

# Reducing the cost of waste shredding

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From Waste to Value®



# Introduction to waste shredding economy

This is a short review of the cornerstones of a successful waste shredding business. It provides waste contractors with some interesting viewpoints and helps to assess the success factors of their future business.

## The guide focuses on the following topics:

The future of the waste shredding business	3
Capital expenditure	4
Operating costs	6
Versatility vs. total cost	8
Case: Kempeleen Siirtokuljetus Oy	10



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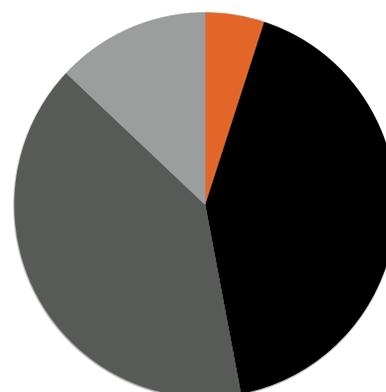
# The waste shredding business is growing and becoming more complex

There is a global trend towards producing smaller waste particle sizes, minimise the volumes that go to landfills and to recycle as much as possible in order to extract value for purposes such as producing fuel. The composition of waste streams is constantly changing, and this is leading to demand for more versatile shredding systems.

Shredders have tended to be designed for particular applications, such as pre-shredding of municipal solid waste (MSW) for volume reduction, or wood chipping. It is common for owners of fixed waste handling facilities to have more than one type of machine, as more machinery is almost always required in order to meet the higher recycling targets.

As the total lifecycle costs of running a large shredding machine over its lifetime (i.e. the ongoing operator, energy/fuel and maintenance costs) are typically larger than the initial capital outlay, the demand for fewer, more versatile shredding machines is now greater than ever.

Example of annual cost structure for a typical shredding machine



Purchase cost 40%  
Operating cost (labour) 13%  
Operating cost (energy) 42%  
Service cost 5%



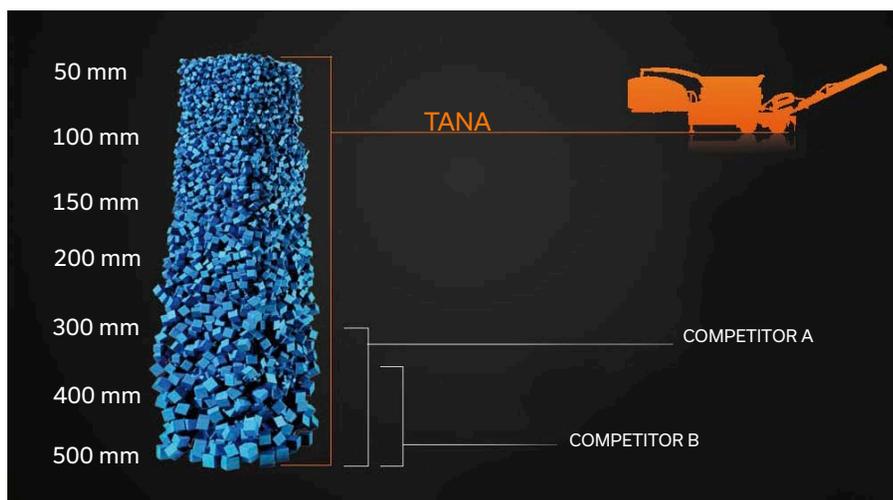
# Reducing capital equipment expenditure

The various application-specific waste shredders on the market today have been designed to meet the growing need for different waste processing applications and fractions. The end product of this kind of processing is particles that typically range in size from around 50 to 500 mm.

Being able to produce a wide spectrum of particle sizes within this range is fundamental in order to reduce the operating costs of shredding, as it typically reduces the number of capital equipment purchases required, and almost invariably simplifies the processing stages/operations that are required as well. When evaluating a new shredding machine purchase, it is very important to consider the features of the machine that determine the range of particle sizes that can be produced.

## Knife configuration:

A key configuration factor is the number and type of cutting knives. Is it necessary to change the cutting knife configuration or is it universal? Does the configuration have to be specified when ordering the machine? Can the shredder both shred and cut? These are vital questions from the cost point of view, since there are many technical solutions on the market. Shredders that can handle a variety of materials with the same set of knives and counter knives, mean lower shredding costs.



## Key features include:

- Knife configuration
- Screening options
- Cutting gap adjustment
- Rotor speed adjustment
- Dealing with non-crushables

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# Reducing capital equipment expenditure

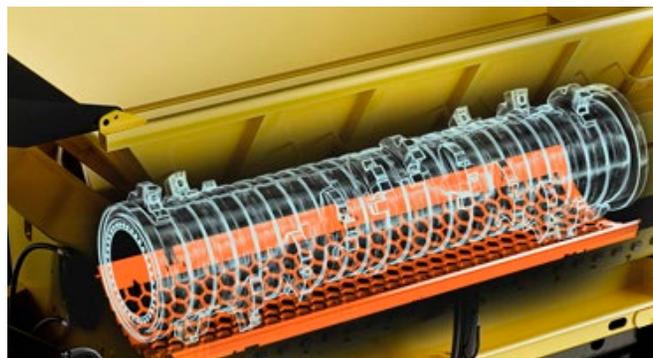
## Screening options

When pre-shredding or producing large particle sizes, you naturally do not need a screen at all. But when you move to smaller sizes, screens ensure that the finished cut particles are produced to a uniform size. Ensuring that the processed waste stream is uniform helps operators to produce highly marketable treated waste fractions. Is this function available on the shredding machine itself, or is it a separate piece of processing equipment? Screening options enhance the versatility and flexibility of the shredder.



## Cutting gap adjustment

Another key function in being able to produce a range of particle sizes and achieving the greatest degree of uniformity in particle size is the ability to adjust the cutting gap. Is it simple or difficult to adjust the gap? Think about how wide a range of particle sizes your machine should be configured for.



## Rotor speed adjustment

Can the shredding rotor speed be adjusted? This is crucial, because the optimal speed and torque depend on the shredded material and have a direct effect on fuel consumption. Also check whether the rotor can be reversed for maximising output.

## Dealing with non-crushables

One major operational problem that shredding operators face is non-crushables within the waste stream being processed, or foreign material that typically cannot be shredded, such as large pieces of metal. This can be a considerable barrier to productivity, and the profitability of shredding machine operations can be greatly affected by the way such material is dealt with.

Some shredders cannot cope with this problem and operators must access the machine in order to remove jams. Other shredders may use one of two main techniques to deal with this: they either sense an overload in the crushing area and then retract the shredding comb to let the non-crushables pass through into the processed waste stream, or they auto-reverse to clear the jam. In all cases, the ease of accessing the machine is critical in handling jams efficiently. If your shredder has a side door that opens, you do not have to empty the hopper to deal with jams.

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# Reducing operating costs

Operating costs can far outweigh initial capital investment. They must therefore be assessed carefully when considering any major shredder purchase.

## Energy costs

The energy efficiency of a particular shredder is dependent on several aspects, including the power source (diesel engine or electric motor), the drive technology that powers the shredding unit and the waste processing action used by the machine (crushing vs. cutting).

However, the most important factor is the shredder's ability to adjust to different materials, so that you use only the power you need in order to achieve the desired outcome in terms of capacity and particle size. Fuel and energy consumption is the biggest expense item over the machinery life span, so reducing consumption will have a significant impact on payback and profitability.

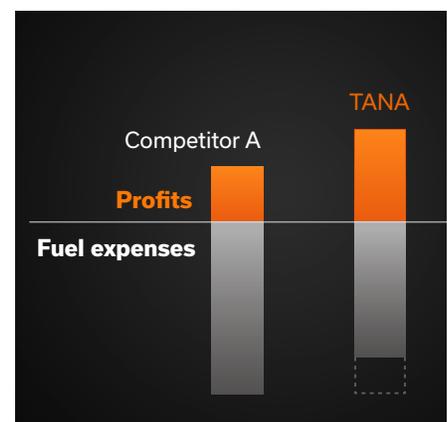
## Operator costs

Ongoing labour costs are comparable for most shredding machinery. When considering operator costs, two elements must be taken into account: initial training and familiarisation, and ongoing operation. It is essential for any shredding machine to be intuitive and easy to use, so that operators can be trained easily.

This requirement becomes even more important when you change particle sizes and waste processing treatments often. Good ergonomics also ensure that operation is safe and that injuries and work-related illnesses are prevented.

Ongoing lifecycle costs fall broadly into three areas:

- Fuel / energy
- Operators
- Maintenance



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# Reducing operating costs

## Reducing maintenance costs

With any capital purchase, the higher the uptime of the equipment, the quicker the payback. Performing the right maintenance at the right time is crucial for minimising machine downtime.

Can your shredder automatically provide you with the information and diagnostics on the health and status of the engine, powertrain and processing sections? The more intelligence that is built into the machine, the more precise and quick the maintenance responses can be.

## Optimising operational usage

Making information available throughout an organisation is another potential benefit of the intelligence that is increasingly being integrated into machines. If information can be provided to the operator and maintenance technician responsible for the machine, then it can also be sent to the management at the shredding organisation. Alarm information, for events such as a jam or low oil warnings, is only one aspect of the information that is readily available.

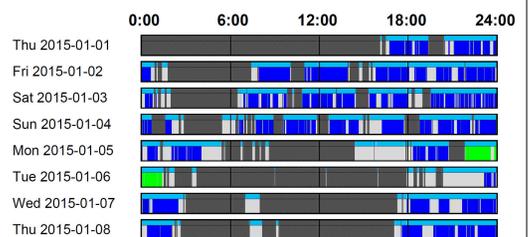
Overall information such as machine start/stop times, processing speeds, etc. can be collected and manipulated to provide reports for management, so as to provide complete 'total cost of ownership' reporting mechanisms. Such high-level feedback provides the key to improving productivity and payback, allowing good practice and operational use to be easily identified and encouraged.



The display of TANA Control System (TCS).

## REPORT

Totals:	374	631	Total / Avg.
Total hours	0.01	344.1	344.31
Working hours	0	207.13	207.2
Idle hours	0.01	136.97	137.12
Idle hour % of total hours	100 %	40 %	40 %
Fuel consumption litres	0	13899	13914
Avg. fuel consumption litres/h	0	40.39	40.41
Avg. load percent when working	0	61.16	61.14



TANA ProTrack<sup>®</sup>, with its reporting feature, helps you adjust the process to maximise the value of waste.

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# The impact of shredding versatility on total costs

Acquiring a more versatile shredding system can have a significant impact on total cost of ownership (TCO). The actual savings are directly related how many units must be used to actually achieve the required particle size.

Imagine a scenario where you are shredding MSW to a uniform 60 mm particle size and selling it to a waste-to-energy processor. Because a constant flow of material with a specific material size is needed, many machine manufacturers have solved this by providing several different units to meet the specification. The material is pre-shredded using a trommel screen, then shredded with a fast speed grinder to obtain the final end product. This can be done more efficiently in one process with a single versatile machine, the TANA Shark.

The table below shows an ordinary recycling process versus a versatile TANA Shark Waste Shredder concept, with rough estimates based on March 2015 cost levels. Less units, more profit and maximum uptime!

	Ordinary pre-shredder	Trommel screen	Secondary fast speed shredder	Total
<b>Purchase cost</b>	500,000 €	210,000 €	310,000 €	1,020,000 €
<b>Labour costs</b>	400,000 €		280,000 €	680,000 €
<b>Fuel costs</b>	550,000 €	150,000 €	455,000 €	1,155,000 €
<b>Knife costs</b>	50,000 €		50,000 €	100,000 €
<b>Screen costs</b>		12,500 €		12,500 €
<b>Service costs</b>	32,000 €	16,000 €	32,000 €	80,000 €
<b>Total</b>	<b>1,532,000 €</b>	<b>388,500 €</b>	<b>1,127,000 €</b>	<b>3,047,500 €</b>

The calculation is based on a lifecycle of 10,000 operating hours except for the secondary shredder that has a lifecycle of 7,000 operating hours.

<b>Versatile shredder TANA Shark</b>	
<b>Purchase cost</b>	550,000 €
<b>Labour costs</b>	400,000 €
<b>Fuel costs</b>	500,000 €
<b>Knives</b>	50,000 €
<b>Service costs</b>	32,000 €
<b>Total</b>	<b>1,532,000 €</b>

**NOTE!** The calculation is illustrative, based on orientative prices which do not include any optional equipment or other additional costs like transport, taxes etc. Actual prices and operating cost calculations are made for each customer specifically.



## A versatile one shredder process means more value from your investment, and more profit

In this scenario the value (gatefee – transport cost to WtE plant) of the first class SRF (Solid Recovered Fuel) is 13 euros per ton.

**A three machine combination will yield a profit of €2.80 per tonne, while a TANA Shark will give you a €5.30 profit per tonne.**

Fewer units used to produce the final product will have a significant effect on fuel costs, uptime and margins. And most importantly, your initial machinery investment costs drop from €1,020,000 to €550,000. Just saving this amount on your investment may help you start up a second shredding facility or easily double your shredding capacity, making your business more flexible and less vulnerable.

	Three-machine combination	TANA Shark
<b>Total cost of ownership</b>	3,047,500 €	1,532,000 €
<b>Total lifecycle capacity</b>	300,000	200,000
<b>Capacity per hour</b>	30t	20t
<b>Shredding cost per tonne (€)</b>	<b>10.20 €</b>	<b>7.70 €</b>

Prices for calculations updated March 2015.

We know that SRF prices, fuel costs and operator costs will fluctuate from country to country, so we would therefore be happy to calculate the local operating costs with you.



Which sounds better to you:  
€2.80 or €5.30 profit per tonne?

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# One TANA Shark waste shredder replaces two machines

**Kempeleen Siirtokuljetus Oy** provides waste management services for businesses and consumers mainly in Oulu region, Finland. Tana has delivered two waste shredders to Kempeleen Siirtokuljetus and now shredding operations can run more cost-effectively. What used to take two machines can now be done with a single TANA shredder.

Kempeleen Siirtokuljetus also provides services for materialization and reuse. In addition to the site in Kempele, the company has another site at Adven power plant in Jepua. In Kempele, company has a TANA shredder on tracks and in Jepua, they have a stationary TANA shredder.

"We also took a so-called complete spare parts container that has all spare parts the TANA shredders might need", tells **Mikko Räisänen**, who works as an equipment manager at Kempeleen Siirtokuljetus.

## One TANA shredder can now handle work of two machines

One factor influencing to choose TANA was the versatility of shredders – basically everything that needs to be shredded can be shredded. "For example, with the shredder in Jepua, we shred a mixture that contains 30% of sandpaper and 70% of mixed waste. In Kempele, we shred wood, furniture, pipes and energy waste. Almost every material can be shredded with the TANA shredder", Räisänen notes.

"Cost efficiency was the primary reason for buying TANA shredders. We used to need two different machines, but now we can get by with just one. TANA shredders even have less parts that can break, so we don't have to be there to fix it all the time. We have time to do other tasks than just repairing the machine line", Räisänen continues.

## "The customer's wishes and desires are listened to"

In Räisänen's opinion, the cooperation with Tana has been straightforward and effortless. Help is always available when needed whether it is a big or small problem. Someone is always answering the phone. "When choosing shredders, another important reason was that Tana is Finnish company. We felt that even if there were problems, we could get the help we need in Finnish. It makes things much easier", Räisänen says. "The customer's wishes and desires are listened to. They are also developing our business. It is of great benefit to us", Räisänen concludes.



**Mikko Räisänen, equipment manager at Kempeleen Siirtokuljetus Oy, has been very satisfied with the TANA shredder.**

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