

Claudia Stefanoiu, CemBR, discusses the uptake of alternative fuels within the cement industry and outlines the issues that may be impeding their usage on a global scale.



ASSESSING THE ALTERNATIVE

Global cement consumption fell by 0.5% in 2020. A more precipitous decline was averted by growth in China of around 1.5%. Ex-China consumption, however, saw a decline of 3.5%. In 2021, CemBR estimates that global cement demand will grow by around 3.5%. Demand in China is expected to grow by 1.5% whereas the rest of the world is expected to see growth of around 6.4%.

Ex-China cement production was at 1.83 billion t in 2020 and is expected to be 1.95 billion t in 2021. Clinker, on the other hand, was at a lower level of 1.5 billion t in 2020 and is estimated to reach 1.55 billion t in 2021.

Alternative fuels usage: A European game so far

CemBR estimates the current AF substitution in Europe to be at around 30%, with some countries even exceeding 60%. The highest substitution rate can be seen in the Northern part of Europe.

At a global level, the situation is quite different. The estimated substitution rate by region ranges from CIS (only 1%) to North America and Brazil (which are in the double-digit range). It can be argued that AF substitution has been mainly a European game so far.

Why is this the case?

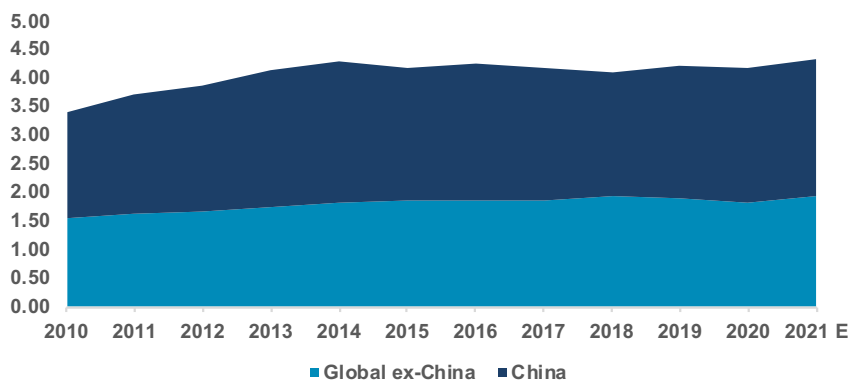
Europe has become a leader in AFs because it exhibits four distinct characteristics.

The cultural aspect implies that whoever produces the waste is responsible for it – the understanding that waste is waste and not a valued product that should bring revenue. Furthermore, when this cultural characteristic exists, legislation is enacted (in diverse forms, such as landfill tax, management and availability of landfill sites, types of AF that can be used and how, and many others). This, in return, makes waste disposal a high-cost activity and

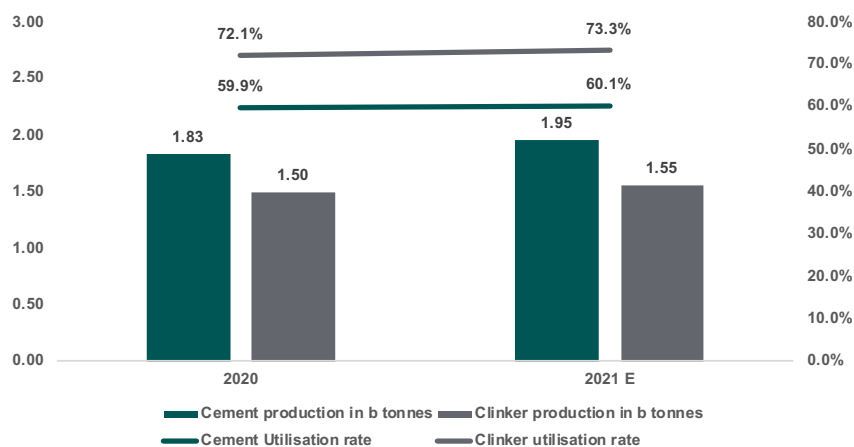
facilitates the development of a waste management industry. Effectively, for cement producers to use AFs the economics must also work. And indeed, this has been the case in Europe, at least so far, where AFs are at a much lower cost than fossil fuels or even have a negative cost.

CemBR estimated that a 60% substitution by AFs would result in a 25% increase in the EBITDA margins of a European cement producer. This is based on several assumptions such as AF costs being set at 40% of fossil fuels. This is a conservative scenario as in reality some AFs have

a negative cost for cement manufacturers. There are really two important elements to this financial impact. The first is the lower cost of fuels and the second is the carbon credit gains due to the biomass within the AFs. CemBR's estimates of a 25% uplift in EBITDA were based on a €25/t carbon cost. However, this has now changed, and the carbon cost is currently in the €50 range, resulting in a much higher impact on the financial performance of a cement plant.

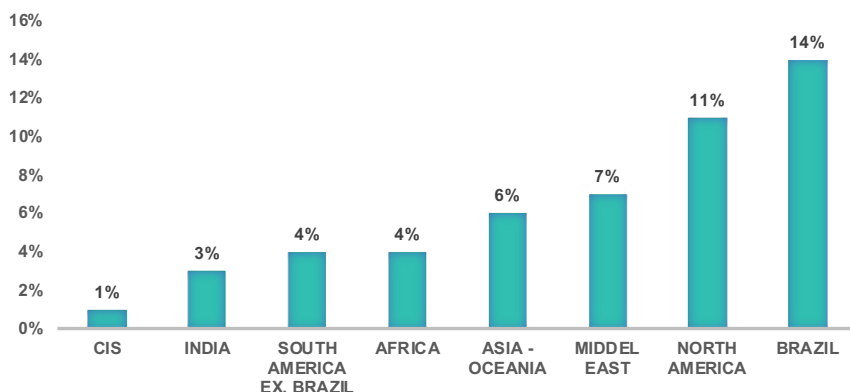


Global cement consumption in billions of tons.



Global production and utilisation rates (excl. China).

Source: CemBR Forecasts report.



Estimated AF substitution in cement around the world.

The carbon dilemma

Currently, all available alternative fuels emit carbon when combusted. However, the EU ETS system considers biomass-based fuels as carbon neutral, encouraging their usage for reducing CO₂ footprints. But not all AFs are rich in biomass.

This is one of the reasons for which even though the EU ETS countries have expanded their AF usage considerably in the last decades, their CO₂ footprint per t of clinker registered only a minor decline. The other main reason of course, is the impact of AFs on the efficiency of a plant, something that will be discussed later in this article. Even more importantly, CemBR concluded in its 'EU ETS & Cement' report that the 0.4% annual decline of CO₂ per t of clinker (to the end of Phase III) was mostly

generated by structural changes (conversions from wet to dry, etc.) and not process related optimisations. This clearly shows that AF usage in Europe has been mostly a profit driven initiative so far and not a carbon reduction strategy.

Technical considerations

Low calorific value, high moisture, and coarse material AFs cannot be burnt in the kiln and thus a precalciner is required.

As a result of the favourable financial impact on plants when using alternative fuels, numerous European cement producers have embarked on precalciner conversions.

Western Europe experienced a sharp increase in precalciner capacity from 25% in 1990 to the current 65%, and there is still room to grow for the region. However, it is important to keep in mind that high AF usage can lead to higher fuel consumption and loss of production capacity.

The share of precalciners in regional clinker capacity varies significantly.

Western Europe, with a lower share of precalciners, has the highest AF substitution. Whereas, for example, Asia-Oceania with a remarkably high precalciner share (97%) has an exceptionally low AF substitution rate. This discrepancy is determined by the fact that Asia-Oceania is still missing the four characteristics discussed previously (cultural, legislation, waste management industry structure, and propensity to use AFs). So, why does Asia-Oceania have such a high precalciner capacity? CemBR believes the reason is a desire to build exceptionally large plants, which could only be designed and built using precalciners. So, although many regions in the world have the technological ability to burn AFs, they do not, because they do not fulfil the overall market requirements as explained earlier.

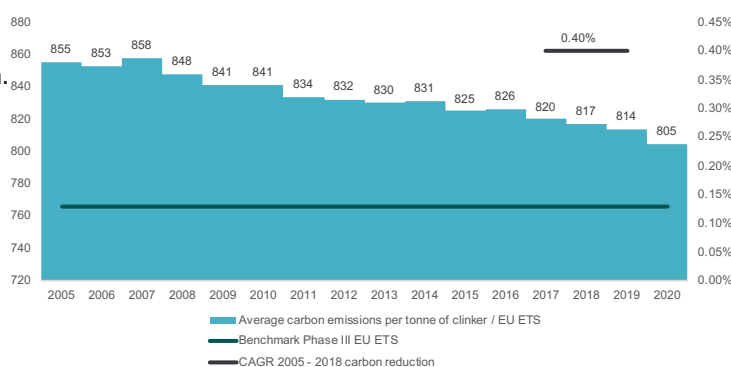
Issues with alternative fuels

When considering the issues with alternative fuels outside of Europe, CemBR believes that the low level of substitution is due to markets not exhibiting the four fundamental characteristics for AF success as described previously.

There may also be other issues that impede the usage of AFs. One is the negative public perception, which affects the companies' license to operate (local community opposition, cumbersome permitting processes, etc.), and in some cases an exceptionally low cost of fossil fuels, which is once again tied to a lower propensity to use AFs. Why should a cement producer facing low fossil fuel costs go through the complicated exercise

Estimated biomass content in main AFs
(Source: CemBR 'EU ETS & CEMENT' report).

Alternative fuel	GJ/T	Biomass %
Tyres	28	30
Waste oil	30	0
Paper	5	100
Plastic	23	0
Wood waste	18	100
Animal meal	18	100
Refuse derived fuel	18	50
Solvents	25	0
Sewage sludge (wet)	3	100
Oil sludge	5	0

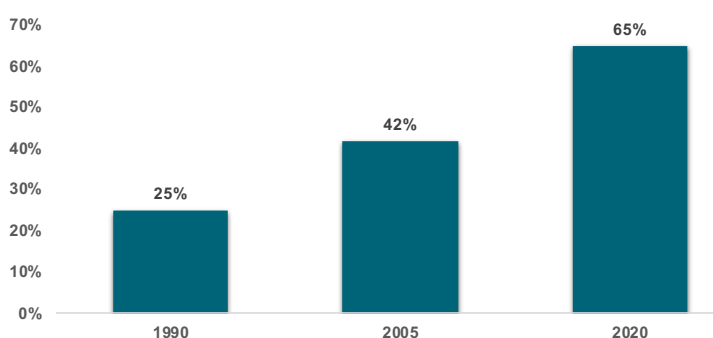


EU ETS achievements from inception to 2020.

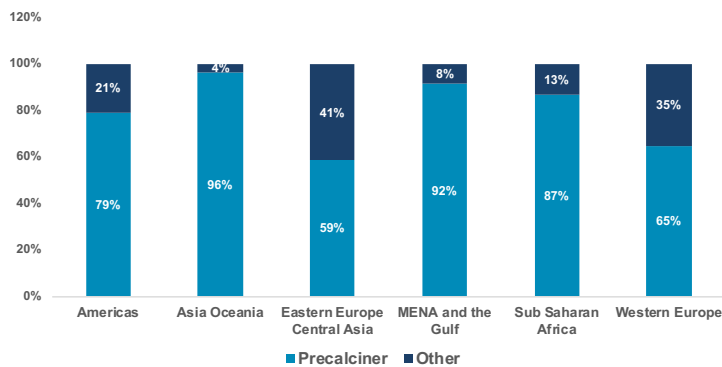
of introducing alternatives? The incentive to do so



The technical constraints for AFs.



Precalciner capacity has increased in Europe significantly over the last 20 years.



Share of precalciner capacity varies across regions.

under these circumstances is non-existent.

In Europe, the environment is generally good for AFs but there are still some issues. Companies need to understand the local waste management industry by grasping its economics, making win-win arrangements, and understanding the impact of other users of waste (e.g., incinerators, power stations etc.). The supplier side is also equally important. Supplier credibility, reliability and long-term commitment remain some of the main issues in Europe.

Globally, cement producers interested in introducing AFs must grasp the technical implications for increasing AF substitution and adapt their cement assets (impacting CAPEX). The impact of their actions on carbon reduction is another aspect to consider. Although carbon

reduction initiatives are currently backed by proper taxation mainly in Europe, this might at some point arrive at other regions of the world.

The final word

AFs are a compelling proposition for the cement industry as they reduce costs and are environmentally attractive. However, AF substitution rates remain low outside of Europe due to the four lacking characteristics highlighted earlier. Cost reduction appears to have been the main driver

so far for AF substitution in Europe, but this might change, at least for EU ETS members as Phase IV is more stringent; many plants operate with a carbon credit deficit and carbon prices are on the upward trend. More companies have already been seen to invest CAPEX into precalciner conversions since entering Phase IV.

The technical assessment is particularly important, and it involves not only CAPEX but also considerable operational expertise. However, one of the main issues globally remains the lack of reliable supplies of high quality, consistent and appropriate AFs.

The bottom line: AF usage is not a 'free lunch' proposition – it requires long-term commitment, resources, and expertise from cement producers.

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