
AS TIME GOES BY

Neville Roberts, N+P Group, The Netherlands, explores where the cement industry has come from and predicts how it might continue to change in the future.

Introduction

In recent years, I have had the privilege of working with other industries outside of the cement industry. My impression of the cement industry was that it was slow to adapt to change and could do better. Through my experiences elsewhere, however, I have concluded that this belief was incorrect. Indeed, I feel that, as an industrial sector, the cement industry has moved very quickly, and I have often been quoted as saying that it is among the greyhounds of the industrial sector. This fills me with great enthusiasm for the future. As my opinion may not be shared by all, I have here attempted to look at where the industry has come from when I first joined it in the 1970s, where it is now, and so extrapolate as to where it could be in the future.

Looking to the past

As a chemical engineering undergraduate, I was seconded to a UK cement plant for my industrial placement in 1977. Little did I realise that I would be wedded to the industry for the vast majority of my working life. My impression of the entire industry at the time was that it was very big, very dusty and, in certain areas, very hot. I suppose I could sum up the entire industry in the following way.

The plants were relatively small, with plants of 3000 tpd looked upon as very large indeed.

Energy efficiency was an issue, but was hampered by fundamentally inefficient processes (many wet process kilns were still in operation) and very little activity in the use of alternative fuels (AF). Indeed, on my first cement plant I was told that a few years previously the plant manager had tried to introduce the concept of AF to the management team. From the comments I overheard, there was little enthusiasm, with one well-known member of staff only being worried about the smell. At another plant, where I later tried to introduce the concept, I was challenged by the production manager, who said to me in an open meeting: "the problem with you is that you think we are here to make money, the truth is, we are here to make cement!"

Environmental management was not a discipline at the time, with visits by the authorities being infrequent and emissions data kept on the plant without any public visibility. I remember once being in a meeting when the word dioxin was mentioned for the first time, with nobody in the meeting having the faintest idea what it meant, including me.

Manning was very high. With factories operating at ratios of less than 3000 tpy per man. On the flipside, the level of automation was minimal. Indeed, I remember that each cement bag produced by the plant was handled manually and automation for the packing plant



was introduced some 5 years later. In addition, the concept of a fully automated kiln was a dream.

Finally, I witnessed many occasions where it was stated that good cement making was an art, and that to understand the process one had to live and breathe the operation, listening carefully to the senior operators, who were the only people that really knew how the process worked.

How far have we come?

From this starting point it could be seen that the industry had to modernise or fail. It is sad to say that many plants did not modernise quickly enough and so perished; however, the remaining plants have modernised and the transformation has been astonishing when we compare it to the period described above.

Modern cement plants can be giants when compared to the plants of the 1970s. Kilns of up to 15 000 tpd of clinker have been installed using the latest technology.

The vast majority of kilns are highly thermally efficient in terms of power consumption and kiln fuel efficiency. In addition, the use of AF is becoming much more commonplace. I can remember when it was openly stated that kilns could not achieve more than 50% thermal substitution and that, at high levels of substitution, clinker production would be adversely affected. Both of these myths have been challenged in recent years, with plants achieving 100% substitution and the impact on clinker production being eliminated. Indeed, in some cases clinker production has increased when burning high levels of AF.

The other area of development within the cement industry has been the growing relationship between the cement industry and the waste management industry. There are now a number of examples where cement companies have long-term contracts with waste management companies to supply high-grade solid recovered fuel (SRF). One example of this is the long term contract through which N+P is exporting SRF from the UK to the Cemex Latvia plant in Broceini. In addition, the leading AF suppliers have changed their mindset and have rebranded themselves as AF suppliers, instead of being waste management companies that have to provide an alternative to landfilling and where the quality of the AF is not the top priority. This has been a major improvement in this part of the AF business.

Regarding environmental control, the use of AF has again benefited the cement industry, in terms of CO₂ emissions, due to the burning of biomass, as well as in terms of NO_x emissions, which can be reduced by more than 50%. Policing the environment is also much more advanced than some 40 years ago. In the modern, world the operating

permits are very detailed and frequent compliance meetings take place. In addition, emission limits are much lower, with many new components now controlled, including organic compounds. There are also many examples where the plant emissions are provided on a live basis to the authorities and examples where emissions are displayed on LED screens outside the gates of the cement plant.

With the increase in plant capacity, there has been a significant increase in clinker produced, with figures of over 30 000 tpy of clinker per employee being achieved. This compares with the 20th Century dream target of 6000 tpy of clinker produced per employee.

Automation has moved on significantly, with expert systems operating at many clinker manufacturing locations and laboratories now routinely being fully automated. It has to be remembered that 40 years ago the internet did not exist, and neither did PCs, tablets or mobile phones, all of which are now fully utilised to run cement businesses.

What will the future look like?

The previous summary really puts into context the advances made in the last 40 years and so offers encouragement that many big changes could be on their way during the next 40 years.

Kiln fuel consumption

Over the coming years, governments around the world will further recognise the importance of landfill avoidance and will adopt legislation, such as landfill tax, thus forcing industry to find alternatives to landfill. This will create a lucrative market in waste and so catalyse the development of AF industries globally. This will then enable cement companies to source good value AF locally and result in the majority of fuel consumed in the industry being AF. However, this could lead to AF shortages, affecting the price of this fuel.

Pelletised AF, such as the Subcoal being produced by the N+P Group BV, will be attractive to cement users due to its high quality, enabling kilns to burn at high substitution levels. The milling of Subcoal on vertical fuel mills, especially Loesche mills, will become commonplace and, indeed, will become the industry standard.

Cement plants will also adopt separate specialist milling of Subcoal, using prescribed milling systems, such as the Atritor coal mill. This approach will become the norm for plants that do not burn fossil fuels and so will not require the vertical mill infrastructure mentioned previously. In addition, this will assist cement plants that want to mill Subcoal to a high degree separately to their primary fuel and so further increase the amount of AF that can be burnt.

Cement plants will form formal collaborations with waste management companies in order to have more control over the processing of the waste feedstock into AF and to move further up the value chain.

It is expected that cement plants will look to generate their own power by utilising waste heat. Where the finances are attractive, the cement industry will also move into waste-to-energy plant technology and use high value waste streams to generate the power they consume.

Environmental control

CO₂ emissions are a major concern to the cement industry. It is therefore predicted that extra efforts will be made towards using raw materials that will reduce the amount of carbonate included within the standard kiln feed.

Extensive use of hydraulic additives will be more common, to minimise the amount of clinker used per tonne of cement consumed in another effort to reduce CO₂ emissions.

Carbon capture and storage (CCS) technology will be used extensively throughout the industry in regions where receptors are available to store CO₂. In addition, instead of using coal as a heat source it is anticipated that cement plants will use waste-to-energy technology for the CCS process,

and so make the whole carbon capture system economically sustainable.

Perhaps a little scarier...

- Driverless trucks in the quarry and remote-control shovel loaders.
- Expert control systems in operation on all kilns with remote kiln operation at head office.
- Drones equipped with heat seeking capabilities used to monitor the plant.
- Driverless cement delivery trucks.
- Kiln refractory improvements, such that kilns can run for a number of years without refractory stops.
- Mobile phones will have the technology for a message to be sent in one language and be immediately translated into another. This means a Welsh speaking engineer could speak to an engineer in China and be immediately understood.

Conclusion

Maybe some of the suggestions are fanciful, but when the progress made over the past 40 years is analysed, anything is possible. I am sure that I will not be around to check these predictions in 40 years time, but good luck to those of you that make it. I am sure that you will have as exciting a career as I have, and I ask for you to be considerate when judging my forecasts. 🌐