



# **RDF, SRF & PEF - Australia's future resources?**

# Contents

|   |           |
|---|-----------|
| <b>Foreword</b>   | <b>2</b>  |
| <b>When is waste, waste?</b>  | <b>3</b>  |
| <b>What do the terms RDF, SRF and PEF mean?</b>                       | <b>4</b>  |
| <b>Why do these fuels matter in Australia?</b>                        | <b>5</b>  |
| <b>A mindset shift?</b>   | <b>5</b>  |
| <b>Where has the waste hierarchy made a difference?</b>               | <b>7</b>  |
| <b>Investing in alternative fuel production shedding technologies</b> | <b>8</b>  |
| <b>Single pass shredding</b>  | <b>9</b>  |
| <b>The benefits of finding the RIGHT shredder</b>                     | <b>9</b>  |
| <b>Knowing what to ask a shredder supplier</b>                        | <b>12</b> |
| <b>What's next?</b>   | <b>12</b> |

# Foreword

With countries all over the globe feeling pressure around how they approach waste management, Australia is not alone.

In recent months, the ban on recyclable materials has meant that the country's environmental agenda has never been such a hot topic. All eyes are watching our next steps towards our much-needed policy and consumer behavioural changes, which will see a difference in the management of both natural and man-made resources.

Why should we be letting go of valuable resources that we could harness value and energy from, ourselves, right here?

Furthermore, now that technology exists to transform a wider variety of materials into something with retained worth, why are we passing them on to become someone else's problem?

This topic – and more specifically, the production of renewable Waste to Energy resources – is something we have been asked to speak about at a number of industry events in recent times. Together UNTHA and FOCUS Enviro have drawn on our varied experiences, gained from working with clients in all parts of the world. And, whilst this is an ever-evolving debate, the feedback has been very encouraging.

We have therefore authored this guide to bring together some of the key discussion points. The purpose of this document is not to provide all the answers, as there can be no such thing as a 'one size fits all' approach. But we hope to provide waste and recycling professionals with 'food for thought' as to the role that 'waste' materials can play in both Australia's future resource agenda, and organisations' own strategic advancement.

Of course, we'd love to continue the conversation with people who want to talk further.

*Gary Moore*

**Director for Global Business Development**  
**UNTHA**

T: 0044 7702 703 225

Gary.Moore@untha.co.uk

[www.linkedin.com/in/garymooreuntha/](http://www.linkedin.com/in/garymooreuntha/)

*Robbie McKernan*

**Director**  
**FOCUS Enviro**

T: 0061 478 220 088

robbie@focusenviro.com.au

[www.linkedin.com/in/robbie-mckernan-76bb9b85/](http://www.linkedin.com/in/robbie-mckernan-76bb9b85/)

# When is waste, waste?

The very term – ‘waste’ – carries quite negative connotations in that it has grown to become associated with materials that contain no value and shouldn’t really have ever been produced in the first place. The latter point is of course true, and far greater effort is required, globally, to ensure more considered use of materials throughout the supply chain, so that the volume of ‘waste’ arisings starts to fall.

However, while environmental efforts are seemingly mounting globally, it will require a vast amount of coordinated effort to tackle this monstrous waste avoidance problem – especially in the throwaway society we appear to have found ourselves living in and particularly in heavily developed parts of the world.

So, what does the picture below show? Waste?

Most people, yes, simply see a pile of rubbish/trash. Others however – certainly in some parts of the world – will view this as a heap of potential.



This image will represent another opportunity to transform residual material into an alternative, renewable fuel such as RDF (Refuse Derived Fuel), SRF (Solid Recovered Fuel) or PEF (Process Engineered Fuel).

In fact, in certain global locations – particularly Western Europe and North America, but also increasingly in South America and parts of Asia – these three energy sources have gone from being little-known possibilities, to a fundamental part of these countries’ environmental infrastructures.

But what role do these fuels play in Australia?

Currently, the market is in its infancy. Yet this is what actually makes it so exciting.



## What do the terms RDF, SRF and PEF mean?

Before delving into any detail about these resources, it is firstly important to explain what they are.

In truth the acronyms RDF, SRF and PEF are used interchangeably around the globe. However, as a group, they represent a type of renewable fuel that can be manufactured from sorted, shredded material arising that most people would simply consider rubbish.

Once these materials have been subjected to a sophisticated yet increasingly simple transformation process – to create a confetti-like output ‘product’ – they can then be used as an energy source in facilities such as power plants and cement kilns, in replacement of ever-depleting fossil fuels such as coal, oil and gas. The net environmental gain of converting this ‘waste’ into energy, is therefore vast.

Generally speaking, **RDF** is the least refined fuel of the three fuels, while **SRF** is the most sophisticated in terms of defined particle sizing and calorific value. **PEF** is the term being increasingly given to these waste-derived resources, in Australia.

However, for the purpose of simplicity, thanks to technological innovation, each of these fuels can be manufactured to a pre-determined specification, either set by industry or the end user of the fuel.

*(Further technical details about typical fuel specifications around the world can be provided upon request.)*

# Why do these fuels matter in Australia?

As the foreword of this document alludes to, globally, waste has never been such a hot topic, and that trend is certainly being witnessed here in Australia too. Environmental pressures are mounting, and the ability for nations to turn a blind eye is now impossible. Waste was once a concern only for those in industry. Now, it's a priority for the masses. The general public is sitting up and paying attention.

Thankfully, recycling rates in this country are rising, and that change was needed. Sadly, Australia's 'green' performance hasn't always compared to that of other developed countries, but great strides have been witnessed, particularly in the last 12 months.

However, there is still a long way to go, which is undoubtedly why the Prime Minister is vocally backing this eco-drive with his proposed ban on exporting recycled material.

This was admittedly a bold pledge, but the country shouldn't be letting go of valuable resources. Recycling creates jobs, reduces reliance on raw materials, boosts resource security, better protects the world's resources, and can even generate revenue for those involved.

The Prime Minister's plan shouldn't therefore be viewed as a negative move – rather an encouraging sign of potential when it comes to Australia's environmental agenda.

Of course, further infrastructure investment is now required, so that the industry has the ability to undertake more recycling processes domestically and the capacity to then turn these recyclables into something new. But there is arguably even more to be done.

## A mindset shift?

In some respects, an entire mindset shift may be required.

As page 3 outlines, waste, by its very nature, is a 'dirty' word. We wish it didn't exist. But we can't get away from the fact that it does.

As a global population we continue to produce it. So, until we all work harder to reduce the creation of waste, at source, we need to look deeper at what we can do with it. We need to recognise the potential it brings.

In the European Union, the principles of the waste hierarchy help shape this mindset.



This pyramid guides the industry's 'conscience' and encourages everyone to think about the prioritised actions for the 'waste' materials they are faced with on a daily basis.

1. As discussed, the priority is to **prevent** the creation of waste in the first place.
2. However, as some waste creation is usually inevitable, efforts should then be made to try and **reduce** the level of arisings, as much as possible.
3. Next, the focus should be **reuse**, i.e. the continued utilisation of materials. Someone may choose to throw out electronic equipment for example, but this redundant appliance could have a long useful life with someone else, even if after a repair. Of course, the examples are numerous – scrap paper can be reused internally in the workplace, surplus food can be donated to food banks and unwanted clothes can be sent to charity stores etc.
4. Where reuse isn't feasible, only then should attempts be made to **recycle** materials, so they can be used in some form of remanufacturing process.
5. Once all recyclable materials have been extracted from the 'waste' stream – as much as is physically and commercially practicable – there is the **energy recovery** option. And this is where resources such as RDF, SRF and PEF come in.

Contrary to belief, RDF, SRF and PEF production is not an 'easy exit' for waste. It isn't simply the incineration of rubbish. And it isn't to the detriment of environmental compliance, as this hierarchy shows. It represents the penultimate option – before **disposal**, the last resort – for materials that, beyond this, don't have any further value as they would just be going to landfill.

# Where has the waste hierarchy made a difference?

It is important to note, at this stage, that few nations are perfect, and many have also found themselves needing to take drastic action in previous years.

Back in the late 1990s, the UK's introduction of landfill tax – followed by the £80 (\$140) per-tonne-hike in the levy in 2013 – almost forced operators into thinking what else they could do with waste arisings, because disposal became financially unviable.

Now, aided by the guidance of the waste hierarchy, a stronger, clearer environmental mindset has emerged. Admittedly, the country still has a long way to go, but there is a general consensus at least regarding what needs to happen with the materials some may otherwise class as merely 'rubbish'.

Fast forward to 2020 and the market has evolved significantly. In the cement industry, for example, a number of operators now produce their own SRF/PEF to boost their environmental agenda and reduce their reliance on fossil fuels. Other organisations buy SRF and PEF from fuel producers for the same reasons, which represents a fantastic revenue stream for the organisations concerned.

The UK is therefore now home to state-of-the-art Waste to Energy facilities turning fuels like RDF into renewable energy. A significant amount is exported too, representing an estimated value of £0.5bn annually (nearly \$AUD 1 billion).

It hasn't been an easy journey, not least because many people still consider waste to be a dirty word. And even those who do care about the environment often still don't want a plant like this in their back yard.

But any negative perceptions are now far outweighed by the enthusiasm that exists to commit to a greener future. And whilst fuels like RDF cannot officially be classed as a product, they are acknowledged as valuable resources.

Waste therefore isn't something to turn our backs on. It's something to invest in. Some specialists are already exploring this Waste to Energy market in Australia, but we need to see more of this activity.







## Investing in alternative fuel production shredding technologies

There was a time when an investment in RDF/SRF/PEF production required several pieces of capital equipment, which of course restricted the business case for alternative fuel manufacturing. Now, single pieces of very clever technology exist to help turn a range of extremely complex materials into renewable resources, in a single step.

These materials range from sorted skip waste from which we can't extract any more recycled materials, to mattresses, textiles and more.

But the options don't stop there. In Asia, one forward-thinking organisation shreds footwear production waste for example, to liberate very different materials ranging from rubber to sponge and metals. Recyclables are extracted and the residual fraction is a fossil fuel substitute, that is used to produce energy in the cement industry.

Because only a single piece of easy maintenance shredding technology is now required – which is flexible enough to handle varied input materials and satisfy numerous output fuel specifications – the payback period is far shorter than it has ever been. In some cases this is as little as 12 months.

And, thanks to engineering developments, such machinery increasingly performs better too – think more throughputs, less energy consumption and reduced wear costs, which again strengthens the rationale to invest.

# Single pass shredding

So, what should operators look for in such single pass waste shredding technology?

- In the beginning **throughput** was the primary consideration, and understandably so. It was seen as the answer to any investment payback – surely more product yield would mean greater ROI.
- Then SRF **quality** appeared on the radar, with operators also demanding that systems deliver fuel on time and to the required specification. The more defined the fuel in terms of particle homogeneity and calorific value, the greater the burn efficiency and the more attractive the output product as an energy source.
- **Flexibility** then became important as well, i.e. could the alternative fuel production line handle more than one type of input material for instance, according to the changing market/supply and demand? If so, it would certainly minimise commercial risk and protect the financial viability of the facility.

However, over time, operators have begun to think less about these points in isolation, in favour of looking for savvier shredders capable of achieving all of these criteria and so much more.

- **Throughputs** are now no longer evaluated on the basis of singular factors such as machine speed for instance, but for the true overall capacity of a machine. In 2020 and beyond, everything from the loading aperture of waste shredders, to quick and easy maintenance regimes, robust high torque drives, and foreign object protection systems that could prevent unplanned outages, will all underpin a plant's technology requirements, as standard.
- Even seemingly sophisticated **quality-led considerations** have evolved further still, because a more refined fuel doesn't just benefit the operator, but the environment too. Better material segregation and the extraction of valuable metals and other recyclates means greater adherence to the waste hierarchy, and therefore the more environmentally gainful utilisation of resources in line with regulatory guidance. The sale of recyclates should also boost the revenue generating potential of the plant, as there's the opportunity to not just avoid disposal costs but kickstart an additional income stream too.
- In terms of **flexibility**, this is no longer evaluated purely in terms of the input materials a plant can handle. Now, operators want to be able to process a range of 'wastes' with just a quick and easy shredder reconfiguration – downtime costs money after all. Operators have also quite rightly begun to seek machines that can satisfy various output requirements too, with different particle sizing, bulk density and calorific value demands set for different types of fuel.

## The benefits of finding the RIGHT shredder

Operators who invest in clever SRF shredding technology will experience reduced energy consumption, improved uptime, more yield and lower operational costs per tonne, compared to more standard equipment. This means margins are maximised as a result. The net environmental efficacy of the manufacturing process is also heightened as the carbon impact of such facilities is far less.



## Case study 1 – Australia

The first UNTHA XR shredder is now operational in Melbourne, Australia, following a 15,000km journey from the world-renowned engineering facility where it was manufactured in Austria.

The 37-tonne mobile machine has been shipped to Knox Recycling (KTS), a long-standing client of FOCUS Enviro. Here the UNTHA XR3000C mobil-e will handle up to 30 tonnes of commercial, industrial and wood waste per hour, to manufacture PEF.

Previously unable to produce this high-specification fuel with only one machine, the Knox team accompanied FOCUS Enviro on several site visits across Europe, to see the UNTHA shredder in action. Impressed by the single pass shredding capabilities of this robust technology, FOCUS Enviro then set about configuring a solution that could achieve Knox's refined output particle requirements, with ease.

At the time of the installation, FOCUS Enviro commented to the media: "We have seen what the XR mobil-e is capable of, as it has continued to transform the throughputs, fuel quality and energy efficiency of facilities worldwide. We've therefore worked hard to bring this pioneering UNTHA innovation to Australia, so that it can start to revolutionise the alternative fuel production market here.

"No other machine can produce such a homogenous fuel in a single pass, so I think the Knox operation is going to be a leading light in Australia, when it comes to this fast-growing future resource market."

Mark Jeffs, owner of Knox, added: "Alternative fuel production is becoming more and more important in Australia, and as a progressive environmental company we want to be ahead of the curve.

"We acknowledged that by investing in world class PEF production technology, we could produce a high-quality resource, efficiently, and hopefully really drive the market for this crucial energy source."



## Case study 2 – UK

UK-based Lancashire Waste Recycling also offers an interesting case in point regarding the net environmental efficacy of the manufacturing process. The SRF specialist has been making a high-specification fuel at its Fleetwood site since the business was established in 2013. However, the firm recently announced that it has halved plant wear costs and further boosted its manufacturing capacity with an investment in its sixth UNTHA shredder.

When Lancashire Waste's SRF journey began, an UNTHA XR2000 pre-shredder fed two TR3200s secondary shredders, to produce a renewable energy source for the cement industry.

But as engineering innovation continued – to challenge the industry norm of high speed SRF manufacturing – the client worked with UNTHA's UK division to understand how to leverage the potential that next-generation technology could bring.

When Lancashire Waste opened its second SRF production plant 46 miles away in Burnley, a single UNTHA XR3000C was installed at its heart. This slower speed equipment could produce a quality 40mm fuel in a single pass, without the concerns surrounding downtime or damage when higher speed machines encounter unshreddable items.

Fast forward to 2019, and the growing company wanted to further strengthen its alternative fuel production capabilities. Advanced trials with UNTHA ensued and it became clear that the new UNTHA XR3000XC could achieve an on-specification 30mm particle with slightly more throughput than the two TRs combined.

The duo of Fleetwood post-shredders were consequently switched, so that the original XR2000 now feeds the XR3000C and the new 85rpm XR3000XC machine. A capacity of 30tph has been achieved as a result.

A 65rpm XR3000XC has also been added to the Burnley line to take hourly throughputs on this site to 20tph.

Commenting on the new fleet of state-of-the-art technology, Lancashire Waste's founder Jim Entwistle said: "As a business, we're constantly looking to progress, so consistency and capacity are key to our operation. We work with three UK cement kilns and one export offtaker, and the better quality the fuel, the more our clients seek. We've doubled our supply to one kiln, for example, over the past 18 months, so the impact on our business – from savvier waste shredding – is vast.

"Add to this 40% less energy costs, halved wear costs and only minimal damage repairs as we've moved away from high-speed machines, and the business case for our shredder investment is extremely strong."

# Knowing what questions to ask a shredder supplier

Whatever a shredder supplier says they can help with, ask for evidence:

- How many similar projects have they completed before?
- Is it possible to speak to or meet existing customers?
- Is the technology available for a trial?
- What features does the machine contain, which make it perfect for RDF/SRF/PEF production? A fit-for-purpose 'quick SRF' system should include, for example, flat blade cutters, simpler machine design with less wear components, rotor speeds of 65-85 rpm (compared to 250-350rpm), even greater resistance to 'unshreddables', downtime of minutes not days thanks to more forgiving clutches, and the option for mobile equipment that provides machine movability where needed.

*If you require detailed support to build a shredder wish list, please contact FOCUS Enviro for help.*

## What's next?

Globally, this industry is undergoing more change than ever before. China's ban on plastic waste imports has rocked the world and economics are tough. But these are the exact reasons why operators need to develop smarter waste handling processes, to maximise waste reduction and reuse opportunities, promote recycling, and recover residual materials via energy recovery.

This could be one of the most exciting times for Australia's waste landscape.

Can we help you explore this lucrative environment?



# About UNTHA

**UNTHA shredding technology** is a global manufacturing brand specialising in the engineering of high-performance industrial machinery that aids the safe, environmentally efficient, and often profit-focused transformation of materials. Able to tackle everything from municipal and commercial waste, through to wood, metals, confidential materials, plastics, organic matter and electronic scrap, these shredders form an increasingly crucial part in organisations' volume reduction, recycling and Waste to Energy operations, around the globe.

UNTHA's XR waste shredder has been particularly responsible for fuelling the company's international presence – particularly in the RDF/SRF/PEF manufacturing space – and there are currently more than 250 of these robust pieces of technology, in operation worldwide.

In May 2019, FOCUS Enviro was announced as the exclusive distribution partner for UNTHA's shredding technology, in Australia.

For more information please visit [www.untha.co.uk](http://www.untha.co.uk) or <https://focusenviro.com.au/products/untha-xr-waste-shredder/>.

# About FOCUS enviro in Australia

At **FOCUS enviro** we offer tailored solutions, from single equipment supply to integrated processing systems – specialising in shredding, separating, baling and wrapping of materials in preparation for use in 'Waste to Energy' processes.

We only work with world-class experienced manufacturers and suppliers that understand the challenges of processing material in the waste, organics and recycling sectors, and who can offer custom solutions that are as individual as each customer and application. Together with complete integrated processing systems for materials recycling facilities, we offer selected technologies that are proven, innovative, relevant, and reliable.

For more on FOCUS enviro solutions go to <https://focusenviro.com.au/company/>.