By Gert van der Have

The plastics alchemists of Worksop

A world-unique operation to treat plastics derived from automotive shredder residue (ASR) is opening its doors on October 1. Located at Worksop in central England, this one-of-a-kind recycling plant is owned by MBA Polymers and scrap processing conglomerate European Metal Recycling (EMR). A few weeks before the grand opening, Recycling International was guided around this brand new facility by MBA's President and Founder, Dr Mike Biddle.

MBA engineers are installing and testing one of the four extrusion lines.

Ron Rau is confident. With only a short time to go before the grand opening of the MBA Polymers/European Metal Recycling (EMR) plant at Worksop in the heart of England, the experience and expertise he has gained over recent years is paying dividends.

Although still quite young, MBA Polymers' manager of the start-up process has previously installed the recycling facilities at plants in Guangzhou, China, and assisted with the one in Kematen, Austria, where the company processes shredder residue from electronics. However, the new venture at Worksop has been further advanced to recycle automotive shredder residue (ASR). 'So far, we don't have any problems, so we expect to start up on time,' says Mr Rau.

MBA has spared itself a lot of stress by hiring contractors to handle almost every element of the construction and equipment jigsaw. Mr Rau is one of an international team of specialist engineers who have worked together on fine-tuning the plant.

The operation at Worksop is described by MBA's founder and President Dr Michael Biddle as 'the only plant which consumes 100% automotive shredder residue to produce high-value plastics'. For him, the Holy Grail is not to be found among the small non-ferrous bits and pieces in the ASR; instead, he grabs a handful of dirty plastic flakes and says: 'This is what we are looking for.'

Usually, the finished product derived from ASR plastics is black granules but MBA is able to pick out various colours. 'Before, ASR plastics were used in those plastic elements of cars and electronics which were hidden; our product can be used for more demanding and even visible parts as well.' Dr Biddle points to some printer components and says proudly: 'Our material was used at 100% as a "drop in" replacement for virgin material. Do you know the new Electrolux advertisements? They use our recycled content in their vacuum cleaner.'

A different facility

Although the basic principles of the UK plant are the same as those applied in China and Austria, it is effectively a different facility. Capacity-wise, the new operation is much larger and also technologically advanced so as to address the characteristics of ASR. In the coming year, the plant at Worksop will convert 60 000 tonnes of ASR into valuable products; during a subsequent stage, annual capacity will be increased to 80 000 tonnes. Targeted materials will be polypropylene, polyethylene, polystyrene and acrylonitrile butadiene styrene (ABS) which together make up around 75% of the plastics used in vehicles.

While it is difficult to calculate product outputs, the greater scale of the Worksop operation is indicated by the fact that, combined, the MBA plants in Austria and China are capable to process 80.000 tonnes of raw ASR as well.

Severe contamination

To obtain a clean input to the four extrusion lines, an impressive array of separation and washing lines have been installed. ASR differs from electronics residue because of its severe contamination with wood, textiles and rubber, as well as with liquids such as water and oils which change material densities. 'And do you realise how much dust is in it - like sand and stones?' quizzes Dr Biddle.

Raw ASR, or shredder fluff as it is often called, contains only between 15 and 25% plastic. It doesn't make sense to transport so much non-plastic to a plastics recycling plant, so the material is processed further at the shredding location to increase the plastic content to 85% or higher. The 15% non-plastic is mostly rubber, wood and foam, with smaller amounts of dirt, glass, stones, textiles, metals and other non-plastics.

During the first stage of the plastics processing plant, the plastics-enriched ASR is transported on a giant conveyor belt to the ceiling of the plant from where it is poured into an array of screeners,

classifiers, washing lines, metal separators and other sorting systems. 'This machinery is not very exotic, although it's adapted to our specifications,' notes Dr Biddle. He points to some high-capacity granulators which cut the material to a uniform size.

Some of the biggest challenges faced by the company concerned wood and rubber, which often have the same density as plastic as well as many other similar characteristics, so are not easily removed. And any residual amount of these materials in the finished products can lead to appearance issues, even fractions as low as 0.001. The wood is sorted out by a machine developed in house while the rubber extraction system is also home grown. In fact, the rubber separation equipment works so well that MBA can also produce purified rubber mixtures that can be used in a variety of rubber products.

With ASR plastics recycling, separation by density alone does not result in high purity products due to overlapping densities for many different plastics and other constituents like wood and rubber; however, MBA's proprietary process enables high-purity plastics to be extracted. 'We don't need to blend our finished products with virgin or even "cleaner" post-production plastics like many other recyclers do to achieve the properties expected by customers,' explains Dr Biddle.

Select few

The company is reluctant to talk about its proprietary technique. Just a select few MBA specialists know how this 'Holy Grail' works while individual operators are acquainted with only part of the technique. What can be said is that MBA is able to separate not only different types of the same plastic, but also some of the important different grades - for example, polystyrene formed by extrusion and by injection moulding. Separation of these two materials has traditionally been an intractable problem for recyclers and has not been undertaken on a commercial scale.

The MBA system also features a safety silo for each product in case a process upset results in a product that does not meet MBA's strict quality requirements. Any such stream is stored in the silo to ensure it does not enter the final product. Also, the system can be monitored remotely via internet access which means MBA engineers in other parts of the world can quickly help on-site staff diagnose any problems that might arise.

MBA's integration of advanced technology throughout the plant puts MBA one step ahead of other shredder residue processors.

Ambition to expand

MBA has significant scope for expanding the Worksop operation both inside and out. The company is bound by the amount of material that can be shipped to the facility by its partner, major scrap processor EMR. The incoming ASR plastics have already been upgraded by EMR to a concentration of 85% of mixed plastics.

The total volume of ASR produced by EMR in the UK (around 500 000 tonnes per annum – see box) will soak up the entire capacity at Worksop in the years ahead. The agreement also allows MBA to accept material from other shredder operators, but that's not expected to happen as the company's ambition is to open one or two plants a year around the world. 'Everyone is getting better - including our competition - so we have to be very quick,' explains Dr Biddle.

It is important for the California-based firm to secure an agreement with a local company, as it has with Müller-Guttenbrunn in Austria and with EMR in the UK. 'They know the local market and they are able to ensure a constant supply,' says Dr Biddle. Some 40 kilometres east of Sheffield, Worksop provided the ideal location for EMR which expects to send 14 truck-loads of ASR to the plant each day when it is running at full capacity. 'We received a lot of help from the local government; also, many people working here were previously unemployed,' adds Piers Grumett, newly-appointed Managing Director of MBA Polymers UK.

'The Nucor of plastics recycling'

'Sometimes we are called the Nucor of plastics recycling,' says Dr Biddle, referring to the US steelmaker which was the first to build a company based entirely on scrap. 'We think we are following the same path.'

MBA's plastics will not be converted into park benches or hidden car parts; instead, the company plans on closing the automotive plastics loop as it has for computers, electronics and appliances. Colours can still present a bit of a challenge for ASR as most of the plastics in ASR are black or dark. So the company initially will be supplying mostly black plastics and different grey tones. It has not been possible as yet to achieve a pure white product from ASR - but equally, there is no need for the company to do this as its existing output is proving quite easy

Long grey curtains shroud MBA Polymers' proprietary plastics recycling technology


MBA's founder and President Dr Mike Biddle examines a handful of automotive shredder residue in a spotless laboratory awaiting the arrival of equipment.


The new facility founded by MBA and European Metal Recycling is scheduled to be opened on October 1.


Worksop will be home to a revolutionary plant for producing plastics from automotive shredder residue.


A giant conveyor belt will transport 80 000 tonnes per annum of plastics-rich automotive shredder residue to the ceiling of the plant.

to sell and over 60% of the plastics used in automobiles, for example, is black.

Describing himself as an environmentalist, Dr Biddle says recycling plastics is much more efficient than breaking down oil into its molecules to produce different types of plastics. 'We save at least 90% of the energy,' he asserts.

Users are convinced

Manufacturers are now waiting in line to incorporate MBA's recycled plastics into their products. Some years ago, these same manufacturers were quite hesitant - but now they are convinced. 'We even have a traditional plastics producer (Sabic) as a minority shareholder in our company,' says Dr Biddle.

A number of automotive OEMs have already visited the facility and "although we are targeting open loop opportunities in the short term, we aim to close the loop by also getting our products specified in automotive applications" adds Mr Grumett.

In addition to winning the hearts and minds of manufacturers, recyclers are also following developments at MBA very closely. The day prior to our visit, another metal recycler had gone along to the Worksop facility to try to expand his understanding of the company process. 'Hey, they are my suppliers,' Dr Biddle points out when speaking of the reasons why he is often to be found at conferences devoted to automobile and electronics recycling.

Looking to the future

Development of the Worksop plant represents a milestone not only in the recycling of ASR plastics but also in the history of MBA, for whom the challenge of separating these materials has been extremely important. 'When we ran some loads of ASR in our system in Austria - just as a trial - we were already quite happy with the result,' recalls Dr Biddle. Further tests at the company's plant in China, confirmed these encouraging findings. Now, both of these existing plants have been upgraded with some of the technology developed by MBA to process ASR.

Now that the multi-award-winning company stands on the verge of opening its new plant and its efforts over many years have begun to pay dividends, the time has come for MBA to look to the future - and Dr Biddle is happy to share the direction in which his thoughts are headed. 'Why aren't we fishing out the plastics coagulating in the sea and recycling them?' he asks enthusiastically. 'Our recycled products are also much more resource efficient when compared with virgin plastic' adds Mr Grumett.

The primary objective of the company's business strategy is to open similar plants around the globe for processing shredder residues. From a technological perspective, research will be focused on recovering high value plastic streams beyond polypropylene, polyethylene, polystyrene and ABS. And MBA is also eyeing plastics in the household waste stream, with Dr Biddle commenting: 'I think plastics from Material Recycling Facilities will be valuable, and I know our technology and experience with WEEE and ASR is directly applicable to these mixed streams as well. It's only a question whether it makes business sense.'

Realising dreams

A few years ago, Dr Biddle handed over the role of company CEO to his long-time colleague Richard McCombs so that he could devote more time to talking with potential investors, partners and even lawmakers, regulators and NGOs to realize his dreams. Also, the move freed up more time for Dr Biddle to pull on his boots and helmet to spend more time with his fellow engineers and with suppliers and customers. 'He knows all the ins and outs of what we are doing,' confirms one of MBA's leading engineers John Gysbers.

Dr Biddle is more recently found meeting government officials in his home country as the USA still lags far behind Europe in its regulation of exports of e-waste and other recyclable materials. Last year he testified before the US Congress on this subject. It is still strange to him - from both an environmental and business perspective - that a country with so many shredder operations should have no effective recycling outlet for its residues. 'There's so much value in it,' he insists. □

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The EMR perspective

David Ireland, Director of Technical Services at European Metal Recycling, offered the following comments on the link-up with MBA Polymers:

'We got to know MBA Polymers in 2006 when I was looking for solutions to save on landfill costs. There are maybe ten ways to process shredder residue, so we shipped some loads of ASR to MBA Polymers, and found the MBA process to be the most commercially viable.

At EMR, we employ our own post-shredding technologies, which means that the half a million tonnes of ASR generated per year by EMR is basically separated into streams of additional recovered metals, rich plastics, aggregates and a percentage to be converted into a combustible fraction for energy recovery. For the last of these, we've set up another joint venture, and the rich plastics stream is sent to the joint venture with MBA Polymers.

Another reason to implement those post-shredder technologies is the 95% recycling target for end-of-life vehicles (ELVs) which has been set up by the European Union. This is the main reason why shredder operators have shifted from recovering only the metals to also the plastics.

Our first post-shredding plant has been in operation for 12 months and processes 100 tonnes per hour. We are still making some changes to it; the plan is

to roll out two other post-shredder technology plants in other parts of the UK. Of course, we expect a positive revenue from the metals fraction and the aggregates, and also in the future from the plastics and combustible stream.

Traditionally, a shredding plant is focused on extracting metals in a high volume - you don't need to have a shredder to extract plastics only. But this initiative provides us with the opportunity to raise the recycling rate from 75% to more than 95%.

In the future, we may be implementing post-shredder technologies for our US shredders as well, but that's a different business model as the drivers in the USA are different. There are no recycling targets and landfill costs are much lower traditionally.

I have been working very closely together with Mike Biddle and Richard McCombs over the past years, and I am very happy that we have found a solution that fits the strategy of both businesses.'

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