Dena: Working With Rubber Nanomolecules

When the industry talks of rubber recycling there is a tendency to aim to devulcanise and re-use rubber for its original purpose. Failing that the aim is for rubber crumb to be bonded using other polymers to create new products such as pavers or road furniture.

Dr. Brian Sulaiman's nano reactor has led to the development of Dena's process for recycling tyre rubber and textile

There are many projects around the world aiming to develop new uses, new products from recycled rubber. We discussed several such products in the previous issue of the magazine – Wood-rub, Eco-rub etc..

Here, we are looking at Dena Technology's use of nanoparticles of rubber to produce a new polymer blend product, using crumb rubber, which has a seemingly endless range of final products, all of which are infinitely recyclable, using the same processes that created them in the first place.

The man behind Dena Technology Ltd is Dr Brian Sulaiman, who qualified from Leeds University and went on to develop a Nanotechnology process that guaranteed high quality output without fluctuation in the grades produced with lower costs and reduced production time. The Nano reactor developed by Dr Sulaiman was used to help develop a patented pyrolysis system with consistent high quality output and for many that would have been enough. However, Dr Sulaiman realised that this was possibly not the best solution from either an environmental or commercial stance. "There are a number of issues with pyrolysis or devulcanisation type processes". He tells me, "They need licences and that can be time consuming. They require large energy input, and there are emissions issues depending upon local standards. Moreover, it can take years to start seeing a return on investment."

Dr Sulaiman took his Nano reactor and looked at what could be done with it, and has found many applications in semiconductor manufacture, pharmaceuticals and in rubber recycling to name but a few fields of interest that the Dena Technology Group has been developing; some 15 separate areas of business development in all.

In the rubber recycling sector Dena has, in essence, created, by utilising the attributes of Nano molecules of rubber and added polymers, a new material that can be utilised as a wood replacement for construction and just about any wood replacement product that can be imagined. Because the process uses crumb rubber as a raw material it needs no licensing, it is simply another manufacturing process. The crumb rubber feedstock is reduced to a standard size (it is then fed into the Dena Machine where the Nano reactor is left to reduce the particle size to allow for different grades and qualities of the Wood Replacement Product) by the Nano reactor, blended with additives and then extruded and rolled to create sheets of the new material. The new sheet material can be created to any manageable length to the width of the press available and to the thickness that the extruder mould is set to. According to Dr Sulaiman the product is resistant to water, fire, insects, UV, as well as being incredibly strong, will not crack and is fully recyclable, again and again, to name just a few benefits.

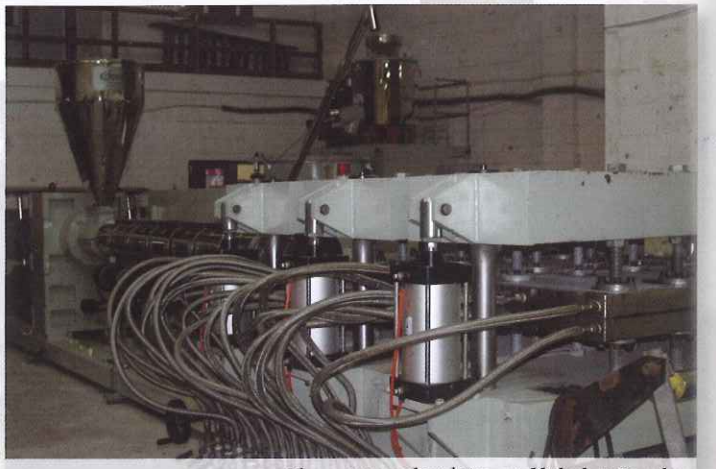
However, by adjusting the size and the quantity of the Nano particles and the pressure applied in manufacture, the hardness of the product can be varied from hard to flexible, even porous, as was demonstrated by the flexible, porous irrigation hose.

The end product can be used to produce interlocking flooring or wall sheets. It can be coloured and laminated to create an alternative to pre-formed sheet steel - a waterproof, heat resistant outer layer can be laminated. Again, Brian says that compared to the currently available steel alternative there are not only cost benefits but higher margins available to the producer of such panels. Other parts of the tyre's waste textile can be converted in to insulation and sound deadening material.

This is a material, which by adjusting the mix, can be poured, extruded, injection moulded, and which can offer a real alternative to wood for a great many uses. Dr Sulaiman says, "This is a Green/Green product. Let's say a mature tree produces one tonne of oxygen, and consumes one and a half tonnes of carbon dioxide. That tree is a net producer of oxygen and an asset to the environment. Yet we cut these trees down to get wood to make decking, park benches, pallets, boarding and many, many other products for indoor and for outdoor use. If instead we use this recycled tyre rubber product as a raw material for those same uses, we help preserve trees, our oxygen generators, we also help recycle tyres, much of the content of which comes from those trees, yet we still have the trees, we reduce the amount of waste tyres creating disposal problems, and we create new products that are 100 per cent recyclable. That is a Green/Green product to my way of thinking." (with zero waste and zero emissions in Dena process).

Dena's factory is based in Barnsley, in the UK, where a production line is being set up to demonstrate the ability of the process to potential business partners. Dr Sulaiman hopes to see his technology reach further around the globe and is offering exclusive markets and exclusive territories to partners, for example with Dena Technology Thailand Co., Ltd. Dr Sulaiman explains, " If we have a partner in Scotland who is producing flooring panels using our process, then he will have exclusivity for that process for that product in the Scottish market, for example. If we develop another product we would offer that to our existing partners first, but if they didn't wish to work in that product area, we would offer exclusivity in that new area to a different partner."

Dena offers everything from product design, production line design, manufacture and installation, and is prepared to co-operate with its partners at any level of business split but it will retain, always, the Nano reactor technology.



The prototype plant being established at Barnsley