



# CEMENT & BUILDING MATERIALS REVIEW

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# Cement and Building Materials Review

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Technical Articles

Diary Dates

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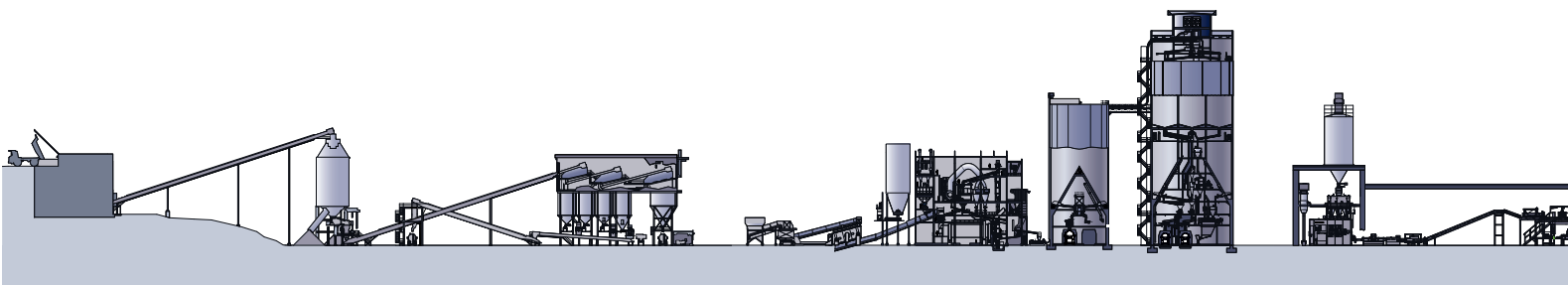
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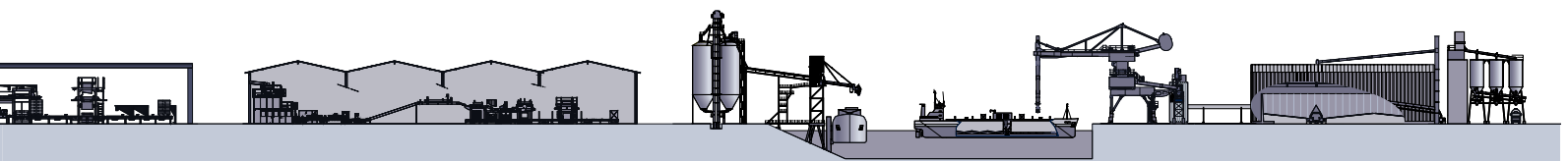
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## Arab Album Arab Album



### Egypt

#### **Misr Cement Qena 9M profits drift down 4.78%**

Misr Cement Qena reported net profits of EGP 231.5 million for the first nine months of 2015, down 4.78% from EGP 243.16 million for the similar period a year earlier.

Earlier, the company released its financial indicators for the first half of 2015, which showed a decline of 15.3% in its net profits.

Source: [english.mubasher.info](http://english.mubasher.info)

### Jordan

#### **Lafarge Cement 9M profit surges 208%**

Jordan's Lafarge Cement reported a net profit of JOD 5.48 million in the first nine months of 2015.

Profit rose by 208.2% in the January-September period 2015, compared to JOD 1.77 million in the same period a year earlier.

The Amman listed company's profit before tax also increased to JOD 544,100 versus JOD 470,630.

Lafarge added deferred tax assets of JOD 5.97 million to the nine month profit, compared to JOD 2.96 million added in the same period of 2014.

Source: [english.mubasher.info](http://english.mubasher.info)

### Saudi Arabia

#### **Arabian Cement's net profit falls 11% in nine-months 2015**

Arabian Cement Co., one of the main producers of cement in the western region, reported a net profit of SAR 446.7 million for the first nine months of 2015, marking an 11% decline compared to the same period a year earlier. The drop was mainly due to lower sales revenue, higher general & administrative expenses and goodwill write-off related to an associate company in Jordan.

The company reported a net profit of SAR 89.5 million in Q32015-, a year-on-year decline of 33%.

Source: [argaam.com](http://argaam.com)

#### **Hail Cement earnings down 30% in Q3, 21% in 9M**

Hail Cement recorded net earnings of SAR 17.45 million in the third quarter ended 30 September 2015, falling 30.47% compared with SAR 25.10 million in the corresponding period a year earlier.

Nine-month net income fell by 21.29% year-on-year from SAR 106.20 million to SAR 83.59 million.

Source: [english.mubasher.info](http://english.mubasher.info)

#### **Al-Jouf Cement's net profit jumps 79% in nine-months 2015**

Al-Jouf Cement reported a net profit of SAR 71.19 million for the first nine months of 2015, a 79% increase compared to the same period a year earlier, thanks to higher sales volumes and lower cost of goods sold.

The company recorded a net profit of SAR 18.62 million in Q3, a surge of 117% compared to the same quarter 2014, backed by higher sales volumes and prices.

Source: [www.argaam.com](http://www.argaam.com)

#### **Saudi Cement's net profit falls 5% in nine-months 2015**

Saudi Cement Co. reported a net profit of SAR 764 million for the first nine months of 2015; a 5.2% year-on-year drop it attributed to a decline in domestic sales. The cement producer's Q3- 2015 net profit fell 10% to SAR 208 million from SAR 232 million in the same quarter a year earlier. Profit dropped by over 18% quarter-on-quarter.

Source: [www.argaam.com](http://www.argaam.com)



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## **LOESCHE supplies 3<sup>rd</sup> and 4<sup>th</sup> vertical roller grinding mills for cement grinding to the Kingdom of Saudi Arabia**



**Similar mill type LM 63.33+ C, Nallalingayapalli, India**

**Rabigh** - Arabian Cement Co. (ACC) is planning to build a new brown field cement line in Rabigh, Kingdom of Saudi Arabia, with a clinker production capacity of 10,000 tpd.

In order to increase the cement grinding capacities (Phase1), prior to the completion of the new line (Phase2), ACC placed an order on China National Building Materials Group Corporation (CNBM) for a cement grinding plant including two LOESCHE vertical roller grinding mills.

The project execution will be done on a Fast-Track Concept which ensures a project schedule - from contract effectiveness to PAC - of only 13 month.

LOESCHE will supply two large vertical roller grinding mills of Type LM 63.33+ with a table diameter of 6.3 m and a main drive size of 7,400 kW.

Under the Fast-Track Concept, LOESCHE will not only supply the mills but also all process related equipment like process filters, process fans, hot gas generators, etc, as well as the complete basic engineering of the grinding plant to ensure a state-of-the-art plant design.

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## **RAS AL KHAIMAH WHITE CEMENT, UAE – CONVERSION PROJECT**

PROMAC Engineering Industries Limited, Bangalore, ordered a second grinding plant from Gebr. Pfeiffer SE for grinding 25 t/h of pet coke. The plant will be set up at Ras Al Khaimah's white cement works in the UAE.

The new grinding plant, just as the grinding plant supplied in 2014, will be used for converting the firing system of the white cement and limestone kilns from gas to pet coke.

In addition to the MPS 2800 BK vertical roller

mill with an installed power of 650 kW the scope of supply includes the feed bin with weigh belt feeder, the plant filter with plant fan, the hot gas fan, dampers, measuring and control equipment, ducting engineering as well as the complete safety equipment required for the grinding of solid fuels.

Delivery of the plant is scheduled for the 1st quarter of 2016.

[www.gebr-pfeiffer.com](http://www.gebr-pfeiffer.com)

## **Sanimed grows in quality and quantity with the Sacmi Group**

*New Riedhammer tunnel kiln now up and running at full capacity*

Sanimed, a Tunisian company belonging to the Abdennadher Group, has been manufacturing and marketing ceramic sanitaryware since 1998. It is currently expanding fast on North African and European markets and has recently made a giant leap forwards thanks to its partnership with the Sacmi Group.

At their Sfax plant a 90-metre Riedhammer TWS 90 /100 /300 - G tunnel kiln – equipped with a pre-kiln DWS 91 / 300 / 100 W dryer – has, in fact, just been tested successfully.

This kiln, a popular model employed extensively on the market, can boost plant productivity and performance considerably. Thanks to advanced combustion technology, it's particularly recommended for reducing fuel consumption.

With a 22-hour firing cycle at a maximum working temperature of 1250° C, the tunnel kiln ensures an output of 1,570 pieces a day and a specific consumption of less than 900 kCal/kg.

On the quality and flexibility front, the Riedhammer kiln is outstandingly efficient in the first firing of a body mix that is of considerable complexity in terms of shape and size: the kiln load (average weight 30 kg) consists of a Vitreous China bathroom set made up of large Fine Fire-Clay pieces such as counter washbasins, kitchen sinks and shower trays, the 90 x 90 cm size of which explains the 1 metre high kiln inlet.

With the new tunnel kiln, Sanimed has now pushed its output capacity well beyond 1 million pieces a year.

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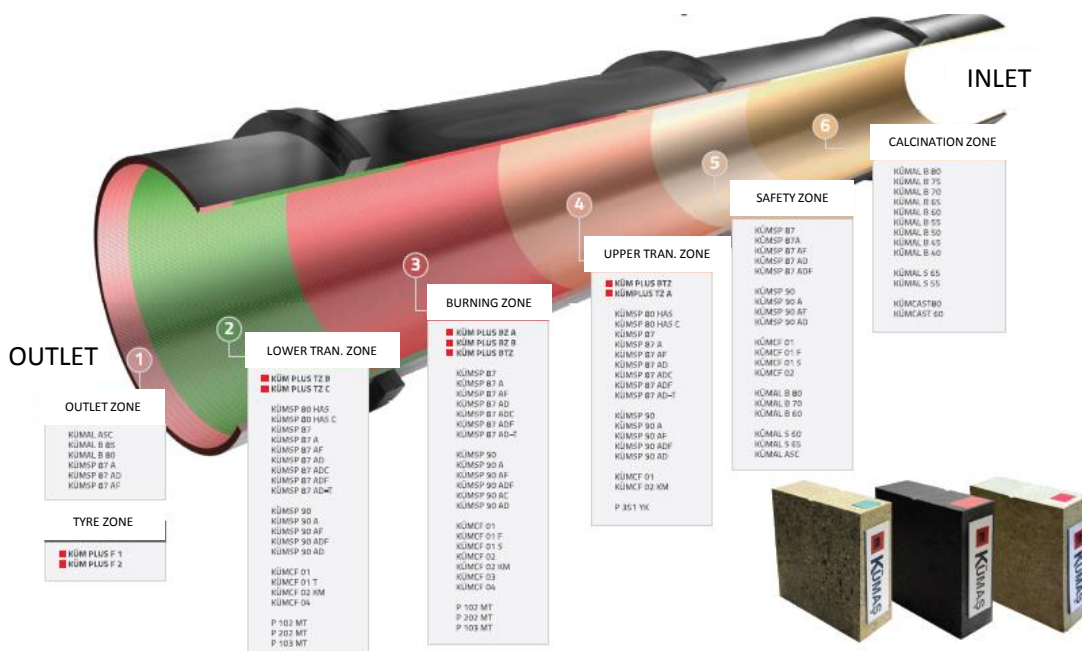
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# How alternative fuels become a regular fuel

Arab countries have a long history in subsidising energy (i.e. fossil fuels or electricity) to the public. In many countries which are abundant of natural resources, such as the Kingdom of Saudi Arabia, low energy prices are used as a tool in order to distribute state benefits to the population without the need for extensive administrative capabilities and income testing.

Under such circumstances: Is there a place for alternative fuels in the Arab world? Asked by Dirk Lechtenberg who is providing an outlook on the alternative fuel prospects for the cement industry in the Arab world.

More than 10 years ago, on an environmental conference of the Arab Union for Construction and Building Materials (AUCBM) I had the honor to present a paper on “Alternative Fuels for the Cement Industry”. At that time, most of the participants could not understand how somebody could use waste-derived fuels in a cement plant. For what? The energy prices at that time were even lower than today – accompanied by high cement prices and needed cement production capacities. One Libyan delegate, Rajab El Mahmoudi, put it to the point: “you made a very interesting presentation – but maybe 10 years too early. However, this will be the future! “

In the Arab Human Development Report [1] “Energy Subsidies in the Arab World” being published already in 2012, the authors already predicted the situation which is currently developing in some Arab countries such as Egypt, Saudi Arabia, Tunisia.

## **Energy subsidies are costly to the Arab world in social, economic and environmental terms**

According to [1] energy subsidies lead to a number of economic inefficiencies that are experienced widely throughout the Arab world. They result in misallocation of resources preventing the country from optimising the use of its reserves; they incentivise over-usage of energy, leading to exceptionally high consumption growth rates for energy in many parts of the Arab world; they lower incentives for productivity improvements and investments in more energy-efficient technology; they distort pricing signals to customers, leading to energy waste, unwanted inter-fuel substitution effects, and a lack of incentives for investment in alternative energies.

The authors of [1] state further, that energy subsidies have also severe implications including insufficient access to food and healthy nutrition, education and basic health services, and also lack of energy access itself. While energy subsidies constitute an important social safety net for the poor, they are regressive in nature because in many instances richer households tend to capture the bulk of subsidies, skewing the existing income distribution. Furthermore, in many cases, fuel subsidies can remove substantial resources from ‘pro-poor’ sectors such as health and education, and from social and infrastructure projects that are more beneficial to households in low-income brackets. Subsidies can lead to higher energy use or reduce the incentive to conserve energy, with potential adverse environmental consequences such as increasing airborne emissions and greenhouse gases. Fuel subsidies can also hinder the development of renewable and clean energy technologies – such as solar and wind – which find it difficult to compete with subsidised fossil fuels.

## **Energy prices and the Arab Spring**

The world, and in particular the Arab world, has changed dramatically since those days. The Arab spring forced governments to rethink their policies and actions for different reasons. The new government in Egypt is not able to continue the former policies in providing cheap energy; in the Kingdom of Saudi Arabia, the government prepares the pathway for less oil exploration with lower environmental impact using more renewable energy.

## **Kingdom of Saudi Arabia**

Under the patronage of HRH Prince Abdulaziz Ibn Salman a “Mandatory Energy Efficiency Programme” has been developed, in order to encourage the industry to reduce the use of fossil fuels and overall energy.

Currently, heavy fuel oil is supplied to the cement industry in the Kingdom of Saudi Arabia at cost of app. 35 US\$ per ton (not per barrel!).

Saudi Aramco, producing on average 11.4 million barrels of crude oil per day (in 2014), is supporting the energy efficiency in Saudi Arabia, for currently one third of overall energy production is consumed in Saudi Arabia. It is estimated, that by 2020, 60% of energy production will be needed to fulfill the local demand.



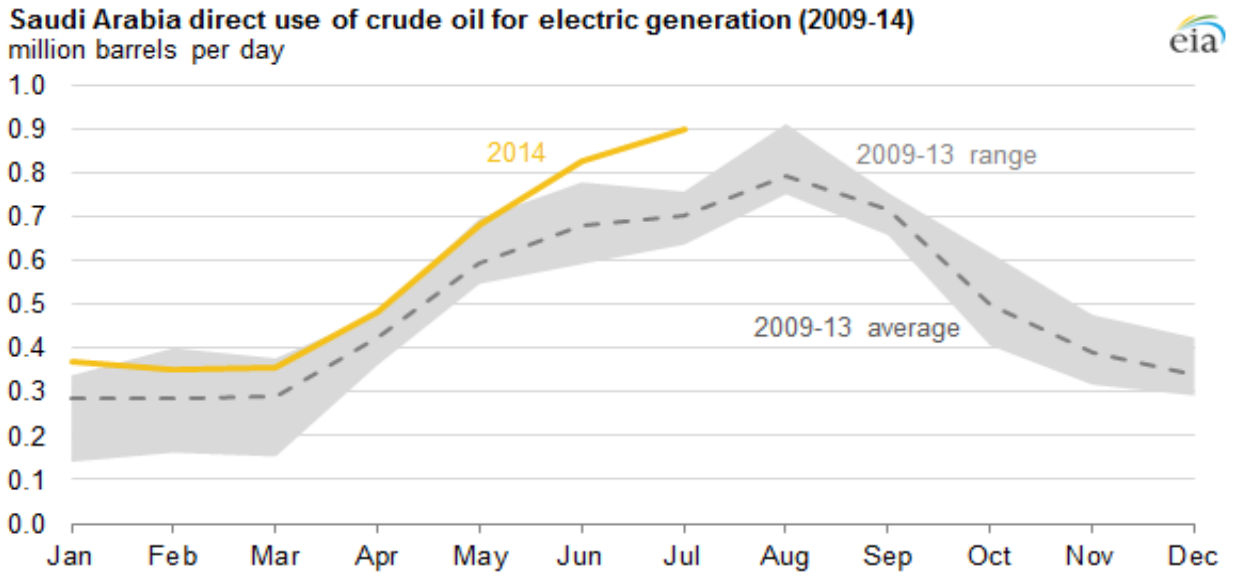
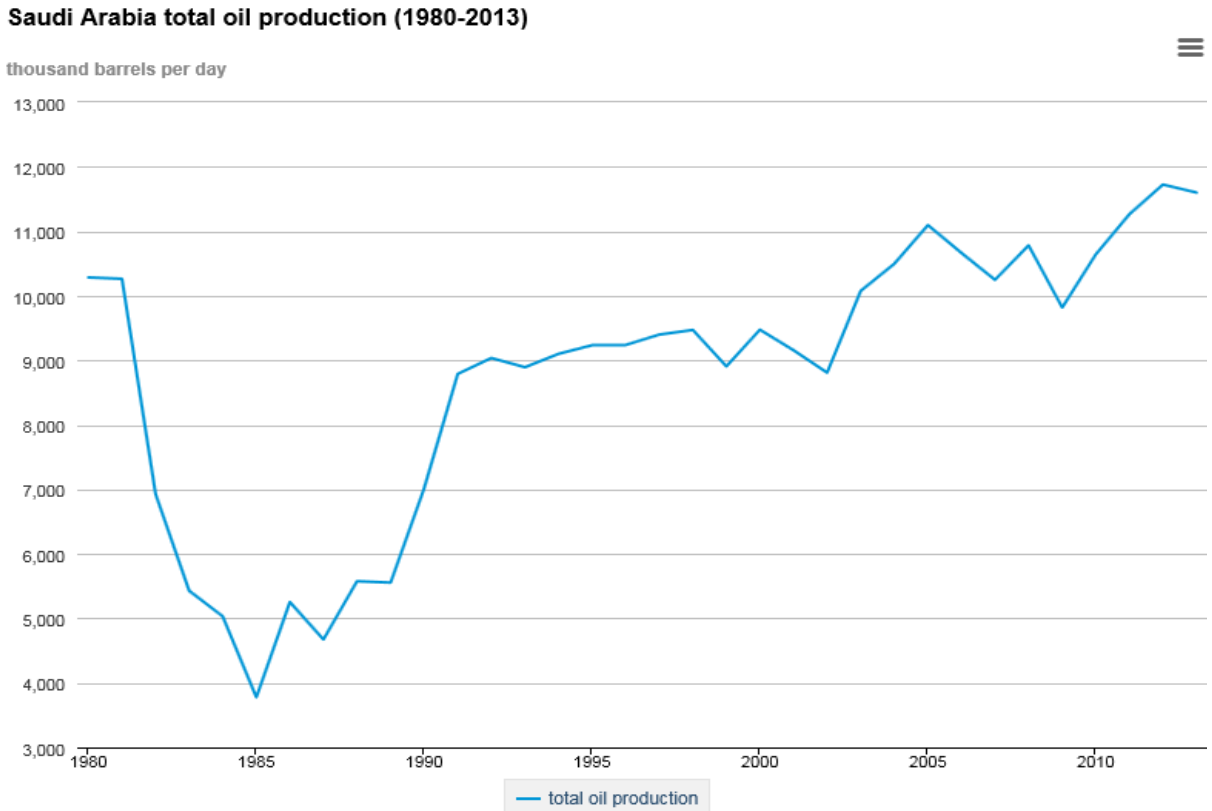
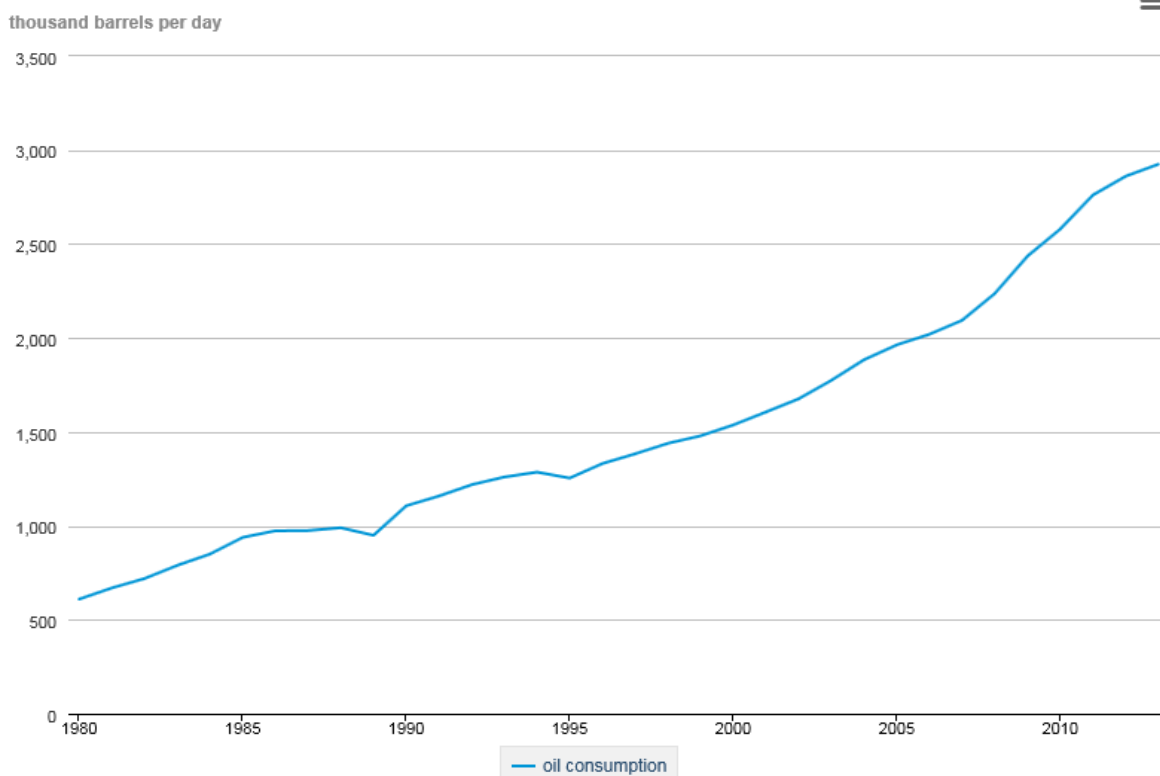


Figure 1: Saudi Arabia uses large amount of crude oil for power generation (source: [2])



**Saudi Arabia oil consumption (1980-2013)**



**Figure 2: Saudi Arabia’s oil consumption and oil production**

Cement producers in the Kingdom of Saudi Arabia already announced renewable energy projects to reduce fossil fuel consumption and independence from Aramco’s fuels supplies. The current situation of fuel allocation from Aramco would force the companies to use alternative fuel, as announced recently by Arabian Cement and City Cement. In 2014 the Ministry of Petroleum turned down fuel supply for new production lines of Qassim Cement, Eastern Cement, Arabian Cement, and City Cement.

Saudi cement producer City Cement Company has announced that it intends to invest US\$6.7m in an alternative energy project (waste heat recovery), following the investment of 45mUS\$ by Najran Cement in 2014. Yanbu Cement had to shut down their plant in 2011 due to fuel supply shortages from Aramco – which has been forcing the cement producers even to start the development of alternative fuel projects, for instance companies like Arabian Cement, and City Cement.

**Capacity to increase 29.1% over 2014 –17**

At the same time, the growing demand for cement in Saudi Arabia in the last few years has emboldened companies to expand operations in order to stay competitive and meet demand. The Saudi cement sector

is expected to add about 23 million tons capacity in the next three years to meet the strong rise in domestic demand; the majority of the capacity addition is likely to enter the market in 2015 [3].

**In Egypt,** natural gas prices for a range of industries have been increased, starting in July 2014 by 30 to 70 per cent. Electricity prices are rising from July 2014 with a view to phasing the subsidy out completely over five years according to a separate official announcement [4].

Ashraf al Arabi, the Egypt’s minister of planning, was quoted in the Shorouk daily on the 5th of July 2014 saying: “In five years fuel will be offered at 80 per cent of its real cost to sections of the population which are deemed to need subsidies, the rest will pay market prices.” The increases are intended to lead to savings of US\$6bn in 2014 bringing down the fuel subsidy bill to US\$14bn or 13 per cent of state spending, according to Financial Times.

Such announcements, accompanied by fuel shortages or even fuel stoppages forced the Egyptian cement industry to start with the use of renewable energies, such as windmills and photovoltaic and to start the use of alternative fuels, mainly biomass-derived fuels

(agriculture waste such as rice husks, rice straw, cotton stalks etc.) and waste-derived fuels.

International cement groups in the Arab world already started to implement refuse-derived fuels owing to their company policies and to secure “waste” resources as potential fuel resources. Some plants, especially in Morocco, without having fuel subsidies, but paying world market prices for coal/ petcoke, have reached substitution rates of up to 50% by using local produced refuse-derived fuels (such as tyres or hazardous wastes) or even importing such alternative fuels.

Cement works in Egypt such as the Cemex plant in Assiut have been developing their alternative fuel projects over years, reaching up to 60% substitution rates. However, the majority of the plants just implemented (or are currently implementing) high capex spendings for processing facilities, storage, dosing and feeding of alternative fuels. There is little operational experience in using alternative fuels in Egypt. However, the majority of Egyptian cement companies are part of international cement companies which have gained experience on the alternative fuel sector elsewhere.

There are two different approaches for the alternative fuels procurement: the first procurement approach involves the purchase of alternative fuels that are readily collected and prepared by others, so that cement company does not get involved in the processing of the fuels themselves, while the second procurement approach involves the collection and the preparation of the alternative fuels by the cement company itself, to control its own supply chain.

**Suez Cement** at its Kattameyha plant opened a new RDF processing facility in summer 2014 with the capability to process presorted municipal solid waste into refuse-derived fuels.

**Arabian Cement** Company described in the project description document [5], according to the “clean development mechanism“ by the UNFCCC, an emission reduction of app. 70,862 tons of CO<sub>2</sub>e/yr while implementing alternative fuels such as RDF, sewage sludge and biomass resulting in a planned substitution rate of up to 12%.



**Pic. Kattameyah plant, Suez Cement (Source: World Cement)**

**Table 1: Alternative fuels mix in Arabian Cement plant**

Alternative Fuel Type	2014	2015	2016	2017	2018
<b>RDF (t/year)</b>	35.280	62.020	82.000	82.000	82.000
<b>Municipal Sludge (t/year)</b>	10.000	15.000	20.000	20.000	20.000
<b>Agricultural waste (t/year)</b>	5.000	20.000	40.000	40.000	40.000
<b>Total</b>	50.280	97.020	142.000	142.000	142.000

**Table 2: Equivalent energy replacement with alternative fuels in Arabian Cement plant**

Years	2014	2015	2016 - 2023
<b>Total replacement %</b>	4.2%	8.1%	11.9%

(Tables:1 and 2 source PDD Document, Arabian Cement, 2012 [5]).

**Lafarge Cement** Company is, according to an article of “Cement UAE” [6] currently using 23,000 ton/ year of hazardous waste on kiln 4. The hazardous waste is mainly composed of the waste generated from the local petroleum industry and the pharmaceutical industry. This application of beneficial utilisation of waste has been welcomed by the regulators (EEAA) and they would be pleased to see the quantity of hazardous waste disposed of by this route increasing.

**Lafarge Cement** has also invested in a solid shredded waste (RDF) fuel plant to utilize 72,000 tons/year of RDF for kiln 2. The RDF will be mainly composed of rejects from a waste sorting and baling plant. Lafarge has also indicated that it is planning a further phase of the alternative fuel project which will utilize a 120,000 t/year of rice straw fuel for kiln 1 [6].

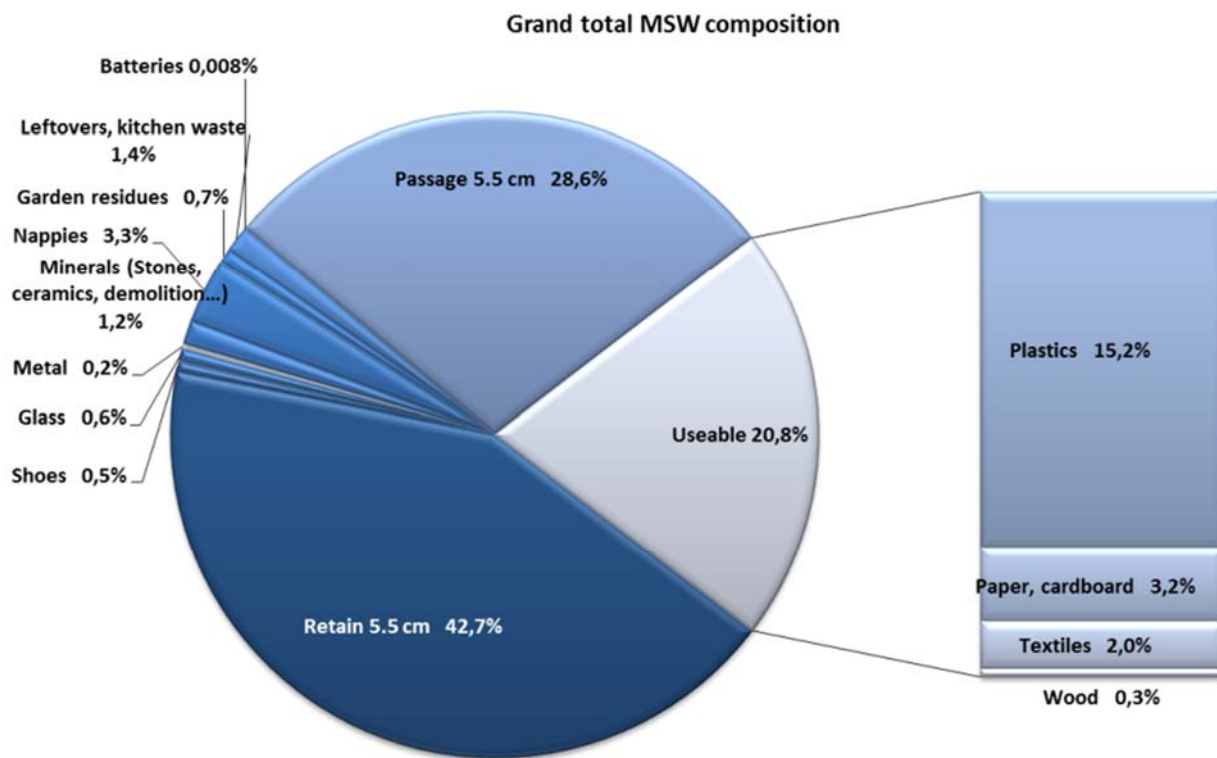
Cement players are either purchasing ready-made alternative fuels such as refuse-derived fuels and biomass or investing in own processing facilities. Main obstacle is the security in supply; as the legal

requirements for contracting services such as waste collection and disposal are not developed yet in Egypt. Currently under the responsibility of the governorates, the Ministry of Environment is taking over these responsibilities in order to provide clear guidelines for such contracting including the environmental, economic and social responsibilities. Furthermore, landfilling on mainly uncontrolled landfills is free of charge. So no tipping fees or gate fees can be anticipated by the RDF producers or cement plants.

Currently, most waste collection is done by the informal sector, which takes out all recyclable or (valued) materials, so that in majority only waste is landfilled without high calorific valuable materials such as textiles, rubber, plastics or paper.

In studies performed by MVW Lechtenberg in 2014, the composition of landfilled waste was evaluated: Only 20 – 25% of the municipal solid waste can be used for further processing in refuse-derived fuels.

Figure 3: Waste sorting test results by MVW Lechtenberg, 2014



Also the chemical and physical parameters of the municipal solid waste were analysed. Having high moisture and ash content, the calorific value of waste fractions (i.e. paper, plastics, textiles) is only 3.000 – 3.500 kcal/kg, thus half of that of coal.

Furthermore, the economics of RDF production and the use of RDF in the cement industry was calculated. As mentioned before, no gate fees or tipping fees for the waste can be charged to the municipalities or governorates- so that the whole process of RDF production needs to be financed by the cement plants.

As there are also high investments needed for the development of the infrastructure and processing equipment, the processing costs per ton of RDF are as high as some 25 - 30€ / ton. With such high costs, the substitution of costly and shortly available natural gas is a more strategic goal for the cement industry. MVW Lechtenberg made a benchmark of RDF costs while using a small scaled, so-called “smart solution” and a

sophisticated full line RDF production facility. Both scenarios confirm a critical viability of RDF usage compared to prevailing energy prices (2014) and high production cost of RDF.

#### The Oil price drop

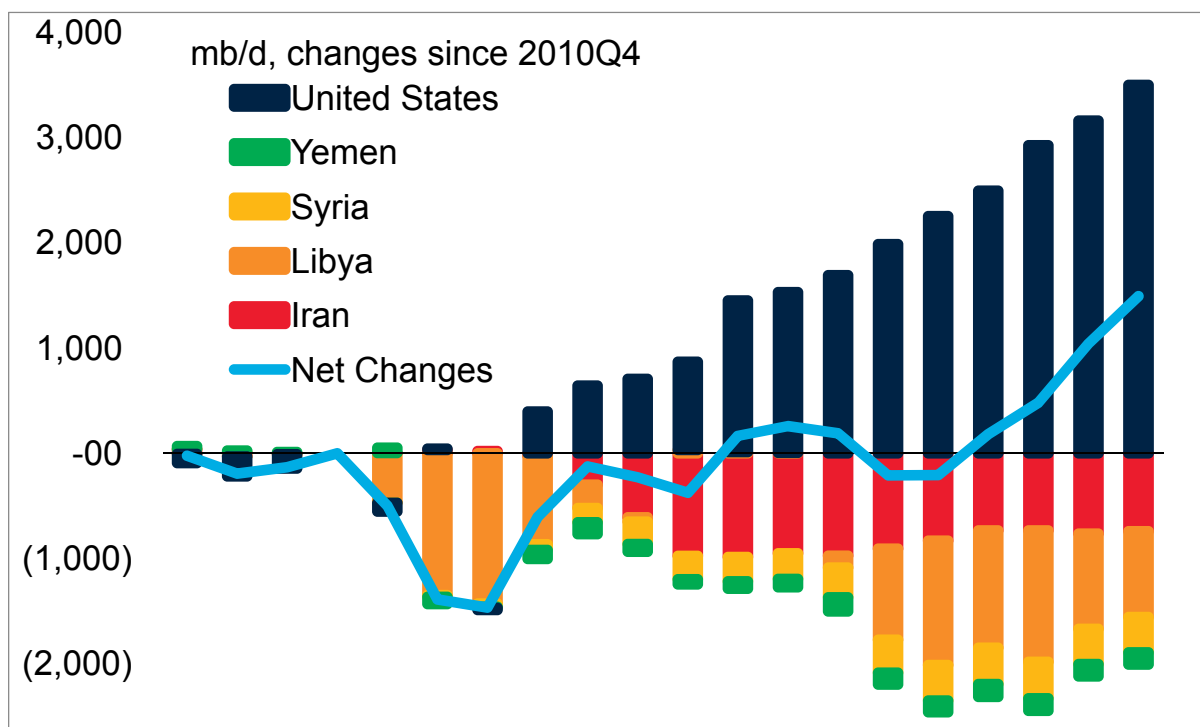
The Middle East is the region that is most exposed to volatility in global energy markets — and the region that can cause the most variation, as seen by Libya's production fluctuations. A sustained drop in the price of oil below \$50 per barrel could jeopardize the economic stability that many of the region's energy exporters have enjoyed following the tumult of the Arab Spring [7]

Following an overcapacity in oil production (mainly derived to the shale oil production in the US, as shown in the table below), the leading OPEC producer Saudi Arabia dropped the prices under the production costs of some oil producing countries.

**Table 3: Benchmark RDF costs / benchmark with coal / natural gas (source: MVW Lechtenberg)**

<b>RDF from treatment plant "smart solution", variant 1</b>			
Production costs			18,42
RDF			€/ton
Calorific value	3.500 kcal/kg	14,7 MJ/kg	1,26 €/GJ
<b>Benchmark gas or HFO</b>			
			4,62 €/GJ
Limit price in comparison to benchmark			67,64
			€/ton
<b>Benchmark coal</b>			
			3,01 €/GJ
Limit price in comparison to benchmark			44,18
			€/ton
Limit price (suitable price)			26,51
<b>RDF from treatment plant "full size", variant 2</b>			
Production costs			32,87
RDF			€/ton
Calorific value	4.000 kcal/kg	16,7 MJ/kg	1,96 €/GJ
<b>Benchmark gas or HFO</b>			
			4,62 €/GJ
Limit price in comparison to benchmark			77,30
			€/ton
<b>Benchmark coal</b>			
			3,01 €/GJ

**Figure 4: Changes in global oil production (source: [8])**



Coal prices declined already and steadily in the first months of 2014 in response to a combination of increased supply and lower import demand from China; following the oil price decrease the coal prices will decline further.

Therefore it is anticipated, that most of the alternative fuel projects in the Arab countries will be postponed until the fossil fuel prices reaches a pre-crisis level.

Especially in Egypt – where all cement works are now implementing coal grinding facilities in order to switch from natural gas and heavy fuel oil to imported coal – the use of not subsidised refuse-derived fuels will be hindered. As long as no gate fees or treatment fees can be received by the cement plants, the use of refuse-derived fuels will become uneconomic.

Independent of world market prices of fossil fuels, there will be still some room in the development of alternative fuel projects. However, as Rajab El Mahmoudi from Libya already said 10 years ago, you are maybe a few years too early as fuel prices are too low – however, this will be the future....

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## Big savings by burning alternative fuels

### *Calciner line upgrade with FLSmidth Pfister dosing technology at Arabian Cement proves full success*

*Altering existing production setups is always a special challenge for any engineer. At Arabian Cement Company in north-eastern Egypt FLSmidth dosing specialists integrated a multifuel feeding line with rotor weighfeeder Pfister® TRW-S-D as the core technology. Imported energy carriers can now be replaced at an increasing rate by low-cost locally available alternative fuels such as biomass, tire chips or sewage sludge.*

Arabian Cement (ACC) is a leading cement company located in the Governorate of Suez, in north-eastern Egypt. Up to five million tons of high quality cement leave ACC every year in support of the local market. In addition, high quality concrete products are provided by Andalus Ready Mix Concrete, an ACC subsidiary. ACC is listed on the Egyptian Stock Exchange and recently expanded operations to Brazil.

Two production lines are running at the heart of the main plant in Egypt. One of them was set up in 2011 by FLSmidth A/S and subsequently equipped with an alternative fuel installation by FLSmidth in 2013. Replacing imported coal or gas with widely available, cheap energy carriers such as sewage sludge or plastic waste made perfect economical sense. Space limitations within the production line sent FLSmidth engineers to the think tank. Their smart solution: a balcony-type addition to the calciner tower holding a rotor weighfeeder Pfister® TRW-S/D setup.

„The entire system is fully automated and includes primary storage and shredder system, magnetic separation, transportation to the intermediate storage area, a discharge system from intermediate storage, a gravimetric dosing system and an injection system into the kiln precalciner“, explains Adel Ezzat, Alternative Fuel Manager at Arabian Cement. In the ACC installation in Egypt, alternative fuels can substitute up to 30 percent of conventional fuels, mainly imported coal. “Starting with a seven-percent substitution rate in 2013, ACC is already using 12 percent alternative fuels in 2015, with similar annual increases planned in the coming years”, Adel Ezzat elaborates.

#### **Rotor Weighfeeder Pfister® TRW-S/D meets all requirements**

Its simple, no-nonsense design with no unnecessary frills makes rotor weighfeeder Pfister® TRW-S/D a sturdy workhorse with low maintenance and high reliability. With the help of a special stirrer the material is loosened and falls out of the pre hopper, without any compression, into the rotor chambers. The weighing and dosing principle of all Pfister rotor weighfeeders is the same: By means of a weighing axis the material weight is gravimetrically determined before material discharge, providing for a highly accurate and consistent mass stream to the pyro process.

An example for the state-of-the-art technology used in the alternative fuel installation with rotor weighfeeder Pfister® TRW-S/D at Arabian Cement is a special rotary valve. Foreign objects in the material, causing blockages in other systems, are tolerated by the FLSmidth Pfister system that is equipped with a flexible sealing lip. Multiplying the internal chambers with the rounds per minute, the valve „packs“ the fuel material in 75 small batches for steady fuel distribution to the calciner. Other providers use double pendulum flaps creating no more than eight batches. A suction effect within the valve is barred by design: Therefore this rotary valve has no leakage air, only the air inside the chambers will pass the valve. Therefore this sealing principle will be used for the pneumatic and mechanical transport of secondary fuels. The valve compensates the air pressure between the system and the material feed piping.

Its outstanding reliability and long service life combined with high dosing accuracy and easy maintenance made rotor weighfeeder Pfister® TRW-S/D the perfect choice for Arabian Cement. At the Egypt plant, the combination of fossil energy carriers such as coal, petroleum, gas, plus the mixture of alternative fuels consisting of dried



sewage sludge, tire chips, plastics and packing materials now reduces energy costs considerably. The big plus: positive effects on the incineration and therefore cement production quality since rotor weighfeeder Pfister® TRW-S/D creates an absolutely reliable flow of material, tolerating various material sizes and impurities.

#### Fuel selection as a crucial aspect

When it comes to properly feeding the great variety of alternative fuel materials into the burner, rotor weighfeeder Pfister® TRW-S/D has proven its efficiency in more than 240 implementations worldwide. In 44 countries plant management chose the FLSmidth Pfister multifuel dosing concept for reliable and flexible low-maintenance operations.

The greatest challenge in dosing alternative fuels is their diversity. Particle size, density and water content are never the same. Refuse-derived fuels (RDF) are fluffy, fibrous or compressible, biomass or sewage sludge may contain additional moisture. Not only in the start-up phase FLSmidth Pfister experts in alternative fuels are assisting customers setting up the material demand profile for their respective suppliers and make sure that materials and technical set-up are a smooth match.

#### Summary: Now future-oriented with Pfister technology

ACC can now use various locally available fuels to cut overall energy costs and minimize its dependency on the expensive import of energy carriers. The company can react to market changes and purchase the fuels which are available at surplus while, at the same time, help to protect the environment. „Materials which would otherwise end up in landfills are being put to economically intelligent use“, FLSmidth Pfister project manager and Area Sales Manager Hassan Jradj wraps up ACCs win-win situation created by Pfister technology and knowledge.

#### Technical data alternative fuel dosing rotor weighfeeder Pfister® TRW-S/D installation at Arabian Cement/Egypt:

Alternative fuels: Mixture of dried sewage sludge (DSS) and municipal solid waste (MSW) like plastics, rubber, packing material

Mass flow: up to 12t/h

MSW grain size: 2D: 98 wt.% < 50 x 50 mm, 100 wt.% < 150 x 150 mm

Bulk density: 0.1 – 0.6 t/m<sup>3</sup>

Water content: max. 25 %

DSS grain size: up to 10 x 10 x 10 mm

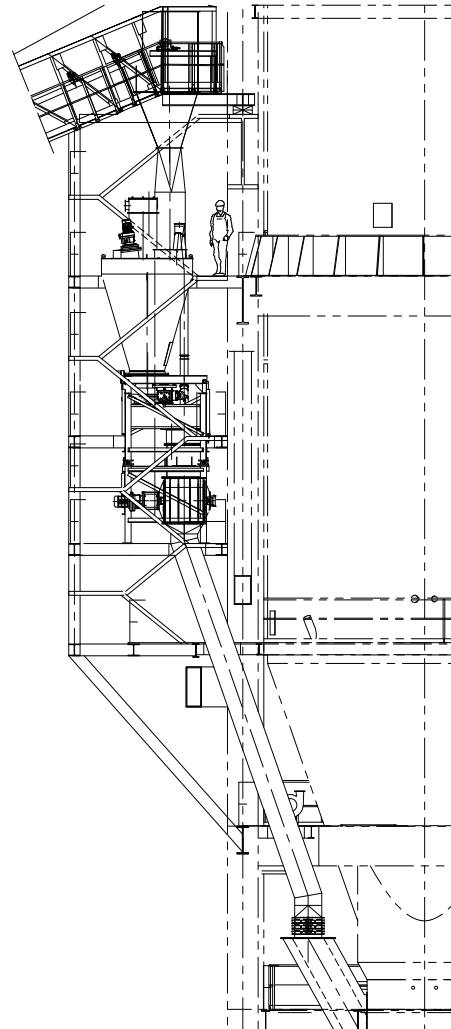
Bulk density: 0.5 – 0.7 t/m<sup>3</sup>

Water content: max. 12 %

More information: [www.flsmidthpfister.com](http://www.flsmidthpfister.com)

Pictures / captions: see below

**Pic 1:** Due to space limitations at the existing plant FLSmidth engineers designed a balcony-type addition to the calciner tower holding the rotor weighfeeder Pfister® TRW-S/D setup for dosing alternative fuels



**Pic 2:** Pulverized rice husk is one of the alternative fuels dosed at Arabian Cement in Egypt



**Pic 3:** The red rotor weighfeeder Pfister® TRW-S/D is designed to dose up to 12 t/h of alternative fuels at Arabian Cement



**Pic 4:** Rotor weighfeeder Pfister® TRW-S/D installation with the intermediate storage above



**Pic 5:** Adel Ezzat, Alternative Fuel Manager at Arabian Cement shows the FLSmidth Pfister installation for dosing alternative fuels at the cement plant in Ramliya, Egypt



# ALTERNATIVE FUELS AND RELATED TECHNOLOGY

By: Amr A. Nader, SMART Systems for Factories Operation & Maintenance Ltd./ Jordan

## Executive Summary

**Utilization of Alternative fuels is a strategic need from a business unit (EXCOM) perspective to attain a competitive edge by cost reduction and social contribution by contribution to country waste management program through industrial ecology as well as attain a diverse fuel (thermal energy) portfolio.**

### Utilization of alternative fuels in MENA and GCC is driven by several factors:

1. The oil prices situation; the drop in oil prices is driving oil rich countries to burn less and process more to sustain incomes at current oil production volumes consequently tighter fuel subsidization and distribution policies is applied on thermal energy hungry industries mainly cement industries; as fuel going for power generation is regulated by other social factors.
2. The current global economic scenario is imposing budget cuts everywhere and thus cement utilization rates is dropping consequently most countries in these regions are at low market demand scenario that consequently requires adapting production units to further optimized operation modes with strict cost optimization policies.
3. For non-oil countries the above two factors are coupled together exponentially forcing cement business to a fierce optimized scenario from both energy and cost aspects; and thus being further aggressive on solid fuel shifting as well as alternative fuel utilization and they are also hit by limited CAPEX and shorter business cycles (three years paybacks).

### From a plant perspective; technically speaking maximizing alternative fuels utilization is a challenge stemming from the following reasons:

1. Sourcing: in most of MENA and GCC countries the waste management market is premature and thus sourcing of alternative fuels in sustainable quantities or controlled qualities is not an easy job.
2. Fuel flexibility: most of the plants in these regions (with some exceptions like Morocco, UAE and partially Jordan and Egypt) are highly dependent on easy classical and currently expensive fuels namely HFO and NG, though some countries are in good state of solid fuel utilization (UAE, Morocco and Jordan); thus most plants lacks the technology and/or knowhow to maximize the utilization of alternative fuels.
3. Environmental regulations: in most countries in MENA and GCC the environmental regulations have outpitched the industry and thus adapting the plant on a further complex fuel mix while maintaining environmental "Emission" regulations is considered a threat by many; in another scenario the environmental regulations is not well developed to meet the industrial needs and thus issuing a confident EIA adaptation and getting it approved to put the plant in a safe legal situation is not easy.
4. Social: in some of the countries in the region utilization of alternative fuels "waste" at a cement plant is considered a social threat from the community health perspective and consequently a bad publicity for the company and most business units overlook the importance of a proper communication plan to educate the community as a vital part of Alternative fuel utilization policy.

Nevertheless alternative fuel utilization is happening in MENA and GCC and will grow further driven by the strategic need; what it currently lacks is that business units have to change mind set of dealing with alternative fuels from "Cheap Waste Firing" to "Strategic Industrial Ecology Waste Management".

The document will cover the latest concept with focus on technical and technological related aspects in the following Manner:

# ALTERNATIVE FUELS

- Strategy
- SMART Fuel Flexibility Concept
- Competitive Edge Technologies:
  - o CFD – Physical Modelling
  - o Burners Design
  - o Expert Control
  - o Thermal Imaging
  - o AF handling system

## Oil Crisis

Oil prices has hit a six year low rounding below 50 USD/barrel for Brent



And Opec is maintaining volumes to secure market share adding further pressures on the prices as well sanctions lifting off Iran will add around 1M barrels a day and thus extra diluted market in addition to shale oil and thus a dim market forecast is expected till at least 2016.

All rich gulf state are suffering budget deficits and consequently cut down on mega projects; resulting in low market scenario for the cement industry in most of Middle east and north Africa.

The political situation in some of the region countries has also shed its impact on the cement market as in

the case of Egypt (low and unstable urban development, energy crisis and subsidization cut offs).

The above resulted in a major changes on the cement industry business unit management approaches forcing all players for:

1. Plant adaptation to low market scenario
2. Fuel shift to solid and alternative fuels
3. Strict energy Management policies
4. Strict capital management policies

In addition to the economic and political factors; social factors after the arab spring is reshaping environmental and waste management regulations in most of the region contries adding another dimension to the situation:

5. Strict Environmental and Safety policies.

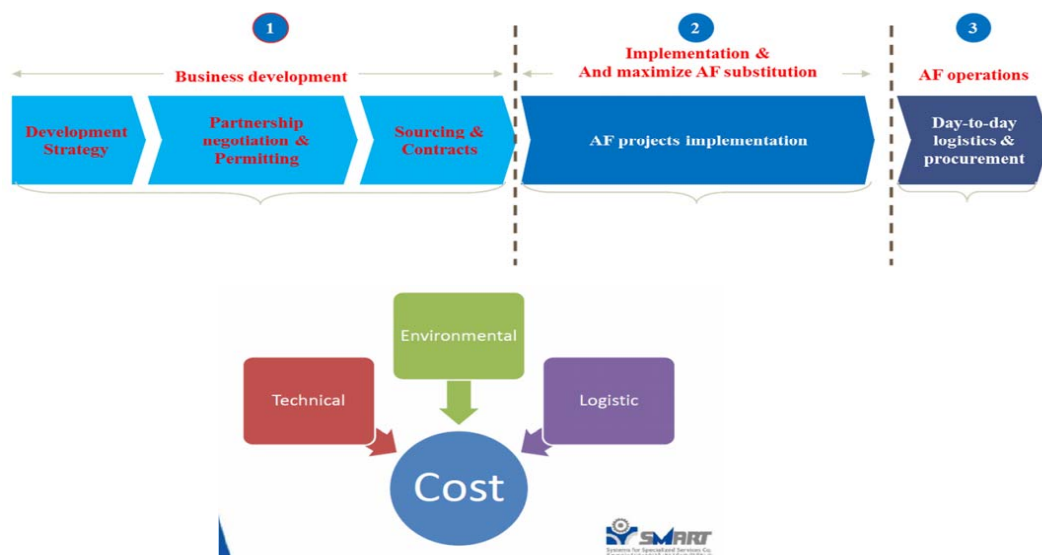
In light of the above most if not all the business units in the region are forced strategically to adopt a new operational methodology in all aspects; in thid document discussion will be focused on the energy related policies; specifically fuel mix and the utilization of Alternative fuels.

## Strategy

The strategy to make a successful maximum utilization of Alternative fuels; must cover the following aspects:

1. No thermal penalty
2. Pyro line in optimum specific heat consumption
3. No quality impacts on product
4. Sustainable BAP (best achieved performance) operations
5. Detailed study of the country waste market.

A successful project must cover both Alternative fuels and Alternative fuels with the following approach:



We consider Alternative Fuels & Raw Materials as a whole complementary activity to the cement core business.

We support setting up organization, developing technical competencies required for Waste Utilization in cement plants.

#### Technical Selection criteria:

1. Physical Characteristics:
  - Fluid Type (Solid, Liquid or Sludge).
  - Density/Viscosity/Size.
  - Flammability/Explosiveness.
2. Quality Assessment:
  - Calorific Value.
  - Volatile Components.
  - Heavy Metals.
  - Chemical Analysis.
- Feeding & Handling Arrangements:
  - Feeding Type (Mechanical/Pneumatic).
  - Intermediate Hoppers/Tanks.
- Firing Points:
  - Injection Point(s) location.
  - Injection Methodology.
- Operational Considerations.
  - Build Up Prevention Methodology.
  - Fuel Mix Management.
- Safety Considerations.
  - Equipment Design.
  - Health & Safety during operations.

Each of the above points requires excessive technical approach and detailed knowledge of the line as well as deep know how of Alternative fuels/raw materials segments as well combustion and material handling expertise.

#### **SMART Fuel Flexibility Concept**

The use of Alternative Fuels is one of the most important challenges we have in the Cement Division for several reasons. Saving the natural reserves of fuel is a key element of the Group's sustainable development principles. The use of Alternate fuel is also an important measure to reduce the CO<sub>2</sub> emissions.

Of course the economic reasons are very important. The use of cheap Alternative Fuels is one of our main levers to improve the performance of our plants; The gross savings due to a lower cost of fuels thanks to fuel flexibility is well identified. Part of this gross savings is offset by the cost of adverse effects on reliability, quality, or refractory. What is important is to get a net savings as close as possible to the gross savings and therefore to reduce the adverse effects impact at the minimum by good process mastery and by a well-adapted technology.

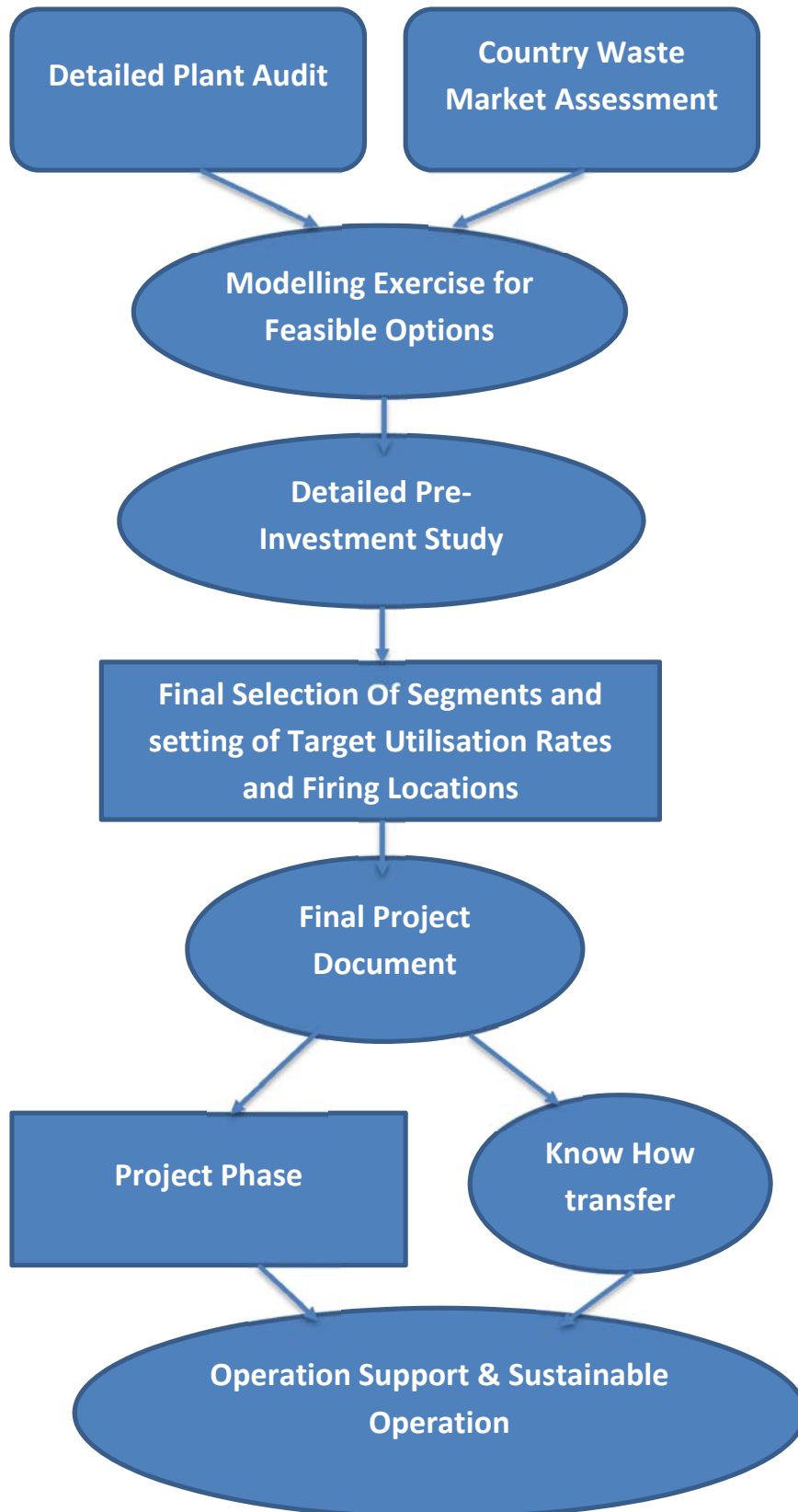
Fuel Flexibility; is the ability of a plant to maximize the utilization of Alternative fuels at Best Achieved Performance (BAP) thus without thermal or production penalty and at world class safety and environmental standard performance.

The main building blocks of the concept are:

1. Segmentation of available Alternative Fuels and Raw materials
2. Combustion Success Criteria
3. Very short and effective trials
4. Optimum handling and storage
5. Fire, Explosion and Health risks and mitigation
6. Capital investment efficiency and shortest payback period

**SMART strategy is built upon a detailed understanding of the plant through a full detailed audit, coupled with a detailed study of the country waste availability and management maturity; followed up by a detailed modeling exercise for feasible options augmented with a detailed pre investment study; upon this study in coordination with the business unit team final selection is made to which segments are going to be used and where exactly they are fired at estimated quantities; this step is followed by a final project document that includes final design, equipment and investment budget upon sign off this document; project phase starts in parallel know how transfer for the project team starts so the plant team is ready to operate upon project finalization; after project finalization we stay with the client till achieving the target substitution rates at optimal operation performance; we also offer logistic support to our client to ensure efficient waste contracting for long sustainable operations.**

**Schematic SMART Fuel Flexibility Concept Competitive Edge Technologies**



**Competitive Edge Technologies**

In SMART we have several competitive edge technologies in partnership with our world class partners; mainly in the combustion and material handling technologies allowing us to offer:

1. Very short or no trials – Modeling; thus no time or capital loss as well as optimized operation and fast increase of utilization rates to reach maximum in record timings. (Partner – FCT)
2. Efficient fuel injection – airloft technology offers excellent dispersion of AF in the main fuel stream and thus offers high efficient burning without thermal losses even at very complex fuel mixes; also our multi-channel burners offers high efficient burning of very complex fuel mixes at high flexibility to change fuel mixes during operation. (Partner – FCT)
3. Optimal material handling - flexible combinations of pneumatic and mechanical fuel handling with accurate fuel splitters offers accurate dosing and maximizes quantities at high reliability as well as accuracy even for low quantities. (Chinese Partner and German Partner)

**Modeling:**

Through detailed process audit measurements we are able to produce three different types of models each have its use and advantages:

1. Physical Modeling – we use this type of modeling either to solve gas handling problems and/or for upgrading modernization of main equipment
2. Acid/Alkali Modeling – We use this type for burner design/modification as well insertion issues

**Physical & Mathematical Modeling:**

Features:

- Modeling gives an insight into the flames' interaction with the secondary air stream so the flame can be visualized inside the process
- Discover how the aerodynamics inside the process interacts with the flame and the effects on the plant's operation
- Report with video footage and includes technical drawings of the suggested modifications for direct implementation of the solution
- Improvement actions can be planned and installed during a scheduled shutdown, minimizing downtime and risk

**Benefits:**

- o Solve difficult combustion related problems of buildup, refractory or fuel consumption
  - o Reduced fuel consumption
  - o Longer refractory life
  - o Increased production and improved product quality
  - o Problem solve off-line without risk to plant or product quality
  - o Determine optimal burner position and operating parameters
3. CFD Modeling – We use this type for firing locations, Temperature Profiles as well as trial scenario modeling.

**Features:**

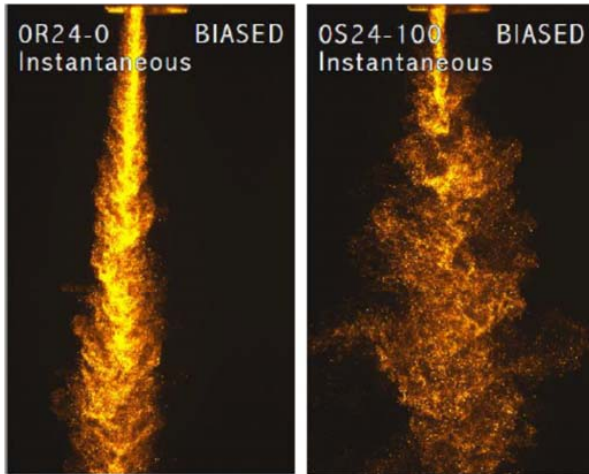
- Temperature profiles and heat flux inside the process are presented graphically
- Graphic representation of the flames interaction with the secondary air stream
- Concentrations of species can be followed inside the process, ie O<sub>2</sub>, CO, CO<sub>2</sub>, NO<sub>x</sub>, CaCO<sub>3</sub> etc
- Report with images generated and includes technical drawings of the suggested modifications for direct implementation of the solution
- Improvement actions can be planned and installed during a scheduled shutdown, minimizing downtime and risk

**Benefits:**

- Solve difficult combustion related problems of build-up, over temperature refractory or high fuel consumption
- Use during the design phase to validate the process geometry
- Problem solve off-line without risk to plant or product quality
- Reduce fuel consumption
- Increase refractory life
- Increase production
- Improve product quality
- Determine optimal burner position and operating parameters

## Air Loft Technology:

- New lofting technology to distribute solid particles of Alternate Fuel
- FCT Combustion's lofting air technology was named the Most Innovative Technology for alternative fuel use at the 7th Global Cemfuels Conference 2013.
- FCT Combustion's research has shown that lofting air increases the dispersion of the particles in the flame.
- Better dispersion means better combustion efficiency.



The use of FCT Combustion's Lofting air greatly improves fuel particle dispersion in to the air stream, right.

- Integrate larger proportions of waste solids with lofting air
- Combine solids, liquids, HFO or prime fuels in the one burner
- Heat flux is easily adjustable by using the primary air amount
- Increase the use of alternate fuels and save
- AF solids: Petcoke, RDF, rice husks, sewage sludge, etc
- AF liquids: Solvents, oils, etc
- Prime fuels: Coal, natural gas, HFO
- Increase operational flexibility



Turbu-Jet burner with large lofting air channel for solid alternate fuels

## Thermal Imaging:

### Purpose:

- Indirect assessment of refractory condition (Clinker Cooler –Kiln Hood –Cyclones –Risers– Other refractory lined equipment)
- In leakage Identification
- Equipment Inspections
- Cyclone / Riser Build-ups –Locations and severity

### Equipment:

- With Thermo-graphic instruments we can "see" infrared radiation on a standard television screen. The TV image can be videotaped or stored on a floppy disk to be later analyzed. Costly heat related problems caused by poor design, poor workmanship, or material failure in electrical/mechanical systems can be pinpointed.
- Thermo-graphic inspections have proven to be an indispensable predictive maintenance tool in providing positive evidence to solving heat related problems.
- The equipment used -Fluke Model Ti30 thermal imager.
- This is a lightweight portable imager that allows for capture and storage of up to fifty digital thermal images.
- These images can be downloaded to a PC much like those from a conventional digital camera.
- Dedicated software then allows the user to display the image in a number of different "views" for evaluation and reporting.



## Preventive cleaning System:

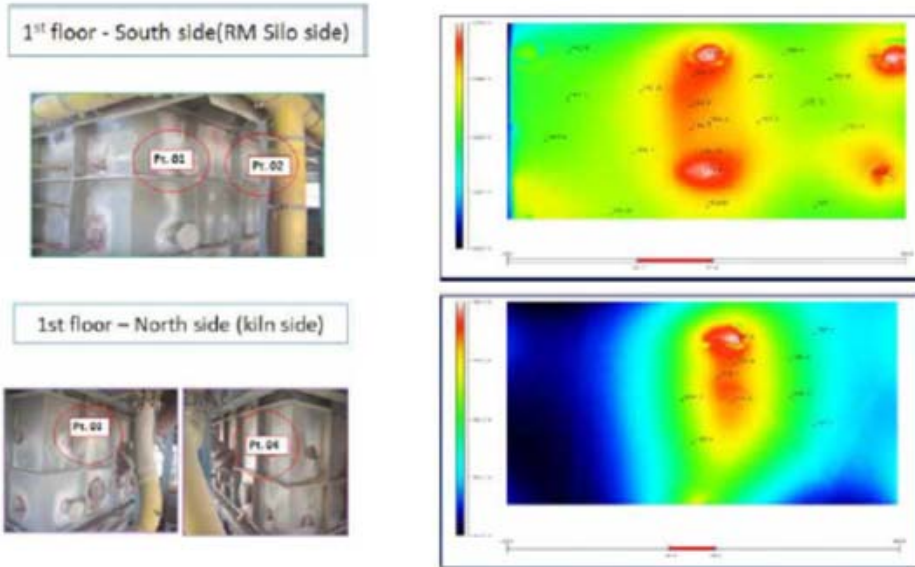
After detailed thermal imaging to the pyro line during operation we produce a build up risk map; that identifies all build up areas and potential build up locations.

We use this map to locate the required airchocks number and locations we install using 45° nozzles to create some swirl for cleaning air and we connect our system to PLC and create an automatic cleaning program that supports preventive cleaing system with elevated AF substitution with high alkali inputs.

Illustrative Example:



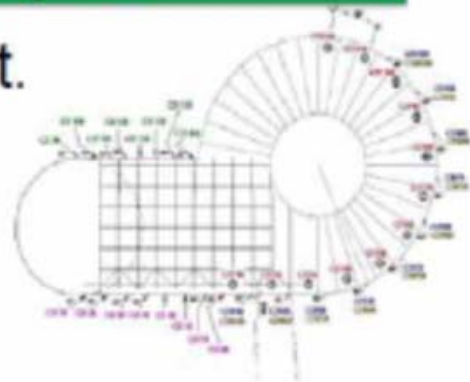
**Illustrative Example:**



**PH preventive cleaning project**

▪ **C5 Roof + Inlet gas duct.**

- Adopted proposal is totally accepted.



▪ **C5 cone + Meal pipe.**

- Currently Installed + proposed locations should be sufficient.



▪ **Riser duct.**

- Utilization of Water High pressure pump in automatic mode is the best solution for this area.

▪ **Operation of All installed preventive cleaning equipment should be in automatic sequential mode to ensure effectiveness**



# REDECAMGROUP



Holcim, Lebanon

Redecam offers highly engineered air pollution control (APC) solutions helping customers worldwide meet their air emission reduction targets rapidly and cost-effectively. Our track record is strong with over 2,000 projects in more than 85 countries and on every continent.

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*Our engineers constantly innovate to offer the best solutions possible. We have devices installed 25 years ago that still achieve the strictest emission requirements to prove it.*

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### Our comprehensive portfolio

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### Our flexibility

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### Our technical support and services

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For more information, or to discover how we can help you achieve your emissions reduction goals please visit [www.redecam.com](http://www.redecam.com) or scan this code:



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Our company has extensive experience improving the performance and reliability of existing solutions as well as designing, manufacturing, installing and commissioning new ones. Our expertise enables us to offer cost-effective solutions for reducing airborne emissions and extending the life of your plant while ensuring compliance with emissions regulations. Our solutions are assured, efficient and reliable.

Our **strength** is tailoring the right solution at the right price to **surpass** your expectations.

## OUR PRODUCTS

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- Bag Filters (baghouses)
- Electrostatic Precipitators
- Dual-Action Filters
- Extreme High Temperature Bag Filters
- Dual-Input Integrated Systems
- Cyclones
- Nuisance Filters

### GAS CONDITIONING

- Gas Conditioning Towers
- Gas-to-Air Heat Exchangers
- Water Injection Systems
- Mixing Chambers

### FLUE GAS TREATMENT

- DeNO<sub>x</sub>
  - Selective Catalytic Reduction (SCR)
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# Energy saving in pneumatic conveying systems with Coperion components

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## Energy saving in pneumatic conveying systems with Coperion components

Energy saving becomes a more and more important topic in the cement industry. The air supply (rotary piston blower/screw compressor) and the material feeding device into a pneumatic conveying system are the highest energy consumers in a pneumatic conveying system. Since many decades the screw pump and pressure vessels have been used as a material feeding system/airlock. New developments regarding the wear resistance surface of rotary valves enable now the successful use of rotary valves as an airlock in pneumatic conveying systems with very abrasive bulk materials and at high conveying pressures in the minerals industry.

### 1 General overview about a pneumatic conveying system

Pneumatic conveying systems have the following advantages for the transport of powder products in a cement plant:

- Flexible pipe routing
- Low space requirement
- Low maintenance expenses
- High operating reliability and operating safety
- Gas- and dust-tight towards atmosphere

Figure 1 gives an overview about the two main energy consumers in a pneumatic conveying system. The air supply system are either a rotary piston blower or a compressor, which can have - depending on the conveying capacity - motor sizes with several hundred kilowatts. A feeding device needs the energy for feeding the product in the pressurized conveying line. On a scale from the highest to the lowest energy consumption: The screw pump has the by far highest energy consumption, the energy consumption of a rotary valve is only one-tenth to a twentieth part of the energy consumption of a screw pump. The pressure vessel has nearly no energy consumption for feeding the material in the conveying line.

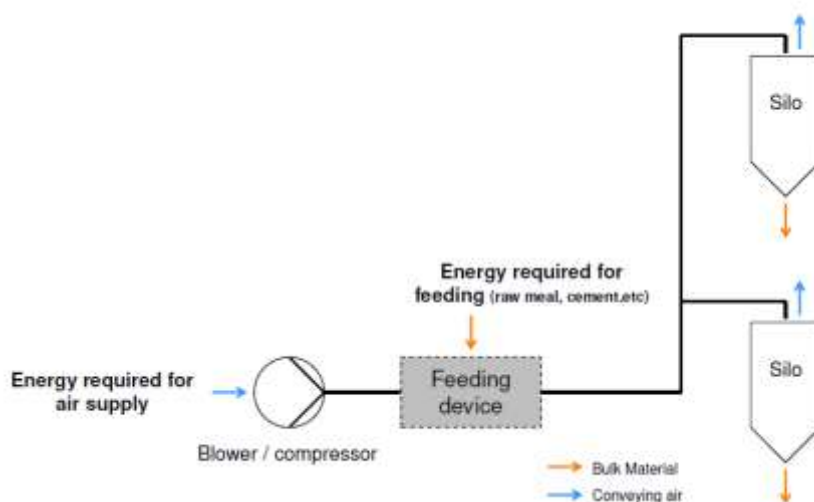


Figure 1: Components of a pneumatic conveying system

## 2 Description of previous feeding technologies in pneumatic conveying systems

Screw pumps and pressure vessels are the feeding technologies in the cement industry, which have been used for several decades in pneumatic conveying systems.

### 2.1 Screw pump

A screw pump works with the principle of bulk material compaction in a screw barrel to seal the upstream product feeding from the conveying air. In order to achieve the sealing in the screw barrel a minimum flood fed is necessary, which restricts the screw pump on the minimum conveying capacity. High rotational speed is necessary for the compaction of the bulk material by the screw barrel. This high rotational speed up to 1500 [rpm] and the abrasiveness of the conveying product generates wear in the screw barrel and regular maintenance is necessary. Screw pumps have a



Figure 2: Screw pump

high power requirement with motor sizes of 300 [kW] and sometimes even more. An average pressure drop in the screw pump is around 300 [mbar], which increases the energy consumption on the air supply equipment.

### 2.2 Pressure vessel

Pressure vessels as a feeding device can be executed as a single or twin vessel design. Figure 3 shows a twin vessel design. With a single pressure vessel the operation mode is discontinuous, due to the fact that there is a dead time for the filling of the pressure vessel. In addition to achieve the average conveying capacity a higher design capacity of the system is necessary to bridge the capacity loss due to the dead time for filling. This results in higher



Figure 3: Twin pressure vessel

investments for the system equipment especially air supply and pipe diameter. To overcome these disadvantages twin pressure vessels can be used to have a continuous conveying capacity. Normally pressure vessels need a high head room especially for higher conveying capacities. In addition all instrumentation and shut-off devices have to be integrated into the PLC. From energy consumption point of view the feeding device has a very low energy consumption, but the air supply equipment has a high energy consumption caused by the pressure losses in the pressure vessel and its extensive air supply and air distribution piping.

### 3 Rotary valves as a feeding device

Rotary valves are a proven technology as a feeding device into pneumatic conveying systems in different applications and in various industries.

#### 3.1 General function of a rotary valve

A rotary valve is a continuous rotating feeding device, which creates a barrier between non-pressure feeding side and the pressurized conveying line. Rotary valves have a very tight clearance between the housing and the rotor. Due to the small clearance very low leakage air will be released. There are two different types of rotary valves available on the market, which are applicable for pneumatic conveying systems. A drop through rotary valve (Figure 4) can be used for lower system pressure up to approximately 1 [bar] for grain and powder conveying products. For conveying pressures above 1 [bar] and high conveying capacities it is recommended to use a blow through rotary valve (Figure 5) which has a forced emptying of the pockets and a higher pressure rating especially for powders.

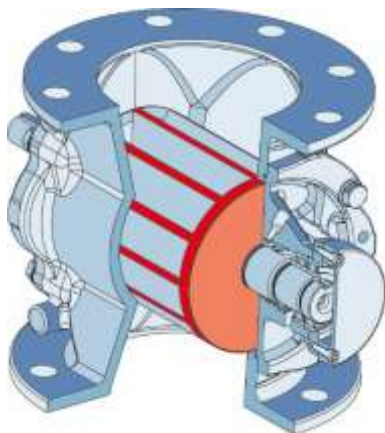


Figure 4: Drop through rotary valve

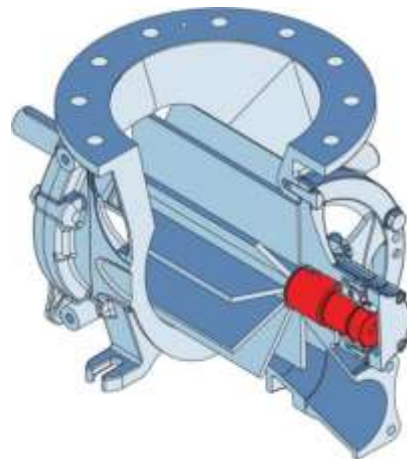


Figure 5: Blow through rotary valve

### 3.2 Advantages of the rotary valve

Rotary valves have various advantages compared to other feeding devices in pneumatic conveying systems. The most beneficial one is the energy saving, which will be described in the chapter 3.4. Table 1 gives an impression about the technical features and the advantages in the conveying system.

**Table 1: Overview technical advantages rotary valve and customer benefits**

Technical advantage	Customer benefit
Rotation speed < 30 [rpm]	Reduced wear due to low rotation speed of the rotor. This results in less maintenance and downtime costs with the positive effect on the operational expenditure costs.
Low gross weight	No requirement for special foundations or extensive steel structure which reduces the capital expenditure costs for a new conveying system. Easy to dismantle and to transport to workshop for maintenance.
Small size	All rotary valve feeding stations need limited head room which reduces the costs for civil structure e.g. secondary support structure of a silo Or upstream process (eg. Grinding)
Low pressure loss at around 50 [mbar] and low leakage air	Reduces the energy consumption of the air supply equipment. See also chapter 3.4.
Low power consumption of the drive motor < 8 [kw]	Significant reduction of the energy consumption of the drive system
Continuous feeding	No batch process which means smaller designed equipment to achieve the requested conveying capacity

### 3.3 Design features of a wear protected rotary valve

To develop rotary valves which can be used for the minerals industry with high wear Coperion has done an intensive research about how wear occurs in the rotary valve with different products like e.g. cement, petcoke, fly ash and raw meal in their own wear test facility in Weingarten, Germany. Based on these test results and feedback of many rotary valves in industry applications the following three drivers for wear in a rotary valve have been identified:

- particle shape
- particle size
- particle hardness



To overcome these drivers and to extend the lifetime of the rotary valve chrome, ceramic and tungsten carbide have been identified as the most appropriate wear protection materials. But not each conveying product has the same wear behavior, therefore Coperion has developed its DuroProtect® program, which has different levels of wear protection based on the conveying product and conveying pressure. All DuroProtect® levels are shown in the following Figure 6.

WEAR RESISTANCE CONCEPT AVAILABLE IN 5 LEVELS FOR ROTARY VALVES FOR POWDERS

Wear resistance level	Standard	DUROPROTECT® 1	DUROPROTECT® 2	DUROPROTECT® 3	DUROPROTECT® 4	DUROPROTECT® 5
Housing	Cast iron	DUROCHROM®	DUROCHROM®	DUROCHROM®	DUROCHROM®	DUROCERA®
Rotor	D-rotor mild steel	D-rotor mild steel	C-rotor mild steel	C-rotor DUROCHROM®	C-rotor DUROCARB®	C-rotor DUROCARB®
Abrasiveness/ pressure difference						
	Low					High

Figure 6: Coperion DuroProtect® wear resistance concept

In order to ensure a long lifetime of the rotary valve and to maintain the low energy consumption it is essential having a small gap between the housing and the rotor. For example cement conveying at higher conveying pressures requires a high wear protection of the rotor, which in this case will be done by a tungsten carbide welding on the tips and a chrome layer on the rotor blades as shown in Figure 8. In addition also the bore of the rotary valve housing needs a very hard surface which can be at the highest protection level a jointless assembled ceramic layer as displayed in the Figure 7.



Figure 7: Jointless assembled ceramic slats in the housing bore

Figure 8: Tungsten carbide welded rotor bore

### 3.4 Energy saving of the rotary valve

A rotary valve has different technical features which lead to energy saving. The features can be separated in direct savings attributed to the rotary valve itself and indirect savings due to the technical advantages of the rotary valve impacting the air supply system (blower/compressor).

- Drive motor with low kilowatt consumption (direct saving)
- Low leakage rate (indirect saving air supply)
- Low pressure drop (indirect saving air supply)

These technical features will be explained in the following chapter.

## Drive motor

Rotary valves have very small drive motors, e.g. the motor of a rotary valve capable to convey more than 200 [t/h] of cement has not more than 8 [kW]. No compression is taking place in a rotary valve. The drive motor needs only the power to rotate the rotor with the filled pockets. Where ever possible a direct drive as a positive impact on the investment costs and reduces the maintenance costs compared to a chain drive.



Figure 9: Comparison motor size screw pump vs. rotary valve

## Low leakage air rate

Minimal clearances between the housing and the rotor avoid high leakage rates from the conveying system. Low leakage

air rates have directly an impact on the power consumption of the air supply due to the fact that required airflow will be reduced. The Coperion DuroProtect® product line assures with its wear protection that these gaps will be maintained for a long time which will result in a long term energy saving, high plant availability and low maintenance costs.

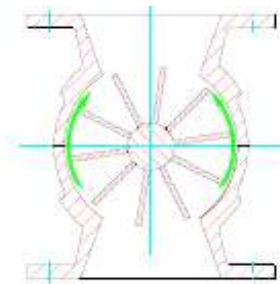
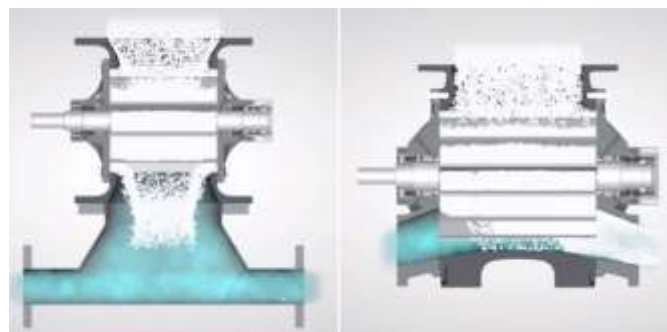


Figure 10: Gaps in a rotary valve

## Pressure drop

Rotary valves have a straight pick-up situation and now bends, nozzles or other interiors which lead to a significant pressure drop in the feeding system. The Figure 11 shows a section of a drop and blow through rotary valve, with a straight channel from the clean air side to the pick-up point and



the exit of the rotary valve. The low pressure drop of around 50 [mbar]

Figure 11: Section of a drop and blow through rotary valve

compared to other technologies, which have a pressure drop up to 300 [mbar], reduces the power consumption of the air supply. With a change of the gear box or the belt drive between the blower stage and the motor these savings can be utilized.

#### 4 Application of special diverter valves in the pneumatic conveying system

Beside the rotary valves of the DuroProtect® Coperion has developed special diverter valves for all kinds of powders in a cement plant. One diverter valve is the two channel diverter valve WZK and the other one is the one channel diverter valve WRK (see also Figure 13 and Figure 12). The WZK diverter valve has different levels of wear protection like stainless steel, hardened steel, tungsten carbide and up to ceramic pipe inserts. Whereas in the WRK the conveyed bulk material impacts on a layer of the bulk material built up in the bend of the valve (and by implication protecting the valve itself). This means the rotating part in the diverter valve will be protected by a product layer to avoid wear on the housing and the rotating part. Both diverter valve can be maintained in an installed position for e.g. on a silo and the replacement of wear and tear parts can be done in less than one hour. Regarding energy saving both diverter valves are designed in a way to have a low pressure drop which has a positive impact of the power consumption of the air supply.

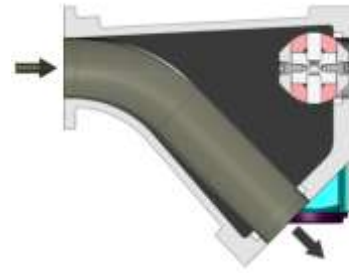


Figure 13: WRK with product layer

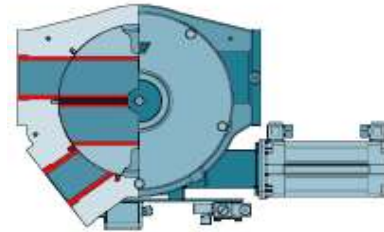


Figure 12: WZK with pipe insert

#### 5 Energy saving application and case studies in a cement plant

##### 5.1 Typical application and case studies in a cement plant

A typical cement plant has several pneumatic conveying systems to handle powders for different applications. The marked areas of the flow sheet in the Figure 14 shows the areas where energy savings can be generated by the application of Coperion rotary valves.

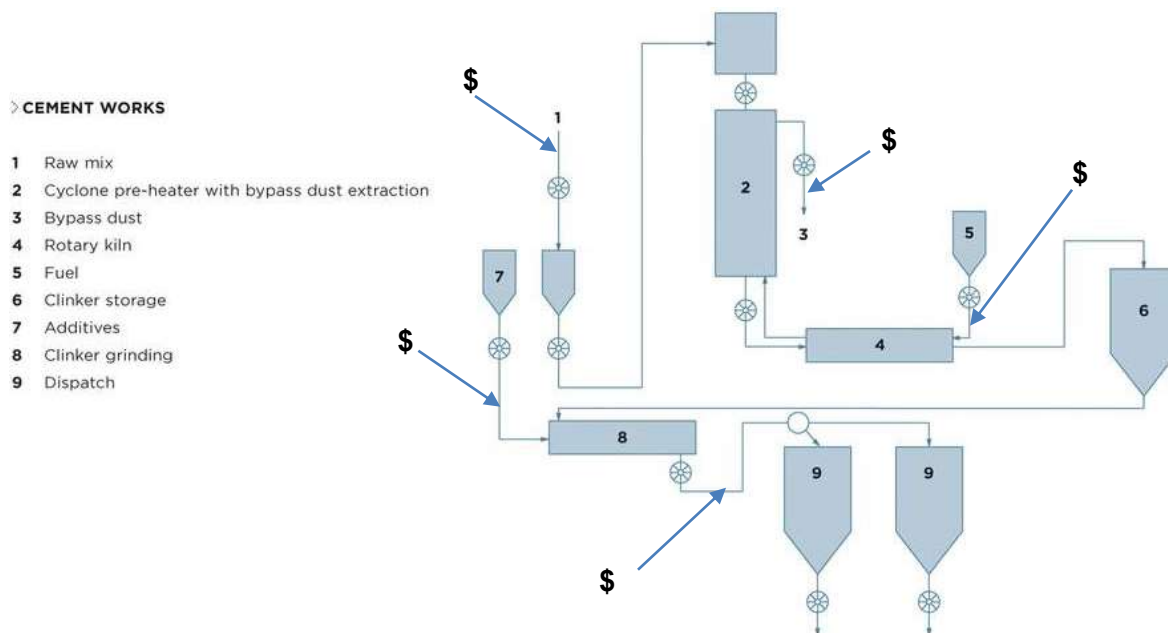


Figure 14: Pneumatic conveying systems and components in a cement plant

## 5.2 Case studies

Following case studies show several projects which Coperion has executed in the cement industry regarding the reduction of energy and maintenance costs in the cement industry.

### Case study - cement conveying after the finish mill (Location: Italy)

In this cement plant the rotary valve ZRC 800 DuroProtect® 5 (ceramic and tungsten carbide wear protection, Figure 15) was installed below the finish mill. The original equipment was a screw pump with a power consumption of around 200 [kW] which has been reduced with the rotary valve to a 5,5 [kW] motor for a 150 [t/h] conveying capacity at around 1 [bar] conveying pressure. The break even for the investment costs was Q3 (see Figure 16) after the start-up of the rotary valve taking into consideration the energy and maintenance cost savings. After a successful test period of two years the customer has also replaced the second screw pump below the finish mill by a Coperion rotary valve.



Figure 15: Rotary valve after the finish mill

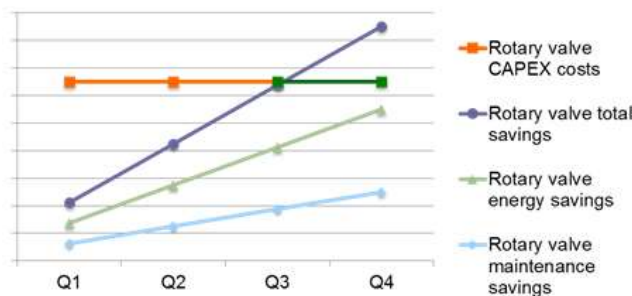


Figure 16: Payback graph of a screw pump replacement

### Case study - lignite conveying (Location: Germany)

At their cement plant "Walzbachtal", Germany, Opterra installed a new silo and conveying system for lignite. The feeding capacity is max. 6.000 [kg/h] at a conveying pressure of 0,5 [bar] (7 PSI). In order to implement an explosion barrier between the conveying system and the silo, Opterra chose a Coperion rotary valve ZXD 300 with DuroProtect® 3. DuroProtect® 3 features a closed end rotor and a chromium plating on the housing and rotor. This rotary valve accomplishes two functions: It serves as the feeding airlock for the conveying line and acts as an explosion barrier (protection system).



Figure 17: ZXD 300 DP 3 for lignite conveying (Source: Opterra)

The capital expenditure for this single conveying rotary valve solution was lower than the cost for overhauling the existing screw pump and also lower than the CAPEX for an explosion protection rotary valve required upstream of the screw pump. In addition, Opterra has achieved energy savings of more than 90% compared to the screw pump concept. Figure 17 shows the installation of the Coperion rotary valves ZXD 300 DP 3.

*Case study – fly ash and limestone handling (location: Germany)*

The cement plant had four screw pumps for the handling of fly ash and limestone in the grinding and mixing plant. Each of the screw pump had an energy consumption of around 100 [kW] for a conveying capacity of 50 [t/h] at around 1 [bar]. The applied rotary valve for the limestone is a ZRC 550 DuroProtect® 4 (chrome housing and tungsten carbide rotor) and for the fly ash handling a ZRC 550 DuroProtect® 5 (ceramic housing and tungsten carbide rotor).

Calculated with an energy price of around 0,8 US\$ /kWh and an operation time of 8000 h/year the annual power savings are around 240.000 US\$ per year.



Figure 18: Fly ash rotary valve

### 5.3 Reference companies

Coperion has supplied rotary and diverter valves worldwide to different customers like e.g. HolcimLafarge, Opterra, Heidelberg Zement, Italcementi, BuzziUnicem, Dyckerhoff, Monarch Cement and many more.

## 6 Coperion energy saving at a glance

New wear protection technologies and their application in rotary valves are offering new opportunities to reduce the energy consumption in a pneumatic conveying. This by direct effects (the comparably very low rotary valve power consumption of rotary valves) and indirect savings in the air supply system. It has been proven in different applications that this rotary valve technology DUROPROTECT® works reliable and guarantees a high plant availability. Beside the components itself Coperion has a strong competence in the design and supply of complete energy efficient pneumatic conveying systems for all powder and grain products in a cement plant. The service range covers energy saving studies up to lump sum turnkey pneumatic conveying systems.

### **Contact :**

Coperion GmbH  
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88250 Weingarten  
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**e-mail: [cwg-components@coperion.com](mailto:cwg-components@coperion.com)**

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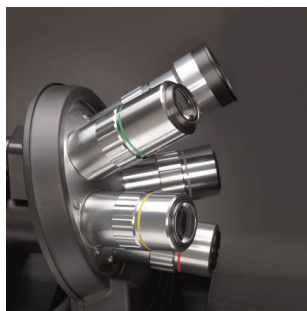
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Optimal wet dispersion

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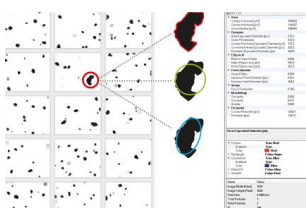
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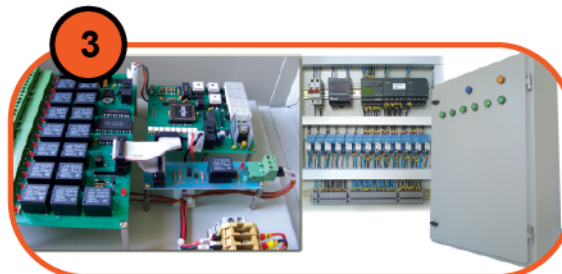
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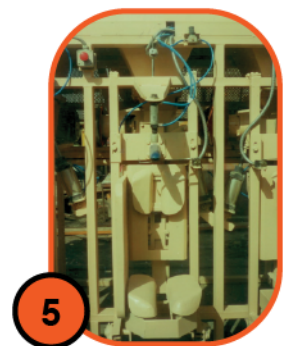
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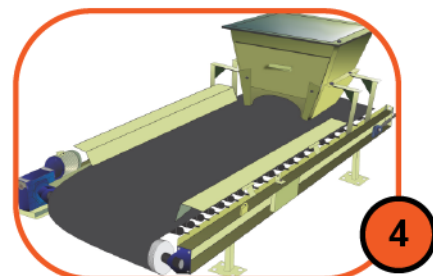


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### **Background information:**

Simatic HMI Mobile Panels of the second generation have a rugged industrial design that can withstand a drop of up to 1.2 meters, and have the same functionality and performance as Simatic HMI Comfort Panels. Operating screens can thus be configured for both stationary and mobile applications, and then, for example, supplemented with mobile specifications. The widescreen format display delivers a pin-sharp, bright, detailed image. It can be fully dimmed for adaptation to different environments.

The emergency stop button is only lit when the mobile operator panel is linked into a safety circuit. The compact connection box requires only one third of the space of the previous model, and can be mounted directly on a control cabinet. This is a particular

advantage for small machines with very little available space. The connection box is simply screwed onto the outside of the control cabinet door, and then fully wired from the inside. Rugged connection cables are available in lengths ranging from 2 to 25 meters so that the user can always have adequate freedom of movement.

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Comos Mobile Solutions Version 2.0 affords all project stakeholders fast, simple access to plant information of relevance for them at any time using web-based services and mobile terminals such as a tablet. With its Comos Mobile Solutions product family, Siemens supports globally networked collaboration for plant projects throughout the process industry along the entire value chain – anytime and anywhere.

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The new, rugged Simatic Ex OG panel PC is designed for use in the chemicals, oil and gas industries. The new panel PC has the high IP66 degree of protection throughout, and is designed for use in temperatures ranging from minus 40 to plus 65 degrees. It is suitable for use in hazardous zones 1/ 21 and 2 /22. The new Simatic Ex OG panel PC is available in versions with either a 4:3 format 15-inch or a 16:9 format 22-inch display. The capacitive, multitouch glass display with automatic brightness regulation is reflection-free, even under direct sunlight. It is easy to operate, even when wearing thin gloves. The industrial PC has a fast Intel Core i7 processor, an eight gigabyte memory, and a 300 GB SSD (solid-state drive). The Simatic Ex OG panel PC can be configured with a support arm, or with a

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Siemens launches devices for operator control and monitoring in special environments. The new monitors and panel PCs are suitable for use in hygienic production areas, such as in the food industry, and also meet the requirements of the chemical, oil and gas industries.

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**“What is good for Man is also good for business”**

**Sacmi publishes its first Sustainability Report, a development of the previous Social Report. Chairman Mongardi: “We have continued to create value for the local area, whilst prioritizing the environment and security, the stability and quality of the workforce, local suppliers and long-term partnerships.”**

A shared style of life but also a market requirement. In one word, “reputation”. This is the corporate responsibility of a business according to Sacmi, which has been clearly set out in the cooperative’s 13th Social Report, which for the first time since 2003 shall be entitled the “Sustainability Report”.

“All reports and statements serve to render account of the capacity to create value” explains Sacmi’s Chairman, Paolo Mongardi, “but the Sustainability Report enables us to better specify the nature and methods of our work: the creation of socially responsible and sustainable value, in terms of economic stability, the environment and human relations”.

Here are some of the main points set out in the report regarding the financial year 2014 and recently presented to the Shareholders’ Meeting, starting with the figures regarding the parent company, Sacmi Imola, which with earnings of 868 million euro and 141 million euro of added value produced for the benefit of stakeholders, has continued to grow, and in turn has contributed towards the growth of the local area and has given importance to a stable, qualified workforce. “With a workforce of 1,085 at the Imola premises, almost all of whom are from the local area, and with 120 new people hired since 2011 – Mongardi explains – we continue to guarantee a good level of employment”. This strong position derives from the enhancement of skills, the quality of work, relations with Shareholders, customers and suppliers (Sacmi acquires over 70% of materials from its own region, giving priority to the local area and to local companies): these concepts have been impressed in the cooperative’s very DNA since its foundation, and in view of a commonly shared degree of corporate responsibility, and in keeping with the new social, institutional and international consciousness, they are now accompanied by measures designed to

monitor and manage environmental, security and regulatory risks.

In addition to environmental certification and an internal organizational model compliant with the provisions of Italian Law 231/ 2001 – which basically establishes the liability of individuals in regard to that of the company – Sacmi has also introduced quality certificates (ISO 9001) and more than 400 man-days (figure for 2014) for the designing and testing of technological and plant solutions at customers’ premises. The company’s business activities are supported by substantial investment in R&D, and by more than 220 special technicians, with 77 new patents filed last year alone. “Basically – Mongardi points out – we target quality in terms of both machines and services, and we aim to reach our targets through the sustainability of resources and human relations. We see sustainability as the driver of a process of constant improvement guaranteeing results over the course of time, and the strengthening of the company’s financial performance and business reputation”.

Furthermore, there have been more than five thousand hours training regarding health and safety provided in a year, a total of 565,000 euro invested in safety at work, together with the OHSAS 18001 certification, various company checks, 14,700 hours of training for employees, in addition to those projects developed for local schools and universities, and for the training of young people. “Sustainability - Sacmi’s Chairman notes – is a style of life that also becomes a requirement of the market and of investors, and must therefore guide our investment decisions and our strategic prospects in the future as well, because we are convinced that what is good for Man is also good for business”.

As a summary and topical rendering of the cooperative spirit of its origins, Sacmi offers this Sustainability



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Report not only to the Group's stakeholders, but also to the Italian cooperative movement as a whole, the validity and vitality of which are shown by good practice, a positive model that has enhanced the local area, to be proposed and exported to international markets. "We would like this instrument – Mongardi concludes – to increasingly represent our capacity to combine productive efficiency and sustainable development, by presenting ourselves as a company based on a sound cooperative business culture at a complicated time like the present".

This, moreover, is the significance of a 2014 that witnessed the celebration of the 95th anniversary of the

cooperative's foundation, during the special open day for all the town's citizens, which was attended by at least 4,000 people who visited the company's plant and the Sacmi Museum. In addition, various meetings and discussions were held regarding pro-active employment policies and successful business experiences – such as that of the Olivetti company – that laid the foundations for the "Italian economic miracle" and that today, more than ever before, need to become the focal point of political and economic action once again.

[www.sacmi.com](http://www.sacmi.com)

## MPH 200<sup>2</sup>: Sacmi's 'Green Runner'

The first SACMI PM press for powder metal compaction was presented at CERAMITEC 2009. Now, six years later, SACMI is taking its second-generation press, the truly innovative MPH200<sup>2</sup>, to CERAMITEC 2015.

Despite having entered the PM market only this last decade, SACMI has already established itself as a major player in the supply of PM equipment: over the last three years, in fact, more than 40 units have successfully been commissioned in 10 different countries on 4 continents, all of them efficiently served by the SACMI GROUP's many local branches.

This machine combines all the SACMI PM Division's hard work - investment, know-how development and partnerships with academia/industry - and aims to set a new standard for PM hydraulic pressing technology. The meticulous attention SACMI always puts into energy saving and environmental sustainability has been taken a step further thanks to an innovative hydraulic circuit that provides lower energy consumption, with reductions in the order of 15 - 40 % depending on production conditions.

The core of the circuit consists of two closed-loop controlled pressure lines fed by variable-speed drives and fixed-displacement pumps. These are activated automatically according to the real needs of the set pressing cycle and ensure that, whatever the production scenario, energy consumption is minimised.

Finally the unparalleled performance provided by the new hydraulic design of the MPH200<sup>2</sup> offers potential speed gains of up to 50% without losing energy efficiency.

In addition to renewed mechanical and hydraulic systems, the other outstanding innovation on show at CERAMITEC will be the new computer-aided programming system; the MPH200<sup>2</sup> will, in fact, feature an Assisted Programming Interface (API). The latter allows operators all over the world to set program parameters easily: all they have to do is enter, via the graphical interface, a few geometrical characteristics of the piece to be pressed and cross-check the results with a user-friendly cycle simulator before pressing any real pieces.

[www.sacmi.com](http://www.sacmi.com)



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**INTERCEM Amman**

Date : 14 - 16 March 2016

Venue: Le Méridien Amman, Amman, Jordan

For more information please visit:

**www.intercem.com**

**8<sup>th</sup> Africa Cement Trade Summit**

Date : 15 - 16 March 2016

Venue: Kigali, Rwanda

For more information please visit:

**www.cmtevents.com**

Global CemCoal

**1<sup>st</sup> Global CemCoal Conference on coal for cement and lime**

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For more information please contact:

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**Tel: +44 1372 743837**

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For more information please visit:

**www.CemCoal.com**

**Middle East & Africa Summit 2016**

Date : 04 - 05 April 2016

Venue: Dubai, UAE

For more information please contact:

GMI Global

**sales@gmiforum.com**

**Argus Mediterranean Solid Fuels 2016**

Date : 04 - 06 May 2016

Venue: Rome, Italy

For more information please contact:

Ms Anita Agyeman, Conference Marketing Manager – Europe & Africa

**Email: anita.agyeman@argusmedia.com**

**3<sup>rd</sup> Global Cement EnviroCem Conference on Environmental Technology for Cement & Lime**

Date : 10 - 11 May 2016

Venue: London, UK

For more information please contact:

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For more information please visit:

**www.globalcement.com**

**2016 China International Cement Industry Exhibition**

Date : 12 - 14 May 2016

Venue: Nanjing, China

For more information please contact:

Miss Elaine JIN

**Tel: 8610 88083329**

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For more information please visit:

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**11<sup>th</sup> Global Slag Conference, Exhibition & Awards 2015**

Date : 24 - 25 May 2016

Venue: the Radisson Blu Edwardian, London, UK

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For more information please visit:

**www.GlobalSlag.com**

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Date : November 2016

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For more information please visit:

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**27<sup>th</sup> International Conference and Exhibition, "BusinessCem Sochi 2016"**

Date : 06 - 08 June 2016

Venue: Radisson Blu Paradise Resort & Spa, Sochi, Russia

For more information please contact:

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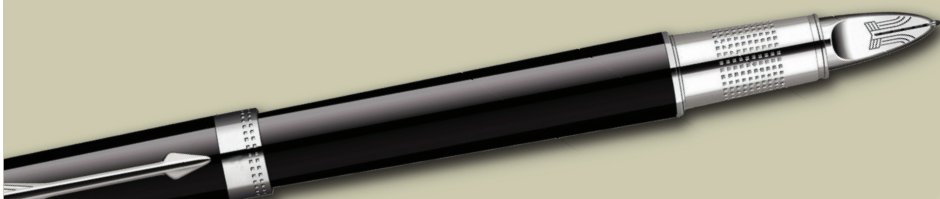
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**<http://www.glasstone.pl/en/>**

**Istanbul Glass Expo 2016**

Date: 09 - 12 March 2016

Venue: Istanbul, Turkey

**Tel: 90 212 867 11 00**

**Fax: 90 212 886 67 48**

For more information, please visit:

**<http://www.glassexpoistanbul.com>**

**24th International Congress on Glass**

Date: 07 - 11 April 2016

Venue: Shanghai, China

For more information, please visit:

**<http://www.icg2016shanghai.com/dct/page/1>**

**China Glass 2016 – The 27th China Glass Expo 2016**

Date: 11 - 14 April 2016

Venue: Shanghai New International Expo Centre (SNIEC), China

For more information, please contact:

The Chinese Ceramic Society (CCS)

Mr. Joe ZHOU; Mr. Jie LIU

**Email: [ceramsoc@163.com](mailto:ceramsoc@163.com)**

**Tel.: +86 10 5781 12601409/**

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**[http://www.chinaexhibition.com/Official\\_Site/11-7876-China\\_Glass\\_2016\\_-\\_The\\_27th\\_China\\_Glass\\_Expo\\_2016.html](http://www.chinaexhibition.com/Official_Site/11-7876-China_Glass_2016_-_The_27th_China_Glass_Expo_2016.html)**

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**Ceramics Expo 2016**

Date: 26 - 28 April 2016

Venue: Cleveland, Ohio, USA

For more information, please contact:

Smarter Shows Ltd

Mr Adam Moore, Event Director

Email: [adam.moore@smartershows.com](mailto:adam.moore@smartershows.com)

Mr Sam Murray, Exhibition Manager

**Email: [sam.murray@smartershows.com](mailto:sam.murray@smartershows.com)**

**<http://www.ceramicsexpousa.com>**

**Glass & Aluminum Saudi Arabia 2016**

Date: 01 - 04 May 2016

Venue: Riyadh, Saudi Arabia

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Date: 06 - 09 June 2016

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For more information, please visit:

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Date: 08 - 11 June 2016

Venue: São Paulo, Brazil

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Date: 17 - 20 August 2016

Venue: Johannesburg, South Africa

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For more information, please visit:

**<http://glassexpo.interbuild.co.za/>**

**6<sup>th</sup> International Congress on Ceramics**

Date: 21 - 25 August 2016

Venue: Dresden, Germany

For more information, please visit:

**<http://www.icc-6.com/>**

**China Glasstec Expo - CGE 2016**

Date: 24 - 26 August 2016

Venue: Guangzhou, China

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**[http://demo5.yiersan.cn/wgctq\\_1715/en/](http://demo5.yiersan.cn/wgctq_1715/en/)**

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Date: 09 - 11 September 2016

Venue: Colombo, Sri Lanka

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**<http://lankaglass.net/>**

**GLASSTEC 2016**

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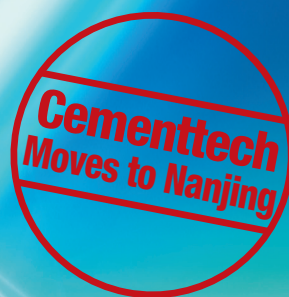
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Web: [www.cementtech.org](http://www.cementtech.org)

# CEMENTTECH

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**For more information please visit:**

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Venue: Havana, Cuba

For more information please visit:

**<http://glassonline.com/site/cubaglass>**

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Venue: Mumbai, India

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Date : 26 February 2016

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### **International Conference on Climate Change, Energy and Environment (ICCCEE2016)**

Date : 08 - 10 March 2016

Venue: London, United Kingdom

For more information please contact:

Mr Edna Duncan

**Email: [ednaduncan814@yahoo.com](mailto:ednaduncan814@yahoo.com)**

### **INTERCEM Amman**

Date : 14 - 16 March 2016

Venue: Amman, Jordan

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### **ISNR Abu Dhabi**

Date : 15 - 17 March 2016

Venue: Abu Dhabi, UAE

For more information please visit:

**[www.isnrabudhabi.com](http://www.isnrabudhabi.com)**

### **4<sup>th</sup> Annual Industrial Estates and Business Parks Conference**

Date : 16 - 17 March 2016

Venue: Singapore

For more information please contact:

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**Tel: +603 2775 0001**

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Date : 28 March - 08 April 2016  
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 Tel: +603 2771 1668  
 Email: workshop@confexhub.com  
 www.CICPD.education

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**Email: johnk@trueventus.com**

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Date : 11 - 17 April 2016  
 Venue: munich, Germany  
 For more information, please visit:  
<http://www.bauma.de>

**London Brownfield Summit**

Date : 13 - 14 April 2016  
 Venue: London, UK  
 For more information, please contact:  
 Mr. Steve Jones  
**Tel: +603 2775 0000 |**  
**Fax: +603 2775 0055**  
**Email: stevej@trueventus.com**

**POWTECH 2016**

Date : 19 - 21 April 2016  
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**Coking Coal Market in Russia 2016**

Date : 22 April 2016  
 Venue: Radisson Blu Paradise Resort & Spa, Sochi, Russia  
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 Ms Anna Sydorenko, Conference Director – Coal, Power, Freight Business-Forum  
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**Hannover Messe 2016**

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**Fax: +603 2775 0005**  
**Email: johnk@trueventus.com**

**6<sup>th</sup> Annual Shopping Malls**

Date : 6 - 7 April 2016  
 Venue: Singapore  
 For more information please contact:  
 Trueventus  
 Mr. John Karras  
**Tel: +603 2775 0001**  
**Fax: +603 2775 0005**  
**Email: johnk@trueventus.com**

**Added Value Facilities Management**

Date : 18 - 19 May 2016  
 Venue: Dubai, UAE  
 For more information please contact:  
**LE Lim on (65) 6825 9609**  
**Email: lelim@fdb.com.sg**  
 Or:  
**Tel: +65 6825 9609**  
**Email: grace@gf-intl.net**

**5<sup>th</sup> Annual Modular and Precast Construction**

Date : 25 - 26 May 2016  
 Venue: Bangkok, Thailand  
 For more information please contact:  
 Trueventus  
 Mr. John Karras  
**Tel: +603 2775 0001**  
**Fax: +603 2775 0005**  
**Email: johnk@trueventus.com**

**3<sup>rd</sup> Global EnviroCem Conference & Exhibition**

Date : 10 - 11 May 2016  
 Venue: London, UK  
 For more information please visit:  
[www.environmental-technology.com](http://www.environmental-technology.com)



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**39<sup>th</sup> YAPI - TURKEYBUILD ISTANBUL**

Date : 10 - 14 May 2016  
Venue: Istanbul, Turkey  
For more information please visit:  
[www.yapifuari.com.tr/eng](http://www.yapifuari.com.tr/eng)

**10<sup>th</sup> Erbil International Building-Construction, Municipality Equipment, Machinery & Natural Stone Exhibition**

Date : 12 - 15 May 2016  
Venue: Erbil, Iraq  
For more information please contact:  
Mr. Tarek ALAMER / Int'l Marketing Executive  
**Tel: +90 216 575 28 28 ext. 223**  
**Email: tarek.alamer@pyramidsfair.com**

**58<sup>th</sup> IEEE-IAS/PCA**

Date : 15 - 19 May 2016  
Venue: Dallas, USA  
Venue: Erbil, Iraq  
For more information please visit:  
[www.cementconference.org](http://www.cementconference.org)

**The First European and Mediterranean Structural Engineering and Construction Conference**

Date : 24 - 29 May 2016  
Venue: Istanbul, Turkey  
For more information please contact:  
ISEC Secretariat  
**Email: euro.med.sec@gmail.com**  
[www.isec-society.org/EURO\\_MED\\_SEC\\_01/](http://www.isec-society.org/EURO_MED_SEC_01/)

**2<sup>nd</sup> ICC Asia Conference on International Arbitration**

Date : 28 - 30 June 2016  
Venue: Hong Kong, China  
For more information please visit:  
[www.iccwbo.org](http://www.iccwbo.org)

**Added Value Facilities Management**

Date : 14 - 15 July 2016  
Venue: Singapore  
For more information please contact:  
**LE Lim on 65 6825 9609**  
**Email: lelim@fdb.com.sg**  
Or:  
**Tel: +65 6825 9609**  
**Email: grace@gf-intl.net**

**TECNO FACHADAS 2016**

Date : 21 - 24 September 2016  
Venue: São Paulo, Brazil  
For more information please visit:  
[www.fesqua.com.br](http://www.fesqua.com.br)

**Mediterranean Coal Markets 2016**

Date : 22 - 23 September 2016  
Venue: Istanbul, Turkey  
For more information, please contact:  
Ms Anna Sydorenko, Conference Director – Coal,  
Power, Freight

**Business-Forum**

**Tel/fax: +380 562 313 919**  
**Email: A.Sidorenko@b-forum.ru**  
[www.b-forum.com](http://www.b-forum.com)

**MSE 2016 – Materials Science and Engineering**

Date : 27 - 29 September 2016  
Venue: Darmstadt, Germany  
For more information please visit:  
[www.mse-congress.de](http://www.mse-congress.de)

**ILA General Assembly: international lime association**

Date : 11 - 14 October 2016  
Venue: Washington, USA  
**Email: ILA2016@icsevents.com**  
For more information please visit:  
[www.icsevents.com](http://www.icsevents.com)

**Erbil International Real Estate & Investment Exhibition**

Date : 26 - 29 October 2016  
Venue: Erbil, Iraq  
For more information please contact:  
Mr. Tarek ALAMER, Int'l Marketing Executive  
**Tel: +90 216 575 28 28 ext. 223**  
**Email: tarek.alamer@pyramidsfair.com**

**Gulf Safety Forum 2016**

Date : 30 - 31 October 2016  
Venue: Doha, Qatar  
For more information please contact:  
Euro Petroleum Consultants DMCC  
Office 21K, Gold Tower  
Jumeirah Lakes Towers,  
PO Box 625766, Dubai  
United Arab Emirates  
**Tel: +971 0 4 421 4642**  
**Email: office@europetro-me.com**  
[www.gulfsafetyforum.com](http://www.gulfsafetyforum.com)

**4<sup>th</sup> Latin American Drymix Mortar Conference**

Date : 6 November 2016  
Venue: Sao Paulo, Brazil  
For more information, please contact:  
Mr. Ferdinand Leopolder  
**Email: drymix-news@drymix.info**

**GLOBAL CEMENT IS PLEASED TO ANNOUNCE...**

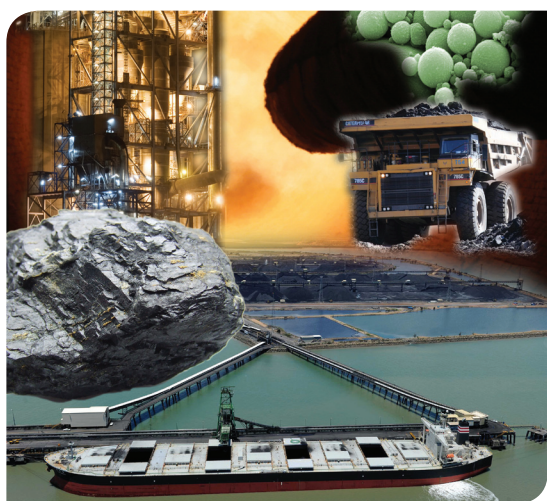
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**22-23 FEBRUARY  
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[www.CemFuels.com](http://www.CemFuels.com)



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The inaugural *Global CemCoal Conference* will bring together coal shippers and traders with coal buyers from the cement and lime industry, as well as providing a forum for coal and by-product users for information exchange, networking and business.

[www.CemCoal.com](http://www.CemCoal.com)

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[www.EnvironmentalTechnology.com](http://www.EnvironmentalTechnology.com)



**FOR ALL EVENTS...**

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[www.Cement-Events.com](http://www.Cement-Events.com)

**Exhibition enquiries:**

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