

AUSTRALIAN
MANUFACTURING
TECHNOLOGY

AMT

JUN/JUL
2023



Fladder® Deburring System



www.fladder.com



MACHINERY FORUM

Machinery Forum
33 Brodie Street NSW 2016
Phone: +61 2 9638 9600
Mobile: +61 4 1111 5585

**AMW2023
WHAT A SHOW!**

AMW2023 REVIEW
Industry 4.0
State Spotlight: WA & NT

Plastic and waste

The world has a waste challenge, none bigger than that posed by plastics. Professor Veena Sahajwalla, UNSW SMaRT Centre Director speaks truth to plastic.

Australia is one of the most wasteful developed nations, second only to the US in terms of per capita plastic bag consumption. On average, each Australian consumes over 24kg of plastic and uses over 230 plastic bags every year.

In 2020, only 12% of the plastic waste was actually recycled and 81% went into landfills, with a lot of it ending up in waterways and the oceans. The 2021 The National Plastics Plan (NPP) also says over one million tonnes of single-use plastics goes straight to landfill and about 130,000 tonnes of plastic leaches into Australian waterways and oceans every year. This is equivalent to 1,280kgs of plastic being dumped every hour in Australia's ocean.

National Geographic estimates there are 5.25 Trillion pieces of plastic debris in the ocean and of that mass, 269,000 tonnes float on the surface, while some four billion plastic microfibres per square kilometer litter the deep sea.

Various waste technology solutions are emerging, and some behavioural changes are taking place, but is enough being done and at a quick enough speed?

The SMaRT Centre at UNSW has developed a range of MICROfactorie™ Technologies that can reform various wastes usually not subject to traditional recycling methods into value added materials and products, such as filament for 3D printing and Green Ceramics made from textiles, glass and other wastes.

While society first needs to prevent plastic and other wastes from getting into our oceans and waterways, we need innovative technical solutions to deal with existing and future wastes.

This includes having stronger 'product stewardship', where producers of products and users of products are more accountable for when they come to their so-called end of life, and better collection and recycling, using new technologies to extract and reform the valuable elements they contain.

Better behavioural responses are also needed, including awareness campaigns for the public and industry. A range of new and emerging regulatory standards have been introduced by all levels of government, including national waste export bans and prohibition of single use plastic bags. But what do we do with all the waste that used to be shipped offshore and is still being landfilled?

The first independently and commercially operated UNSW SMaRT Centre designed Plastics and Green Ceramics MICROfactorie™ modules are being operated by collaborators Shoalhaven City Council and Kandui Technologies in regional NSW.

The council's plastics module aims to remanufacture around many tonnes of waste plastics into filament for 3D printing per year, and its Green Ceramics MICROfactorie™ module also being built expects to reform hundreds of tonnes of glass and mattresses per year into green ceramic tiles and other forms of furnishings in the council's operated facility. Climate change narratives often overlook the need for more sustainable manufacturing and waste management practices, where waste is used as a resource.

Manufacturing that aligns with innovative waste management, recycling and materials circularity are central to helping address the globe's biggest challenges, including waste plastics.

There is growing appetite in industry and society to tackle these issues more swiftly.

Australia has world-leading scientific research and development institutions and leaders, but many feel progress on delivering practical outcomes to our big sustainability challenges has been lacking.



UNSW SMaRT Centre Director, Professor Veena Sahajwalla

Collaboration through co-investing and nurturing pathways to innovation and economic success must be our focus if we want to realise that "waste is a resource" that can be used in so many new, innovative ways. As we develop new and transformative approaches to what needs to be a new era of 'green manufacturing', we need to build new and localised supply chains that are laterally integrated.

The lateral integration of supply chains of green materials and products is needed to ensure we connect different sectors across our regions.

This integration would build interconnectivity between and across markets, sectors and logistics networks, enabling decentralised, localised and regional pathways to new national and global opportunities. This can be done for micro to macro materials and manufacturing opportunities, eventually leading to mega solutions, depending on the volumes and values associated with the waste materials concerned. Such an approach will boost our sustainability and sovereign capacity.

A recent important breakthrough by the UNSW SMaRT Centre, where carbon and hydrogen needed to make steel come from various wastes, including plastics, found waste materials can actually improve the efficiency of steel making.

This represents the next generation of SMaRT Centre's patented Polymer Injection Technology, known as Green Steel™, with steel industrial partner, Molycop, which started out as the Commonwealth Steel Company over 100 years ago. The first 1.0 generation of Green Steel™ is well known for using millions of waste rubber tyres destined for landfill as an alternative source for partial replacement coke and coal in electric arc furnace steel making.

But the next generation of Green Steel™ research now shows waste plastics and bio-waste like coffee grounds are also effective and contain hydrogen which improves the efficiency of steel making.

This technology locks the carbon from waste resources into the steel, hence causing no emissions and delivers a form of carbon capture. With the right will, society can find a purpose for most waste types by understanding the elemental value inherent in it.

This can only be done through rigorous scientific analysis and active collaboration with industry, the community and governments to ensure innovations are taken up and used. By better valuing our waste materials and creating circularity for their reuse, we can help the world be more sustainable and tackle our big global challenges.

unsw.edu.au
smart.unsw.edu.au/technologies-products/microfactorie-technologies