

# New Asian capacity and sustainable feedstock reshape global EPDM market

Ethylene-propylene (EP) elastomers are the third-largest volume of synthetic rubber consumed worldwide, after styrene-butadiene rubber (SBR) and polybutadiene rubber (BR). EP elastomers are characterised by their outstanding resistance to ozone, ageing, weathering, and high temperatures. They possess good low-temperature flexibility and have excellent electrical properties. They are particularly useful in many automotive parts, single-ply roofing, appliance parts, polymer modification, wire and cable sheathing, and viscosity index improvers for lubricating oils and hoses.

Two primary types of EP elastomers are manufactured: ethylene-propylene copolymer (EPM) and ethylene-propylene terpolymer (EPDM). EPDM is estimated to account for about 85 % of total world production of ethylene-propylene elastomers. Although dwarfed by butadiene rubber production, EPDM is the most versatile synthetic rubber and is showing the steady growth. It is in the area of automobile construction where the main growth is being seen. In the 1970's plastics and rubbers accounted for just 3 % of a vehicle. That figure has increased to 15 % in Europe and 9 % in Japan. In the 1970's most of the usage was for interior components but now plastics and rubbers are being used in the engine compartment and for functional parts. Higher performance from these products coupled with a drive to reduce vehicle weight and improve efficiency is driving the increase.

- Legislation to reduce CO<sub>2</sub> is in place in Europe. The target of 130 g/km must be achieved by 2015.
- The California Air Resources Board requires manufacturers to ensure that 15 % of new vehicle sales from 2017 are environmentally friendly. Labelling systems for fuel-efficient tyres are in place across many countries.

- Projections suggest that there will be annual sales of more than 60 million passenger vehicles across the USA, China, Europe, and Japan. 20 % are expected to be classified as environmentally friendly.

Thermoplastic elastomers (TPO/TPE) and thermoplastic vulcanisates (TPV) are establishing a significant market share in automobile construction. TPE has the biggest market share of the total modified elastomers market and with EPDM used in its production, the demand for EPDM is mirroring the increase.

TPE are finding more applications in automotive construction, plastic modification, and building + construction segments by replacing other products such as bitumen and PVC, which have a poorer environmental standing. TPE/TPV exhibit high impact resistance, good resistance to weathering, and toughness. However, the main benefit is the ability to be recycled.

## Current market trends

Recessionary pressures in 2008/2009 hit hard and consumption of EP elastomers dropped considerably. However, during 2010 – 2011 there was a noticeable increase in EP elastomer consumption as the automotive industry started a recovery. The EP elastomer market is highly dependent on the automotive sector as well as the building + construction sector. Consumption of EPDM in automotive applications is the major use for EP elastomers accounting for more than half of global demand. This demand for

EP elastomers will depend on several important factors:

- Continuing competition between EP elastomers and other polymers/copolymers
- Automotive production levels
- The levels of building construction/single-ply roofing materials/re-roofing rates
- Regional GDP growth.

To profile the market and focus on the fast growing Asia/Pacific region, The Strategy Works Ltd. (TSW) has conducted three in depth interviews with leading manufacturers representing different parts of the EPDM supply chain:

- Lanxess, spun off from Bayer in 2004 and then acquired parts of DSM Elastomers in 2011, has grown to an EUR 9.1 billion group in just nine years. EPDM accounts for some 5 % of this turnover (> EUR 500 million) making Lanxess the largest EPDM manufacturer in the world. The acquisition nearly tripled the company's capacity and the Lanxess EPDM headquarters was then relocated to the former DSM office in the Netherlands. The Keltan brand name was applied in May 2012 and most of its existing Buna grades were renamed Keltan, except for the Buna discontinued grades, which will all be replaced by the end of 2013.
- JSR in Japan posted net sales of JPY 371.5 billion (~ EUR 2.8 billion) in fiscal year ended 31 March 2013, with the Elastomers business contributing JPY 195.8 billion (~ EUR 1.5 billion). For its EPDM business, JSR is planning to make full use of its own technology to become a world class EPDM manufacturing company. One of its strategies is the leverage of Kumho Polychem Co., Ltd, a 50 % joint venture company with Korea Kumho Petrochemical, by adding an additional production line with a capacity of 60 kt/y in September 2013 and another 60 kt/y in September 2015. Thus, total capacity of JSR and KPC will grow to approximately 250 kt/y. A spokesman for JSR commented: "The synergy effect of JSR's high quality polymer technology and KPC's advantageous geographical position will help us deliver on our promise."

Michael Herson  
mherson@thestrategyworks.com  
Managing Director,  
The Strategy Works Ltd., London, UK

- Further down the supply chain, Dutch manufacturer BRB International has grown from EUR 5.5 million in 1999 into a EUR 140 million business in 2012, divided 50:50 into the two main divisions Silicones and Lubricants Additives + Chemicals (LAC). Oil additives are the major focus for LAC with viscosity modifiers and fuel additives and a range of products used for cleaning, degreasing, and corrosion inhibition.

## Global demand: Impact of new capacity in Asia by 2016

**Table 1** clearly shows Asia (in particular China and India) as the main driver behind global demand for EPDM, driven largely by the automotive and construction sectors.

Lanxess has four existing production sites with a fifth currently under construction in China. The Chinese plant will be commissioned by 2015 and is 100 % owned by Lanxess. **Oliver Osborne**, Director Global Marketing of Lanxess, explained: "We believe that it's to our advantage to remain independent and have not opted for JV capacity investments." The expansion in China is equivalent to adding almost 50 % extra capacity (from 362 kt/y to 522 kt/y) supporting Lanxess' claim to be the number one global producer with a significant investment and a commitment to the industry.

Osborne calculates that only between 20 – 40 kt of EPDM demand is actually manufactured in China and, with the local market estimated to be 200 kt, this means 75 % of demand is imported. "We have quite a good presence already with our imported products, but we think this investment will create further growth in the future, increasing our growth in China as well as the other Asian countries," added Osborne.

BRB is further downstream in the supply chain and its LAC facilities are predominantly blending and mixing. They have plants in USA, Malaysia, the Netherlands, and Germany and **Roger Dohmen**, Vice President of the LAC division, said BRB is ready to meet increased demand: "[...] we have substantial capacity and can offer customers production flexibility to meet the requirements of official approvals."

## Technical capabilities

The Keltan ACE (Advanced Catalyst EPDM) catalysts technology is the preferred option for Lanxess. "We have shown our ACE technology to the world, customers have seen that it works in all applications, they have tested it and approved it, so we have the confidence that it works," commented Osborne.

JSR prefers not to adopt metallocene catalysis in its manufacturing. The company

claims that customers are wary of the products made using metallocene. A spokesman for JSR commented: "According to our research, some customers say that Ziegler catalyst grades are easier to process. We are not considering metallocene, but will focus on polishing up our existing technology."

## Sustainable feedstock

Most important to Lanxess is its sustainable sourcing 'Keltan Eco' technology launched in 2011. Lanxess is the first and only company to produce EPDM using ethylene from bio-ethanol. In an industry dominated by oil-derived feedstock, Lanxess is setting new standards for sustainability. Its EPDM plant in Triunfo Brazil is close to Braskem, an independent company selling green ethylene produced from sugar cane-derived ethanol. Lanxess has access to 42 kt/y capacity in Brazil. "In the near future Braskem has the ambition to produce propylene from sugar cane and then our products will become over 90 % bio-based," commented Osborne.

The limitation of this technology is that the EPDM production has to be near to the sugar cane. Ethylene derived from this source can not support extra transport costs to be delivered to other regions. However, recent research has identified rice straw as a viable source of lignocellulosic material, that can be used to produce bio-ethanol. There

**Tab. 1:** World supply/demand for EP elastomers (Source: TSW estimates)

Region	Annual capacity / kt/y	Production / kt/y	Imports / kt/y	Exports / kt/y	Consumption 2011 / kt/y	Consumption 2016 / kt/y	Growth 2011 – 2016 / %
USA	>486	486	44.2	254	276	317	2.8
Canada	0	0	19.2	0	19.2	17.5	-1.8
Total Latin America	42	34.5	32	15.1	51.4	65.8	5.1
Western Europe	400	330	70	137	263	283	1.5
Central/ Eastern Europe	34	12	62.1	3.8	70.1	81.2	3
Africa	0	0	1.8	0	1.8	2	2.1
Middle East	0	0	44.5	2.1	42.4	51	3.8
China	45	35	207.2	4.1	238.1	408	11.4
India	10	0	32	2	30	50	10.8
Japan	174	160.2	20.2	78.3	102.1	116.4	2.7
Korea	127	109	9	73	45	51	2.5
Taiwan	0	0	19	3	16	18	2.4
Other	0	0	49.3	0	49.3	58.5	3.5
Total Asia	356	304.2	336.7	160.4	480.5	701.9	7.9
Oceania	0	0	6	0	6	6	0
<b>Total</b>	<b>&gt;1,318</b>	<b>1,167</b>	<b>617</b>	<b>573</b>	<b>1,210</b>	<b>1,525</b>	<b>4.7</b>

are challenges to overcome before the process could be commercialised, but this would then open the door for other regions to enter the sustainable feedstock market.

Lanxess can counter any arguments about excessive use of arable land for ethanol production. The area currently designated for ethanol production occupies 1.5 % of the Brazilian arable land and < 1 % of the total area. "If all new cars used Keltan Eco it would mean that in the end it all comes down to 0.04 % of arable land in Brazil that has to be used to get to that point," added Osborne. He pointed out that this is a sustainable technology that can be shown to have little impact on the Amazon rain forest and the global energy vs. food equation because:

- The sugarcane is produced more than 2,000 km away from the Amazon rain forest.
- Assuming an average usage of 7 kg of EPDM per car and a capacity of 7,000 litres of annual ethanol production per hectare, more than 600 cars per hectare with bio-based EPDM can be produced. 78 million cars produced globally per year equates to the calculations indicated above.

"We focus on high-end applications. It is extremely important that our partners also have sustainability on their agenda. So we can think of companies like Toyota with the Prius but also consumer goods like household appliances. As distributor and producer, BRB has plans to market this technology for oil additives," added Osborne. Lanxess has a marketing relationship with BRB and works with the company as a channel for viscosity modifiers. "All our EPM is produced in Brazil. Sugarcane can be harvested three times a year. So there is enough sugarcane to produce the materials. So there is no limitation," confirmed Dohmen.

It is economical for BRB to import from Brazil and the company is receiving positive feedback from its customers for its Viscotech Eco brand. One of the focus areas for Lanxess with its ACE and ECO brands is green mobility. Labelling of tyres is now showing how green they are in relation to reduced fuel consumption and Lanxess is tapping into this opportunity. "Lanxess, as a rubber supplier

compared with competition, has a very broad range. So we have the tyre products, SBR, butyl rubber and butadiene, and then the technical rubber products, as we call them, like EPDM, CR, NBR, HNBR, and EVM," commented Osborne.

## External market trends in Asia

JSR expects an increase in EPDM demand due to the increase of automobile production centred in Asia in addition to the stable rise in demand in developed nations. The company sees other manufacturers investing heavily in new capacity to meet this demand and forecasts a change in the market dynamic. JSR believes that the supply-demand balance will change places after 2014 and it will become a buyers' market and uncompetitive players will die out.

70 % of EPDM's applications are with automobile manufacturers where JSR already has many clients, so it will continue to focus on that area. A spokesman for JSR said: "Many automobile parts manufacturers in Japan have plans to start up plants in Asia and we think that sales in East Asia will increase. In fact we see this as a larger growth market than China in the future."

## Alternative technologies

Thermoplastic vulcanisates are expected to grow strongly. It will take some business from the direct EPDM market as the design tolerances of TPV can be three times tighter than EPDM. Items such as glass run rubber strips for automotive windows have already started the switch to TPV. "However, EPDM will always have this uniqueness of being a flexible and weather/ozone/heat resistant material. If you go to a mixture with plastics you always lose some flexibility in the product, it will become more rigid," commented Osborne. Lanxess has involvement in this market via several TPV manufacturers. One of them is Teknor Apex, who acquired the DSM Sarlink brand promoted as "feels like rubber, processes like plastic".

JSR have 17 standard grades of EPDM but also have several 'special' grades, i. e.:

- A bimodal molecular weight grade that offers good workability in compounding and excellent mechanical properties.
- Improved randomness of the ethylene and propylene in the polymer backbone. This contributes to superior properties even in cold temperatures.
- JSR also has very high molecular weight grades that offer high physical properties and high oil extension.

JSR is also focusing on the TPV sector. The company's TPV is a EPDM / PP and is more expensive than other suppliers' standard TPV, but it has good adhesion properties and contributes to a cost reduction in the process. Therefore, it is used in areas where high quality performance is required, such as the corner mouldings of automotive weather seals and glass run channels. JSR is launching new TPV grades under the Excelink brand (Excelink 2<sup>nd</sup> generation), one is a short cycle time grade and the other is a high elasticity grade. JSR believes that there is big growth potential in these grades.

BRB plans to expand its viscosity modifier range from its current level of 25 products. The aim is to have a 100 % sustainable Viscotech Eco VII. By combining the Lanxess EPM from Brazil with recycled oils, BRB will have a fully sustainable product. Dohmen reported that OEM's such as Volvo and Scania are very interested in these products and with many governments struggling to reach environmental targets, such products will be well received.

## Conclusion

The expansion of capacity in Asia coupled with a new focus on both high-end applications and sustainable feedstock is changing the shape of the global EPDM market. Lanxess' significant investment (~ EUR 235 million) in China has already been the catalyst for the formation of a new business unit 'Keltan Elastomers'. Within two years a 1,500 kt global market is predicted and this new capacity will ensure security of supply will no longer be an issue and underpin market growth worldwide.