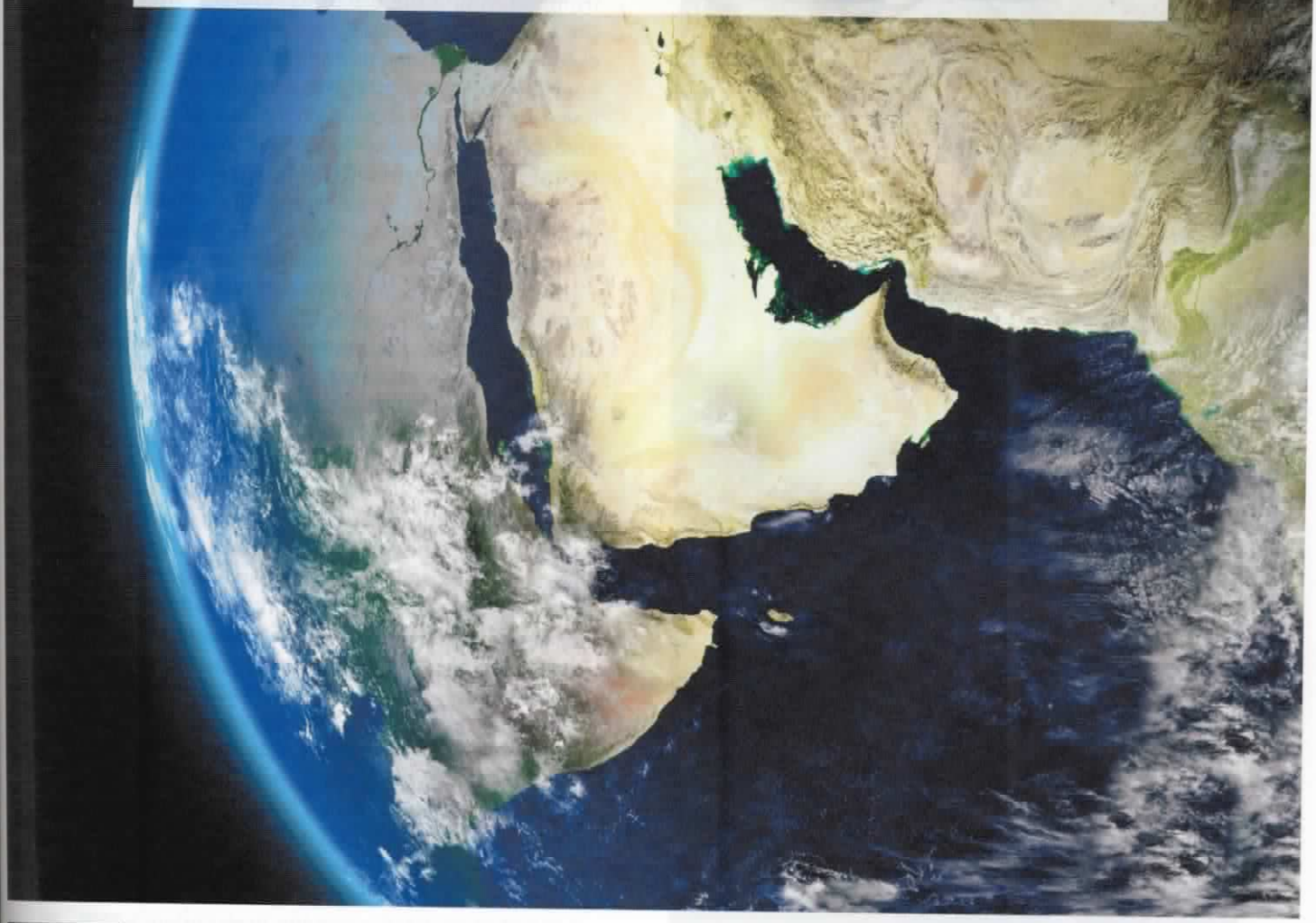
DIRK LECHTENBERG, MVW LECHTENBERG, GERMANY, TALKS THROUGH THE OUTLOOK AND DEVELOPMENT OF THE ALTERNATIVE FUELS AND RENEWABLE ENERGY MARKETS IN THE MENA REGION.

ALTERNATIVE FUELS IN THE ARAB WORLD



Introduction

Arab countries have a long history of subsidising energy (fossil fuels or electricity) for public consumption. In many resource-rich countries such as the Kingdom of Saudi Arabia, low energy prices are used as a tool 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?

More than 10 years ago, MVW Lechtenberg presented a paper on 'Alternative Fuels for the Cement Industry' at the Arab International Cement Conference. At that time, most of the participants could not understand how

Landfill in Egypt. *(Source: MVW.)*

Street site 'transfer station' for waste in Cairo, Egypt, 2014. *(Source: MVW.)*

waste-derived fuels could be used in a cement plant. Energy prices during this period were even lower than today, accompanied by high cement prices and required cement production capacities. A Libyan delegate, Rajab El Mahmoudi, noted: "You made a very interesting presentation, but maybe 10 years too early. However, this will be the future!"

In the Arab Human Development Report 'Energy Subsidies in the Arab World', published in 2012, the authors predicted the energy situation currently developing in some Arab countries, such as Egypt, Saudi Arabia and Tunisia.[1]

Energy subsidies, prices and the Arab Spring

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

Energy subsidies can also have severe implications, including insufficient access to food and healthy nutrition, education and basic health services, as well as a lack of energy access itself.[1] While energy subsidies constitute an important social safety net for the poor, they are regressive in nature as, 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.

The world – especially the Arab world – has changed dramatically since the Arab Spring, which forced governments to rethink their policies and actions for different reasons. The new Egyptian government is not able to continue the former policies for providing cheap energy, while in the Kingdom of Saudi Arabia the government is preparing the pathway for less oil exploration with lower environmental impact using more renewable energy.

Alternative fuels and renewable energy in the cement industry

Saudi Arabia

Under the patronage of HRH Prince Abdulaziz Ibn Salman, a 'mandatory energy efficiency programme' was developed to encourage the cement industry to reduce its use of fossil fuels and overall energy consumption. Currently, heavy fuel oil is supplied to the cement industry throughout the Kingdom at around US$35/t. These energy efficiency efforts are supported by the Kingdom's largest oil and gas company, Saudi Aramco, which produced an average of 11.4 million bpd of crude oil in 2014. Currently, one third of its overall energy production is consumed in the Kingdom, and it is estimated that by 2020 around 60% of overall energy production will be required to fulfill the local demand.

Renewable energy projects

Saudi cement manufacturers have already announced a number of renewable energy projects to reduce fossil fuel consumption and their dependence on Saudi Aramco's fuel supplies. Aramco's current fuel allocation situation would force these companies to use alternative fuels, as recently announced by Arabian Cement and City Cement Company. In 2014, the Ministry of Petroleum reduced the fuel supply for new production lines at Qassim Cement, Eastern Cement, Arabian Cement and City Cement.

City Cement has announced that it intends to invest US$6.7 million in a waste heat recovery project, following Najran Cement's US$45 million investment in 2014. Yanbu Cement was forced to shut down operations at its plant in 2011 due to fuel supply shortages from Aramco. These shortages are forcing cement producers throughout the country to begin investing in alternative fuel projects.

Meanwhile, the growing demand for cement in Saudi Arabia over the last few years has encouraged companies to expand operations in order to stay competitive and meet market requirements. The Saudi cement sector is expected to add approximately 23 million t of capacity over the next three years to meet this rise in domestic demand. The majority of capacity expansions are likely to enter the market in 2015.[2]

Egypt

Since July 2014, natural gas prices have increased by 30 – 70% for a range of industries in Egypt. Electricity prices have also risen, with a view to phasing the subsidy out completely over the next five years, according to an official announcement.[3]

Ashraf al Arabi, Egypt's Minister of Planning, was quoted in the *Shorouk Daily* on 5 July 2014 as stating: "In five years, fuel will be offered at 80% of its real cost to sections of the population that are deemed to need subsidies; the rest will pay market prices."

Waste sorting test by MVW, Cairo, 2014. ***(Source: MVW.)***

Handpicking – sorting of recyclables, Egypt, 2013. ***(Source: MVW.)***

The increases are intended to lead to savings of some US$6 billion in 2014, bringing down the fuel subsidy bill to US$14 billion, or 13% of state spending, according to the *Financial Times*.

Such announcements, accompanied by fuel shortages and stoppages, have forced the Egyptian cement industry to begin developing its use of renewable energies, such as wind and photovoltaic energy, and to increase its use of alternative fuels, such as biomass-derived fuels (agricultural waste: rice husks, rice straw, cotton stalks, etc.) and waste-derived fuels.

A number of international cement producers that operate in Arab countries have already started to implement refuse-derived fuels to comply with new company policies. Some plants, particularly in Morocco where there are no fuel subsidies and world market prices for coal or petcoke, have reached substitution rates of up to 50% by using locally produced refuse-derived fuels (tyres or hazardous wastes) or imported alternative fuels.

Tyre processing at a cement plant, Egypt.
(Source: MVW, 2012.)

There are two different approaches for alternative fuels procurement. The first procurement approach involves the purchase of alternative fuels that are readily collected and prepared by others (so that a cement company does not get involved in the processing of the fuels themselves). The second procurement method involves the collection and the preparation of alternative fuels by the cement manufacturer itself, to control its own supply chain. Cement manufacturers are either purchasing readymade alternative fuels, such as refuse-derived fuels and biomass, or investing in their own processing facilities.

Alternative fuel projects

Plants in Egypt, such as Cemex's Assiut unit, have been developing alternative fuel projects over a number of years, reaching up to 60% substitution rates. However, the majority of plants have just implemented (or are currently implementing) high capex investment in processing facilities, storage, dosing and feeding systems for alternative fuels. There is little operational experience of using alternative fuels in Egypt; however, the majority of cement companies operating in the country belong to international groups, which have experience elsewhere.

- Suez Cement's Katamehya plant opened a new RDF processing facility in the summer of 2014, with the capability of processing presorted municipal solid waste into refuse-derived fuels.
- Arabian Cement Company is currently implementing alternative fuels such as RDF, sewage sludge and biomass (resulting in a planned substitution rate of up to 12%) and has claimed to have achieved a CO_2 emission reduction of approximately 70 862 tpy, in line with the UNFCC's Clean Development Mechanism.[4]
- According to an article in *Cement Egypt*,[5] Lafarge Cement Company is currently using around 23 000 tpy of hazardous waste for its kiln no. 4. The hazardous waste is mainly composed of waste generated from the local petroleum and pharmaceutical industries. This beneficial utilisation of waste has been welcomed by the EEAA.
- Lafarge Cement has also invested in a solid shredded waste (RDF) fuel plant to utilise 72 000 tpy of RDF for its kiln no. 2. The RDF will be mainly composed of rejects from a waste sorting and baling plant. The company has also indicated that it is planning a further phase of its alternative fuel project, which will utilise some 120 000 tpy of rice straw fuel for kiln no. 1.[5]

Obstacles and challenges

The main obstacle facing Egyptian companies is the security of alternative fuel supplies, as legal requirements for contracting services such as waste collection and disposal are not yet developed in Egypt. Currently, under the supervision of the governorates, the Ministry of Environment is taking over these responsibilities in order to provide clear guidelines for such contracting, including environmental, economic and social issues. Furthermore, landfilling on mainly uncontrolled landfills is free of charge; therefore, no tipping or gate fees can be anticipated by RDF producers or cement plants.

Currently, the majority of waste collection is carried out by the informal sector, which removes all recyclable or valued materials so that only materials without a high calorific value (textiles, rubber, plastics, paper, etc.) are landfilled.

The composition of landfilled waste was evaluated in studies performed by MVW Lechtenberg in 2014. It was found that only 20 – 25% of the municipal solid waste can be used for further processing in refuse derived fuels. Furthermore, the chemical and physical parameters of the municipal solid waste were analysed. Containing a high moisture and ash content, the calorific value of such wastes is only 3000 – 3500 kcal (half that of coal). MVW Lechtenberg also calculated the economics of RDF production and the use of RDF in the cement industry. As mentioned previously, no gate or tipping fees for the waste can be charged to the municipalities or governorates. This means that the whole process of RDF production needs to be financed by the cement plants.

As high investments are also required for the development of infrastructure and necessary equipment, the processing cost per tonne of RDF is as high as €25 – 30/t (source: MVW database). With such high costs, the substitution of expensive and quickly available natural gas is a more strategic goal for the cement industry. MVW Lechtenberg developed a benchmark of RDF costs using a small scale so-called 'smart solution' and a sophisticated full-line RDF production facility compared to natural gas and coal. Both scenarios confirm a critical viability of RDF usage under the current energy prices (2014) and the high production cost of RDF.

The oil price drop

The Middle East is the most exposed region to volatility in global energy markets, and the region that can cause the most variation, as seen through Libya's production fluctuations. A sustained drop in the price of oil below US$50 per barrel could jeopardise the economic stability that many of the region's energy exporters have enjoyed following the tumult of the Arab Spring.[6]

Following an overcapacity in oil production (mainly derived to the shale oil production in the US), the leading OPEC producer Saudi Arabia dropped prices under the production costs of some oil producing countries. Coal prices steadily declined in the first few months of 2014 in response to a combination of increased supply and lower import demand from China. Following the oil price drop, coal prices are expected to decline further.

For this reason, it is anticipated that the majority of alternative fuel projects in the Arab countries will be postponed until the fossil fuel prices reach a pre-crisis level. This is particularly the case for Egypt, where all plants are now implementing coal-grinding facilities to switch from natural gas and heavy fuel oil to imported coal, meaning that the use of refuse-derived fuels will be hindered. So long as no gate or treatment fees are received by cement plants, the use of refuse-derived fuels will become uneconomic. However, being independent from world market prices for fossil fuels, there will still be some room for the development of alternative fuel projects. As Rajab El Mahmoudi noted, this may be a few years too early as fuel prices are too low, but it will be the future.

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