HMA Patching	Slab Stabilization
	Overlays	Joint Repair
	Bituminous Surface Treatments	Crack Seals
	Slurry Seals	Bituminous Surface Treatments
	Fog Seals	Slurry Seals

The study assumes a design life of 20 years for flexible pavement and 30 years for composite pavement. Net Present Value (NPV) per one Kilometer per year was used as a measure of comparison between the two alternatives.

For the “Good” soil section, the flexible pavement was clearly more economical with a cost of \$45,120/Km/Year. For the “Weak” soil section, the results were comparable. Therefore, the subsequent sections focus on the comparison between the two design methods for the weak soil section.

Table 7 summarizes the cost of construction and maintenance for both pavement design alternatives throughout their life cycle for the weak soil section. Life-cycle-cost-analysis (LCCA) results are shown in Table 8.

LCCA shows that the cost of the flexible pavement was less than the composite (\$68,570/Km/Year vs \$70,970/Km/Year, respectively). It is noteworthy that these analyses are conducted for a specific road section, with specific project conditions including soil strength, anticipated traffic volumes/loads, and current cost estimates (year 2025). If any of these parameters change, the LCCA will change accordingly. For example, if the cost of cement relative to asphalt drops by 12%, the composite pavement shall be more favorable with a cost of \$68,310/Km/Year as shown in Table 8.

Furthermore, this study is based on designing the rigid pavement using Jointed Reinforced Concrete Pavement (JRCP). There are alternative rigid pavement design methods that may also reduce the cost of the rigid pavement. For example, if Roller Compacted Concrete (RCC) is used for the shoulders, the cost of the composite pavement shall be noticeably reduced to \$62,850/Km/Year as shown in Table 8.

Moreover, there are other factors that may also come into play that may affect the decision on the pavement type selection that are not included in this study. This includes the environmental impact of both designs (i.e. CO₂ emission). Some countries apply a tax on every Ton of CO₂ gas emission, which may change the LCCA results. Recycling potential is also another factor that was not included in this study.

Regardless, the aim of this study is not to recommend or favor one pavement design over another. Rather, it is to show that the decision on which pavement type to choose depends on the project conditions at the time of the design and the selection criteria. Despite the fact that flexible pavements are generally more economical, there are certain cases and under certain project conditions, whereby composite pavements may be more favorable. Especially, when subgrade soil is weak combined with heavy traffic volume.

Table 7: The Cost of Construction and Maintenance for Pavement Design Alternatives - Weak Soil Section

Pavement Type	* Flexible		*Composite	
	Action	Cost (JD/M2)	Action	Cost (JD/M2)
0	Initial construction	36.7	Initial construction	62.8
10	Maintenance	10	Maintenance	4
20	Reconstruction		Maintenance	5

*** Poor soil condition is used in the analysis.**

Table 8. Life-Cycle Cost of One Km/Year for Flexible & Composite Pavement - Weak Soil Section

Pavement Type	Cost	
	JD/Km/year	USD/Km/year
Flexible Pavement	48,550 JD	\$ 68,570
Composite Pavement	50,250 JD	\$ 70,970

Scenarios where Composite pavement becomes more feasible

Composite Pavement with a 12% reduction on Cement cost	48,360 JD	\$ 68,310
Composite Pavement with RCC shoulders	44,500 JD	\$ 62,850

*** Discount Rate: 3%**

*** Two lanes and a shoulder are assumed per direction. A total width of 22 meters for both directions**

IV. Conclusion

Pavement design was conducted using the two alternative design methods, namely flexible and composite (rigid) pavement. The design was done on two sections of a major highway in Jordan. One section had a relatively weak subgrade soil ($\text{CBR} < 5$) and the other had a good soil strength ($\text{CBR} > 20$).

Cost of construction and maintenance was determined for each alternative design method and a comparison between the two designs was conducted based on the Life-Cycle-Cost-Analysis (LCCA).

For the good subgrade soil section ($\text{CBR} > 20$), the flexible pavement was clearly more feasible. For the weak soil section, the LCCA still showed that the flexible pavement was slightly less expensive than the composite one with \$68,570 per Km/Year and \$70,970 per Km/Year, respectively. This was for a specific road and project conditions. If these conditions change, LCCA results will change accordingly. For example, if the price of cement relative to asphalt drops by 12%, the cost of the two design methods for the weak section shall become comparable with the composite pavement cost of \$68,310 per Km/Year, which is slightly less than the flexible.

This study was based on designing the rigid pavement using Jointed Reinforced Concrete Pavement (JRCP). There are alternative rigid pavement design methods that may also reduce the cost of the rigid pavement. The use of Roller Compacted Concrete (RCC) on the shoulders reduced the cost of the composite pavement significantly below that of the flexible pavement with a cost of \$62,850 per Km/Year.

Nonetheless, the study showed that a pavement engineer shall not ignore the composite pavement (rigid) as an alternative design method that may, in some cases, be a better choice, especially when subgrade soil strength is weak combined with heavy traffic volume.

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Power auditing – the JAMCEM way

Mark Mutter, JAMCEM Consulting, United Kingdom

Introduction

Power auditing is nothing new in the cement industry, in particular for countries where the cost of power is high. Many countries in the MENA region have historically had relatively cheap power – either through a low cost of power through the grid or through heavily subsidised fuel to produce electricity through self-generation. With the cost of power increasing across many of the region's countries, power auditing is a key tool in reducing costs and increasing profitability. Whilst emissions relating to power consumption are Scope 2 emissions – indirect emissions for purchased electricity – they are being included more and more often in the Sustainability Reporting for many cement companies. The JAMCEM Energy Auditing process can be completed either as a desktop assignment or with a site visit, with the latter option providing more scope for accuracy, understanding of the process and recommendations for improvement. The benchmarking for the process is derived from the JAMCEM “Performance Analysis and Diagnostics System” – a tool that is unique to the company and that has been used by numerous companies to assist in their plant performance improvement. The PADS tool covers a wide range of areas such as throughput, fuel and power consumption, quality, maintenance, headcount and environment. Within this article, we have explained some of the methodology used by JAMCEM in Power Auditing assignments.

High-level benchmarking

The starting point of the high level benchmarking process is to assess the power consumption of the major process stages. Within this analysis, it is important to consider and understand what equipment is included in the plant calculation for each section – for example whether raw meal blending is included in the raw milling section or not.

- Power for raw milling stage: The benchmarking is considered both for the mill only power consumption (i.e. mill drive) to give the kWh/tonne for grinding only as well as the power consumption for the raw

milling section in total. Input from the plant is often required to understand the raw mix and the hardness of the materials used, which are often available from the plant design documentation. As well as the actual power consumption, a comparison of the actual and installed power of the mill motor is considered to identify how well the available power to the mill is being used. The assessment of the overall power consumption for the milling section is used to identify whether the ancillary equipment is causing a higher than expected raw meal power consumption.



- Power to clinker stage: Clearly the power consumption for the raw meal is included in the power to clinker and therefore any excessive power consumption for clinker production could be due to the performance of the raw milling section. However, the performance of the pyro-processing section has a significant impact and therefore the overall power to clinker is compared to the JAMCEM benchmark, which is built up from various factors such as the equipment type in use, fuel used (and therefore whether a mill is required), whether the system is a 2 or 3-fan system etc.
- Power to cement stage: As with the power to clinker being affected by the raw mill power consumption, the power to cement will be affected by the power to clinker and this is taken into consideration in the cement stage power consumption. However, there are numerous other factors that are considered: the absorbed power of the mill compared to the installed power, the clinker factor and other materials in use and the fineness of the cement that is produced. All of these factors will give a target that is appropriate and specific to the plant itself as opposed to a generic figure that does not take into account the local circumstances.

Shown below is an example of the assessment of the high level benchmarking along with some of the secondary benchmarking that is completed as part of the next phase of the study.

POWER CONSUMPTION

Power Consumption – Summary

The overall power consumption for a plant can be summarised as kWh/t of cement, taking into account all power used from raw materials reception through to cement despatched. In order to facilitate a more precise analysis with targeting, the process has been broken down into several components, each one with a defined target versus actual performance.

	Actual kWh/t	PADS Target kWh/t	Penalty (kWh/t clink or cem)
kWh/t cement overall	94.6	86.4	8.2
kWh/t clinker	61.2	58.0	3.2
kWh/t clinker raw mill	11.8	11.5	0.3
kWh/t clinker raw mill fan	11.9	7.5	4.4
kWh/t clinker preheater fan	11.6	8.5	3.1
kWh/t clinker cooler system	9.2	4.5	4.7
kWh/t cement grinding total	38.75	32.2	6.5
kWh/t cement grinding mill only	26.4	26.2	0.2
kWh/t cement grinding auxiliaries	12.3	6.06	6.3
Clinker to cement ratio	87.2%	86.5%	0.4
kWh/t services	0.5	3.0	-2.5
kWh/t packing and loading	2.0	1.5	0.5

Conclusion

The overall power to cement for the plant reported by the plant is 94.6 kWh/t cement versus a target of 86.4 kWh/t cement and the reported power to clinker is 61.2 kWh/tonne compared to a target of 58.0 kWh/tonne. There are opportunities for improvement in several areas such as raw mill fan performance, cooler and exhaust and preheater fan. It should be noted that the actual power consumption to clinker and cement is that which is provided by the plant whereas the specific power consumption for the different areas of the plant is based on the power absorbed divided by the throughput of that unit. The total power for clinker and cement can be affected by the way that power is assigned to the different process stage.

Secondary benchmarking

The secondary benchmarking phase digs deeper into the main users of power within each of the process sections to identify any specific items that are using more power than expected. The data that is used as a benchmark for this part of the analysis is based on the theoretical minimum power that is required for the equipment to operate. Examples of the benchmarks are as follows:

- Raw mill transport systems and raw mill fan.
- Preheater fan, kiln drive and cooler exhaust fans
- Cement mill transport systems and cement mill fan.

The secondary benchmarking stage allows us to identify where the gap in the power consumption for each of the different stages

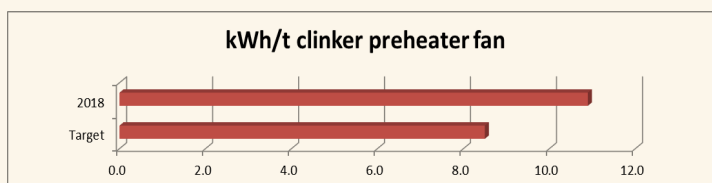
may be, and potential reasons for the gap. If the audit involves a site visit, then it is much easier to identify potential causes as well as solutions by working with the plant team.

Within the secondary benchmarking phase, we also consider other factors that are assessed within the JAMCEM PADS system. So for example, the power consumption of the raw milling system may be high, but this could be related to the plant producing raw meal with a very low 90 micron residue. With this information, we can quantify the cost of grinding to a low fineness to assist the plant in evaluating whether such a fine raw meal can be justified. A further example would be considering the oxygen level at the stack, which is an indicator of the inleaking air in the system which will both affect power consumption and process throughput. Shown below are two examples of analysis from the PADS Power Section which would be part of the JAMCEM Power Audit.



Power Consumption – Preheater fan

Power consumed by the preheater fan divided by clinker production rate. Target proposed is best practice.



Conclusion

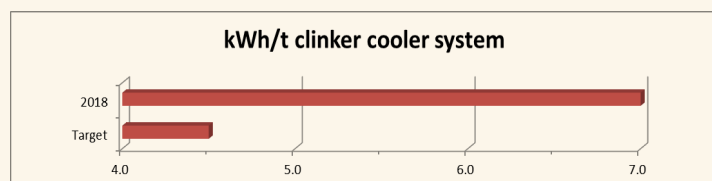
The power consumption at the preheater fan is 10.9 kWh/t clinker versus a target of 8.5 for this process. This is an unsatisfactory performance.

Recommendation

The preheater pressure drop is relatively high, but this does not explain fully the high fan power consumption (see preheater fan loss on following slide). Further work is recommended to isolate the reason (inleak, poor fan condition, dampers, drive efficiency).

Power Consumption – Clinker cooler system

Total power consumed by the cooler system including grate drives, undergrate fans, clinker crusher and cooler exhaust system divided by total clinker produced. Target proposed is best practice.



Conclusion

The power consumption for the cooler system is 9.2 kWh/t clinker versus a target of 4.5 for this process. The main reason is the high power consumed in the cooler fans and part of this is explained by the high air to clinker ratio used for a relatively modern cooler. However, there is still a significant unexplained gap in performance.

Recommendation

Audit cooler fans performance



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Drive-based energy auditing

The final stage of the audit – if selected by the Client – is the drive-by-drive assessment of the plant power consumption. The process starts with the plant completing a questionnaire supplied by JAMCEM which covers all of the drives on the plant that are above 25kW. Each drive is identified with its purpose and duty – so for example for a belt conveyor the length and throughput, for a bucket elevator the height and throughput, for a fan the flow and pressure drop etc. The plant will also provide the absorbed power for the drive – or if not available the volts, amps and cos phi to allow calculation of the absorbed power.

From the duty information that is provided for each drive, it is possible to calculate the efficiency of the motor by comparing the actual power drawn by the theoretical consumption. Drives are then categorized in three different ways:

- Red: Less than 50% efficiency
- Orange: Between 50% and 65% efficiency
- Yellow: Between 65% and 75% efficiency

All motors above 75% were deemed to be satisfactory and not requiring attention. A combination of the categorization of the efficiency and the size of the motor (i.e., the potential impact of poor efficiency) will decide the order in which the motors should be assessed by the plant subsequent to the audit. It should be noted that when considering such a large number of motors, the analysis of the cause of poor efficiency for each motor is not possible, but the analysis gives the plant personnel guidance in where to start the internal analysis/power improvement initiative. Shown below is an example from a previous audit.

Conclusion

With the cost of power increasing, power auditing becomes increasingly important to managing the cost of production of clinker and cement. Through the development of the JAMCEM PADS system as well as the detailed drive-based auditing methodology, JAMCEM has the tools to assist cement manufacturers to better understand energy use within the plant and start a programme of continuous improvement to reduce the specific power consumption of the plant.

SCCC VIETNAM DESKTOP POWER AUDIT

JAMCEM
CONSULTING

AREAS FOR OPTIMISATION - RED

The following items were deemed as red areas of further investigation/optimization i.e. less than 50% efficiency

ITEM	THEORETICAL POWER (KW)	ACTUAL POWER (KW)	EFFICIENCY (%)	KWH/TONNE GAP	COMMENT
LS CRUSHER BELT DRIVE 2	3.01	14.5	20.7	0.03	Poor efficiency. Common issues with belts are misalignment, poor tensioning and idlers jamming.
LS CRUSHER BELT TRANSPORT TO PREHOMO.	17.91	64.3	27.9	0.13	Poor efficiency. Common issues with belts are misalignment, poor tensioning and idlers jamming.
CLAY QUARRY DEWATERING PUMPS	21.9	58.6	37.4	0.45	A water pump should be approximately 75% efficient. Flow and /or head data provided to be checked
RAW MILL RECIRCULATION ELEVATOR	2.66	9.8	27	0.05	Difficult to quantify external recirculation rate thus data difficult to analyse. Confirms that the design is for minor spillage only and later designs were for 100% of mill feed rate. May need a further detailed analysis
KILN FEED HOMOGENISATION ELEVATOR	28.4	64.1	44.4	0.13	Problems with tipping plate condition / alignment or other?
KILN COOLING FANS		260.1		0.62	Power used on kiln shell cooling fans is very high. Are the fans efficient? Normal power used 5 - 10kW per m of shell length. Hon Chong appears to be 20. Opportunities for operation only when shell temperature high and /or use of KIMA type water spray
CONDITIONING TOWER WATER PUMP	15.1	114.4	13.2	0.05	Data of head in doubt as does not appear to include spray pressure head. Normal for this with a spillback system is 35 bar or approximately 350m of head. Assume 37 bar. Pump efficiency very poor. Reasons unknown

CEMENT

Enhancing energy security and sustainability in cement plants through Turboden ORC technology

Mirko Ferrari, Turboden Waste Heat to Power & Gas Expander Sales Manager

The cement industry in the Gulf region is entering a new phase of transformation, driven not only by the global decarbonization agenda but also by regional priorities such as energy security, water scarcity, and industrial competitiveness.

Countries across the Gulf Cooperation Council are investing heavily in infrastructure and industrial development, resulting in sustained demand for cement. At the same time, producers are facing increasing pressure to optimize energy use, reduce operating costs, and align with emerging international regulations such as the Carbon Border Adjustment Mechanism (CBAM).

In this context, Waste Heat to Power (WHP), and in particular Organic Rankine Cycle (ORC) technology, represents one of the most direct and impactful approaches to enhancing the energy efficiency of the clinker production process

By capturing thermal energy from hot exhaust gases generated during clinker production, WHP systems can produce up to 30% of the electricity required by a cement plant. Without such systems, this valuable energy is not only wasted, but also additional resources such as water or electricity might be consumed to cool and process these streams. Implementing WHP not only reduces environmental impact but also improves operational efficiency and cost-effectiveness.

Over the past 15 years, the cement industry has increasingly embraced ORC technology

as a dependable and competitive alternative to the conventional Steam Rankine Cycle (SRC) for heat recovery applications. This shift has been driven by continuous innovation in ORC systems, enhanced economic viability, and a growing global focus on sustainable industrial solutions.

Today, Turboden, a group company of Mitsubishi Heavy Industry and the foremost global supplier of ORC plants designed for medium-to-high-temperature applications in energy-intensive sectors, offers ORC solutions ranging from 500 kW to 40 MW of electrical output from a single turbine, marking a significant expansion into power ranges traditionally dominated by SRC technology. This evolution positions Turboden ORC not only as a complementary solution but as a leading option for large-scale cement plants seeking efficient, water-free, and low-maintenance heat recovery systems.

Between 2024 and 2026, Turboden successfully secured seven new projects exclusively within the cement industry, representing a combined installed capacity of over 40 MW of clean, water-free, electricity. This achievement highlights the growing appeal of waste heat recovery via ORC technology as a strategic solution for cement plants aiming to reduce their carbon footprint.

In addition, since the beginning of 2025, Turboden has commissioned five ORC plants in the cement sector, further reinforcing its leadership in industrial energy efficiency.

A standout example is the 13 MW ORC plant commissioned at Riyadh Cement Company in the Kingdom of Saudi Arabia, the first of this kind in the Kingdom.



This project demonstrates Turboden's ability to compete in power ranges traditionally dominated by Steam Rankine Cycle (SRC) systems, especially in regions where water scarcity makes dry, closed-loop solutions like ORC particularly advantageous.

The plant recovers heat from both the preheater and clinker cooler gas streams of two clinker production lines (each rated at 5,000 tons/day) and is expected to generate more than 80 GWh/year of clean electricity. This will result in an annual reduction of over 37.000 tons of CO₂ emissions, contributing meaningfully to Saudi Arabia's broader decarbonization goals.

This particular ORC system marks a significant milestone as the first to recover heat from two separate kilns simultaneously. It showcases the exceptional flexibility of Turboden's ORC technology, which is designed to operate efficiently even when one of the kilns is offline for maintenance. This capability ensures continuous energy production and maximizes the utilization of available waste heat.

Moreover, the project demonstrates the strategic advantage of deploying a high-efficiency, large-scale ORC system, which benefits from a lower €/kW investment cost compared to smaller, low-temperature modular units. These smaller

systems typically achieve less than half the efficiency and offer limited additional flexibility, making them less suitable and attractive for larger cement plants.

While a variety of strategies, including the use of lower-carbon fuels, improved material efficiency, and carbon capture technologies, are essential to reducing emissions in line with global climate targets, WHP stands out as one of the most immediate and cost-effective solutions to enhance both the sustainability and profitability of cement plants.

Cement plants typically have two sources of recoverable thermal power that can be utilized through an ORC unit: exhaust gas from the preheater towers and hot air from the clinker cooler. Turboden has installed numerous ORC units

in cement plants, recovering energy from either or both sources. The electric power output of these units ranges from 1 MWe to 13 MWe, depending on the exploitable thermal source conditions. However, Turboden can offer units with mechanical power ranging from 500 kW up to 40 MWe from a single turbine and it has successfully implemented more than 460 ORCs worldwide in different sectors.

Customer	Country	Start-up	Kiln capacity (ton/day)	Heat source	Heat carrier	ORC gross electric power (kW)
CIMENTS DU MAROC (HeidelbergCement Group)	Morocco	2010	5.000	PH	thermal oil	2.000
HOLCIM ROMANIA (LafargeHolcim Group)	Romania	2012	4.000	PH + CC	thermal oil + superheated water	4.000
CRH SLOVAKIA	Slovakia	2014	3.600	PH + CC	thermal oil	5.000
CARPATCEMENT (HeidelbergCement Group)	Romania	2015	3.500	PH + CC	thermal oil	3.800
JURA-CEMENT-FABRIKEN (CRH Group)	Switzerland	2016	3.000	PH	superheated water	2.300
CEMENTI ROSSI	Italy	2018	3.500	PH + CC	none – direct exchange	2.000
ÇİMKO (Sanko Group)	Turkey	2019	9.500	CC	thermal oil	7.000
HOLCIM SUISSE ECLÉPENS (LafargeHolcim Group)	Switzerland	2020	2.300	PH + CC	thermal oil	1.300
SÖNMEZ ÇİMENTO	Turkey	2020	6.000	PH + CC	thermal oil	7.300
SECIL	Portugal	2024	3.800	PH + CC	thermal oil	7.200
CIMPOR (Souselas)	Portugal	2025	4.200	PH + CC	thermal oil	8.400
CIMPOR (Alhandra)	Portugal	Under construction	3.100	PH + CC	thermal oil	6.200
HOLCIM UAE (Holcim Group)	UAE	2026	7.500	PH + CC	thermal oil	10.000
MEDCEM	Turkey	2025	10.000	CC	thermal oil	11.000
CIMSA ESKİSEHIR	Turkey	2025	4.500	PH + CC	thermal oil	5.900

Customer	Country	Start-up	Kiln capacity (ton/day)	Heat source	Heat carrier	ORC gross electric power (kW)
RIYADH CEMENT COMPANY	Kingdom of Saudi Arabia	2026	2 x 5.000	PH + CC	thermal oil	12.600
COLACEM SESTO CAMPANO	Italy	Under construction	3.000	PH + CC	thermal oil	2.000
HOLCIM OBOURG (GO4ZERO)	Belgium	Under construction	4.500	PH + CC Oxyfuel kiln	thermal oil	7.500
UNDISCLOSED	Turkey	Under construction	3.300	CC	thermal oil	3.500
UNDISCLOSED	Turkey	Under construction	3.300	CC	thermal oil	3.500

Figure 1: Turboden references in cement plants

The exhaust gas or hot air from the process enters a heat recovery exchanger, which transfers the thermal power in the gas stream to a thermal vector, typically thermal oil. The heat exchanger is designed to effectively handle the gas stream's specific conditions, managing pollutants and dust commonly present in the gas. The thermal vector then transfers the thermal power to the ORC working fluid, often cyclopentane for cement plant applications (being the working fluid that best fits with the thermal source characteristics in terms of temperature). The cyclopentane evaporates and enters the turbine, Turboden core product, generating mechanical power, which is converted into electric power by a connected generator. The expanded vapor then passes through an internal heat exchanger called regenerator, where it releases heat to its liquid phase coming from the opposite side. After the regenerator, the vapor enters the condenser, where it further cools down and returns to a liquid phase. This condensation, especially in Countries with scarcity of water, can occur by utilizing ambient air directly. In this way, no water is consumed for ORC plant operation. The ORC working fluid is then pumped back through the regenerator to the evaporator, completing its cycle.

Compared to traditional heat recovery systems like SRC, ORC technology offers clear advantages for cement producers. One of its most significant strengths is operational flexibility: ORC systems can efficiently manage thermal input variations from 20% to 110% of the design load, while maintaining efficiency levels close to nominal one.

Turboden ORC systems are fully automated, eliminating the need for constant on-site supervision and allowing cement plant teams to focus on their core operations.

The WHP plant is installed in bypass to the existing gas treatment line, ensuring that clinker production remains uninterrupted even during ORC maintenance or downtime.

Unlike solar PV or other renewable options, WHP offers superior economic efficiency thanks to its high utilization rate; it can operate continuously whenever the cement plant is running, delivering significantly more annual kWh while requiring minimal space.

Recent years have shown how energy price fluctuations can impact competitiveness, even in strong markets. WHP with ORC is now a mature, proven solution that locks in a stable electricity cost for the entire plant lifecycle, reducing exposure to sudden and unpredictable price spikes. Existing Turboden installations have already demonstrated this resilience in real-world conditions.



Turboden ORC in a cement plant, details of the ACC

Conclusion

In the Gulf region cement producers are facing a unique combination of challenges: ensuring energy security, optimizing operating costs, and aligning with an evolving global regulatory landscape, including mechanisms such as CBAM.

At the same time, constraints such as water scarcity and the need for process efficiency optimization are becoming increasingly critical in project design and plant operation.

Waste Heat Recovery through ORC technology directly addresses these regional priorities by enabling cement plants to increase energy self-sufficiency and reduce dependence on external power supply, operate with zero water consumption, improve process efficiency by

turning waste energy into valuable electricity and reduce carbon intensity and enhance competitiveness in export markets

Backed by over four decades of experience, and with proven large-scale installations in the region, Turboden is ideally positioned to support this transition, offering flexible ORC solutions capable of delivering reliable power generation, enhanced efficiency, and full alignment with the specific requirements of the GCC market.

The Author

Mirko Ferrari

Turboden Waste Heat to Power & Gas
Expander Sales Manager,

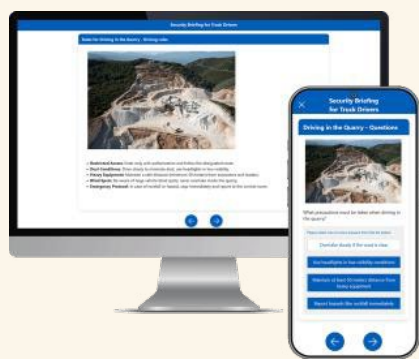
Mirko.Ferrari@turboden.com

For more safety in industrial facilities

Axians IAS introduces “SafetyFlow” app for digital safety training and access control



VAS SafetyFlow, the latest development from Axians Industrial Applications & Services GmbH, promises enhanced safety in industrial facilities and a standardized, digital training process across all sites. The web-based application enables operators of industrial facilities to map and control their entire training process via a central software platform. In bulk material plants and industrial facilities where heavy equipment and hazardous materials are handled, strict safety regulations apply to prevent accidents and personal injury. Operators must ensure that external parties such as truck drivers, service providers, or visitors are appropriately trained before entering the plant. With “VAS SafetyFlow,” Axians Industrial Applications & Services GmbH now presents its answer to the question of how training processes can be carried out efficiently and digitally.



Increased safety through mandatory training and controlled access

VAS SafetyFlow is a central, web-based software platform that allows the entire training process to be mapped, controlled, and documented entirely digitally, from the creation of plant- and user group-specific safety trainings to the management of users and training certificates. The multimedia and multilingual trainings can be completed independently of location and device via any browser: After an introduction to the applicable safety rules and the successful completion of a questionnaire, a personalized digital training certificate, the SafetyQR, is automatically issued to the user. This certificate can be used as a prerequisite for access when checking into the plant at access control systems such as the VAS self-service terminal.

Audit security thanks to seamless documentation

All user and training data, such as training courses that have already been completed, issued certificates and their status (current/expired/cancelled), are seamlessly documented and can be referred to during audits as proof of proper safety training and to ensure that internal standards are met.

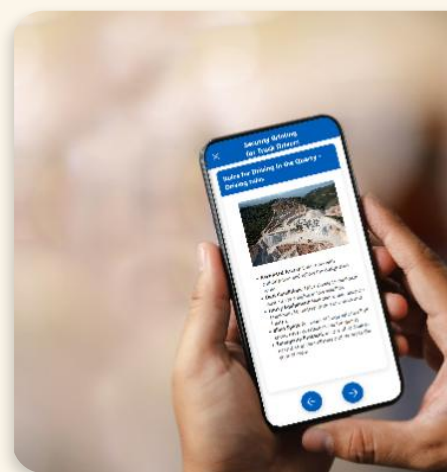
Usable as fully integrated or independent system

As an industry- and hardware-independent solution from the VAS Eco-System, SafetyFlow can be used both as a stand-alone system and fully integrated: A seamless integration with VAS Yard Management and existing processes such as VAS Driver Self-Service Check-In is possible, as is a connection to existing access control systems.

SafetyFlow will be showcased live for the first time from March 24 to 26 at LogiMAT in Stuttgart, at the Actemium booth (booth 7C36 in hall 7), and from May 4 to 7 at IFAT in Munich, at the Axians booth (hall A6, booth 139).

About Axians

IAS Axians Industrial Applications & Services GmbH, or Axians IAS for short, specializes in the development and implementation of customized, software-based logistics solutions for the bulk goods industry. With over 30 years of experience, the company supports the optimization and digitization of logistics processes in the core industries of cement, ready-mixed concrete, sand & gravel, asphalt, and calcium carbonate. In addition to software solutions, Axians IAS also offers consulting, project management, training, and support services.



Explosion Safety Wiki from REMBE GmbH Safety+Control

REMBE, a leader in explosion safety, has launched its comprehensive Explosion Safety Wiki, a free online resource dedicated to educating industry professionals and the public on the critical concepts of explosion prevention and protection.

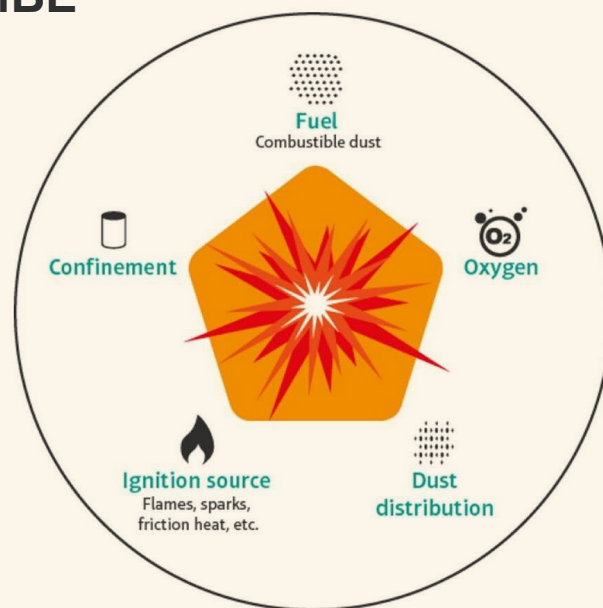
The wiki serves as a vital guide for understanding regulatory requirements and implementing effective safety measures in industrial plants worldwide.

Serious and costly hazard

Industrial explosions are a serious and costly hazard. The history of industrial accidents shows that explosions in unprotected plants can lead to immense structural and financial damage, often driving companies to bankruptcy. Even if nobody is harmed, every hour of lost production costs money and puts the company's existence at risk. For example, the most severe explosion in German history occurred in 1921 at BASF in Ludwigshafen, resulting in 561 fatalities. Industrial plants must be protected against the consequences of explosions to ensure employee safety and quick resumption of production. Explosion safety concepts can dramatically reduce or even eliminate production downtime.

Causes of an industrial explosion

Understanding what causes an industrial explosion. Explosions occur when a combustible material, an ignition source, and atmospheric oxygen collide in a confined space. While preventive measures aim to stop this lethal mixture, the vast number of potential ignition sources often makes complete prevention impossible. This is why constructive explosion protection, which minimizes the damage caused by an incident, is the most crucial aspect of industrial safety. Hazardous areas, known as potentially explosive areas, are classified into zones based on the likelihood of an explosive atmosphere occurring. These zones are critical for defining appropriate safety measures.



The wiki outlines the EX zones for hazardous areas:

Gas-Explosive Areas (ATEX)

- Zone 0: Permanent or long-term presence of an explosive gas atmosphere.
- Zone 1: Likely presence of an explosive gas atmosphere during normal operation.
- Zone 2: Not expected to occur, and if it does, it is infrequent and temporary.

Areas with Combustible Dusts (ATEX)

- Zone 20: Continuous, long-term, or frequent presence of a combustible dust cloud.
- Zone 21: Occasionally expected presence of a combustible dust cloud during normal operation.
- Zone 22: Not expected during normal operation, but if it occurs, it is only for a short time.

Plant safety and operational efficiency

Modern protection concepts must meet three requirements. A modern explosion protection concept is built on essential pillars to ensure plant safety and operational efficiency. These systems must be permanently available, comply with all legal requirements, and be cost-effective in terms of installation and running costs. All protection concepts from REMBE meet these requirements.

Steps to making processes safer include:

- Risk Assessment
- Prevention and organisational measures (e.g., technical measures like effective dust extraction or eliminating ignition sources)
- Protective measures (Constructive explosion protection)

Key Protective Measures Detailed in the Wiki:

- Conventional Explosion Venting: Using explosion vents to rupture and reduce pressure below a vessel's strength.
- Explosion Suppression: Using sensors to detect an explosion at an early stage and initiating the sudden release of extinguishing powder.
- Explosion Isolation (Decoupling): Protecting adjacent parts of the plant from the spread of an explosion, using active or passive systems like quench valves or non-return flaps.

Flameless pressure relief

Flameless explosion venting enables indoor installation. With flameless pressure relief, the flames in the filter fabric of the flame trap are cooled extremely efficiently and thus nipped in the bud. Neither flames nor pressure escape. This allows the production plant to be set up in a process-optimized manner indoors, eliminating the need for vent ducts that are required for conventional venting and which prevent a process-optimized system design. This technology also ensures the highest level of protection for employees by reducing the typical increase in pressure and noise pollution to a barely perceptible minimum.

Explosion Safety Wiki

The REMBE Explosion Safety Wiki is available now for free access, providing tailored solutions to limit the effects of an explosion to a harmless level and ensure quick resumption of production.

New Products

Sinfimasa analyses safe conveying in ATEX environments

Sinfimasa presents a technical analysis of engineering requirements for bulk solids handling in explosive atmospheres. The report focuses on mechanical safety and ATEX directive compliance for industrial conveying systems.

Technical safety in the bulk solids industry begins with a precise classification of the operating environment. This process involves evaluating the dust characteristics and the likelihood of explosive concentrations. By identifying the specific ATEX zones, engineers can select materials and components that minimize the risk of thermal or electrical ignition.



Design Principles for Mechanical Explosion Protection

- Use of materials that prevent the generation of friction sparks.
- Integration of temperature sensors on bearings and moving parts.
- Design of reinforced housings to contain potential overpressure.
- Application of conductive finishes to prevent electrostatic discharge.

Monitoring and Mitigation in Bulk Solids Handling

Continuous monitoring of equipment status is essential for maintaining safety standards in hazardous zones. Beyond prevention, technical solutions include the installation of explosion venting and decoupling systems. These measures ensure that, in the event of an ignition, the resulting pressure and flames are safely diverted, preventing propagation to other parts of the production plant.

New Products

Load testing of supersized vertical motors

Menzel Elektromotoren now also performs load tests on motors in a vertical installation position. The family business has expanded its in-house test field to include a right-angle gearbox with various flange options for vertical motors of different sizes. This enables thorough testing of vertical motors for pumps, compressors and other industrial applications under realistic load conditions. Menzel tests motors and generators from its own production and also offers its state-of-the-art test facilities for manufacturer-independent external tests. The plant in Hennigsdorf near Berlin has two large test stands. Indoor cranes with a hook height of 7.52 meters shift large drive units up to 80 tons. The range of services includes all common routine, type and system tests in accordance with international standards for test voltages from 3 to 13.8 kV. Machines up to 1800 kW and 2300 kVA can be load tested. In addition, Menzel offers a heat run test with the equivalent load method according to IEC60034-29 for higher electrical performances. The test field engineers and certified technicians carry out all measurements and inspections according to EN 60034, with full documentation. The team also has extensive expertise in testing requirements of international acceptance organizations.

Detailed information about Menzel's testing services and facilities:

<https://www.menzel-motors.com/motor-test-field/>

About Menzel Elektromotoren

Menzel Elektromotoren GmbH has been manufacturing and distributing electric motors since 1927. The German family-run company based in Hennigsdorf near Berlin specializes in the delivery of large electric motors, including special models, within the shortest time possible. The product range comprises high and low voltage motors, DC motors, transformers, and frequency inverters. Services include motor production up to and beyond 25 MW and short-term adaptation of stock motors to application-specific requirements. In order to ensure short delivery times, Menzel maintains a large inventory with over 20,000 motors up to 15 MW. Qualified engineering, experienced staff, and state-of-the-art production and testing facilities help the manufacturer provide excellent reliability. Menzel operates subsidiaries in Sweden, the UK, France and Italy and cooperates with numerous partners worldwide.

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Internet: www.menzel-motors.com



Menzel Elektromotoren now also performs load tests on large industrial motors in a vertical installation position



Launch VPFlowScope M Thermal In-line for reliable compressed air and technical gas measurement

VPInstruments, a global leader in industrial energy monitoring solutions, proudly announces the launch of the VPFlowScope® M Thermal In-line. An advanced 4-in-1 flowmeter designed to optimize compressed air and industrial gas consumption.

The VPFlowScope M Thermal In-line sets a new standard in flow measurement, offering bi-directional flow, pressure, temperature, and total flow monitoring—all in one device. Engineered for point-of-use consumption measurements, this cutting-edge thermal mass flow sensor ensures efficiency, reliability, and unparalleled ease of maintenance.



Key features & benefits

- 4-in-1 Measurement: Bi-directional flow, pressure, temperature, and total flow in a single device.
- Seamless connectivity: Available with 4-20mA/ Modbus RTU or PoE (Modbus TCP)
- Quick Connect technology for easy installation and safe and precise alignment
- VPSensorCartridge® for quick servicing on-site
- Ideal for smaller diameters (1" to 2"), making it perfect for point-of-use and submetering applications.
- Lowest Total Cost of Ownership (TCO): near-zero downtime, lower transport costs, and continued reliable measurements.

A new era in flow measurement

With its patented VPSensorCartridge® technology, the VPFlowScope M Thermal In-line eliminates the need for traditional recalibration. Instead, users can simply exchange the sensor cartridge on-site, significantly reducing downtime and maintenance costs. This innovation ensures continuous, precise measurements with minimal operational disruptions.

Be green with VPCartridgeSwap+

Support sustainability by returning your used VPSensorCartridges. Each returned Cartridge is refurbished for reuse, reducing waste and conserving resources. You'll receive a refund—and as a bonus, VPInstruments will plant a tree on your behalf for every Cartridge returned.

Empowering Industries with real-time insights

The VPFlowScope M Thermal In-line is designed for a wide range of industrial applications, including:

- Compressed air monitoring for leak detection and cost allocation.
- Industrial gas measurement (N₂, O₂, CO₂, He, Ar, and other dry, non-corrosive gases).
- Energy optimization and predictive maintenance for manufacturing and production facilities.

With the launch of the VPFlowScope M Thermal In-line, we are taking industrial gas monitoring to the next level, offering unmatched accuracy, ease of maintenance, and integration flexibility. For more information, visit www.vpinstruments.com or contact your local distributor.

About VPInstruments

VPInstruments offers industrial customers easy insight into energy flows. We believe that industrial energy monitoring should be easy and effortless, to enable insight, savings, and optimization. VPInstruments products are recommended by leading energy professionals worldwide and offer a complete measurement solution for compressed air flow, gas flow, and electric energy consumption. Our monitoring software VPVision can be used for all utilities and enables you to see where, when, and how much you can save. Our products can be found all over the world. We serve all industrial markets, for example; automotive, glass manufacturing, metal processing, food and beverage, and consumer goods. We can also help your industry. Let us open your eyes and start saving energy.

Indian Global Magazine on Industry

INDUSTRIAL ANGLES

The Industrial Leader's Vision

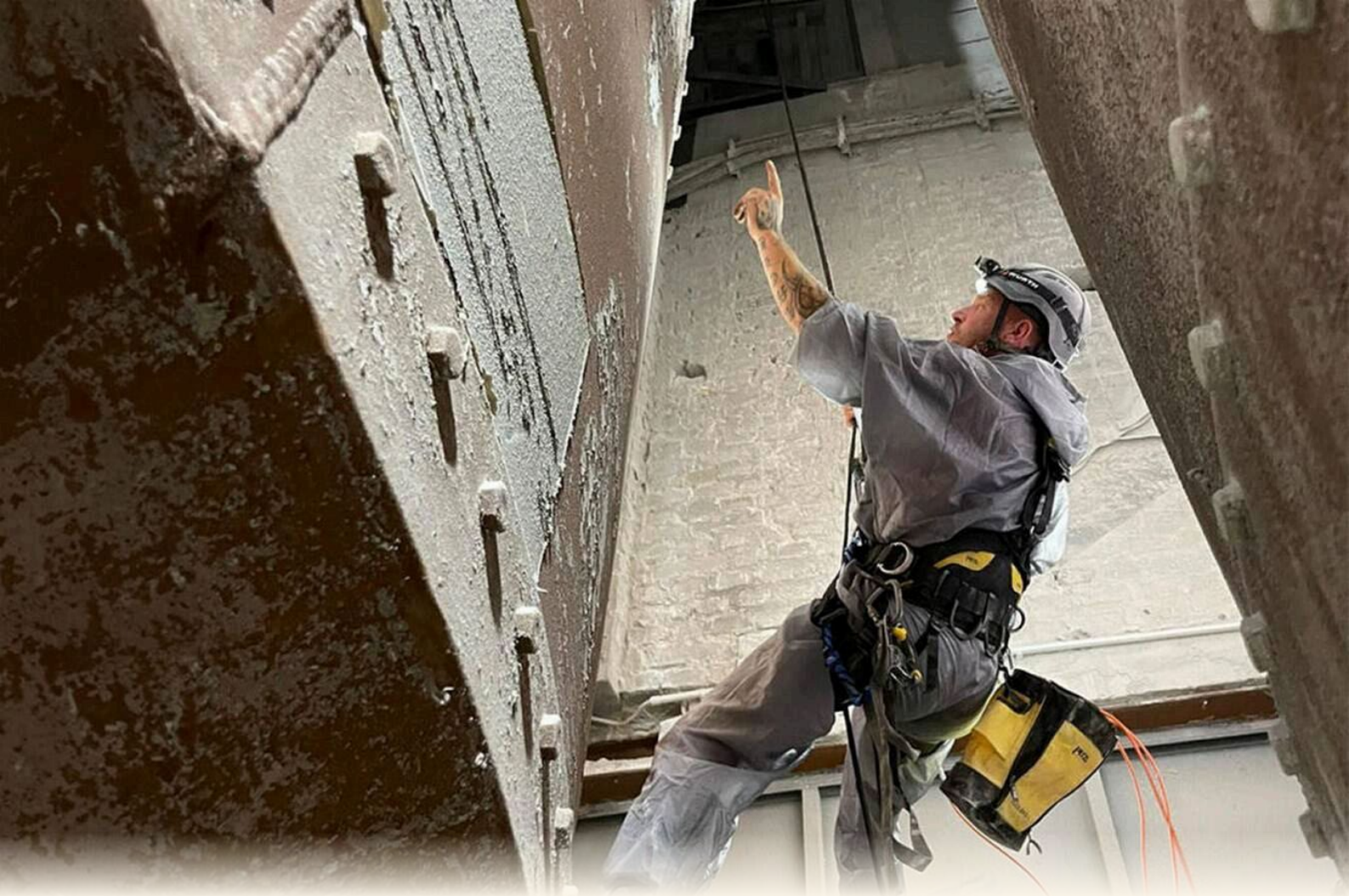


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NT service GMBH sets standards in specialized silo maintenance

NT Service GmbH provides comprehensive industrial silo cleaning and maintenance across Europe, utilizing advanced rope access technology and vacuum systems to ensure operational safety and high material flow.

- Expert structural assessments and wall thickness measurement
- Detailed logging and documentation of cleaning processes

Advanced cleaning for industrial bulk solids

The master craftsman enterprise specializes in the removal of stubborn residues and material bridges to prevent production downtime. By employing certified rope access technicians, the company eliminates the need for expensive scaffolding while maintaining strict safety.

Comprehensive service portfolio for silo systems

- Industrial silo vacuuming and dust removal
- Specialized cleaning via rope access technology
- Innovative silo welding and assembly techniques

Efficient vacuum technology reduces operational costs

The use of high-performance vacuum suction units allows for the economical removal of raw material blockages. This technology transports materials directly into containers, potentially saving operators significant daily costs by minimizing vehicle downtime.

Safety and quality through expert oversight

Each project is supervised by technical management to ensure compliance with rigorous safety standards. The company's focus on preventive maintenance and expert opinions helps extend the lifespan of storage facilities while meeting hygiene and quality requirements.

ЦЕМЕНТ

и его применение

SCIENCE, ENGINEERING
AND PRODUCTION JOURNAL
SINCE 1901

News
Markets analysis
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technology,
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**The journal for producers
and customers of cement
and other binders, as well
as for construction
companies and
equipment producers**

The Russian-language periodical professional publication devoted to the production of cement and other binders, concretes, dry mixes and their applications, as to research and design.

A conspicuous place in the journal materials is given to the problems of plant development, capital movement, economic problems facing the cement industries of Russia and other countries.

The journal comes out once in two months and includes news, analytical materials and detailed abstracts of all the articles in English.

Russia, 191119, Saint-Peterburg,
Zvenigorodskaya street, 22,
office 440

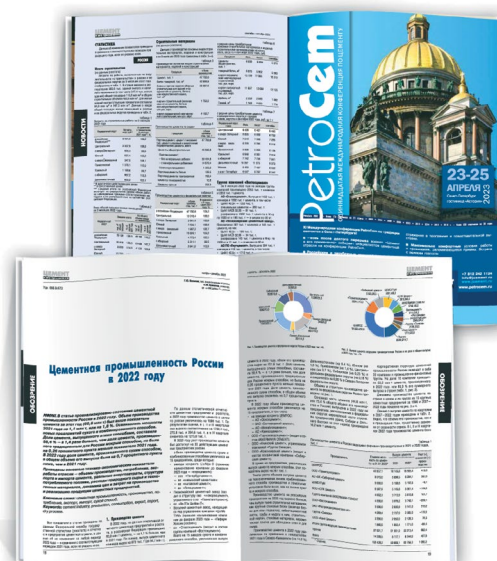
PETROCEM Ltd

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Web: www.jcement.ru

www.petrocem.ru





Digital moisture measurement for concrete quality control

The integration of precise moisture measurement in concrete production ensures consistent quality and cost-effectiveness by adjusting water and cement ratios in real-time during the mixing process.

Optimizing Water-Cement Ratios with Sensors

Modern microwave sensors provide instantaneous data on aggregate moisture, allowing for automatic dosing adjustments. This prevents strength fluctuations and reduces the volume of rejected batches in ready-mix plants.

Key Technical Advantages of Digital Probes

- High-precision microwave measurement technology
- Real-time data integration with plant control systems
- Wear-resistant sensor surfaces for abrasive aggregates

- Significant reduction in cement waste and energy costs

Enhanced Quality Control via Mobile Monitoring

Handheld moisture meters offer flexibility for rapid spot checks in stockpiles or delivery trucks. These devices complement stationary sensors by providing a comprehensive overview of material conditions across the entire site.

Summary

In summary, digital moisture measurement methods for concrete and its raw materials provide a precise, fast, and practical basis for quality assessment. Site-specific calibration and AI-assisted optimization will play a decisive role in shaping the future of this technology.

Smartphone solution for mobile moisture measurement

Apps make mobile measurements more efficient. Discover how Ludwig is turning the smartphone into an intelligent interface for precise moisture measurement and rapid data evaluation.

Modern app solutions provide maximum flexibility

Smartphones are everywhere and, thanks to apps, are ideally suited for mobile measurement tasks. The widespread use of operating systems allows easy access via the app store. This means important measurement data is available at all times, can be retrieved quickly, and can be shared effortlessly with other users—the perfect basis for a mobile moisture measurement system.

Intuitive operation for the FL-Mobimic-Profi Check

Ludwig has developed an Android app for the FL-Mobimic-Profi Check measuring device, which is available for free in the Google Play Store. The focus is on an intuitive user interface. Pre-calibrated calibration curves in a favorites list make getting started easier, while users can add their own curves for specific media at any time.

Precise analysis and efficient quality control

The app enables automatic mean and median calculations, which is particularly helpful during raw material delivery or inspections at production machines. All results are saved in a log list. This can be exported for detailed evaluation on a PC or sent directly to colleagues and partners.

The future of the human-technology interface

For Ludwig, apps are the key to noticeably improving the operation of complex systems. The seamless connection of hardware and mobile software will therefore play a central role in all of the company's future new developments to further optimize work processes.

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IMKO optimizes concrete production with TDR moisture measurement

IMKO Micromodultechnik GmbH utilizes refined TRIME-TDR technology to ensure precise moisture measurement in sand, gravel, and fresh concrete, enabling adherence to strict recipe specifications.

Innovative TDR Technology for the Construction Industry

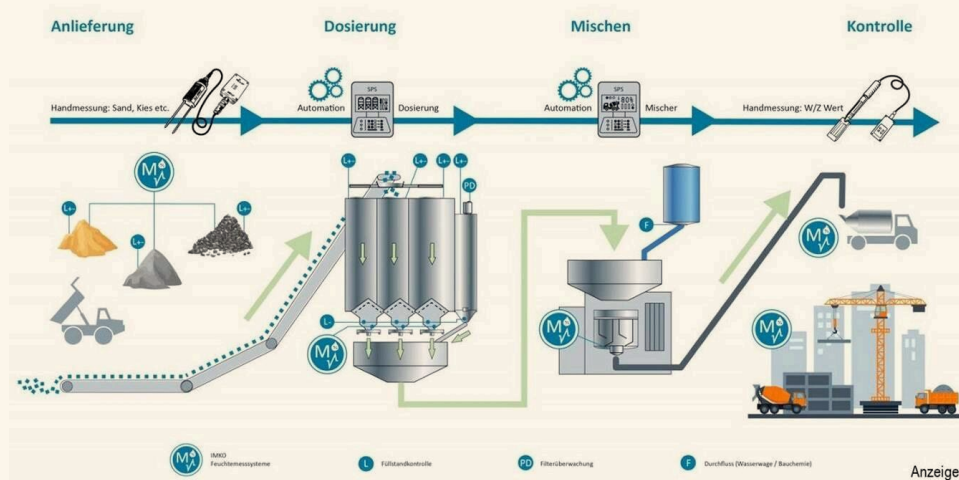
For over 40 years, IMKO has developed specialized sensors that surpass traditional measurement methods. The TRIME technology creates a defined measurement volume along the sensor, eliminating the need for recalibration due to surface abrasion. This ensures long-term accuracy and high reliability in demanding bulk solids environments.

Advantages of the SONO sensor series:

- Short measurement times for rapid process control
- High resistance to mechanical wear and abrasion
- Flexibility in mechanical integration with low material coverage
- Reliable data for w/c ratio determination

Quality Control from Material Delivery to Mixing

Monitoring begins at the point of delivery. Mobile solutions allow for the immediate assessment of aggregates like sand and gravel before they enter the process. This ensures that recipe adjustments can be made in real-time, preventing costly mixing errors and maintaining project schedules.



Precision Measurement during Dosing and Mixing Processes

Stationary SONO sensors facilitate moisture detection during the dosing of aggregates up to 32 mm grain size, whether under silo flaps or on conveyor belts. The technology is compatible with all standard mixer types, including pan, planetary, and twin-shaft mixers, providing stable data for both earth-moist and fluid concrete.

Seamless Integration and System Networking

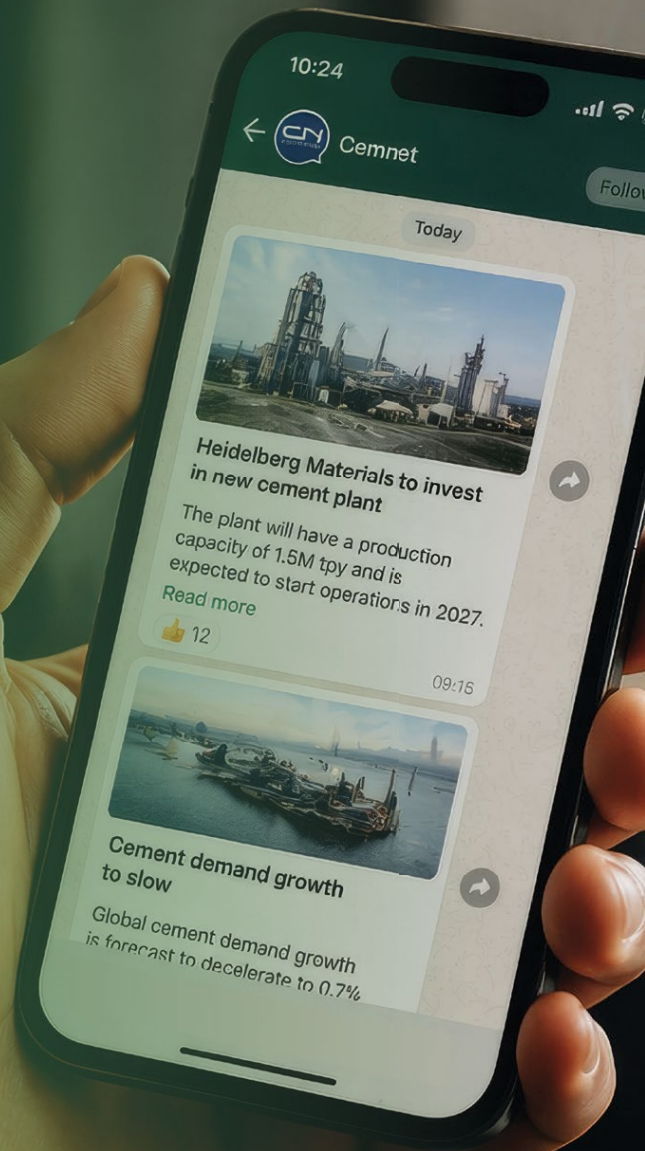
The system is designed for user-friendly commissioning and networking. Using SONO CONNECT or SONO VIEW interfaces, operators can parameterize sensors, select calibrations, and analyze measurement data wirelessly or via wired displays.

- Wireless data transmission and graphical analysis
- Pre-installed calibrations for common aggregates
- Easy integration into existing plant control systems
- Exchangeable wear heads for increased cost-efficiency



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Three-dimensional surfaces: BVERSO, More is Less

Vetriceramici presents BVERSO, a breakthrough in material application, a simple, innovative method that uses a single grit to generate a variety of 3D finishes and textures for creating truly unique products.

By Eros Giavelli (Vetriceramici-Altadia Italia)

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MORE IS LESS

Today, three-dimensional ceramic surfaces are typically created using additive techniques, applying either solvent- or water-based adhesives followed by grit. The grit is fixed in place either with digital adhesives, which are capable of bonding one or more types of grit, or by new-generation machines that apply water-based digital glazes prior to the engobe.

Now, however, an alternative approach is available: BVERSO.

BVERSO is a breakthrough in material application that Vetriceramici aims to position as a new industry standard, offering the ceramic sector a solution for creating products that are both truly unique and increasingly aesthetically appealing.

The origins of BVERSO

In 2021, Vetriceramici introduced a new application method called “3D Before Technology” to a select group of clients. The technique involved applying grit between two layers of engobe and achieved exceptional definition, precise material distribution and a strikingly three-dimensional finish. Vetriceramici was the first to believe in this innovative technology and promote it in the ceramic sector, at a time when no one had yet considered using adhesives and grit prior to engobing and digital decoration. The same spirit of innovation also prompted the company to pioneer the use of water-repellent or resist agents before the engobe application and drying phases, another practice that has now been adopted in a number of facilities.

Three-dimensionality as a sensory experience

There is growing demand in today's market for textured, three-dimensional surfaces. Architects in particular appreciate materials with pronounced textures, raw surfaces and deliberate imperfections, features that become an integral part of a product's visual and tactile identity.

This trend, which is perhaps sociological as well as aesthetic in nature, extends beyond ceramics to materials such as wood, polycarbonate and plywood as part of a decisive shift towards surface texturisation.

At the same time, environmental sustainability is a growing priority, driving demand for low-impact, locally sourced materials that help reduce carbon emissions.

BVERSO technology

BVERSO is a patent-pending technology capable of creating three-dimensional ceramic surfaces. It is a simple, innovative method that uses a single grit to generate a variety of finishes and textures and can be integrated into any production line. Initial industrial trials with customers have already delivered promising results.

So what are its advantages?

First, the process is straightforward and easy to adopt on any production line: it involves applying digital products and special abrasives using widely available machines and familiar technologies.

Second, it offers a high level of customisation in ceramic tile design, enabling manufacturers to create unique, natural-looking products that can easily be engineered to meet their specific needs while being recognisable in the marketplace and difficult to imitate.

Third, the process allows a wide variety of 3D effects to be obtained on a single ceramic surface. Using a single high-thickness, textured grit, manufacturers can differentiate tiles within a collection or even achieve three or more different finishes (matt, glossy, transparent, opaque or coloured) on a single tile.

The materials: B-Grits and B-Fix

BVERSO technology is based on two key materials:

- B-Grits: specialty grits with specific chemical and physical properties and particle size;
- B-Fix: textured fixer inks available in solvent-based (Fixer Solvy) and water-based (Fixer Hydro) versions, the latter compatible with high-discharge printheads already available on the market.

A single B-Grit can yield a wide range of surface effects in combination with any of the four types of B-Fix inks: Snow for white textures, Matt Velvet for material textures such as stone, Satin Stone for soft, waxy textures, and Shine for glossy, transparent textures. These inks can be blended to create intermediate textures or used in combination on a single tile.



Looking ahead

The excellent results achieved to date show that BVERSO can play an important role in the future of ceramic surfaces. In addition to the advantages described above, particularly the ability to create unique, highly distinctive materials, it delivers clear environmental and operational benefits. By using a single grit and varying only the fixers (which alter the chemical and physical properties of B-Grits), it reduces material waste, pollutant emissions, grit applicator cleaning time and flue emissions (by reducing the amount of material requiring firing) and optimises warehouse management.

In short, it is a forward-looking solution for the production of high-value ceramics.



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Info



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05-06

October 2026

AshTrans 2026



Athens, Greece



07-09

Cemtech Europe 2026



Hyatt Regency, Paris, France



27-29

CarbonZero – Alternative Fuels & Raw Materials Global Conference & Exhibition



Brussels, Belgium

For more information, please contact:

Industry Link

Ms. Mariana Gheorghe, Marketing and Program Manager

Tel.: +40726 497 448



30/09 – 2/10 2026

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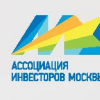
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28-29

October 2026

Cementitious Materials – International Technical and Trade Congress Europe

Brussels, Belgium

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30

Women in CemCO – EMEA

Brussels, Belgium

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11-12

November 2026

15th Africa Cementrade Summit

Casablanca, Morocco



17-19

INTERCEM Americas 2026

Los Angeles, USA

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01-03

December 2026

DeCarbon Tokyo 2026

Tokyo, Japan



01-05

19th TÜRKÇİMENTO International Technical Seminar & Exhibition

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**Marrakech, Morocco**

15-17

16th CEMENT EXPO Concrete 2026

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**India Expo Centre & Mart, Greater Noida**

27-28

January 2027

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07-10

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EnviroTech Madrid 2027**Madrid, Spain**

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18-19

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**Brussels, Belgium**

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Fax: +44 1372 743838



28-29

April 2027

19th Global Slag Conference, Exhibition & Awards

Maximising profits from slag

**Aachen, Germany**

For more information, please contact:

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All Enquiries

Exhibition and sponsorship:
paul.brown@propubs.com

Programme and speakers:
robert.mccaffrey@propubs.com



12-13

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Munich, Bavaria

For more information, please contact:

Dr. Robert McCaffrey

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18-22

October 2027

The 17th International congress on the Chemistry of Cement ICCC 2027

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New Delhi, India**

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National Council for Cement and Building Materials



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13 July 2026
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Cement Kiln Pyroprocessing
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26 October 2026

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20 July 2026

Cement Kiln Refractories

20-21

October 2026

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01-02

December 2026

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02-06

November 2026

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 Istanbul Expo Center, Türkiye

02-04

December 2026

ceramics Vietnam & stone Vietnam 2026

 Hanoi, Vietnam

03-05

March 2027

Indian Ceramics Asia 2027

 Gandhinagar (Gujarat), India

October 2027

ceramics Thailand & stone Thailand

 Bangkok, Thailand



21-26

July 2026

Angola International Fair (FILDA) 2026

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25-27

August 2026

**10th Nigeria Build Expo, International
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27-30

16th ERBIL BUILD EXPOErbil International Building and
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 **Erbil Build Expo, Iraq**


27-30

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Iraq International Building and Construction Exhibition

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Fairground, Baghdad, Iraq**


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05-07

September 2026

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15-18

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16-18

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17

September 2026

9th Central and South European Drymix Mortar Conference cedmmc9 **Istanbul, Türkiye**

23-25

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06-08

October 2026

Morocco International Mining Congress (IMC Morocco)



Rabat, Kingdom of Morocco

15

2nd Egypt Drymix Mortar Meeting and University Symposium (MEDMA)



New Administrative Capital, Egypt



20-22

CADFEM World Conference 2026



Darmstadtium, Darmstadt, Germany

16-18

November 2026

Analytica China 2026

The International trade fair for laboratory technology, analysis and biotechnology in China



Shanghai New International Expo Centre (SNIEC)

18-19

Breakbulk Asia



Marina Bay, Singapore

23-26

Big 5 Global



Dubai World Trade Centre, UAE



24-27

November 2026

Bauma China 2026

Shanghai New International Expo Centre, China



26

The International Conference and Symposium on Building Rehabilitation, Renovation, Refurbishment and Re-Purposing (ICB4R)



Shanghai, China



04-06

December 2026

Big 5 Construct Syria

Syria Expo Center, Damascus Fairgrounds



18

March 2027

Drymix Mortars in the Middle East 2027
The 19th Annual MEDMA Conference

Sharjah, UAE



20-23

Bauma Saudi Arabia 2027

Riyadh Front Exhibition & Conference Center, Riyadh, Saudi Arabia



31 March – 2 April 2027

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26

April 2026

The 11th International Drymix Mortar Conference idmmcXI

Nürnberg, Germany



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العدد: سبتمبر/أيلول 2026، (عدد خاص)، رقم 105		
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المواضيع	المناسبات	
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العدد: ديسمبر/كانون الأول 2026، رقم 106		
آخر موعد لاستلام المقالات أو النصوص الصحفية أو الإعلانات هو: 8 ديسمبر / كانون الأول 2026		
المواضيع	المناسبات	
- تصنيع الإسمنت الأبيض - الإسمنت المخلوط - الإسمنت متعدد المكونات - إسمنت الخبث - إنتاج الإسمنت الأخضر - خلاط الإسمنت - مضافات الإسمنت - مكونات الإسمنت - كيمياء الإسمنت	- الإسمنت الخالي من الكربون - إنتاج الكلنكر منخفض الكربون - المواد الخام لمضافات الإسمنت - إدارة الإمدادات - إنتاج الإسمنت بطاقة منخفضة - تأكيد الجودة ومراقبة العمليات في مصانع الإسمنت - توفير تكلفة إنتاج الإسمنت	

الإعلانات

(بالدولار الأمريكي)

المكان	الإعلان في عدد واحد	الإعلان في عددين	الإعلان في ثلاثة أعداد	الإعلان في أربعة أعداد
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150	عرض 150 بيكسل وارتفاع 100 بيكسل	الكمبيوتر المحمول: الشريط الجانبي الأيسر الهاتف المحمول: شريط علوي بعرض <u>كامل</u> الشاشة
100	عرض 75 بيكسل وارتفاع 100 بيكسل	الكمبيوتر المحمول: الشريط الجانبي الأيسر الهاتف المحمول: شريط علوي بعرض <u>نصف</u> الشاشة
75	عرض 50 بيكسل وارتفاع 100 بيكسل	الكمبيوتر المحمول: الشريط الجانبي الأيسر الهاتف المحمول: شريط علوي بعرض <u>ثلث</u> الشاشة

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”إسمنت الشرقية“ تعلن اكتمال أعمال تنفيذ خط إنتاجها الجديد وبدء عمليات الإنتاج التجريبي

أعلنت شركة إسمنت الشرقية اكتمال أعمال تنفيذ خط إنتاج إسمنت بطاقة 10 آلاف طن كلنكر في اليوم في مصنع الشركة الحالي بمنطقة الخرسانية وتجري حالياً عمليات الإنتاج التجريبي.

ومن المتوقع أن تستمر حتى يتم الانتهاء من عمليات اختبار كافة معدات المصنع والتأكد من كفاءتها.

وكانت شركة إسمنت المنطقة الشرقية قد وقعت في فبراير / شباط 2024 عقداً مع شركة سينوما سي دي أي الصينية لمشروع إنشاء خط الإنتاج الجديد في مصنع الشركة.

”إسمنت الجوف“ توقع عقد مشروع الربط الكهربائي بمصنع طريف

أعلنت شركة إسمنت الجوف عن توقيع عقد مع شركة التيك المحدودة، لتنفيذ أعمال التصميم والتوريد والتركيب لمشروع الربط الكهربائي بمصنع الشركة في محافظة طريف.

وأوضحت الشركة أن هذا العقد، الذي تبلغ قيمته 27.8 مليون ريال، يأتي في إطار التزام الشركة بمتطلبات برنامج إزاحة الوقود السائل، وسعيها نحو تعزيز كفاءة استهلاك الطاقة وتحقيق الاستدامة في عملياتها التشغيلية والإنتاجية.

وتم توقيع العقد بتاريخ 21 مايو 2026م، وهو التاريخ نفسه الذي شهد ترسية المشروع على شركة التيك المحدودة، ويتضمن موضوع التعاقد تنفيذ كافة أعمال الربط الكهربائي لمصنع الشركة الواقع في منطقة طريف، وذلك على أساس عقد تسليم مفتاح (Turnkey Project)، مما يعني تولي الجهة المنفذة المسؤولية الكاملة عن كافة مراحل المشروع بدءاً من الدراسات الهندسية والتصاميم، وصولاً إلى توريد المعدات والتركيب النهائي والتشغيل.

وأوضحت الشركة أنه من المتوقع أن يسهم هذا المشروع في رفع كفاءة استهلاك الطاقة وخفض الانبعاثات الكربونية المرتبطة بإنتاج الطاقة الكهربائية داخل مرافق الشركة.

وسيؤدي الربط الكهربائي الجديد إلى تعزيز موثوقية العمليات التشغيلية، مما يدعم استقرار خطوط الإنتاج واستدامتها على المدى الطويل.

ومن المرتقب أن يبدأ انعكاس هذا الأثر المالي والتشغيلي على نتائج الشركة بعد الانتهاء من أعمال التنفيذ وبدء التشغيل التجاري الفعلي، والمخطط له خلال الربع الأول من عام 2027م.

”إسمنت اليمامة“ تبدأ التشغيل التجاري للخط الثالث: خطوة استراتيجية نحو تعزيز الإنتاجية

أعلنت شركة إسمنت اليمامة بدء التشغيل التجاري للخط الثالث في مصنعها بطاقة إنتاجية يومية تصل إلى 12.5 ألف طن من الكلنكر، مما يعكس التزام الشركة بتوسيع طاقتها الإنتاجية وتعزيز قدرتها التنافسية في السوق. هذا المشروع، الذي تم تنفيذه بالتعاون مع شركة صينية، يعكس أيضاً التوجه نحو تحديث البنية التحتية الصناعية في المملكة.

وسيكون من أبرز التأثيرات زيادة الطاقة الإنتاجية التي ستعزز من قدرة الشركة على تلبية الطلب المتزايد على الإسمنت في السوق المحلي. كما أن الاستثمار في تحديث المنشآت الصناعية قد يجذب مستثمرين جدد ويعزز من الثقة في القطاع الإنشائي، فضلاً عن تحسين الكفاءة الإنتاجية الذي قد يؤدي إلى تقليل التكاليف وزيادة الربحية على المدى الطويل.

”إسمنت نجران“: توقيع اتفاقية مع برنامج تنافسية القطاع الصناعي لخفض تكاليف الإنتاج

أعلنت شركة إسمنت نجران عن تطورات جوهرية تتعلق بالأثر المالي الناتج عن تعديل أسعار منتجات الوقود المستخدمة في عملياتها الإنتاجية.

وكشفت الشركة عن توقيع اتفاقية استراتيجية مع برنامج تنافسية القطاع الصناعي تهدف إلى خفض تكاليف الإنتاج ورفع الكفاءة التشغيلية، وهو ما سيؤدي إلى تقليص الزيادة المتوقعة في تكلفة الإنتاج من 11% إلى 8%، مع توقع ظهور الأثر المالي لهذا التحسن ابتداءً من نتائج الربع الثاني من العام المالي 2026.

وفي إطار سعيها للحد من التداعيات المالية لهذه الزيادة، أوضحت إسمنت نجران أنها انضمت إلى برنامج تنافسية القطاع الصناعي، وهي خطوة تهدف إلى تبني حلول تقنية وفنية تساهم في رفع كفاءة استهلاك الطاقة وتنويع مصادرها المستخدمة في المنشآت التصنيعية التابعة لها.

ووفقاً للبيانات الصادرة عن الشركة، فإن الاتفاقية المبرمة تتضمن تقديم دعم فني وحلول متكاملة تساعد في تحسين جودة ونوع مصادر الطاقة، مما ينعكس بشكل مباشر على هيكل التكاليف.

الجمهورية العربية السورية

عقد استثمار لإعادة تأهيل وتشغيل مطاحن معمل إسمنت طرطوس

تم توقيع عقد استثمار لإعادة تأهيل وتشغيل مطاحن معمل إسمنت طرطوس مع شركة QZ، في خطوة تهدف إلى تطوير صناعة الإسمنت في سوريا وزيادة الإنتاج المحلي. ويسهم المشروع في إعادة تشغيل منشأة صناعية مهمة، وتقليل الاعتماد على الإسمنت المستورد، ودعم استقرار الأسعار في السوق المحلية، إضافة إلى توفير فرص عمل وتنشيط الاقتصاد المحلي، مع الحفاظ على ملكية المعمل للدولة السورية.

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- أنظمة إدارة الطاقة ISO 50001:2018 كيفية دمج كفاءة الطاقة في العمليات الصناعية
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- أسواق وأرصدة الكربون بين النظرية والتطبيق (الطريق إلى التطبيق الفعلي)
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- إعادة تدوير المخلفات ومعالجة النفايات الصناعية «الصلبة / السائلة / الغازية» واستخدام التكنولوجيا الأنظف في الصناعة
03-06 أغسطس / آب 2026
- التميز والإبداع في التطوير الإداري وتنمية الموارد البشرية – أدوات التحفيز وتشجيع الموارد البشرية والتطوير
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- مؤشرات الأداء واستخدام التقنيات الحديثة والذكاء الاصطناعي في عمليات القياس والتخطيط بالمؤسسات الصناعية والتعدينية
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المكان: القاهرة، جمهورية مصر العربية

التاريخ: 10-13 أغسطس / آب 2026

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