ETHYLENE-PROPYLENE RUBBER (EPR)
The global market
EP(D)M : A LONG HISTORY STILL GOING ON.....

• 1950’s : pioneering research on ionic coordination catalysts by Ziegler and Natta. Pilot plants active in Europe, USA and Japan

1960s : first industrial plants built in Europe and USA

1970’s : 10 companies strongly involved in EP(D)M market; total production reaches hundreds Kton

Today : volume as a commodity, performance as a specialty
EP(D)M WORLD MARKET

12 PRODUCERS * (TOTAL CAPACITY IN 2011 = 1266 Kt)

TOTAL CONSUMPTION (2011) : 1130 Kt

EPDM / EPM RATIO = 85 / 15

EPDM GROWING FASTER THAN "GDP"

"GROWING ECONOMIES" CONSUMPTION RATE FASTER THAN USA/EUROPE

* Except Unimers (India) and Nizhnekamkniplastnikhkim (Russia)
SYNTHETIC RUBBER WORLD MARKET
- Consumption in 2011 by type (Ktons) -

EP(D)M, is today the third largest synthetic rubber consumed worldwide, after SBR and BR

Source: Sinopec in the Futures Research department
# After SBR and BR, EPR is today the third-largest synthetic rubber consumed worldwide.

# Global EPDM market will grow at an average annual rate of 6.5 percent through 2019¹

* Estimated

Source: IISRP, IRSG, IHS Chemical

¹ IISRP (Global SR Overview, 2014)
Fields of application
EP(D)M APPLICATIONS
- Automotive: hoses and moulded parts -

Dashboard
Radiator hoses, A/C hoses, Heater hoses
Front and rear bumpers
V-belts
Front lamp gaskets
Brake system
Rear lamp gaskets
Sidewalls, inner tube
Interior panels
EPR APPLICATIONS
- Automotive profiles -

- Cow seal
- Hood-to-cowl seal
- Hood-to-radiator seal
- Cutline seal
- Rear window seal
- Sunroof seal
- Trunk/tailgate seal
- Rear quarterlight
- Windshield gasket
- Rock panel
- Primary door seal
- Inner belt line seal
- Lower strip
- Molded corner
- Glass run channel
- Secondary door seal
- Outer belt line seal
- Rear quarterlight
- Roof line seal
EP(D)M APPLICATIONS
- Primary door seal -

- Expanded profile
- Metal insert
- Compact profiles
EP(D)M APPLICATIONS
- Tyre sector -

Bladder
Flap
Tubeless tyre valve
Bycicle tyre sidewall
Car tyre sidewall
Inner tube
EP(D)M APPLICATIONS
- Building -

1. Roofing membranes
2. Seals (windows, doors)
3. Expansion joints
4. Ballast
5. EPDM Membrane
6. Insulation
EPR APPLICATIONS
- Washing Machines -

Bellows and Pipes

Door gaskets
EP(D)M APPLICATIONS
- Mechanical goods -

- Tank Lining

- O-Rings

- Conveyor belts

- Steam and Gas Hoses

- Roll Covers

- Tubes & belts
Olefinic TPEs comprise two main classes of rubber-modified polypropylene, known as TPO and TPV.

In their most simplicistic representation, TPO recipes comprise two-component mixtures of an elastomeric soft domain (EPR) and a hard domain (PP).

As such, the EPR component in TPO usually forms a discontinuous phase within the thermoplastic resin matrix that is the continuous phase.
EP(D)M APPLICATIONS
- Polyolefins modification in the automotive field-

- Bumpers
- Door panels
- Dashboard
- Air ducts
EP(D)M IN OIL ADDITIVES (V.I.I.)
- Why EP(D)M is used -

• Today’s engine oil contains some additives (dispersants, detergents and antioxidants) to keep the engine clean. Special additive – called Viscosity Index Improver (VII) – is also added in order to enhance oil performance at low/high temperature.

A VII is an oil-soluble polymer which reduces the tendency of an oil to change its viscosity with temperature, so to obtain a “Multi Grade Oil”.

• Among viscosity modifiers, EPR copolymers are widely used for motor oil due to the excellent balance between performance and cost.
LUBRICANTS FOR ENGINE

Viscosity improvers

Viscosity

SAE 30
SAE 10W30
SAE 10

Low Temperature
High Temperature
EP(D)M APPLICATION
- Motor oil (V.I.I.) -

• Improve the thickening ability

• Have slight effect on shearing stability and enhance heat oxidation

• Increase the low temperature performance

• V.I.I. based on EPR shows a good compatibility with other additives without affecting other index
THERMOPLASTIC VULCANIZATES (TPV)
- What are TPVs-

- Thermoplastic vulcanizates (TPVs) belong to the family of thermoplastic elastomers (TPE).

- TPVs are polymeric compounds that exhibit a thermoplastic behaviour at melt temperature and elastomeric properties in a wide range of temperature.

- Several elastomers can be used for TPVs.

- One of the most interesting TPV is based on EPDM and PP; they are obtained by blending EPDM and PP and by crosslinking the rubber component.
EPDM BASED TPV

- **TPV** is a material in which crosslinked rubber particles are present in a relative high amount (50–70 wt %)

- The EPDM particles and domains are dispersed in the continuous PP matrix.

- The size and distribution of the elastomer and the final properties depended on the amount and the type of EPDM and PP.
THERMOPLASTIC VULCANIZATES (TPV)
- Applications -
EPRs are normally supplied in form of compact bales. Some grades are also supplied in friable bale or in pellet form.

**Compact bales:** no limit with regard to the polymer structural parameters. Bales based on very low Mooney viscosity or and very narrow MWD polymer can be subjected to deformation (cold flow).

**Friable bales:** permit to improve the processability in internal mixer due to a faster dispersion and filler incorporation than compact bales. Obtainable only with high ethylene grades.

**Pellets:** can permit automatic handling and feeding of internal mixer or of continuous mixer. Can give compounds to be produced in pellet form. Obtainable only with high ethylene grades.
EPR CHARACTERISTICS
- Rubber physical form -

Friable Bale

Compact Bale

Pellets

Box