Let’s talk:

Rising to the climate challenge

Pablo Hofelich, CEO of thyssenkrupp Polysius GmbH, discusses conventional and innovative approaches to mitigating climate change from a supplier's perspective in an interview with International Cement Review.

In recent years, the cement industry has benefitted from a largely positive development in market demand while at the same time it had to deal with highly volatile energy prices and a great deal of uncertainty, including the COVID- 19 pandemic. Despite those difficult circumstances, the big cement companies have upped their efforts to produce cement with

considerably lower carbon emissions. Heidelberg Materials, for instance, has set itself the goal of reducing its specific net CO2 emissions to 400kg/t of cementitious material by 2030, while many large cement producers are aiming to achieve net zero emissions by 2050. Indeed, investors, governments and society as a whole have raised the bar for decarbonisation in the industry and are promoting it through increasingly strict regulations.

Pressure to decarbonize

ICR: What is your view of developments on the political front concerning the reduction of carbon emissions in different countries?

Pablo Hofelich (PH): The development of the political situation is highly dynamic and varies from region to region. For instance, look at the Inflation Reduction Act (IRA) of 2022 in the US. This subsidy package contains a price of US$85/t of sequestered CO2. This alone makes investments in a range of green technologies worthwhile.

Similarly, in the EU there is on the one side the EU Innovation Fund, in which the European Commission has announced it will be investing EUR1.8bn in multiple major projects in the area of clean technologies, including carbon capture and storage (CCS). This includes a range of cement projects. On the other hand, free CO2 certificates will be cut by half in 2030

and are planned to be phased out by 2034. In other regions there are also various incentives or, like in China, larger-scale infrastructure programmes with a focus on green technologies.

Overall, the topic is recognised globally and is being promoted at the political level, whether in the form of direct subsidies, the creation of additional demand or through carbon pricing. In my opinion, the political frameworks in North America and especially Europe are most advanced towards green regulations currently.

ICR: The COP27 Climate Change Conference took place in Egypt last year. What were the most important lessons learned from this meeting? What will it mean for cement manufacturers, in particular in the Middle East and Africa?

PH: The fact that the cement industry is responsible for around seven per cent of global CO2 emissions made the industry a topic at the COP27. Both the final resolutions and the general acceptance of the necessity of immediate action can be seen as positive. The speed of implementation will now be decisive. In general, it can be said that efforts for the decarbonisation of cement plants are picking up speed in the region, eg, with specific initiatives in Saudi Arabia and the UAE. I expect that COP27 is accelerating such and other initiatives further.

ICR: The next COP28 meeting will take place in the UAE in November 2023. Do you see a shift towards stricter emission regulations in the MENA region?

PH: The choice of venue alone shows that the region has understood the urgency of the situation and is demonstrating great interest in achieving sustainability goals. For instance, the region is working on the introduction of internationally accepted CO2 certificates, and not

only for the cement industry. According to government guidelines, Saudi Arabia intends to be CO2 neutral by 2060, while the UAE intends to reach the same goal by 2050. Both countries are already investing in circular economies and providing better financial conditions for sustainability projects. The high level of importance placed on the topics of emission regulations and decarbonisation in the MENA region is also apparent in the fact that recent cement conferences and trade fairs, for instance Cemtech MEA 2023 in Dubai, have been dominated by these topics.

Overall, I expect the MEA region to also continue to move towards the promotion of green cement. Similarly to other regions, this will take place in the form of direct subsidies, the creation of demand for green cements, or through some sort of carbon pricing.

ICR: How do you view the situation from the point of view of an equipment supplier? How has thyssenkrupp Polysius changed its approach to supply and service for the cement industry in light of the prioritisation of climate change mitigation?

PH: thyssenkrupp Polysius already recognised the enormous importance of decarbonising cement production years ago and invested in the development of “green” technologies. We see ourselves as a technological partner for our customers and decarbonisation as our industry’s biggest technological step for quite some time. To this end, we have further

increased our research spending and invest the vast majority of our research and development budget in green technologies.

We also made the conscious decision to retain the complete cement manufacturing process in our portfolio, including materials handling, raw grinding, thermal processing as well as cement grinding and automation solutions, as optimal technological solutions can only be found with consideration to the entire cement manufacturing process.

Traditional methods:conventional and proven measures

ICR: Which conventional or “proven” technologies can cement manufacturers now introduce to reduce their carbon footprint, and which have the biggest potential?

PH: Various factors can be leveraged to reduce the carbon footprint. Today, we already have a range of market-ready solutions at our disposal. One example of this is to increase the efficiency of existing plants. Based on analyses in the scope of audits and detailed scans, we are able to optimize plant operations. Furthermore, we provide various solutions to reduce the clinker factor. We are currently commissioning the industry’s first flash calciner activated clay plant. The carbon footprint of activated clay is around 4x less than conventional clinker production.

The polysius® booster mill also serves to reduce the clinker factor. An additional grinding stage enables particularly efficient fine grinding. Further potential is in the much quicker analysis of the clinker produced by our analysis tool, the polab® Cal. Solutions relating to the use of alternative fuels are particularly in demand currently. Whether waste-intensive pretreatment with the polflame® burner or waste-free pretreatment with the prepol® SC step combustor – our solutions enable the combustion of fuels directly in the calciner or in a separate combustion chamber and satisfy regional and customer-specific requirements.

> “...optimal technological solutions can only be found with consideration to the entire cement manufacturing process.”
>
> **Pablo Hofelich, CEO thyssenkrupp Polysius GmbH**

ICR: Are you seeing that cement manufacturers are using different solutions depending on their geographic location?

PH: It is clear that there is no one single standard solution. Instead, every solution is custom-tailored. The best one is derived from the sum of all factors at the respective location. Those variable factors include, for instance, the quality of the raw material, the availability of high-quality clays and alternative fuels, the prices of materials or transport costs. Current cement prices, demand and regulatory factors through political entities are of course also decisive.

On a global scale we are seeing both pure efficiency increases as well as demand for reducing the clinker factor. Clay is currently particular popular in places where limestone and other low-cost SCMs are not available. Alternative fuels are particularly dependent on the availability of a consistent raw material. These can vary from country to country.

Future methods: innovative and untried measures

ICR: Process-related emissions make up almost half of all CO2 emissions in the cement manufacturing process. Will the industry need to use completely new carbon capture technologies to achieve the goal of net zero by 2050?

PH: Carbon capture and utilization (CCU) and CCS are essential tools for the carbon neutral transformation. Existing technologies for carbon capture, such as amine scrubbing, are already available. However, they are very expensive and, therefore, a burden on capex and opex. This makes it necessary to use new, cheaper solutions. This is where the oxyfuel process comes into play, and in particular our new and improved polysius® pure oxyfuel technology.

ICR: What is the technical advantage of this system compared to other approaches, and how technically mature and cost-effective is it as a capture technology?

PH: Our polysius® pure oxyfuel technology replaces the ambient air previously used in the kiln with pure oxygen. Accordingly, the exhaust gas that is generated during clinker production is primarily made up of CO2. It can thus be captured and used more easily. It no longer escapes into the atmosphere.

ICR: Are there other pioneering technologies in the field of innovation that thyssenkrupp Polysius considers feasible, for instance the electrification of kilns?

PH: We are working on a number of innovative solutions – either alone or, increasingly, in cooperation with customers and research institutes. These range from alternative cements, fine grinding and other methods for reducing the clinker factor to alternative carbon capture methods, including in the area of lime. However, they are still in the research stage and therefore cannot be communicated at this point in time.

We are rather sceptical of kiln electrification due to the electricity costs and very high temperatures alone. We are sure to see further leaps of innovation in the future thanks to the very dynamic development environment.

ICR: What are the most realistic options for carbon storage or utilisation, once the carbon has been captured? Does thyssenkrupp Polysius offer a consulting service or technology in this area?

PH: As already mentioned, we consider CCU and CCS to be essential technologies in the scope of the sustainable transformation of cement production. However, our technological solutions extend up until the end of the cement manufacturing process and lead to considerably lower and highly concentrated CO2 emissions. We are in constant close dialogue with our customers regarding the follow-up utilisation of the CO2.

ICR: Overall, how well are cement equipment suppliers prepared for the technical challenge of supplying net zero cement plants within the next decade and beyond?

PH: Both plant builders and cement manufacturers are addressing the topic with great vigour. Many new methods are currently being trialled or built, sometimes in very large demonstration plants. However, the investment cycles and the period from investment decisions to the start of production at a new plant are generally long. Furthermore, for some fundamental innovations, standards also have to be tested, reviewed and adjusted by authorities.

Where the general conditions for a sustainable conversion of the industry remain positive and allow corresponding business models, cement plant builders will develop the necessary “green” technologies and make them available.

Investment incentives and profitability

ICR: How would you compare the investment situation in the MEA region with that in Europe and North America, where carbon pricing has since become well established and represents an economic incentive in this area?

PH: In contrast to the highly dynamic regulatory situation in North America and Europe, which is accelerating the large-scale transformation of the industry, what we see in the MEA region are major investments of a more sporadic nature.

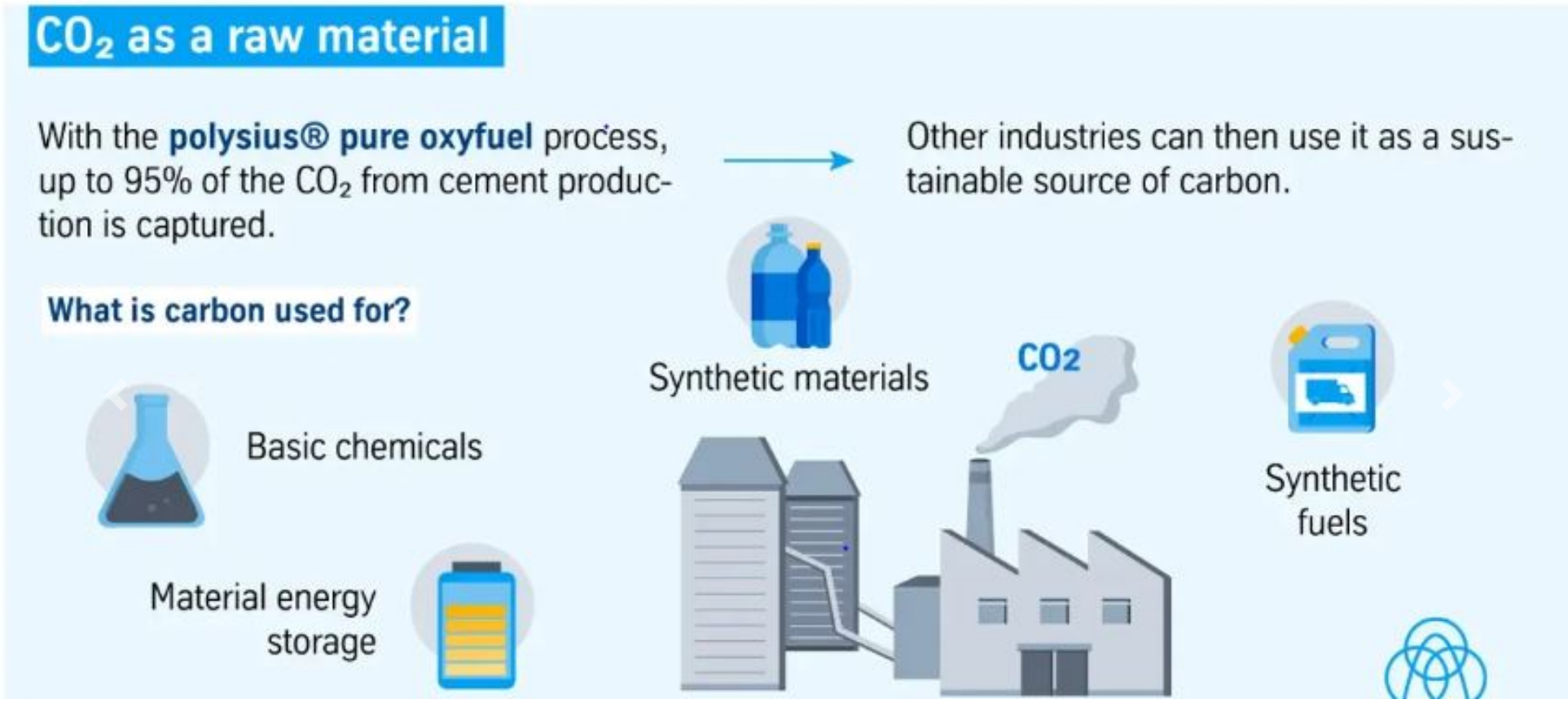
However, these major investments may also contribute to the acceleration of the transformation, because many countries have very favourable local conditions for the generation of renewable energies, meaning they could export green fuels, specifically hydrogen or methanol. Green fuels and chemicals depend, in turn, on a source of carbon which, eg, can be efficiently sequestered from the exhaust gas of oxyfuel cement plants.

ICR: In your opinion, how willing is the cement industry to commit itself to larger investments in decarbonisation, particularly with regard to carbon capture? How much of the burden should be borne by governments rather than by companies?

PH: That is more of a question for our customers. Based on project enquiries and studies, we can, however, see a clear will to change throughout the entire industry – from plant builders to cement manufacturers. But such long-term investments are always dependent on a stable market. An increased demand for green cement on the part of the public sector and a regulatory environment that is at least stable in the mid-term, for instance through appropriate funding, definition of the term “green cement” or carbon leakage regulations, would be desirable.

ICR: How much sense does it make to invest in the conversion of existing cement plants, in particular older ones, if we consider that a substantial portion of them may be outdated by 2050, if not already by 2030? Should cement manufacturers wait until proven technologies emerge on the market, or should they act now?

PH: Investment decisions, regardless of whether conversion or new build, always depend on the individual business case. Due to the dynamic regulatory environment with regard to funding and CO2 pricing and the changing business cases, we are seeing that the tendency in the above-mentioned regions is for decisions for green investments to be accelerated and brought forward. We have to act now!



Sources: Federal Ministry of Education and Research, Federal Environment Agency, BBC, OurworldinData.org, beton-info.de, handelsblatt.de

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