



Best Practices in Scrap Tires & Rubber Recycling

Devulcanization - Microwave

Material: Recycled Rubber from Tires, Industrial Scrap Rubber, and Post-Consumer Scrap Rubber Products

Issue: *The thermodynamically irreversible reaction of sulfur and rubber molecules creates a three dimensional network of sulfur polymer molecules. These crosslinks create the useful viscoelastic properties of rubber compounds. The crosslinked rubber possesses useful dynamic properties and good physical properties. The problem is that after the rubber article has used up its useful life, it is difficult to devulcanize the rubber compound and produce a useful material.*

Best Practice: Microwave energy is part of the electromagnetic spectra. The process utilizes frequencies of 915 and 2450 Mhz according to the Goodyear Tire microwave patent. The process produces rubber material that is reportedly devulcanized using impulses that can rupture atomic and molecular bonds. Microwave devulcanization involves exposing rubber materials to microwave energy under controlled conditions. These conditions theoretically sever sulfur binds and produce a rubber material that can be compounded and used in virgin rubber compounds.

Implementation: Goodyear Tire and Rubber Co. obtained a patent for the use of microwave energy in “devulcanizing” rubber compounds in the late 1970s. They used the process to “devulcanize” sort ends of hose trim and out of specification EPDM hose. The resulting material, with the proper compound adjustments, such as oil/filler ratios, could be added back into non-OE and other industrial EPDM hose and industrial goods. The process was used for many years and then abandoned due to unfavorable economics.

Benefits: The major benefit of the process was to take scrap rubber ends and out of tolerance EPDM hose and produce a useful recycled product that was added to new rubber goods.

Application Sites: Formerly Goodyear Tire and Rubber Plant, Lincoln, NE. There are at least 2 other proprietary sites prototyping this process for commercial development.

Contact: For more information about this Best Practice, contact the CWC at (206) 443-7746, email info@cw.org.

References:

1. Patent No. 4104205 issued August 1, 1978, to Goodyear Tire and Rubber Co., Akron, OH.
2. Westinghouse Electric, Nuclear Division, Personnel Communication.
3. Former Goodyear employee involved in the development and use of the microwave process.

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