NATURAL AND SYNTHETIC RUBBER

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INTRODUCTION

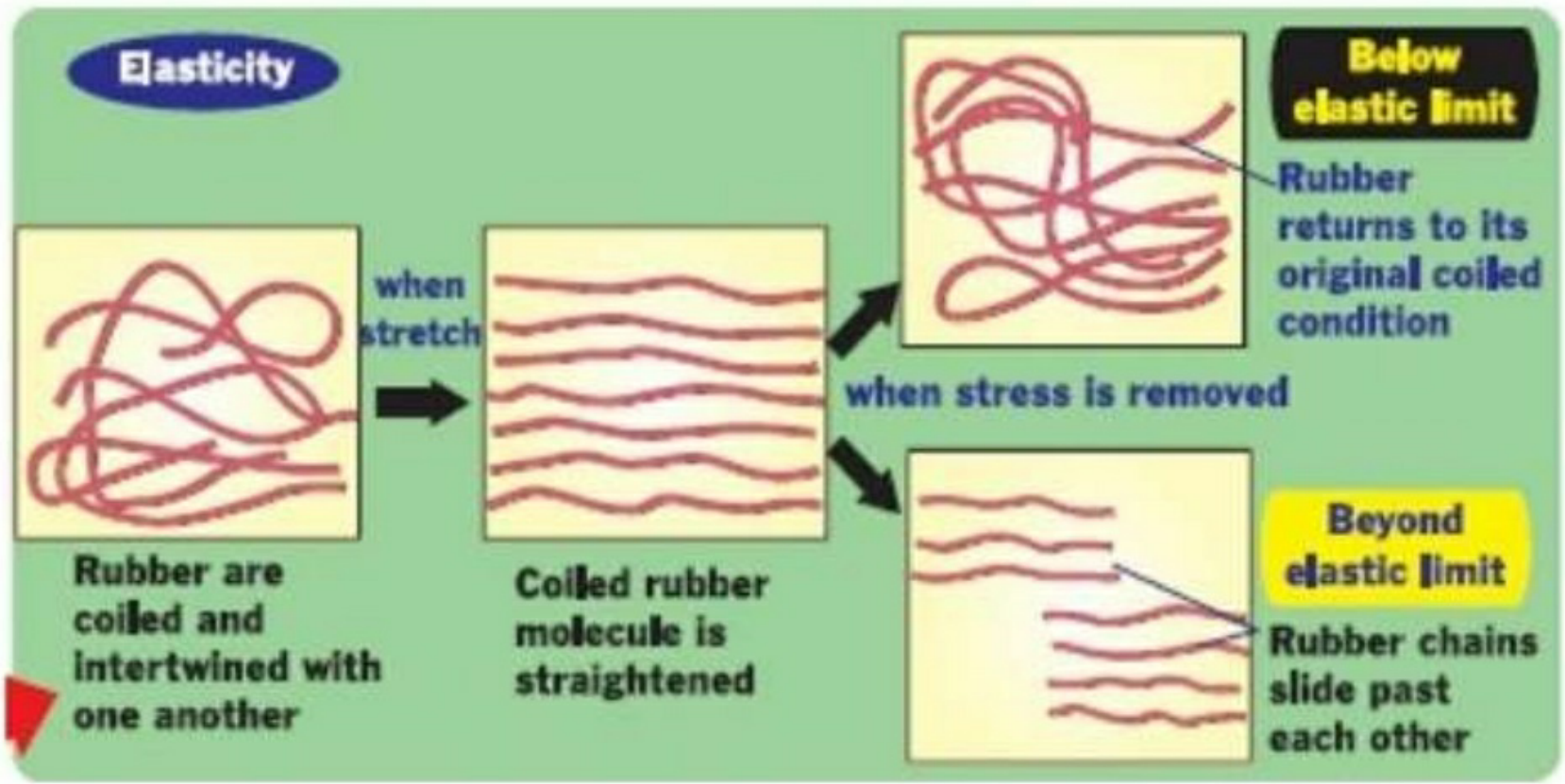
- Elastomers are used in wide variety of industrial, medical and household products and major portion of elastomers consumption goes into tyres next largest product sector is latex goods.
- There are two major types of elastomers; natural rubber a product of tropical tree Hevea brasiliens is and synthetic rubber- a family of materials derived from petrochemical feed stocks[Chemistry & industry 5, August 1996, p.574]. Major producers of natural rubber are natural rubber producing country are Thailand, Indonesia and Malaysia, Africa, Latin America, Brazil,Cambodia, Nigeria, Sri Lanka, Thailand, India.
- Demand for natural is estimated to have been around 10.9 million tones in 2011 out of which around 45 percent was from Asia. About 92percent of natural rubber is produced from Asian countries. The demand for natural rubber globally is projected to grow by 3-4percent through 2014.
- Synthetic rubbers have slowly replaced natural rubbers and have undergone variousdevelopments for applications in automotives, chemical industry, energy generationSports,aerospace industry,etc

NATURAL RUBBER

Natural rubber, also called **India rubber** or ***caoutchouc***, as initially produced, consists of polymers of the organic compound isoprene, with minor impurities of other organic compounds plus water. Forms of polyisoprene that are used as natural rubbers are classified as elastomers. Currently, rubber is harvested mainly in the form of the latex from certain trees. The latex is a sticky, milky colloid drawn off by making incisions into the bark and collecting the fluid in vessels in a process called "tapping". The latex then is refined into rubber ready for commercial processing. Natural rubber is used extensively in many applications and products, either alone or in combination with other materials. In most of its useful forms, it has a large stretch ratio and high resilience, and is extremely waterproof.

PROPERTIES OF NATURAL RUBBER

* Reactive towards oxidation
* Low melting point
* Low tensile strength
* Too rigid when cool
* Too soft and sticky when hot
* Insoluble in water, acid and alkali



INDIAN STATISTICS OF NATURAL RUBBER

Availability of Natural Rubber in Tonnes

Year	vious Balance	Production	Import	Availability	Consumption
1996-97	103190	549425	19770	672385	561765
1997-98	107310	583830	32070	723210	571820
1998-99	147300	605045	29534	781879	591545
1999-00	187965	622265	20213	830443	628110
2000-01	192570	630405	8970	831945	631475
2001-02	183900	631400	49769	865069	638210
2002-03	193070	649435	26217	868722	695425
2003-04	117995	711650	44199	873844	719600
2004-05	78340	749665	72835	900840	755405
2005-06	106200	802625	45285	954110	801110
2006-07	93020	852895	89699	1035614	820305

SYNTHETIC RUBBER

- **Synthetic rubber**, invariably a polymer, is any type of artificial elastomer mainly synthesised from petroleum byproducts. An elastomer is a material with the mechanical (or material) property that it can undergo much more elastic deformation under stress than most materials and still return to its previous size without permanent deformation. About 15 billion kilograms of rubbers are produced annually, and of that amount two thirds is synthetic. Global revenues generated with synthetic rubbers are likely to rise to approximately US$56 billion in 2020.
- Synthetic rubber, like natural rubber, has uses in the automotive industry for tires, door and window profiles, hoses, belts, matting, flooring and dampeners (antivibration mounts).

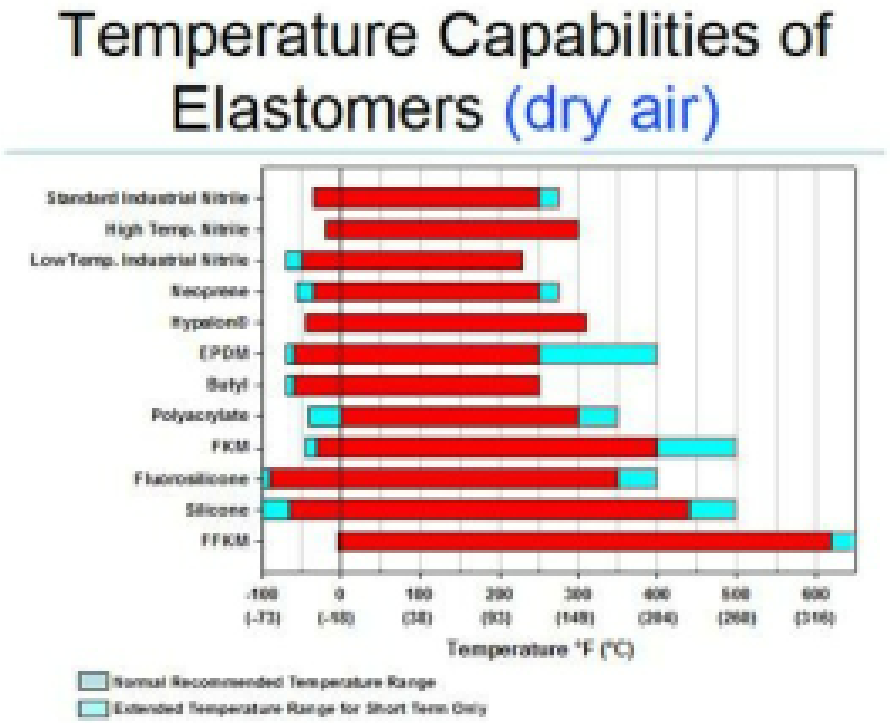
APPLICATIONS

SYNTHETIC RUBBER

USES

- Car tires.
- Flexible rubber toys.
- Paint.
- Shoe soles.
- Rubber gloves.
- Tubes and hoses.

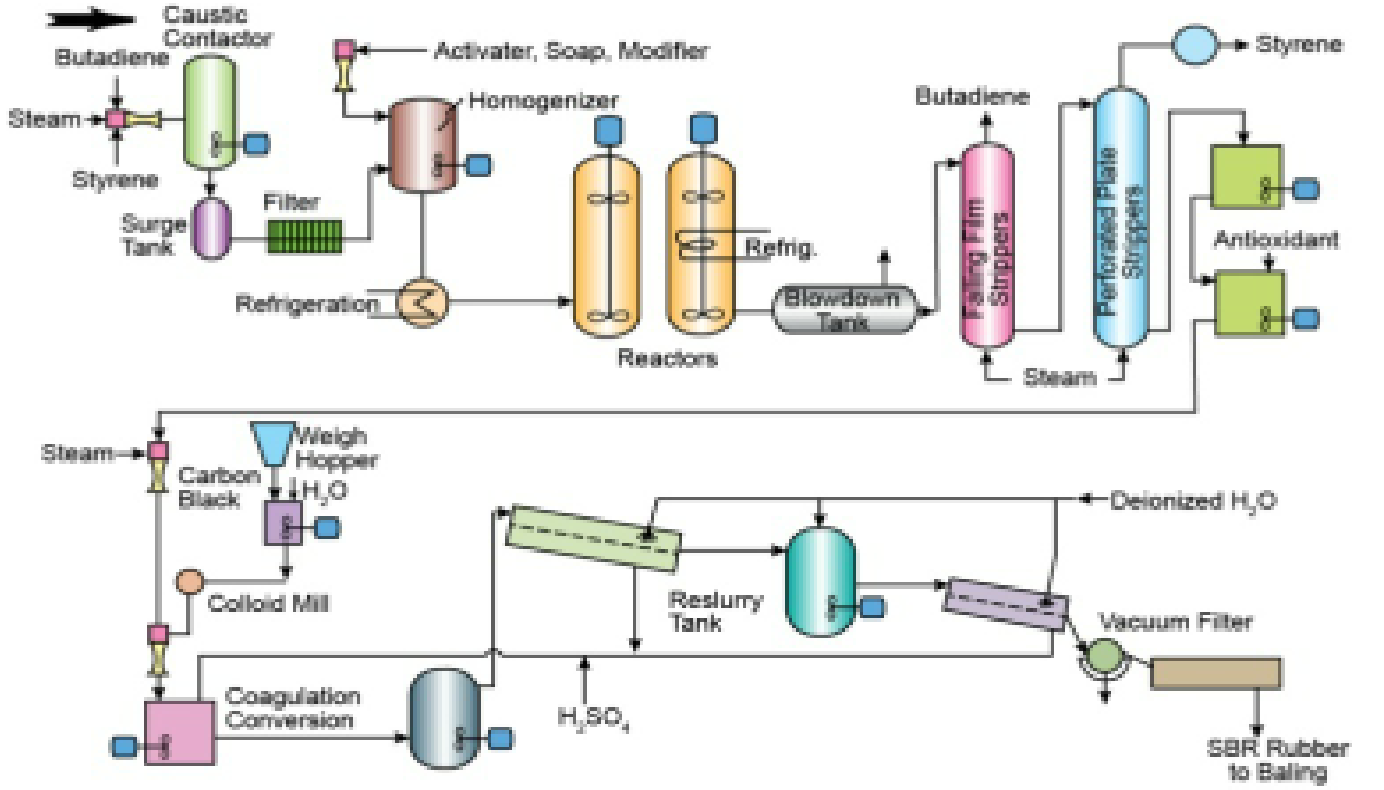
GRAPH:


Temperature Capabilities of Elastomers (dry air)
Standard Industrial Nitrile
High Temp. Nitrile
Low Temp. Industrial Nitrile
Neoprene
Hypalon®
EPDM
Butyl
Polyacrylate
FKM
Fluorosilicone
Silicone
FFKM
-100 (-73)
0 (-18)
100 (38)
200 (93)
300 (149)
400 (204)
500 (260)
600 (316)
Temperature °F (°C)
Normal Recommended Temperature Range
Extended Temperature Range for Short Term Only

STYRENE BUTADIENE RUBBER (SBR)

- Styrene butadiene rubber is most widely used elastomer in the world.SBR is used forboth tire and non-tire application Styrene butadiene rubber known as Buna-S was first prepared by I.G.
- Farbenindustrie in Germany. There has been significant development in the process technology of styrene butadiene rubber manufacture. Amongst the various processes, emulsion polymerisation of SBR is most commonly used. The cold process of emulsion polymerisation process has replaced the hot polymerisation process. In India, first SBR manufacture was started by Synthetic and Chemicals, Bareilly in 1963, however, the unit has been closed presently.
- Although butadiene is recovered from cracker plant, it can be also made from ethanol route.
- Styrene is made from ethyl benzene by alkylation of benzene with ethylene which can be also recovered from FCC gases.

Butadiene styrene(SBR) rubber process



Production technology

- There are tow conventional routes to producing solid SBR:

  - Hot emulsion polymerization
  - Cold emulsion polymerization

HOT EMULSION POLYMERISATION

- Hot emulsion polymerization is the original SBR process. The major characteristic of this process is that these grades have exceptional processing characteristics in terms of low mill shrinkage, good dimensional stability and good extrusion characteristics.

- However, high levels of micro-gels are also produced, so there is a trend towards using the cold emulsion grades in many applications.

- However, they are still used in applications such as adhesives and flow modifiers for other elastomers where good flow properties are required.

COLD EMULSION POLYMERISATION

- Cold emulsion polymerization produces SBR grades with superior mechanical properties, especially tensile strength and abrasion resistance, compared to the grades produced by the hot emulsion polymerization process.

- This process has largely replaced the hot emulsion polymerization process for production of e-SBR grades.

NEOPRENE

DESCRIPTION AND PROPERTIES

- Synthetic rubber.
- It's produced by polymerization of chloroprene.
- It has good chemical stability.
- Flexible over a wide temperature range.
- It is colourless.
- Resistant to sun, climate and ozone deterioration.

NEOPRENE

ORIGINS AND HISTORY

- It was invented by DuPont scientist (1930).
- First name: DuPrene.
- It smelled bad and was expensive.
- Problems were solved and was a success.
- It name was changed to neoprene.

NEOPRENE

RECLYCLING

- Waste burying techniques.
- Incineration.
- Some brands do recycling processes.
- Using old neoprene to create shoes, t-shirts…

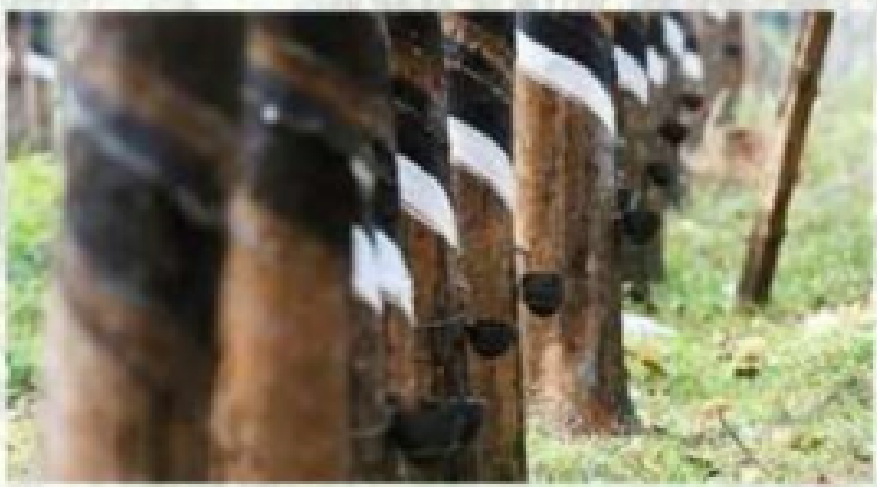
NEOPRENE

USES

- Laptop sleeves.
- Wetsuits.
- Small boats.
- Boots.

Conclusion

- Both natural & synthetic rubber is not widely use in the construction industry.
- However, it is mainly used in household & industrial products
- Therefore, rubber industry have a bright future for rubber industry.




Thank You!