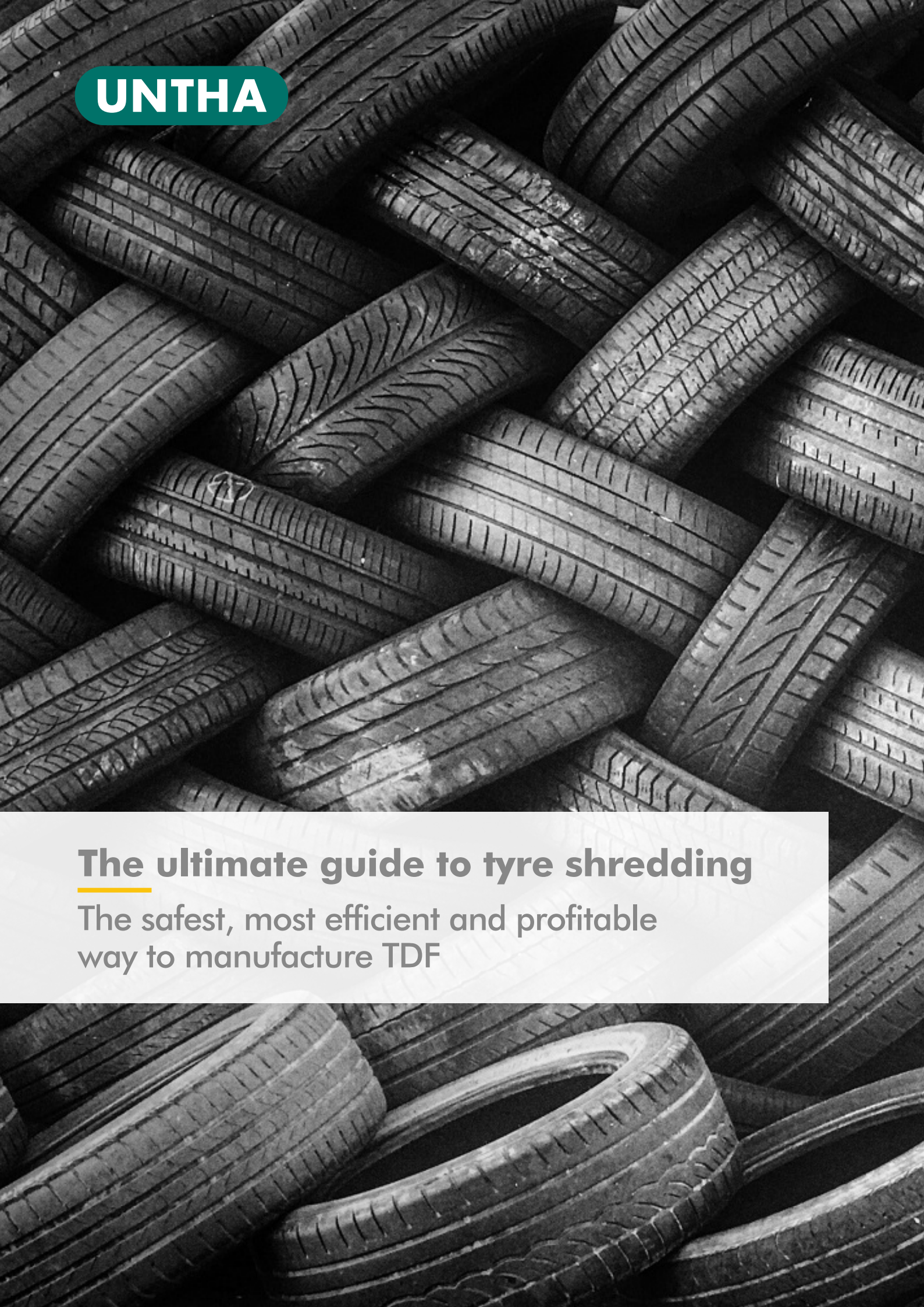

UNTHA

The ultimate guide to tyre shredding

The safest, most efficient and profitable way to manufacture TDF

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Introduction

A staggering 1.5 billion tyres reportedly reach their end of life, globally, every year – a statistic that nobody wants to read in a world striving for zero waste. However, the figures become bleaker still when considering that a worrying 60% of these tyres are said to be landfilled, stockpiled, illegally dumped or 'lost' from the resource chain.

In many respects this is due to the bulky nature of tyres, not to mention the resource intensive methodologies typically associated with processing them. It is difficult to store, handle and transform them into something new – certainly when all eyes are on an organisation's bottom line – which means they so frequently hit the headlines for all the wrong reasons.

But complex as tyres may be, their unscrupulous handling cannot be excused. The environmental impact of non-compliant processing is vast, especially when stockpile fires break out unexpectedly or are deliberately started to solve the mounting waste issue.

However, in the absence of engineering advancement in this specific area of waste handling, what are the options? Waste operators need to make money if their operations are to remain commercially sustainable, and in the eyes of many – even those who want to support the drive to achieve a circular economy – end-of-life tyres are simply a waste headache.

However, fast forward to 2021 and they could just become an industry hero.

This guide is designed to be a straight-talking resource that unlocks the true potential of tyre shredding, particularly when it comes to the safe, efficient and profitable production of Tyre Derived Fuel (TDF).

For established tyre recyclers, we want to show what is now possible. For wider waste operators, scrap yards and alternative fuel producers, tyres deserve greater attention.

There is a significant amount of resource potential to be extracted from this albeit challenging material stream. This guide will uncover how...

Introducing Tyre Derived Fuel (TDF)

Tyre Derived Fuel (TDF) is one of the most mature fuels in the Energy from Waste (EfW) market.

When EfW was in its relative infancy, scrap tyres were a 'go to' input material for alternative fuel lines, not least due to their typically high calorific value. With the calorific value typically between 6450kCal/kg – 8000kCal/kg, only 0.76 – 0.95 tonnes of tyres are required to substitute 1 tonne of coal.

Tyres have also long been in abundant supply, so TDF availability has rarely been an issue for cement kilns or co-processing plants understandably seeking much-needed resource security.

However, as the market developed in EfW-ready nations across Europe and the United States, for example, operators began to acknowledge the varied material streams that could be transformed into an energy-rich fuel.

The high wear and cost intensive nature of tyre processing therefore began to lose its appeal in favour of fuels such as SRF, especially because a lack of engineering advancements in this specific area meant the financial viability of TDF remained questionable. And profit is not a dirty word, after all, so operators should not be afraid of striving to ensure their EfW facilities are commercially sustainable.

In short, the controllable feedstock quality of TDF means this fuel is an attractive option in the cement industry. But the cost of producing it has remained the barrier – not its acceptability for energy recovery.

UNTHA has not discovered a new resource panacea. TDF has long existed. But safe, efficient and profitable means of producing TDF, have not.

The question is therefore not what to do with this rubber product, but how to process it.

"Whatever is going on in the external landscape, shredding innovation continues at pace at UNTHA. This means everything from standard car/passenger tyres, through to more rugged truck and off the road (OTR) tyres, can now be efficiently processed for a variety of recycling and energy recovery applications, with UNTHA's tyre shredders."

Marcus Brew, managing director, UNTHA UK

The changing landscape

The global Covid-19 pandemic has contributed to newfound difficulties across the environmental sector overall, with valuable recyclables now in short supply. Consequently, this changing commodity landscape – certainly when it comes to material availability – means that all infeed wastes are being re-evaluated for their resource potential, including tyres.

Furthermore, research and development has been ongoing in some waste technology firms which means the days of expensive contra-shear, 'scissor-action' tyre shredders are gone. It is now possible to feed tyres through single shaft shredding technology, to replicate the quality of a contra-shear process, but with lower operating costs, higher tonnages and far easier maintenance. In fact, many waste handlers have achieved a payback period as short as 18 months.

This methodology requires less upstream processing effort and is far kinder to downstream equipment too, without any detrimental impact on the resulting product.

Best practice TDF production

As is usually the case – certainly in the world of energy recovery – there is no such thing as 'one size fits all' when it comes to TDF production. Cement manufacturers often have their own fuel specifications for example, which means there may be nuances – however minor – from one tyre processing plant to the next.

A 50mm (2") clean cut TDF chip with minimal cross hairs is a common burn-efficient fuel for a kiln, for instance. However, requirements may differ between operators.

Organisations with a strong 'green' agenda will also be keen to maximise the environmental efficacy of their facility – not just its commercial viability. It is therefore important to also consider the other valuable recylates that may otherwise remain 'locked' within tyres, unless the products are shredded and the composite materials liberated for segregation. In other words, TDF is not the only possible output.

In fact, devise a carefully designed tyre processing line and it is possible to extract steel for resale and transform rubber into a homogenous product that can be used for road base, tip cover, landscaping and playground safety surfaces. The residual material – arguably containing some sulphur to boost the calorific value – is what can then be utilised in energy recovery processes such as TDF manufacturing, or even thermal desorption to produce fuel oils and clean gas for electricity generation.

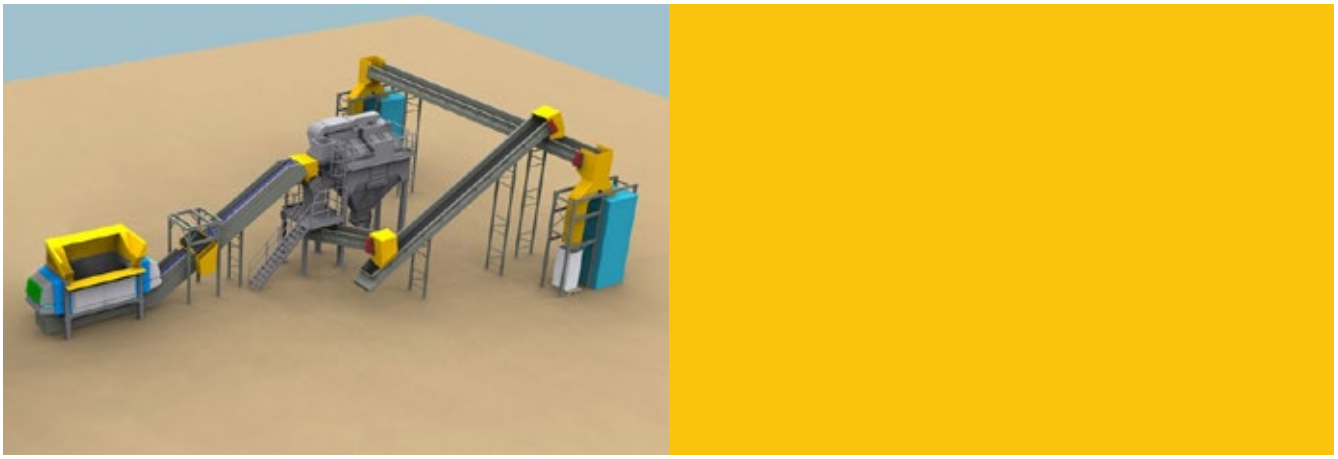
"With the UNTHA XR, we can run harder, for longer."

Ian Lawman, operations director, Envirofuel Ltd

Modular processing lines

The first key piece of advice when designing a new tyre shredding line, is that it should be flexible enough to accommodate ongoing adjustments in terms of infeed materials and output fraction.

Tyres vary in weight, design and construction – depending on their intended use – so the technology should ideally be configurable to handle the complex compositions of standard car and passenger tyres, through to more rugged truck and agricultural products, to protect the investment.



Modern TDF lines are typically modular in their construct, to allow operators to make the facility as simple or as sophisticated as necessary. In a comprehensive turnkey system, for example, a front-end loader can feed an in-floor conveyor that goes straight into a primary tyre shredder. In the case of UNTHA, this would be an XR3000C with two 132kW motors, two knife rows and a slow speed yet high torque gearbox. This could comfortably take the product down to a homogenous, contaminant-free 50mm particle, in a single pass.

If a more refined shred is needed, a horizontal incline conveyor can pass the pre-shredded material through to a secondary machine such as the new UNTHA XR3000XC, to achieve a more precise <20mm fraction.

A discharge conveyor with cross belt magnet and neodymium magnet will remove the fibres and feathers, and a horizontal or zigzag screen will separate the heavy and light metals to complete the defibration process. It is possible to ensure the resulting rubber is so clean that it could be used in pyrolysis, but as stressed above, much depends on what the line needs to produce. It is foolish to over-invest. So, if a 50mm chip is the desired specification, only the pre-shredder is required.

"With the world's raw materials rapidly depleting – and businesses and consumers alike demanding more environmentally responsible solutions – this is a fantastic example of clever engineering and innovative thinking coming together to change the face of the industry."

Gary Moore, sales director, UNTHA UK

Do not debead

The inherently dangerous debeading process can also now be avoided.

A debeaded tyre has long been considered easier to shred, which explains why many TDF lines have traditionally incorporated a 'hook' which grabs the bead from the tyre to rip it out with brute force. However, while this technique protects the machine from wear and possible damage, it adds to the plant's labour intensiveness and level of risk that the operator is exposed to.

Small, low power, dual shaft shredders would still struggle to handle a tyre's bead, but larger, high torque, single shaft machines are now purposefully engineered to withstand the pressures of this tough, bulky waste stream. A slow running speed will further reduce likely wear and ensure long service intervals, which maintains plant uptime and safeguards throughput levels. A capacity of 8-10 tonnes per hour should be comfortably achievable, with operator safety always assured.

Maintenance costs can now also remain low. A cutter replacement for a typical high wear tyre shredder could represent a quarterly investment of 67 000 € - 79 000 € plus labour costs, which – when added to the capital investment required at the outset – explains the perceived unaffordability of tyre shredding. However, the low wear nature of modern tyre shredding, as outlined here, means the process should be able to run for as little as 2 € per tonne when processing passenger car tyres.

Learn more about the UNTHA XR

UNTHA has launched a new tyre shredding innovation designed to produce a high-quality Tyre Derived Fuel (TDF) with a level of cost-effectiveness never before associated with this application.

The single shaft UNTHA XR3000C-HT (high torque) shredder has been purposefully engineered to tackle notoriously tricky, high wear applications, such as tyres, with ease. Operating at far slower speeds than its contra-shear counterparts – without any detriment to throughputs – the goal is to prove that materials such as tyres are no longer uneconomical to shred.

Available as a static or mobile machine, the UNTHA tyre shredder achieves variable product sizing – from a rough shred 100mm chip through to a refined 50mm TDF – within a single efficient pass and with no debeading required. The motors are driven by electricity, rather than diesel, for an energy efficient operation that compounds the cost-effectiveness of the machine – not least in light of the much-debated fuel duty.

It contains a robust and indexable cutter system with low cost wear parts for affordable shredding long into the future. Cutters can be exchanged quickly, easily and safely – via an ergonomic service door.

And due to its modular construct, the XR can also be integrated into a sophisticated turnkey solution able to shred down to a homogenous 15mm fraction for pyrolysis, depending on end user specifications.

Machine specification at-a-glance

- New high torque innovation
- Purposefully engineered for this high wear application
- Variable product sizing
- Electric drive (circumnavigates costly fuel duty & fire risk)
- Indexable, quick-change cutter system
- Low cost wear parts for ongoing affordability
- Throughputs of up to 15 tonnes per hour
- Variable feed (grab, conveyor etc)
- Static or mobile machine available
- Payback period as little as 18 months

Viewing this guide online?

Viewing this guide online? Click to download the UNTHA XR brochure or visit https://www.untha.com/en/news-media/brochures

Contact us

To arrange a trial of the UNTHA XR shredder, or to discuss the content of this guide in further detail, please don't hesitate to contact:

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