How Concrete Recycling is becoming an opportunity for value creation

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Concrete is the most widely used construction material on the planet. It is essential to the construction of everything from buildings and bridges to roads and dams. But while concrete is incredibly strong and durable, it is also a major source of carbon emissions. The production of concrete accounts for about 8% of global carbon emissions, and as the world's population continues to grow, so does the demand for this vital material.

Fortunately, there have been some exciting developments in the field of concrete recycling and the use of low-carbon binders, which could help to reduce the environmental impact of this crucial building material.

As Mckinsey noted in their article on “Decarbonizing cement and concrete value chains”, circularity is an opportunity for value creation. recycled concrete can be used in new buildings, either as elements or as materials. Concrete recycling is the process of taking old, demolished concrete and turning it into new concrete, reducing waste, conserving natural resources, and lowering the carbon footprint of new concrete production.

One of the most common methods of concrete recycling involves crushing old concrete into small pieces, which can then be used as aggregate in new concrete. Unfortunately, conventional recycling produces inferior quality aggregates and using them in concrete require more cement and therefore has a higher carbon footprint.

Often recycled concrete is used as a base or fill material for roads and other infrastructure. While crushed concrete can be compacted and used as a sub-base layer, this is a lower value use than recycling into new concrete.

The production of cement, which is the primary binder in concrete, is a major source of carbon emissions. In recent years, there has been a lot of research into developing alternative, low-carbon binders that can be used in place of cement. The cement industry have used blast furnace slag and fly ash as supplementary cementitious materials for many years, substituting a portion of clinker with these lower carbon materials. However, supply of these by-product materials is limited and declining.

There has been a great deal of interest in using metakaolin as a cementitious material in recent years. Metakaolin is made by calcining clay, a very common material throughout the world and an

increasing number of new calcination plants are being built. Another alternative is some regions is the use of natural pozzolans.

A promising approach to low-carbon binders is called alkali-activated materials (AAMs) or geopolymers. AAMs are made by combining an alkaline activator (such as sodium silicate) with a source material (such as fly ash or slag). AAMs have properties similar to concrete but with a much lower carbon footprint.

New technologies offer the potential to fully recycle demolished concrete into new concrete. Improved recycling technique can minimise the presence of agglomerates in recycled aggregates and effectively separate the cementitious binder into a powder. Other technologies can regenerate the cementitious qualities of the powder, suitable for use in new concrete.

Concrete is an essential building material, but its production is a major contributor to carbon emissions. Fortunately, there are many exciting developments in the field of concrete recycling and low-carbon binders that could help to reduce the environmental impact of this vital material. By incorporating these new technologies and techniques, we can continue to build the infrastructure we need while also protecting the planet.