

## END USE DEFINITIONS PROJECT TIRE-DERIVED FUEL (TDF)

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### INTRODUCTION

Over a billion end-of-life tires (ELTs) are generated annually, worldwide. In 2018, 487,470 tonnes of tires were recycled in Canada with 26,036 tonnes (5%) consumed as tire-derived fuel (TDF) and the remainder recycled into various products or shredded for other purposes. Manufacturing and processing facilities are thriving in Canada because of the successful tire collection programs across the country. By contrast, in the U.S. around 272 million ELTs were generated in 2019 with 100 million of these tires (37%) consumed as TDF. Between 2015 and 2019, however, the number of ELTs used as TDF in the U.S. declined as the utilities and pulp and paper mills moved more towards natural gas.

The major reasons for the obvious discrepancy in the percentage of ELTs used as fuel in the U.S. compared to Canada are the long-standing environmental concerns of Canada's provincial governments and pressures for circular economy solutions for ELTs. In Manitoba and some other Canadian provinces where no TDF markets currently exist, the ELTs are mainly recycled in the province or a small amount exported to the U.S. or neighboring provinces to be used for TDF if provincial market conditions warrant.

### CREATION / PROPERTIES

ELTs taken out of service due to wear or damage beyond repair are used to produce TDF. ELTs can be used as fuel in their whole form or in a shredded form that is processed into uniform, flowable pieces typically of 1-3 inches, to burn as a fuel source or in ways that meet the specifications of the end-user.

### END APPLICATION

Cement kilns, pulp and paper mills, electric utilities and industrial / institutional boilers are some end applications of TDF. These industries use TDF as supplemental fuel in their operations. In Canada specifically, cement manufacturing accounts for most use of TDF. Presently, 30% of the ELTs generated annually in the Province of Nova Scotia is allotted to TDF schemes, reflecting the province's decision to diversify its recycling and waste diversion programs.

## ADVANTAGES / DISADVANTAGES OF TDF

TDF offers the potential advantage of decreasing emissions of oxides of sulphur when used to replace high sulphur coal in cement kiln applications. Also, when used in cement kilns, the ash resulting from TDF and coal combustion becomes a major component of the product which eliminates the landfilling of ash. TDF can provide higher heating value than coal or wood, with a heating value of approximately one-third more than what is obtainable from coal and more than double that of wood. These benefits drive the global demand for TDF. However, TDF poses a problem for the ash-handling systems of power generating stations, since the steel wires in the tires pose a materials handling problem, as they may clump and foul the ash-handling system.

## GEOGRAPHIC AREAS / GLOBAL SCOPE

The global TDF market is very competitive, with a large number of players operating both in Canada and internationally. Some key TDF suppliers in the global market are Liberty Tire Recycling, ResourceCo Pty Ltd., Tire Disposal & Recycling, Inc., L&S Tire Company, Lakin Tire West Inc., Ragn-Sells Group, and Probio Energy International.

Since the 1970s, ELTs have been used as a supplemental fuel in cement kilns in Europe and Japan and currently represent a rapidly growing application in North America. Only Calaveras Cement in California consumed waste tires 10-15 years ago, but today many kilns in the U.S. use TDF as a supplemental energy source. In Canada, TDF generally represents 5-6% of all tire-based products. The use of ELTs as a supplemental fuel in cement kilns has been recognized by most provinces as an environmentally acceptable and appropriate resource based on testing performance. Lehigh Northwest Cement, a TDF user since the 1990s, had completed TDF trials at their facility in Delta, British Columbia. Lehigh is equipped with a 4-stage suspension preheater, planetary coolers, and an electrostatic precipitator. All fuel is normally introduced at the firing end of the kiln, but TDF was added between the preheater and kiln sections to provide about 7% of the kiln's energy requirement. It is worth noting that only the Province of Ontario currently bans tire incineration for TDF in Canada.

## ADVANCES IN DEVELOPMENT

The cement industry has long called for the use of tires for energy. It argues that the use of TDF lessens the need for other fuels (e.g., coal) and reduces overall greenhouse gas emissions. A cement plant using TDF is considered more competitive because ELTs are less costly than fossil fuel. In Canada, the Province of Nova Scotia granted Lafarge Canada Inc. industrial approval to use tires as a low-carbon fuel at its Brookfield cement plant in Colchester County. The approval allowed the company to operate a 12-month pilot project that commenced in August 2019.

Lafarge is required by regulation to do air quality monitoring at regular intervals when the kiln is operating as well as groundwater and surface water monitoring. Should the pilot prove successful, Lafarge will continue to receive used tires under their multi-year agreement with the provincial recycling program.

Independent third-party research conducted in the U.S. reveals that cement kilns using TDF as a substitute for coal for the past 20 years have continuously met or exceeded the emissions standards in all jurisdictions where it was applied. TDF is also being used in power generation as it is proven to generate large amounts of power. One TDF supplier provides enough TDF to generate 100% of the electricity needed to power a city of 150,000 people, more than the combined population of the Northwest Territories, Yukon, and Nunavut in Canada.

## FURTHER RESEARCH

Some current research aimed at growing the application of TDF is the development of a new generation of pulverized coal-fired boiler technology to aid the use of TDF in power generation. The anticipated regulated circular economy regimes across Canada are also expected to contribute to TDF growth with privatized and non-prescriptive extended producer responsibility (EPR) obligations that may allow producers to economically benefit from TDF resource recovery.

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