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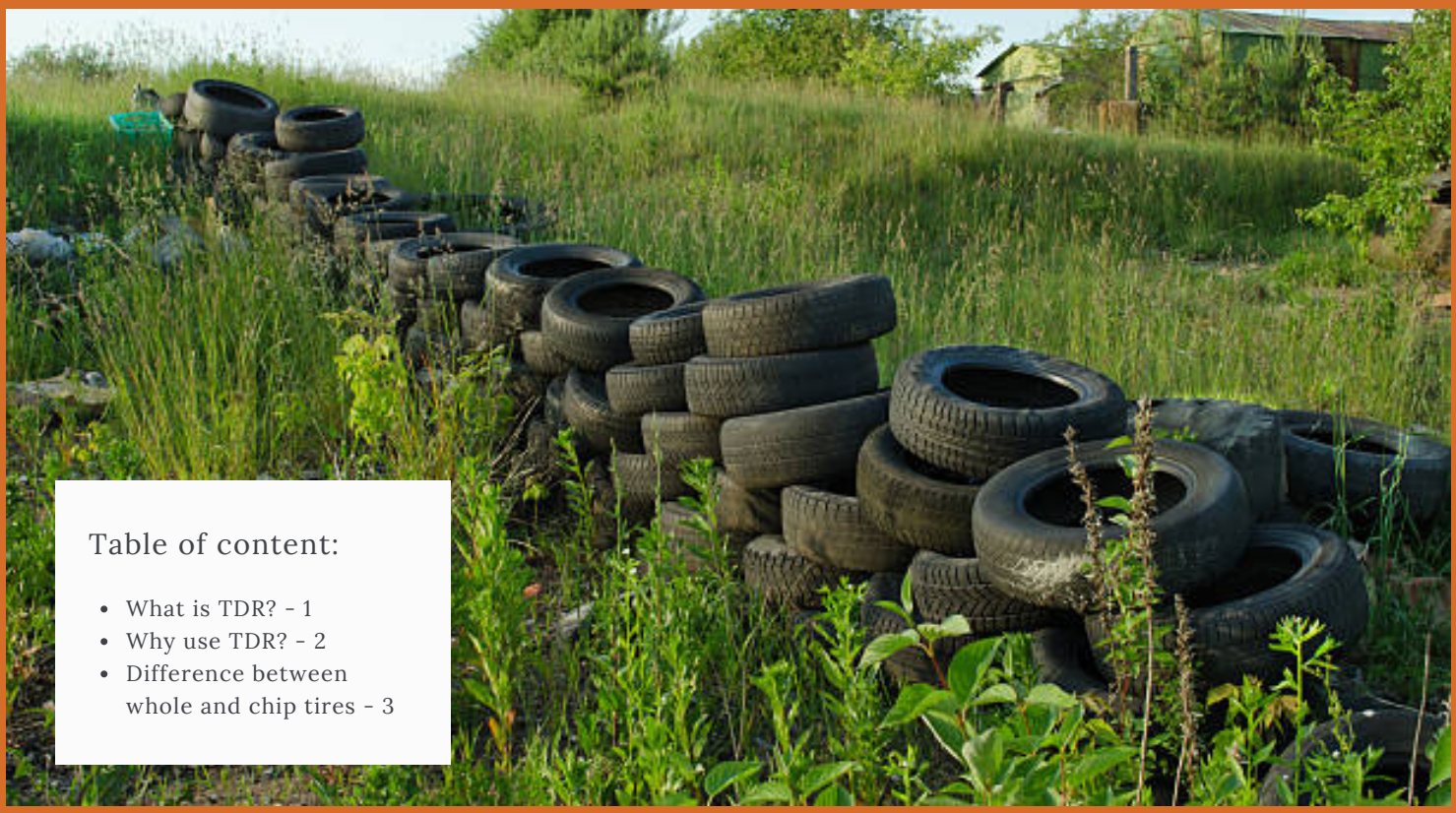
GOAL GREEN WORLD PTE LTD

TIRE-DERIVED FUEL

An important co-fuel for the cement industry



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What is Tire-Derived Fuel?

Tire-Derived Fuel (TDF) is from shredded scrap tires mixed with coal and other fuels to power boilers or factories. Each year millions of used tires are produced. Here is a rough breakdown of what happens to used tires. Throwing away used tires in landfills, stockpiles, or on illegal dumping grounds causes threats to the environment. Examples of these threats are accidental fires, where they may emit an uncontrolled amount of possible harmful compounds, and the breeding of viruses and harmful insects (Pipilikaki et al., 2005).

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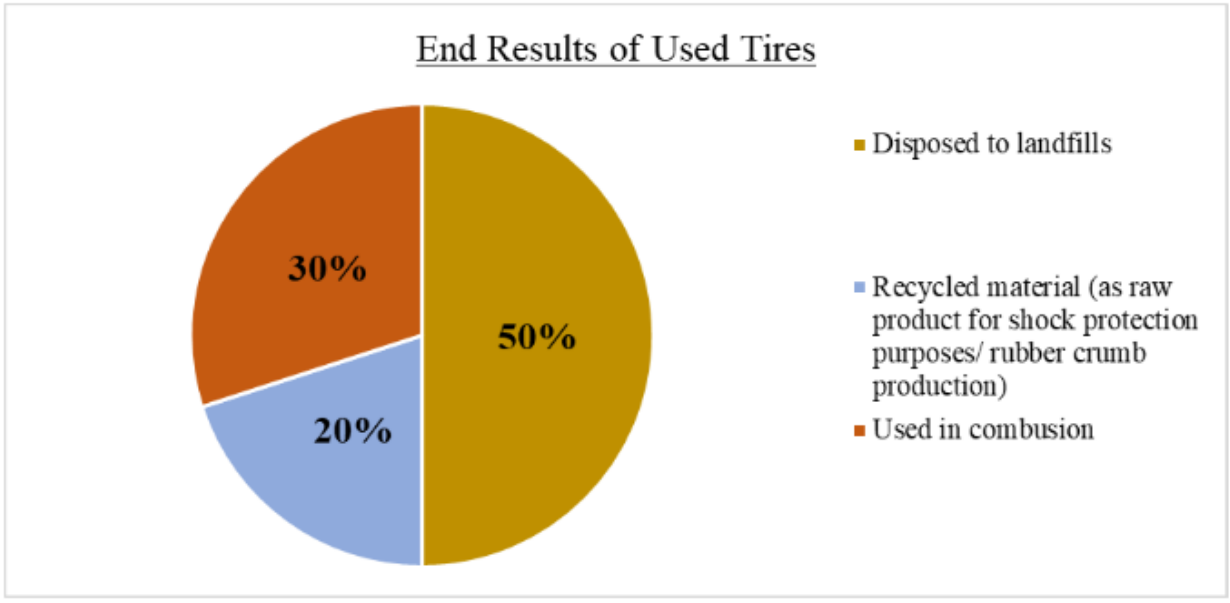

Table 1 shows the distribution of used tires

Balancing profit and environmental preservation is difficult and delicate work. Achieving it is a win-win for all.

WHY SHOULD THE CEMENT INDUSTRY USE TDF?

How does it benefit the industry?

Cement production is an energy-intensive process. Clinker production takes up a large amount of thermal energy in cement production. For instance, 1 ton of cement production needs 3.3GJ thermal energy. “Forming 1 ton of clinker releases an average of 825kg of carbon dioxide” (Sai Kishan et al., 2021, pg. 5483).

Conventionally, the primary source to fire cement-making kilns is coal. Other fuel types include oil, gas, liquid and solid waste materials, petroleum coke, and its combinations. There is increasing pressure on the cement manufacturing industry to lower emissions. Cement production emits lots of carbon dioxide and Nitrogen Oxide (Manzanera, 2011).

Around 7% of the world's carbon dioxide is from cement industries. Carbon dioxide and Nitrogen oxide are detrimental to the planet and human health. In addition, the cost of thermal energy generation contributes about 30-40% of the total cost of cement production. The higher the usage of oil and gas as fuel, the higher the cement prices in the country (Cheema et al., 2013). TDF can be a co-fuel, up to 30%, for coals and other fuels in the cement kilns. It has a promising ability to lower the general fuel cost of the cement industry by half. By using TDF, Cement plant operators could trade 'carbon credit certificates' and get a new source of revenue (Markets, 2022).

HOW WOULD TDF LOWER COST AND EMISSION LEVELS?

What benefits does it bring to the environment?

The tires' composition consists of a narrow range of materials. It has 88% of carbon and oxygen. The high percentage of carbon and oxygen makes it have a calorific value of 32MJ/kg, higher than the coal - 26MJ/kg. It also has low moisture levels, thus acting as a consistent fuel in the cement kiln and pre-calciner. The materials of the tire have a high temperature of around 1430 ℃. The long residence time in the cement kiln completely burns up the tire content. The ash gets captured in air pollution control devices. There would be little or no ash to discard.

Lastly, heavy metals in the tires, such as zinc and chromium, get chemically combined into the clinker and has no chance of escaping to the environment. Hence emissions are limited. Tires, in comparison to coals, has low sulfur contents. In tires, the sulfur weight ranges from 1.24% to 1.30%, while the sulfur weight in coals is about 1.5%. Calcium carbonate, the main ingredient in cement is an effective sulfur gas scrubber, it controls the sulfur emissions from a cement kiln. Since tires have lesser sulfur content than coal, the emission data of kilns using TDF showed a consistent reduction in sulfur and other gaseous emissions (Pipilikaki et. al, 2005).

Cement production requires the addition of iron ore. Cement manufacturers can reduce the quantity of some additives, such as iron ore, as the tires already contain iron from the beads and steel belts, thus lowering the cost of cement (Cheema et. al, 2013; Pipilikaki et. al, 2005).

I only feel angry when I see waste. When I see people throwing away things we could use.

~ Mother Theresa

WHOLE TIRES AND TIRE CHIPS. WHAT'S THE DIFFERENCE?

Whole tires have the following advantages over tire chips.

1. **Cost.** There will be no additional cost for creating tire chips. In some countries, for instance, Greece, cement plants receive subsidies for burning tires. Whole tires lower the cost of production.
2. **The weighing and feeding process is straightforward.** Hooks are used to unloading and weigh the tires. The conveyor would be moving at a rate where it feeds the kiln at a specific time interval, one tire at a time.
3. **Acquiring the tires is simplified.** Truckloads of tires get transported using a covered truck. It gets deposited at the end of the conveyor belt.

The process of unloading the feeding the tires into the kilns for combustion

However, tire chips have a higher calorific value as their fuel contains lesser wire, beads, and belts. Caloric value is the fuel efficiency to produce thermal energy with 1kg of fuel. The higher the caloric value, the better it will be for combustion. Moreover, beads and belts contain about 1.40% of zinc. It will negatively affect the cement hydration and alter the chemistry of the cement hardening process.

Tire chips shredded into smaller pieces

TYPES OF TIRES WE SELL

We sell both whole tires and tire chips. Please contact us for product and pricing details.

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