SUSTAINABILITY ADVANCES IN CONCRETE CONSTRUCTION

Concrete is a heavy and rough mixture of various sized stone, cement, and other ingredients poured and formed into a stone like mass. Concrete is usually an important figure in most construction projects.[1] As an artificial substance so crucial to everyday building projects, concrete is primarily used for its form-ability--concrete is prepared in a thick liquid form which hardens over time. These days there is not a basic construction project that doesn't use concrete. The material is important for fabricating various man-made things such as a near perfect flat foundation, shaped columns, and anchors or pylons.

Improvements

is getting harder and harder to find these days. Not only may there be a shortage of vital ingredients, the environmental impact of concrete construction is also be taken into consideration. *"The cement industry is actively engaged and committed to sustainable development—a philosophy that focuses on meeting our construction needs today without depleting future resources."*[2] [3] Currently, concrete is the most used

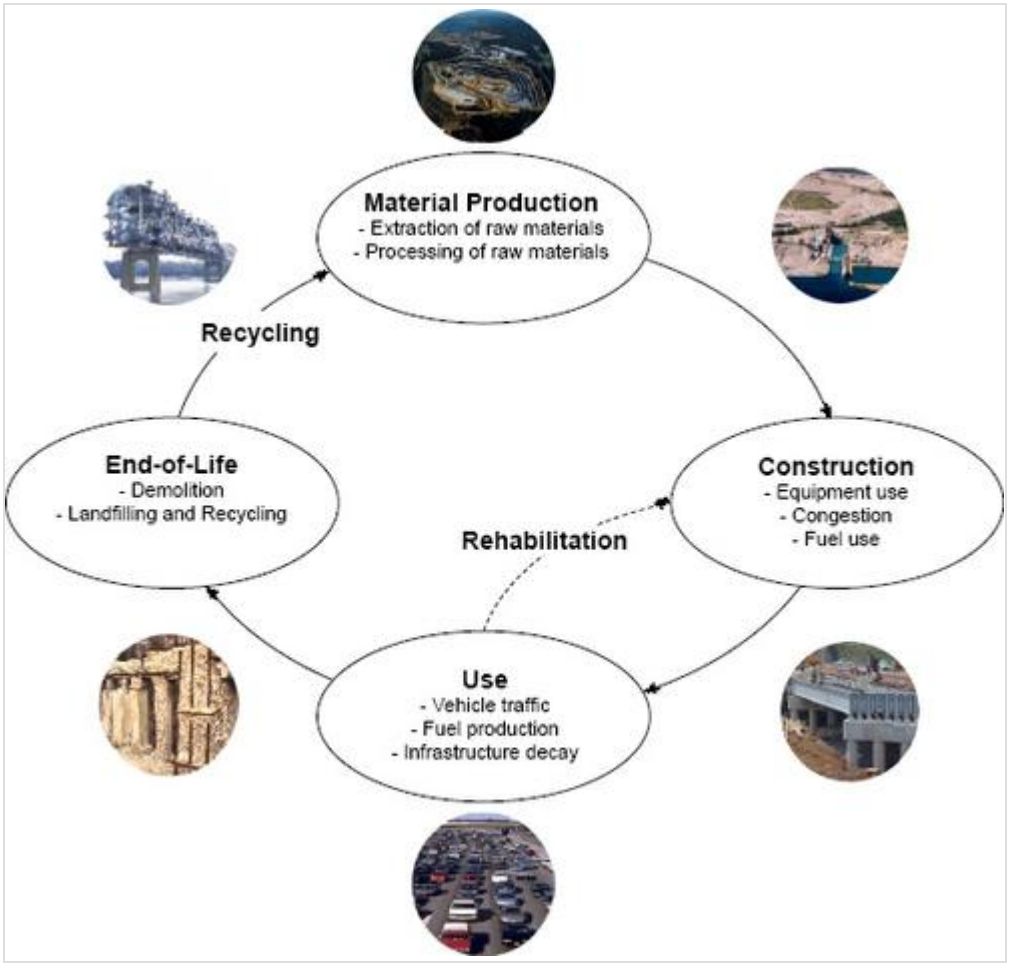
man-made product in the World. [4] The World Commission on Environment and Development of the United States defines sustainability as meeting the needs of the present without compromising the future generation of meeting their own needs.[5] The longevity of concrete is incredibly important as it is one of the most used construction materials. The ingredients of the concrete mix are readily available in even the most barren part of the world. However, quality concrete mixes require quality ingredients. Limestone is an abundant mineral that is imperative to the concrete mixture, but quality limestone

History

The basic concept and design behind concrete has been around for over 1000 years. Archaeologists have uncovered lime and pebble floors built by the Romans. [6] However, modern reinforced concrete has come a long way in terms of development since ancient times.

The Roman Pantheon is still the largest unreinforced solid concrete structure

Before concrete structures were reinforced with steel re bar, they were completely supported by the concrete themselves. The first, more modern concrete was not seen until the mid-1700's when an English inventor used crumpled brick, pebbles, and cement. Then, in 1824, another Englishman named Joseph Aspdin invented Portland cement, which to this day has remained the dominate cement used in production. The inventor accomplished this by burning limestone and clay together. [7] As technology improved, the effects of producing concrete started to become more apparent, and the process that may seem harmless in plain site actually has an enormous environmental impact. Traditional concrete of around 75% aggregate, 17% water, and the remaining percentage of cement and other additives including steel reinforcement. Mass excavation of aggregates and the production of steel reinforcement consumes large amounts of energy. In order to provide a more sustainable future for concrete technologies, the industry must invest into a more cost-effective realm. Technology has also improved to a point in which chemical properties of concrete's ingredients can be improved Once the lifespan of the concrete has concluded, procedures taken to minimize as much waste as possible is important to the environment.



A basic outline of the life cycle of concrete

Resource Efficiency

Quarries have a substantial impact on the visual landscape

The environmental impact of concrete and cement production is incredibly high compared to that of other construction materials. Everything from the harvesting of aggregates to the curing process of concrete has a significant impact in the environment. Aggregates are the largest component of the concrete mix and vary in types. Compared to past construction projects, many professionals today seek responsible sources of building materials. Such sources are certified by agencies because of their low-impact environmental impact methods of obtaining resources. Professionals may sometimes look to certify their projects by an institution such as the Environmental Product Declaration for Concrete.[8] The importance of a responsible sourcing plan that provides information for and promotes responsible practices in the concrete production and supply chain. Many are apt to reuse aggregate from demolished projects as it is becoming less costly in some areas.

Concrete Recycling

As quality aggregate becomes more costly to acquire, new and more economical approaches are being made. Not only does the used building material serve as material for a newer project, concrete recycling also proves itself to be a useful method in removing ruble. Before this method was starting to be utilized, concrete was routinely hauled to landfills. Since then, environmental awareness has gained more of a following and thus contributed to better practices. Uncontaminated concrete collected from demolition sites is put through a series of crushers. Reinforced concrete including metal is also accepted at these sites.[9]Once the aggregates and fine particles are separated, the material is used again in newer mixtures. Concrete recycling does have its disadvantages. Any used concrete that is contaminated with

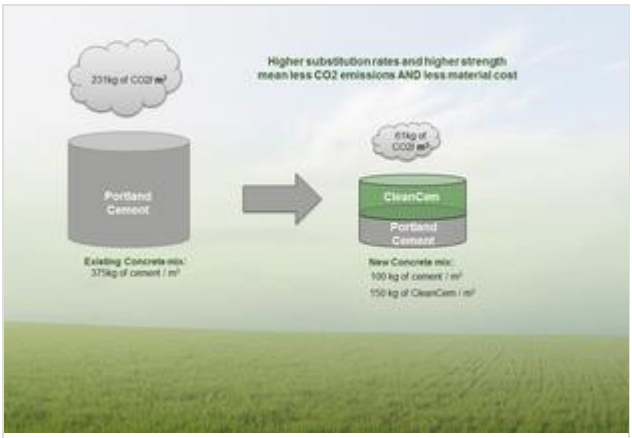
Typical site for concrete recycling

Durability and Feasibility with Admixtures

The lifespan of concrete can be directly related to its sustainability. While Portland cement has been the dominating cement ingredient in the modern concrete mixture for decades, advancements in technology have allowed the use of chemical admixtures which distinctively improve certain characteristics of the material. These chemicals are seperate from the typical cement, aggregate, and water that is mixed in.[10] Admixtures are primarily used to reduce the cost of concrete and to modify the strengthening properties of hardened concrete.[11] Admixtures can also be used to ensure the quality of the concrete mixture during mixing, transporting, placing, and curing. Currently there are five distinct classes of admixtures used, all of which improve the economic feasibility of the concrete in one way or another. As previously mentioned, economy is an important factor in sustainability. More directly, though, corrosion-inhibiting admixtures increase the lifetime of concrete. These chemicals are used to slow the corrosion process of reinforced steel.in concrete. While these additives may be more expensive, they are more economical in the long run for specific projects such as marine facilities, bridges, and parking garages exposed to salt. [12] The major disadvantage to admixtures is largely the unavailability of the chemicals to most parts of the world. The admixtures may promise to save money in the long run, but they are undoubtedly more expensive up front.

Emissions Monitoring

Just as any building product would, production of concrete requires energy. The curing process of concrete is a extensive chemical reaction. The largest byproduct of said process is carbon dioxide. While the CO2 impact of concrete production is relatively low when considering dangerous levels[13] , it still contributes to a significant amount of preventable, man-made total carbon dioxide production (5%).[14] Cement is the ingredient responsible for giving off CO2, and removing that from the mixture is uncanny. However, new technology allows a reduction in the required cement



EF Technology Chart

amount for an average mix.

EF Technology

Central Concrete Supply Company has developed new methods that significantly reduce the carbon dioxide given off. The company's EF Technology uses alternative cementitious materials to reduce the emission of green house gasses. Cost-effective solutions are also in place with this new technology. The sustainability of EF Technology is advanced even further as the mixture out-performs most traditional concrete batches in areas such as high early-strength, low shrinkage, and permeability. Central Concrete is also an active industry that facilitates return concrete recycling. Their state-of-the-art recycling plant uses block forms to capture leftovers and maximize efficiency.

Source : http://letu-cefs.wikispaces.com/Sustainability+Advances+in+Concrete+Construction