**Carbon Neutral Concrete**

With at least 8% of human caused carbon emissions coming from the cement industry alone, decarbonising its production has become a key weapon in the battle against climate change.

Worldwide 30 billion tonnes of concrete is used every year and demand is only increasing. And while alternative materials are being developed, it’s clear that the most effective way to move the industry towards Net Zero, is to neutralise the amount of carbon in concrete itself.

**Change is coming**

Cement makes up 10-15% of the concrete mix and given its production is the most carbon intensive part of the process, it’s here that the industry can make the most significant environmentally conscious changes. The limestone and clay in cement needs to be heated to more than 1400 degrees Celsius to create the clinker that is then ground into fine powdered cement. Traditionally (and for the most part still) this temperature is reached through burning fossil fuels such as coal or petroleum coke. If the energy required to reach this temperature comes from renewable sources, or low carbon fuels such as hydrogen or biomass, the carbon footprint of the end product can be greatly reduced.

There still remains carbon emissions from the exhausted gases in this heating process, though. That’s where technologies such as amine scrubbing come into play. Amine scrubbing has actually been around since 1930 but its use in the cement industry is a recent development. It involves capturing carbon emissions in factory flues before they reach the atmosphere. Once secured they can then be buried in disused cavities leftover from the mining industry. In this way, the carbon is seen to be ‘coming home’. One such project is in the planning stages in Sweden, where the captured carbon is intended to be placed in exhausted oil and gas cavities in the North Sea. If biomass, which itself captures atmospheric carbon through photosynthesis, is used in the heating process, and the carbon from burning that is captured using amine scrubbing, the overall process has the potential to actually become carbon negative.

**Another way**

Alternatives to using the core ingredient of limestone are also available. Cemex’s product, Vertua Ultra, uses an alkali activated alumina-silicate polymer matrix instead. This doesn’t require high temperatures in its preparation and, crucially, doesn’t release carbon in doing so. Compared to standard concrete the carbon footprint is reduced by 70%. Carbon offsets are then used to make the final product 100% carbon neutral.

Carbon curing is another nascent technology set to make significant inroads into industry emissions. This involves introducing captured carbon into the concrete mix during the curing phase. By combining it with steam and ‘sinking’ it into the concrete, the final product not only reduces its overall carbon footprint, but can actually result in a stronger, more efficient building material. When Aramco experimented with this they discovered that the end product not only achieved the industry standard mechanical strength in a fraction of the time (three days compared to 28), but it showed lower water permeability and greater chlorine and sulphite resistance than traditional concrete. This makes it a potential game changer in offshore construction and environments with high humidity.

Combining carbon capture at cement plants with carbon sinking in concrete manufacture, along with other carbon neutral efforts in transport and logistics, can greatly impact the overall footprint, or even achieve neutrality, in concrete production.

**Driving change**

While these and other technologies are new or still in development, it’s important that we stay abreast of what the concrete industry is doing to reduce their emissions. As customers, we can greatly influence the environmental direction of our suppliers, which in turns affects our ability to achieve our climate targets.

Modern Methods of Construction are crucial in the industry’s ambitions to reach Net Zero and carbon neutral concrete is a significant plank in these efforts. By striving for alternative technologies, greener processes and the use of developments such as the digital twin, we can move the industry forward and play our part in securing a safe and healthy planet for future generations.