

MAKING POLYMERS ECO-FRIENDLY

One of the major trends in polymer science that have received increasing attention relates to its growing environmental impact. Scientists are aware of the problem and are grappling with the issue of lessening its adverse impact on the ecosystem, says **Morteza Shirazi**, a researcher on Elastomer Technology and Engineering at the University of Twente, working on a project funded by Eindhoven-based Dutch Polymer Institute

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In tyre industry, where polymers are used in large scale, greater attention is being given to find ways to reduce their negative impact on the environment. The thrust of major research is to come up with product and processes that are green, says Morteza Shirazi, a researcher on Elastomer Technology and Engineering at the University of Twente.

One of the world's leading research institutions working in this area is the Dutch Polymer Institute, a public-private partnership. It conducts pre-competitive research on polymers and their applications, by funding researches in universities and linking scientific knowledge to technological impact, responding to the industrial need for innovation.

It has taken up research on sustainable elastomers where high-performance fibres are introduced to rubbers to make them efficient and green. Such composite materials have shown improved mechanical properties. It is now known that hysteresis loss of aramid-fibre reinforced rubber is greatly reduced resulting in lower rolling resistance and fuel savings when used in tyres.

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Today, more than 30 multinational companies in the area of polymer development, manufacture and use and some 35 academic institutions are collaborating with DPI, where quality academic research with high industrial relevance is being conducted by some 250 researchers. They are collaborating with an almost equal number of industrial experts, who are developing intellectual property.

In an interview to Tyre Asia, Shirazi identified three major trends in the after usage life of polymers. First, researchers like him are trying to make polymers from natural sources; second, they are striving to make recyclable or biodegradable polymers and third, they are aiming to increase the life time of polymers.

"In the tyre industry although a large amount of polymers which are used are from natural sources (natural rubber), because of curing, they are not easily recyclable or degradable," he noted.

However, he thinks that this issue will affect tyre industry in two ways. "They are increasing the life time of tyres, which has always been an issue; and activities such as retreading and recycling."

Relevance of synthetics

He does not think increasing emphasis on green technologies will see a drop in the use of synthetic rubber in the manufacture of tyres. "I don't expect a drop in the usage of synthetic rubbers," he said. "It's because as explained earlier, despite being a natural source, after curing, natural rubber is not very green either."

On the other hand synthetic rubbers have better performance in some applications comparing to natural rubber like the tread of passenger tyres, Shirazi said. "I suppose more efforts would be done on



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recycling of synthetic rubbers, especially in the case of Styrene-Butadiene-Rubber (SBR)."

Commenting on breakthroughs in polymer R&D that the tyre industry is doing to help cut down on production costs of tyres with enhanced low rolling resistance and better grip, the scientist said that the usage of resins in tyres can be a way to increase grip with minor effect, or even no effect on rolling resistance.

"The advantages of using resins— some grades of them can be obtained from natural sources — seem not to be considered by tyre factories extensively yet, but actually they can be a very good option." Using short fibres in tyre treads — although a lot of questions in this field still exist — can be considered as well, he said.

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Generally speaking, the magic triangle always will be the main challenge, which means that three most important properties of tyres — rolling resistance, wear and grip — will not usually change in the same direction. The same story exists for the safety and durability.

The project that is running now in University of Twente in the Netherlands, in which Shirazi is involved, is also addressing this challenge. "Although a lot of question in this respect should be answered, short fibres sound promising when used in tyre treads as it increases durability with no negative effect on safety," he said.

The use of such fibres can even improve traction, he reasoned. In this respect, tribological properties of these composites (short fibre-rubber) are now under investigation by researchers at the university. ▲