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Chipping away at fuel costs

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Traditional fossil fuels remain in high demand despite escalating prices. With an increasing number of producers successfully reducing their fuel costs through the use of alternative fuels, Asia Cement operates a fully-equipped recycling centre in South Korea and has enlisted Colombus McKinnon to process scrap tyres to feed its dry-process kiln.

The recycling industry has made significant advances in alternative fuel solutions, including the use of end-of-life tyres as environmentally-sound and less expensive alternatives to fossil fuels. Scrap tyres exist in just about every sector across the world and ways to resolve the issue of eliminating existing piles and newly-discarded tyres are continually being sought.

Benefits of waste tyres

Cement kilns worldwide account for over 50 per cent of scrap tyre recycling as tyre chips can be completely combusted in a cement kiln. The combination of high temperatures (1450-1500˚C), a positive oxygen atmosphere and a long gas residence time (4-12s at the elevated temperatures) assures total combustion. Allowing for an adequate supply of oxygen ensures complete burnout of organics which minimises the formation of dioxins and furans, a primary concern in solid waste combustion.

With an average sulphur content of 0.5-2.5 per cent, tyres are on a par with, or less than, most coals and petcokes. In terms of substitution, a kiln operator can reduce coal usage by 1.25t per tonne of used tyre chips.

In terms of emissions, chipped tyres, or tyre-derived fuel (TDF) in general, can help reduce NO_x levels by up to 30 per cent if injected in the right spot under optimised conditions.

Additionally, the cement production process can use the iron contained in the tyre's steel beads, belts and ply. These components do not change the quality of the cement, since large quantities of iron ore are already present as one of the main ingredients of clinker.

In evaluating current market prices worldwide, coal is selling between US$60-140/t. The average price of 50mm nominal recycled tyre chips in 2012 was US$24-40.

Co-processing TDF as an alternative energy source at a cement plant not only lowers fuel costs in a sustainable manner, but has direct benefits on the environment. For instance, discarded tyres are known for collecting water, which is the perfect breeding ground for mosquitoes and the associated diseases they can transmit. TDF usage also helps eliminate unsightly and hazardous tyre piles.

Left: an example of poor-quality TDF. The exposed wire can block the kiln feed, creating a bird nest or clogging effect

Below: CM clean-cut, consistently-sized tyre chips provide optimum feed material for the kiln

CM Dual Speed Tyre Shredder processes whole passenger car, light truck, SUV and truck tyres down to 50mm clean-cut chips at a rate of 8-12tph

Asia Cement tyre recycling

Asia Cement Co Ltd is one of the largest manufacturing cement and ready-mixed concrete companies in South Korea with a cement capacity of 4.5Mta. Headquartered in Seoul, it operates nine factories throughout the country.

Asia Cement is increasing its competitiveness through continuous reforms, including environmental and sustainability initiatives and reducing operating costs by introducing alternative fuel solutions. In line with these measures the company has built and operates a fully-equipped recycling centre in Jechon. This facility processes large quantities of general waste including plastics, rubber and scrap tyres to be used as alternative fuel for the kiln. As such, coal costs have been significantly reduced.

C&energy Company, headed by president Chris Aum, is one of the partners of the Jechon Factory. For the past two years, the company has been operating

Mr Seo, plant manager of the Jechon Factory, with the CM Dual Speed Shredder

a Columbus McKinnon (CM) Dual Speed Tyre Shredder on site. Specially outfitted with a double stack knife configuration for making clean-cut <100mm tyre chips, the shredder can process both whole passenger car and truck tyres, down to the required chip size at a rate of 11-13tph. Currently, C&energy produces 2000tpm of tyre chips which are fed directly to the long dry-process kiln at the plant.

Subsequently, the chips are mixed with traditional coal, plastic, rubber and other waste which together create a clean-burning, high-value BTU heat source for optimum kiln performance. At present, 25 per cent of the total mix is derived from scrap tyres. Some 88 per cent of a tyre is carbon and oxygen, which accounts for its rapid combustion and high heat value. Nominal wire tyre chips contain approximately 33GJ/t where sub-bituminous coal contains only 27GJ/t, and some petcokes 31GJ/t.

The right tool for the job

Columbus McKinnon (CM) manufactures tyre recycling equipment systems designed specifically for reducing whole tyres into clean-cut nominal tyre chips, leading to cost savings and increased production for many cement companies. The CM-patented Holman knife design is renowned for the extremely close knife tolerances which provides the 'clean-cut' material with minimal exposed tyre wire. The chips can be fed easily and cleanly into the kiln feed without the risk of 'bird nesting' or clogging as the TDF is introduced into the system

CM has been building whole-tyre reduction systems since 1982 and has installations in place for many of the largest cement producers worldwide. Many of these manufacturers are actively receiving end-of-life tyres at their facility and processing the tyres on site.

Depending on the volume and size of TDF required on one side, and the operational and market constraints on the other, CM can provide the proper equipment to meet the kilns specifications. CM Tyre Recycling Equipment can process a wide array of tyre sizes from passenger car tyres up to OTR tyres 1525mm in diameter, producing two-inch nominal, clean-cut tyre chip at production rates of approximately 10-12tph.

According to Mr Aum: "the CM Dual Speed Tyre Shredder is by far the best built, toughest and highest volume shredder in the tyre recycling industry today."