

EPDM Rubber (9359)

The EPDM business is changing due to a number of factors such as globalization of end user OEMS, the growth of developing countries, especially in Asia, the advent of new competitive technologies, and polymers such as those produced with metallocene catalysts, gas phase EPDM, and second generation polyolefins. These changes are all happening in a relatively short period of time, which puts a great deal of pressure on producers to react in a way that will not create a chaotic competitive climate. But each producer is quite different and will have to exercise its respective strengths to maintain or increase profits in spite of the changing business environment. Change is the message of the 1990s and companies that can develop a new vision or context for doing business in the next century will be best positioned to come out ahead.

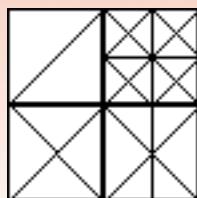
EPDM is primarily produced in Ziegler-Natta catalyzed solution polymerization. The copolymer or terpolymer can be used cured or uncured. The products made from ethylene and propylene (EPR) are saturated and cannot be sulfur cured. These require a peroxide for curing. The incorporation of a third diolefinic monomer such as dicyclopentadiene (DCPD), ethylidene-5-norbornene-2 (ENB) or 1,4-hexadiene (1,4-HD) adds unsaturation and permits the conventional type of sulfur cure.

The solution process for EPDM is carried out continuously in two reactors arranged in series. The solvent is an inert organic solvent, including hexane, cyclohexane, benzene, dichloroethylene, and other hydrocarbons in the C5-C8 range. The coordination catalysts normally used are prepared by mixing a vanadium compound (vanadium oxytrichloride) and an alkylaluminum compound (triethylaluminum or triethylaluminum sesquichloride).

Production cost economics are presented for a 45,000 metric ton per year EPDM (ENB diene) plant at a USGC location. The economics represents a typical 60/35.5/4.5 ethylene/propylene/ENB wire and cable grade.

The slurry process is used in plants in Italy (Enichem) and the United States (Bayer). The reaction occurs in a two stage reactor at pressures similar to the solution process. The reaction heat is removed by propylene liquid feed, which is condensed and recycled. The polymer is insoluble in the reaction medium and higher solids contents can be maintained than in the solution process.

An important development in EPDM production is the use of gas phase processing. Union Carbide has developed, and is erecting, a major commercial plant in Seadrift, Texas. The process is based on Union Carbide's UNIPOL process for the production of polyethylene and polypropylene. A comparison of the production economics from the



conventional solution and Union Carbide gas phase processes shows a distinct advantage for the gas phase process largely due to the economy of scale of the single line gas phase plant compared to the multiline solution plant.

EPDM will be in competition with the new generation of metallocene and non-metallocene products that have comparable properties. This report examines the cost competitiveness of two such materials, Dow INSITE (metallocene) polyolefin elastomer (POE) and gas phase in situ TPO (non-metallocene). Solution produced EPDM will be at a significant disadvantage to these materials, as described in the report, where a 70/25.5/4.5 ethylene/propylene/ENB solution EPDM is compared to Dow's POE, and a 60/40 ethylene/propylene solution EPR is compared to in situ gas phase TPO.

