



## TECH 2020S10: Tire Pyrolysis

Tire Pyrolysis is one in a series of reports published as part of NexantECA's 2020 Technoeconomics – Energy & Chemicals (TECH) program.

### Overview

The disposal of end-of-life tires has been a longstanding problem for the waste treatment and recycling industry. While in Western Europe and the United States the great majority of tires no longer go to landfill, the use of waste tires as a solid fuel or crumb rubber filler means that much of the value of the highly engineered tire components are lost.

Tire pyrolysis has been presented as a potential solution for over 50 years, with end-of-life tires capable of being thermally decomposed to generate pyrolysis oil, pyrolysis gas, and a recovered carbon black char.

Of these products:

- The pyrolysis oil can be sold as a fuel oil or refinery feedstock, with potential to be refined into a higher value fuel or source of aromatics including limonene;
- The pyrolysis gas can be used to generate steam or electricity for export, or used internally to heat the pyrolysis reactor;
- The solid char generated in pyrolysis is primarily made up of the carbon black contained in tires and can be milled to produce a recovered carbon black (rCB) product and sold as a substitute or partial substitute for virgin carbon black

Commercializing this process has, however, proved challenging, with small production scale, and limited demand for the often lower quality pyrolysis products preventing the industry becoming more widespread.

As presented in the Tire Pyrolysis report, this may well be set to change. A greater drive towards circular economy principles from major tire manufacturers, aided by improved quality recovered carbon black from the major tire pyrolysis technology players is expected to boost demand. This has led to both established and new market participants developing new pyrolysis capacity to match this, with a number of new larger scale projects currently either in construction or planning in Western Europe, North America, and Asia Pacific.

### Commercial Technologies

The report describes the chemistry and process principles involved in thermal decomposition of tires via continuous or batch pyrolysis using fixed bed reactors, rotary and screw kilns, and vacuum and catalyst reactors.

The major technological processes and patents produced by key commercial participants Scandinavian Enviro Systems, Pyrolyx, Delta-Energy, Enrestec, and Black Bear Carbon are discussed in detail.

Other companies and commercial technologies covered in the report include (amongst others) Doublestar, Klean Industries, Bolder Black, Beston (Henan), Henan Doing, and Huayin.

Additionally, the report also includes tire decomposition processes that differ from conventional pyrolysis as practiced by Environmental Waste International, Alpha Carbone, and Cassandra Oil.

### Process Economics

The relatively high capital cost required to embark on a tire pyrolysis plant investment means that economic evaluation of commercially available plants is critical. As such the report includes the following:

- Economic modelling of available semi-batch tire pyrolysis technologies to generate rCB. This was studied for the Pyrolyx technology in USGC and Western Europe, and the Scandinavian Enviro Systems technology in USGC and Western Europe.
- The economic evaluation includes a range of rCB and pyrolysis oil price scenarios to investigate the potential profitability of the pyrolysis process

### Commercial Overview

The commercial viability of tire pyrolysis, particularly in North America and Western Europe is highly dependent on sales of both pyrolysis oil and rCB.

The report details the challenges, and substitution potential of rCB into the conventional carbon black market as well as the carbon black market growth globally.



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