HAAS®
Recycling-Systems



Stationary

PROCESSING SYSTEMS

Meeting your demand is our aspiration!

www.haas-recycling.de/en



Always your partner!

Reliable. Competent. Flexible.

If you are faced with the challenge of having to shred, sort and recycle thousands of tonnes of material every year, the first thing you need is the best possible advice and a custom-fit concept!
With a team of highly qualified specialists and over 30 years of experience, we are at your disposal for exactly this purpose.

We are available for project consulting in both the planning and design phases, for new projects as well as for existing operational processes with potential for improvement. In a comprehensive advisory service, we find the most suitable machines for your individual requirements.
We have the competence to plan and install your recycling plants ATEX-compliant. In addition, we can give you important ideas on how to optimise the workflow, efficient machine use and the design of recycling plants. Furthermore - besides achieving maximum performance - aspects of efficiency and environmental protection also play an important role.
For individual advice, please get in touch with your HAAS sales contact or info@haas-recycling.de

HAAS® Recycling-Systems



Shredder
Shredding - Breaking - Chipping



Screening
& Separating Technology
Screening - Sifting - Separating



Loading
& Unloading Systems
Docking - Filling - Emptying





EXPERIENCE

LINKED

FORESIGHTED

TAILOR-MADE

REGIONAL

MADE IN GERMANY

CUSTOMER-FOCUSED

FACE-TO-FACE

INNOVATIVE

QUALITY

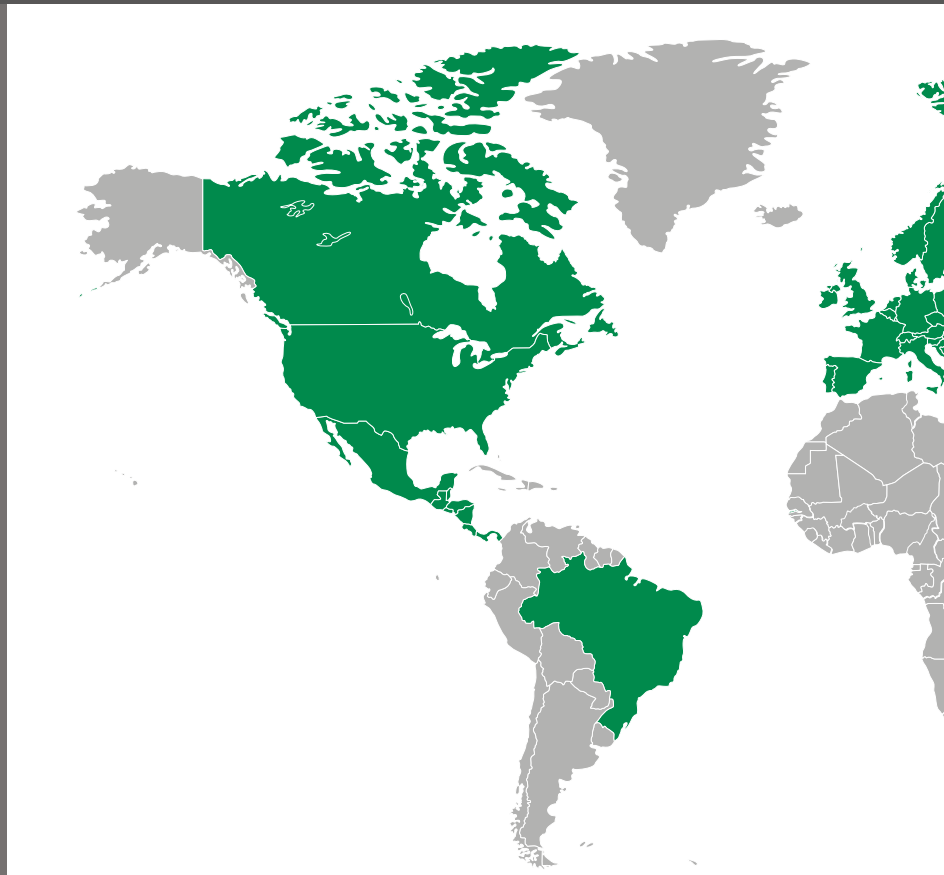


Over 30 years of plant engineering

Continuity
HAAS guarantees continuity - fixed contact persons are at your side from the planning phase to the commissioning.

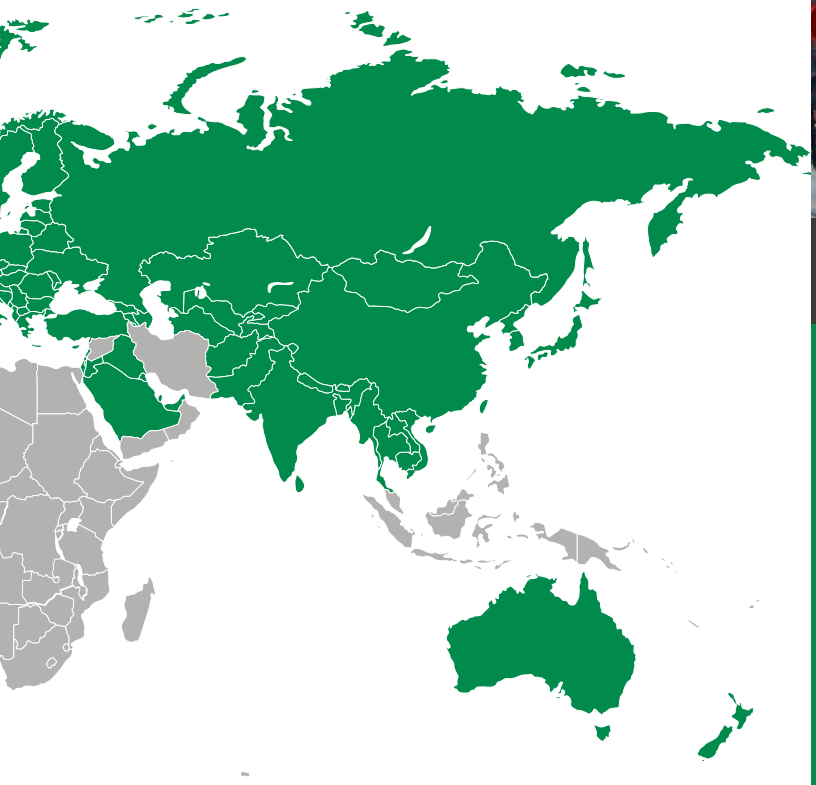
Support
Assistance with applications and approval procedures.

ATEX-Compliant
We have the competence to plan and install your recycling plants ATEX-compliant.



HAAS machines and systems worldwide.
We are making the world a bit greener.





You can benefit from our know-how on new investments for complete systems and upgrades to existing systems.
With a HAAS system you get a tailor-made solution, adapted to your individual needs and requirements.
From shredding to screening or separating and up to the baling press or bunker storage, you will get a suitable solution for every stage of the process.
Even for the toughest demands we can offer you the best solution. Just put us to the test!

30 Years



4.800.000 tons of waste wood!

Since 2004, we have been processing 70 - 80 tons of waste wood per hour with our HAAS processing line!

renewi

Van Vliet Groep
Part of Shanks Group

„We are still very satisfied today that we chose HAAS at that time.“

Our system still runs reliably. We are very satisfied that we have chosen HAAS that time. We are convinced of the good support. The entire management and service team of HAAS is supporting us at any time, solving any problems and assisting us in any possible way. Maintenance intervals and regular service visits are planned with foresight well in advance and the spare and replacement parts are manufactured in good time and stored at HAAS or in our warehouse.

„...we have established a trustful relationship.“

We don't know long downtimes. The entire plant still has a very high availability. Since the beginning, we have maintained a good partnership with HAAS. This means we have excellent communication and a mutual trust has been built up. I would implement a new plant project together with Volker Haas and his team again today.“

Renewi, Mr Johan Peter Post

The perfect solution for your application

You need individual solutions - machinery and equipment tailored to your materials and processes. We are not just a machine supplier - we support you in planning and designing your modern, high-performance solution, mobile or stationary.

Our standards are ambitious: A HAAS plant optimally fulfils the daily requirements not only in terms of performance, but also in terms of operation and maintenance.

Our advantage is our wide range of success stories, which means that we can offer you visits to reference sites as part of the decision-making process!

With over 30 years of experience in processing technology, we can find the perfect concept for every application. Benefit from our expertise in environmental technology and increase your profitability.



Waste Wood & Biomass For the processing of waste wood of all grades, we offer you innovative and economical single-stage as well as two-stage shredding concepts. The machines (e.g. TYRON pre-shredders) can be either stationary or mobile. Low operating costs, extremely low fines content and insensitivity to impurities combined with high performance are the success factors of waste wood processing plants from HAAS Recycling-Systems.



Waste & Refuse Derived Fuel The aim of processing waste is to utilise the valuable energy contained in the waste and thus reduce the use of fossil fuels. In the interaction of pre- and post-shredders, metal and non-metal separators, conveyor technology, screening and separation technology, and so on, the material flow is separated step by step into the different fractions. This results in defined marketable outputs.



PVC & Plastics Recycle as profitably as possible. Due to its shape, composition and characteristics, plastic is a very versatile raw material. In plastic recycling, the resulting plastic waste is processed into a reusable recyclate by shredding, screening and separating technology, washing and subsequent granulation.



Sawmill & Residual Wood Since the company was founded in 1989, the cornerstone of HAAS has been the design and production of stationary machines such as chippers, screens, conveyors and bunkers to equip complete sawmill plants as well as for the timber industry. At HAAS, we deliver exactly what you need: Individual components or systems for waste wood disposal.



Special Applications The range of applications for our technologies is far-reaching: Light metal shredding as part of the recycling loop, regardless of whether your metal and aluminium residues come from the metal processing industry, automotive industry, electrical industry or waste industry. Whether it is a volume reduction for easier processing in smelting plants or for better separation of different metals and composites. We always offer you a suitable shredding system for the processing of your recyclables!



Waste wood plant

Processing of 30 t/h waste wood

Input material
Waste wood, grade A, B and C

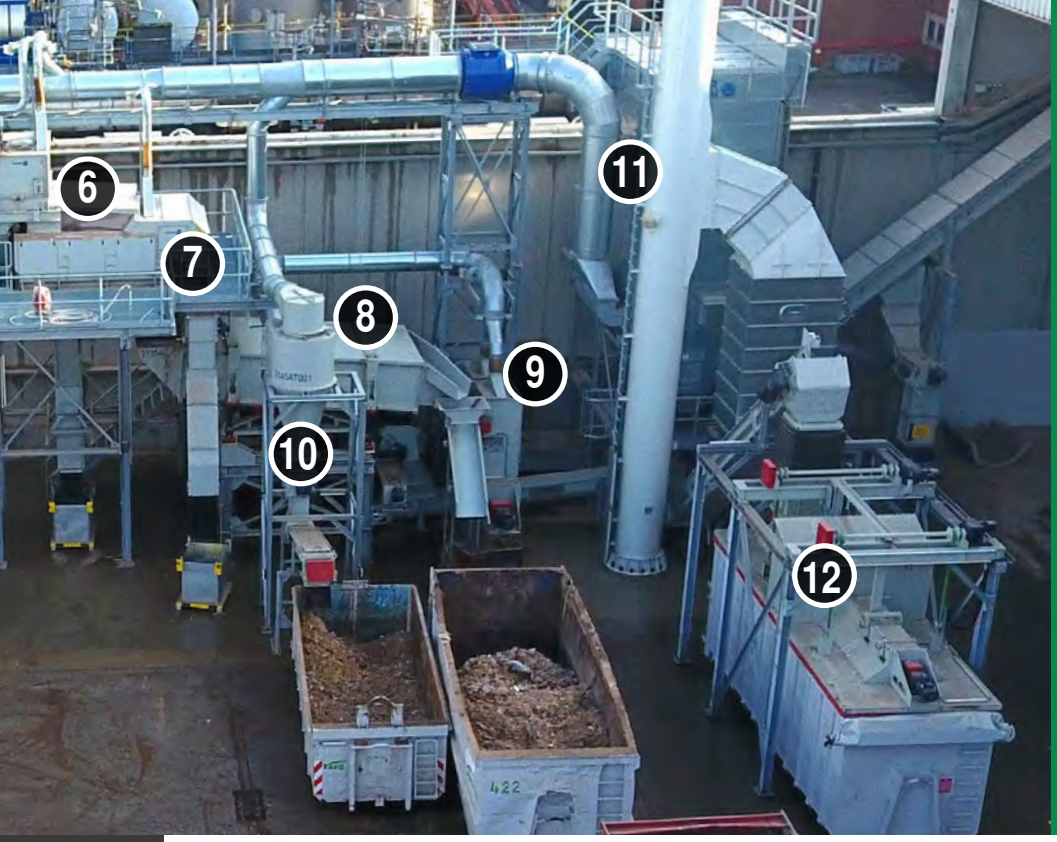
End product(s)
< 80 mm recycled chips for material (A) and thermal (B + C) recovery

The solution

A customised HAAS waste wood processing plant including among others pre- and secondary-shredder, an air separator and a complete dust extraction system.
The planning concept was convincing. The system was planned, designed and installed by us. We combine individual customer requirements with a customised system without compromise.

Highlights

- Equipped with the latest extraction technology.
- The entire conveyor technology is fully enclosed.
- The trucks are loaded in an enclosed loading bay.
- AVG also sets new standards in fire protection. Flash flood systems in all storage bays, infrared monitoring of the shredding technology and a spark extinguishing system as part of the filter system ensure the highest level of safety.



„The new waste wood processing plant is one of the most modern of its type in Germany and meets all currently required environmental and emission standards“

Karl Georg Boje, Managing Director of AVG Ressourcen GmbH

1 **TYRON 2000-E 2.0**
- The double shaft slow speed shredder shreds the unprocessed waste wood to a size of approx. < 300 mm.

2&4 **Enclosed electro overband magnet incl. dust extraction point**
Separates the coarse ferrous material downstream the pre-shredder and the remaing ferrous, mainly nails, and screws downstream the hammermill.

3 **ARTHOS 1600-E hammermill incl. ballistic chute and quick-change screen system**
The pre-shredded waste wood is shredded to chips of < 80 mm. Impurities, e.g. iron, are automatically separated thanks to the ballistic chute.

5 **Vibrating infeed**

6 **Magnetic drum**
Additional iron separation upstream the following ECS.

7 **Eddy Current Separator**
Separates non-ferrous metals.

8 **Flat screen HPS 125**
Splits the material -separated from ferrous and non-ferrous- into four fractions:

- Fines: < 5 mm
- Fine mid fraction: 5 - 25 mm
- Coarse mid fraction: 25 - 80 mm (is conveyed to the windsifter)
- Coarse fraction: > 80 mm (re-processed)

9 **Windsifter**
Separates the light fraction, such as film and paper, from the coarse mid fraction 25 - 80 mm.

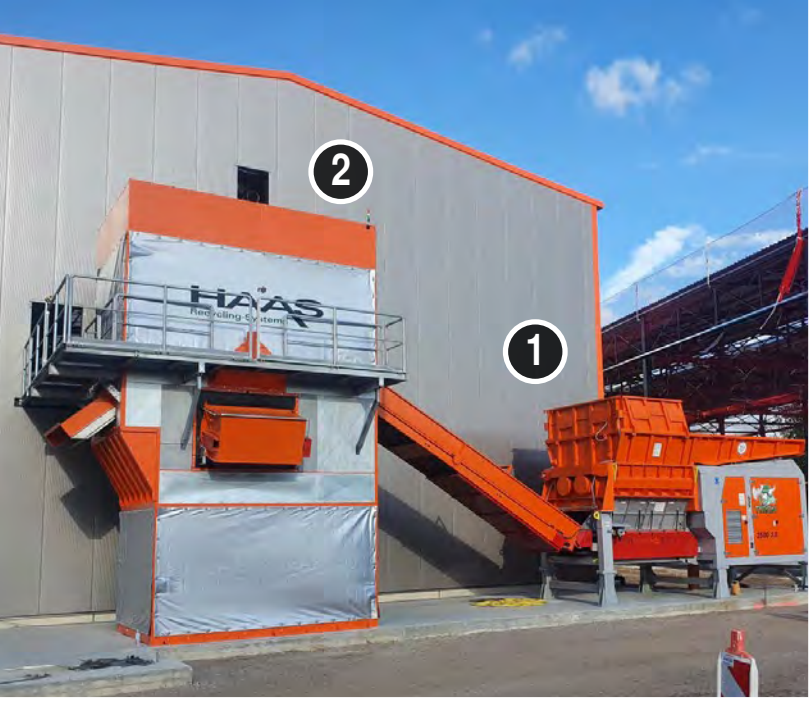
10 **Cyclone**
For the discharge of the separated light material.

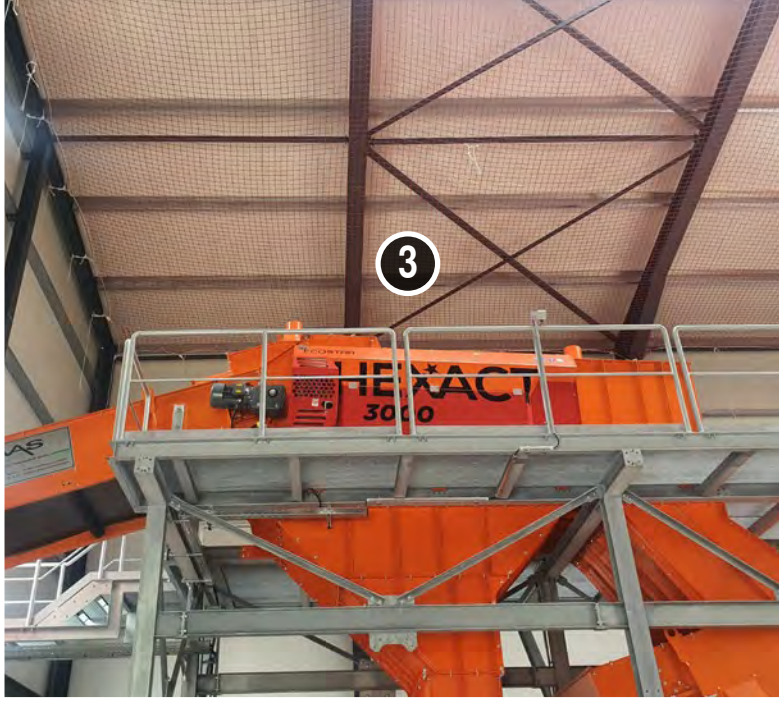
11 **Dust extraction system**

12 **Container loading system**
Dust-free loading of the fine fraction < 5 mm and the extracted filter dust.

13 **7 Storage bays**
Distribution chain conveyor systems (for automatic bay filling) and mist system.











Waste wood plant

Processing of 300.000 t waste wood per year (60 t/h)

Input material
Waste wood, grade A, B and C

End product
Biomass fuel (chips 5 - 100 mm) for the SOLVAY biomass power plant next door to generate process steam and electrical energy.

Highlights

- Dynamic material diverters guarantee redundancies and ensure operational reliability.
- A filter system of the latest generation guarantees an almost dust-free process.

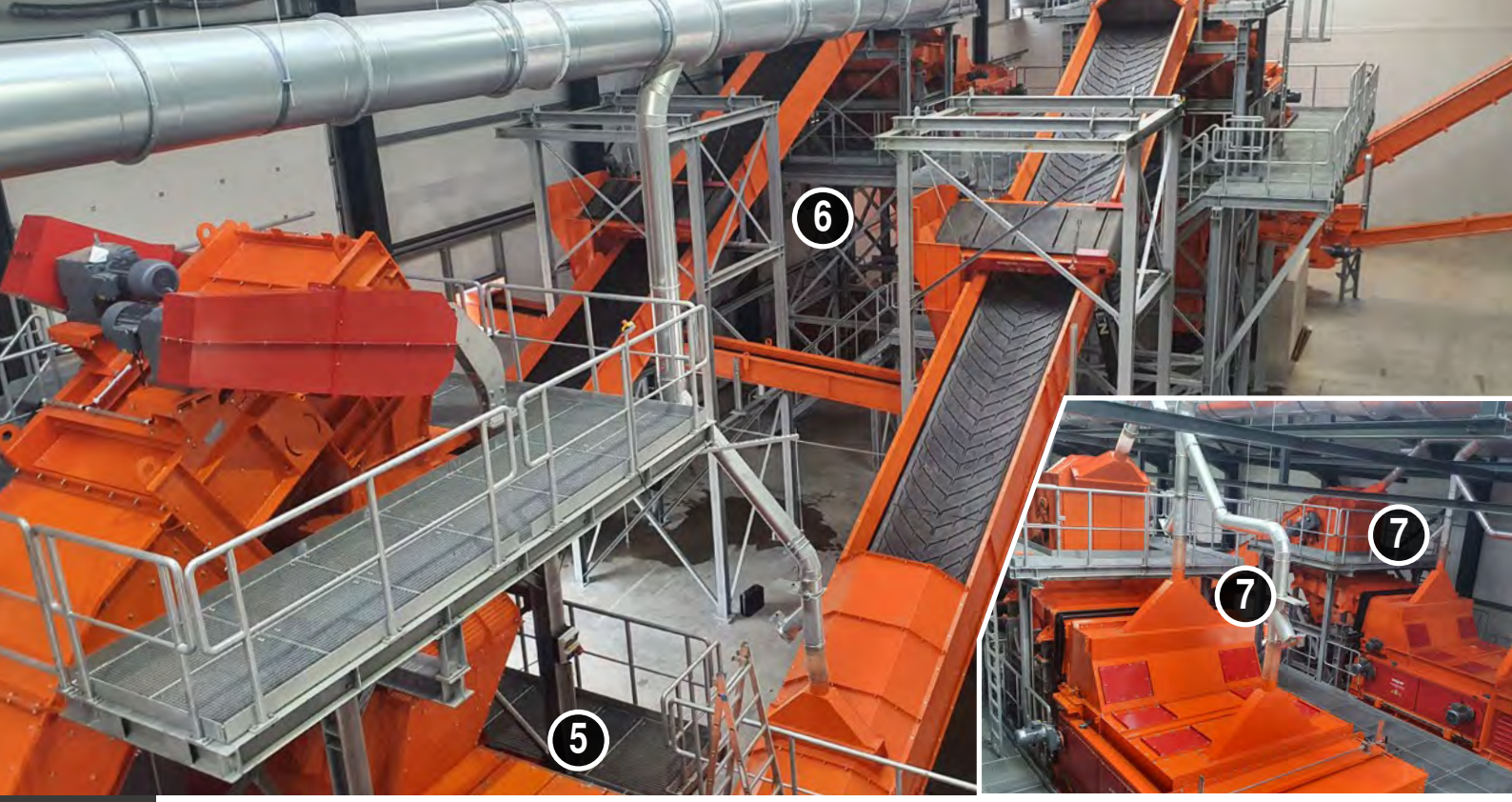
The solution

With the customised waste wood processing line, untreated waste wood is processed into high-quality biomass fuel. By using waste wood instead of coal, CO_2 emissions are significantly reduced by around 190.000 tons per year.
The splitting of the material flow into two lines ensures best ferrous and non-ferrous separation as well as ideal screening results.

AVG

„The long-term experience and expertise of HAAS in waste wood processing, especially in large-scale projects with throughputs of more than 60 t/h, have convinced us that we have chosen the right partner“

Rheinhold Pancherz,
Operations Manager of AVG Baustoffe Goch GmbH



1 **TYRON 2500-E 2.0**
- The double shaft slow speed shredder, the biggest pre-shredder from HAAS, shreds the incoming waste wood to an edge length of approx. < 300 mm.

2 **Enclosed electro overband magnet**
Separates the coarse ferrous material downstream the pre-shredder.

3 **ECOSTAR HEXACT dynamic disc screen**
The pre-shredded material is split to two fractions </> 80 mm:
Wood chips < 80 mm bypassing the hammermill are mixed back into the material downstream the hamermill. Wood chips over 80 mm are fed to the hammermill.

4 **ARTHOS 2000-E hammermill**
With a total of 630 kW drive power, the rotor of the hammermill is accelerated to 1.100 rpm. In one hour about 400 m³ of wood are processed into chips < 100 mm. Impurities, such as iron, are automatically separated by the ballistic chute.

5 **Screw conveyor(s)**
With an intelligent material flap and two screw conveyors the material flow is split into two lines. The split ensures optimum utilisation of the upstream ferrous and non-ferrous separators and the flat screens.

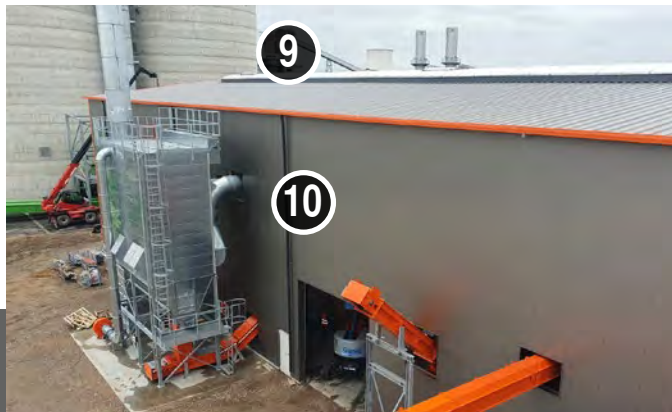
6 **Permanent overband magnets (neodym)**
The exposed ferrous, mainly nails and screws, downstream the hammermill is separated.

7 **Eddy Current Separator 2500 incl. magnetic drum**
After the two overband magnetic separators, the remaining ferrous and especially non-ferrous metals are sorted out of the wood.

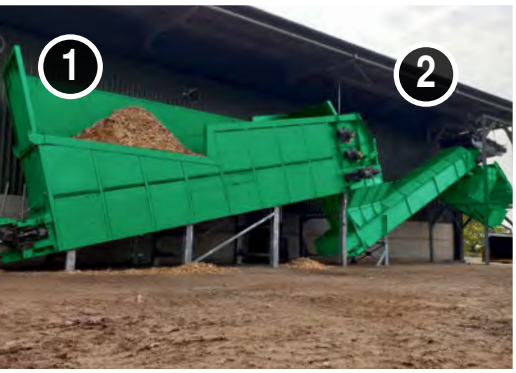
8 **Flat screens HPS 125**
Split the material -cleaned from ferrous and non-ferrous- into three fractions:
- Fines: < 5 mm (separated)
- Mid fraction: 5 - 100 mm (accepted product)
- Coarse fraction: > 100 mm (re-processed)

9 **Power plant interface**
The process chain ends with the storage of the biomass fuel in the power plant storage silos. From there the power plant is fed.

10 **Dust extraction and filter system**
The processing plant is equipped with a filter unit. The wood dust produced in the process is extracted with a volume flow of over 45.000 m³/h. Dust emission is reduced to an absolut minimum.









Waste wood plant

Processing of 35 t/h of pre-shredded waste wood

Input material
Waste wood, grade A

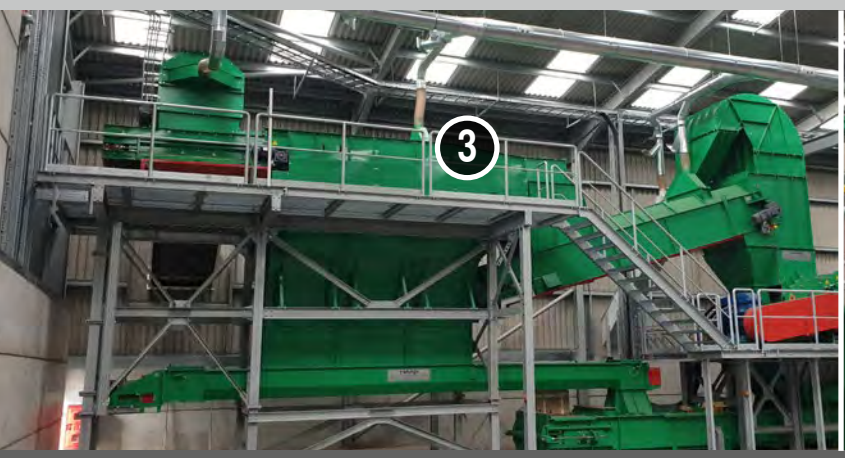
End product 0 - 5 mm, 5 - 20 mm, 20 - 50 mm
High quality grade A biofuel (wood chips > 50 mm) for power stations and „animal bedding“ for farmers.

The solution

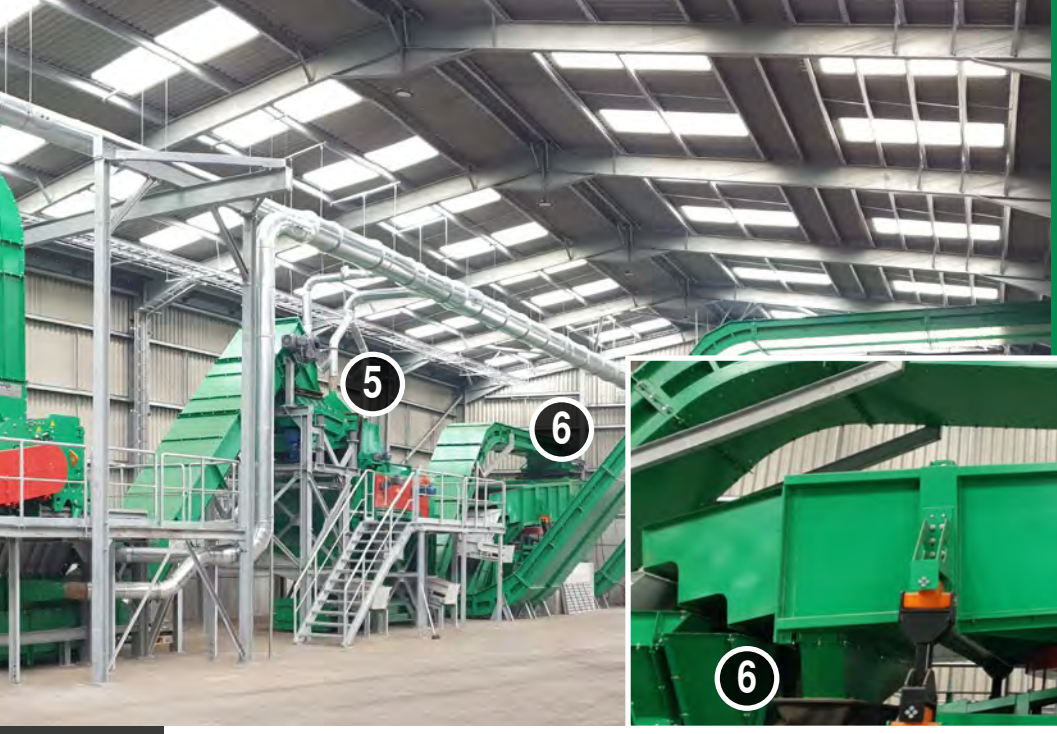
A turnkey waste wood processing line among others consisting of an ARTHOS hammermill, ferrous and non-ferrous separation and screening is producing clean high-quality recycling chips. The desired grain size can be varied as required with minimal downtime. The quality chips are used as fuel in power plants and by farmers as „animal bedding“.

Highlights

- The integrated dust extraction system ensures an almost dust-free process.
- Two control panels provide maximum user comfort. The plant operator controls the plant from the control room or, optionally, from the control panel in the processing building.
- Quick-change screen system reduces the exchange time and guarantee greatest flexibility in the selected particle size.









1 **Feed and dosing hopper**
The pre-shredded waste wood is fed to the dosing bunker. The bunker is fed with a wheel loader. The bunker ensures a constant material feed.

2 **Overband magnet**
Separates the exposed ferrous material.

3 **Starscreen ALVA**
The pre-shredded material is split into two fractions </> 25 mm:
Wood chips < 25 mm bypassing the hammermill are mixed back into the material downstream the hammermill. Wood chips over 25 mm are fed to the hammermill.

4 **ARTHOS 1600-E hammermill**
The pre-shredded waste wood > 25 mm is shredded to the required end product size.

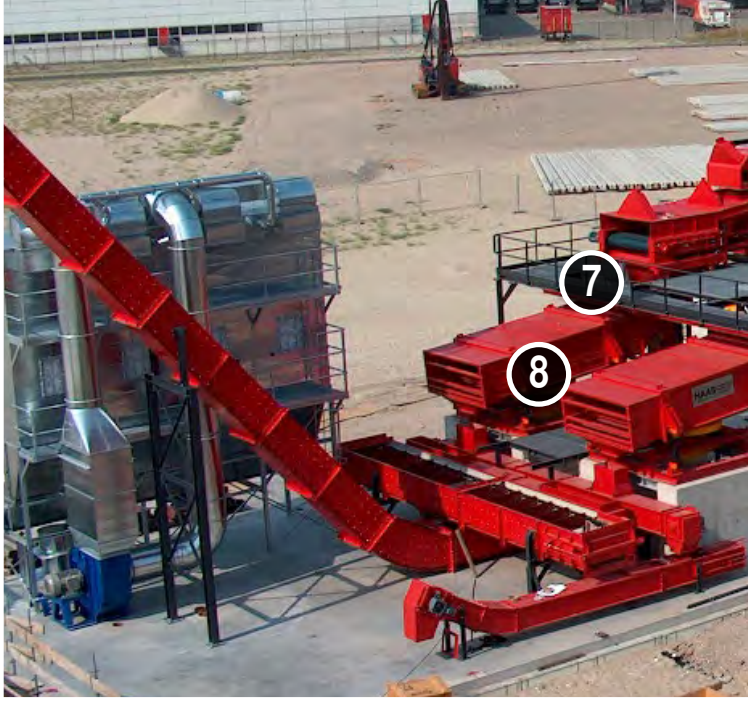
5 **Eddy Current Separator 2000 incl. magnetic drum**
After the hammermill, the remaining ferrous and non-ferrous metals are separated, mainly nails and screws.

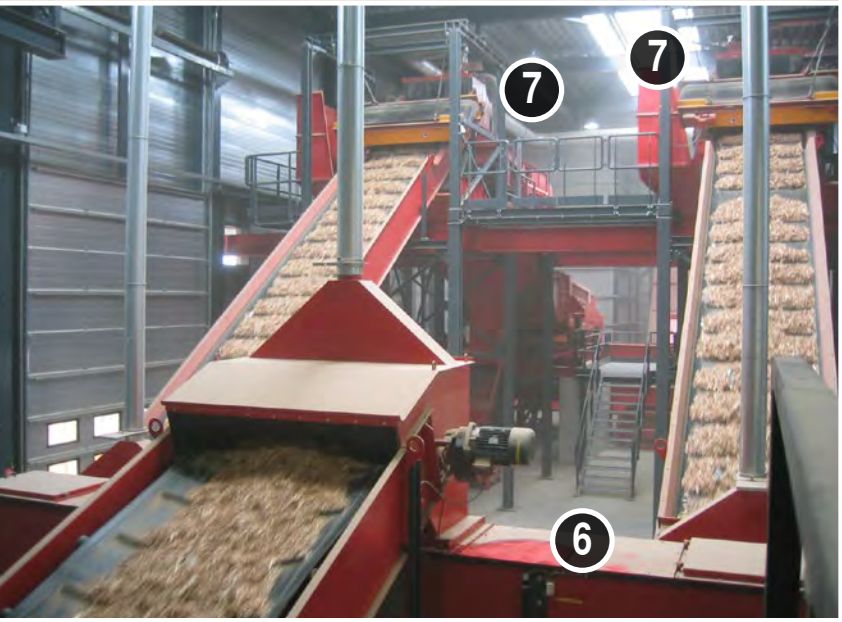
6 **Flat screen HPS 125**
Separates the material -separated from ferrous and non-ferrous- into 4 fractions:
- Fines: < 5 mm.
- Fine mid fraction: 5 - 20 mm
- Coarse mid fraction: 20 - 50 mm
- Coarse fraction: > 50 mm (re-processed)

7 **Storage bay**
The three different fractions (fines/fine mid/coarse mid) are distributed to six storage bays by chain conveyors.











Waste wood plant

Processing of 70 - 80 t/h waste wood

Input material
Waste wood, grade A, B and C

End product
< 5 mm, 5 - 100 mm
Fuel for biomass plants and high-quality chips for the chipboard industry.

The solution

This is a highly comprehensive HAAS waste wood processing line with a throughput capacity of up to 80 tons of waste wood per hour. The plant includes five huge storage silos for the intermediate storage of the recycled wood chips prior being loaded onto lorries or vessels.

Highlights

- Reliable operation since 2004! More than 5 million tons of waste wood have been processed.
- The plant stretches on a total area of approx. 2000 m².
- The chip size can be flexibly varied as required.
- The spark extinguishing system prevents serious fires caused by flying sparks and detects pockets of embers and provides reliable protection against overheating and dust explosions.



renewi

Van Vliet Groep

„Our plant is running reliably since 2004. We are very satisfied that we have chosen HAAS that time. I would implement a new plant project together with Volker Haas and his team again today.“

Johan Peter Post, Operations Manager, Renewi Nederland BV

1 **TYRON 2500-E**
- The double shaft slow speed shredder
The biggest double shaft slow speed shredder is the first machine in this huge waste wood processing line. It shreds the incoming waste wood to a size of approx. < 300 mm.

2 **Heavy duty electric overband magnet**
Separates the coarse ferrous metals.

3 **ARTHOS 2000-E hammermill**
The pre-shredded waste wood is shredded into recycling chips < 100 mm. The hammermill is equipped with the quick-change screen system and the ballistic chute. Foreign bodies are separated automatically and the screen basket of the mill can be changed in no time.

4 **Double screw conveyor**
Receives the wood chips underneath the hammermill and feeds the material to the following belt conveyor with integrated scale.

5 **Belt conveyor with integrated weighing system**
Enables the continuous monitoring of the throughput capacity.

6 **Distribution screw conveyor**
Divides the material equally onto the following ferrous and non-ferrous separators and the flat screens. The split grants the best possible separating and screening.

7 **2 Ferrous and non-ferrous separators**
The remaing ferrous and non-ferrous metals are separated by two cross belt overband magnets and two non-ferrous separators.

8 **2 Flat screens HPS 125**
Are separating the material, cleaned from ferrous and non-ferrous parts into three different sizes.

1. Fine fraction < 5 mm - the fine fraction is collected and conveyed to the two dustfree, patented **container-filling stations** by a **chain conveyor**. In addition, the fine dust extracted by the dust extraction system is stocked here too. The containers can be changed during the running operation without any downtime.

2. Middle fraction (accepted material) 5 - 100 mm – **heavy chain conveyors** transport the material into five large **storage silos** for the temporary storage of the end product.

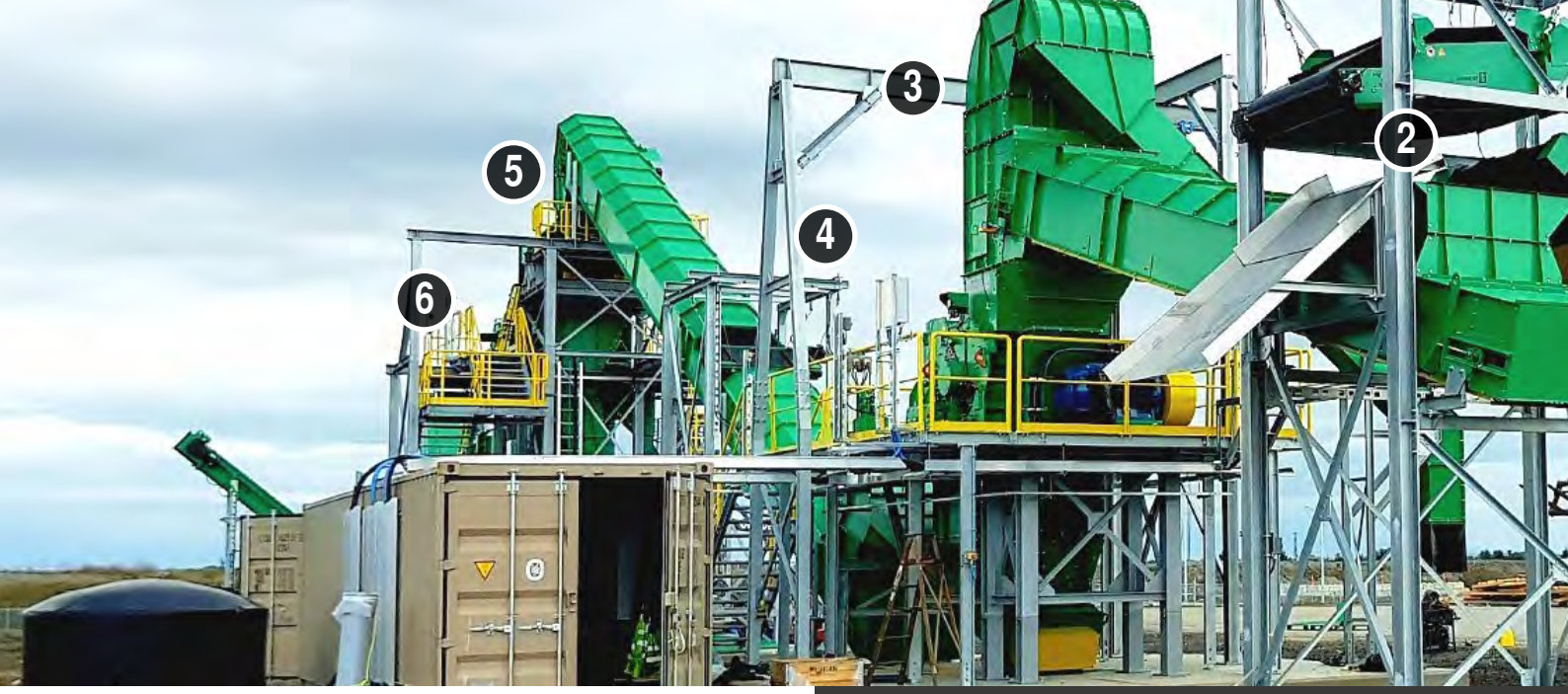
The discharge of the silos is done with heavy duty screw conveyors. The wood chips are dropped into the conveyors of the combined **lorry** or **ship loading station** (capacity up to 600 m^3/h).

3. Oversizes > 100 mm are conveyed to a small storage **bunker**, from which a wheel loader picks the overs up to return them to the recycling process.

9 **Filter system / dust extraction**
The production line is kept dustfree by a dust extraction unit with a volume flow of over 40.000 m^3/h.







Waste wood plant

Processing of 30 t/h waste wood

Input material
Waste wood, grade A, B and C

End product
< 80 mm

The solution

The versatile TYRON pre-shredder and the ARTHOS hammermill, with the ballistic chute, make it possible to process all types of wood waste and biomass in the plant.

Highlights

- Low maintenance and high availability! Thanks to the high built quality and technical improvements, the system is designed for reliable long term operation.





ECOWASTE

1 TYRON 2000-E 2.0
- The double shaft slow speed shredder
The mid-size primary shredder from HAAS shreds all kinds of untreated waste wood and partly greenwaste to a size of approx. < 300 mm.

2 Electro overband magnet
Separates the coarse ferrous metals.

3 ARTHOS 1600-E hammermill
The pre-shredded material is reduced to the required end product size of < 80 mm. Impurities are automatically separated by the ballistic chute. With the quick-change screen system the screen basket of the hammermill can be changed in no time.

4 Permanent overband magnet (neodym)
Separates the exposed ferrous material down-stream the hammermill, mainly nails and screws

5 Eddy Current Separator 2000
with integrated magnetic drum
After the cross belt magnet the remaining ferrous metals are separated by the magnetic drum as part of the eddy current separator. After that all non-ferrous metals are sorted out.

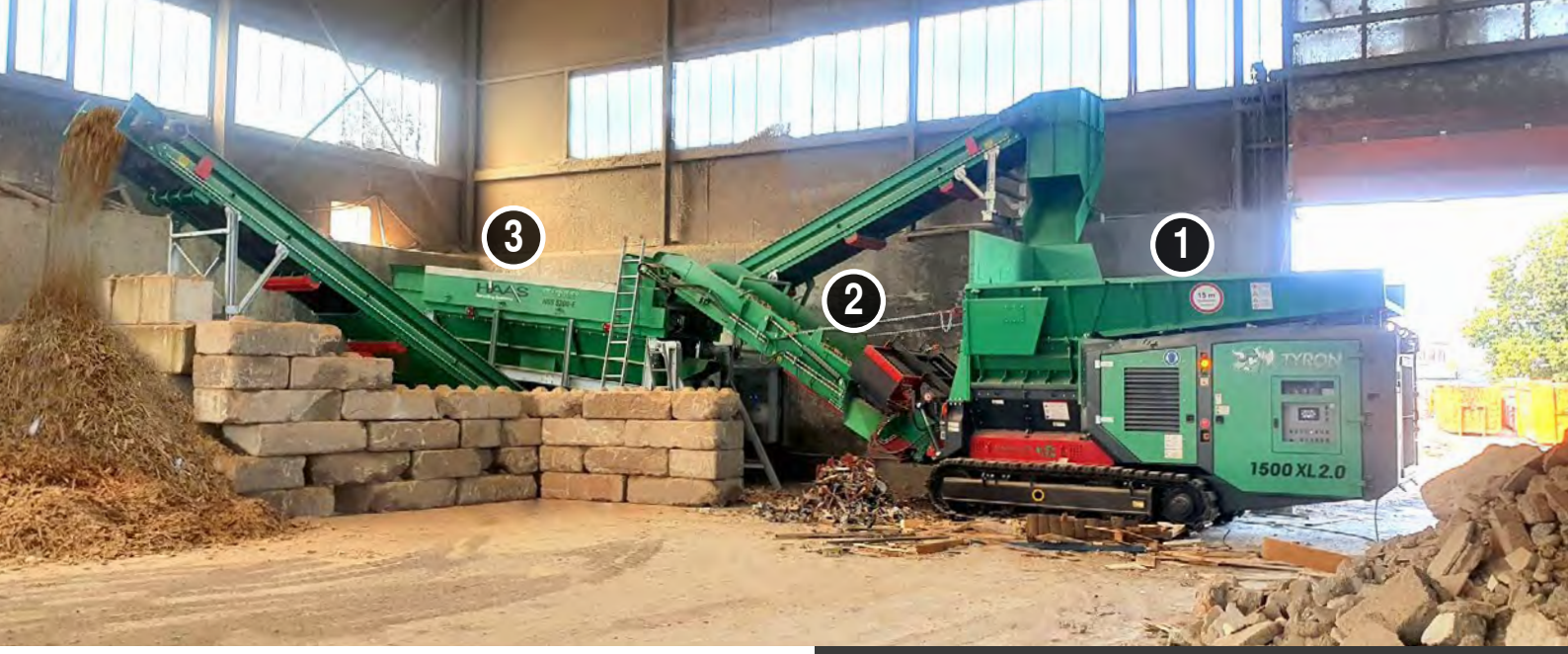
6 HAAS Flat screen HPS 125
Separates the ferrous-free and non-ferrous-free waste wood into four fractions:
- Fines: < 5 mm
- Fine mid fraction: 5 - 25 mm
- Coarse mid fraction: 25 - 80 mm
- Coarse fraction: > 80 mm (re-processed)

7 Windsifter
Separates the light fraction, such as film and paper, from the coarse mid fraction 25 - 80 mm.

8 Cyclone
For the discharge of the separated light material.







Waste wood plant

Processing of 20 t/h waste wood

Input material
Waste wood, grade A, B and C

End product
< 120 mm wood chips

The solution

The perfectly matched combination TYRON & ALVA for single-stage waste wood processing.

The HAAS combination gives us an ideal result in the limited amount of space. We no longer have to handle the overlengths with the wheel loader.

BWE Balthasar GmbH

1

TYRON 1500 XL 2.0
- The double shaft slow speed shredder
The pre-shredder is fitted with the finest available tool configuration and shreds the mixed waste wood to an edge length of approx. < 150 mm.

2

Overband magnet (neodym)
Separates the ferrous metals.

3

Starscreen ALVA
incl. oversize return
The pre-shredded waste wood is splitted in two fractions </> 120 mm. Thanks to a frequency converter the rotating speed of the single shafts can be varied and with it the screen size from approx. 100 to 120 mm. With an integrated screw conveyor, the fraction < 120 mm is collected and discharged to pile by a belt conveyor. The separated oversize material is conveniently returned to the shredder by the integrated return belt.

Highlights

- **Minimum space requirement with outstanding screening performance.**
- **Low energy requirement for a homogeneous end product with low fines content.**



HAAS 30 Years
Recycling-Systems



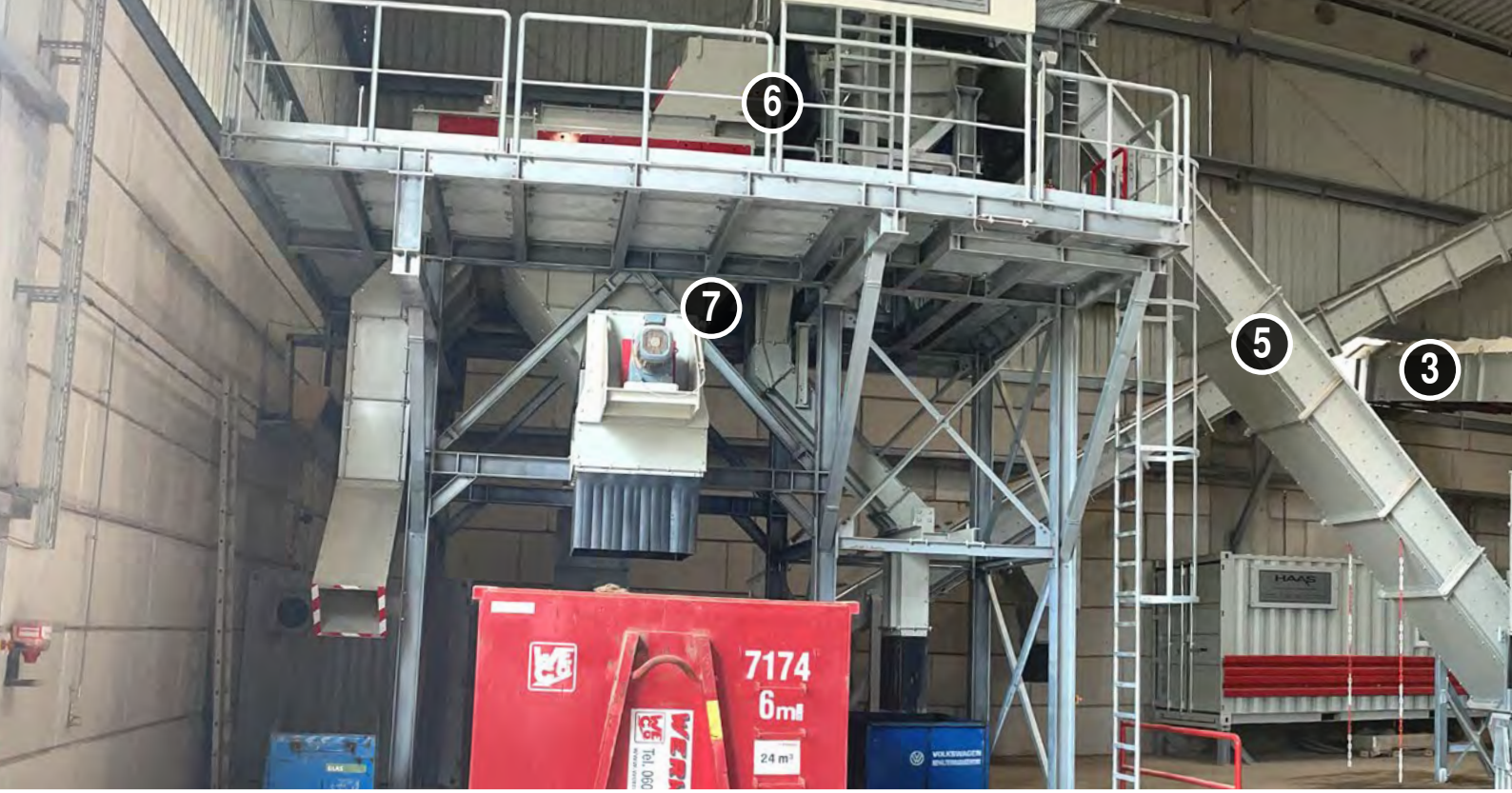
TYRON & ALVA

A perfect team

Shredder TYRON & Starscreen ALVA
with oversize return!

- Minimised footprint
- Easy access for S&M
- 200 m^3/h peak performance
- Radial rear conveyor
- Unique with collecting auger

ALVA









Waste wood plant

Processing of 30 t/h waste wood
30.000 - 60.000 t waste wood per year

Input material
Waste wood, grade A, B and C

End product
High quality wood chips < 100 mm
pre-shredded material 0 - 300 mm

The solution

In this customised waste wood processing plant, untreated waste wood is processed into high-quality biomass fuel. The plant sets standards in minimising dust emissions (without a filter system). Optionally, the plant can be operated without high speed shredding, which guarantees cost minimisation in terms of wear, maintenance and energy consumption!

Highlights

- Individual concept for dust minimisation.
- Fully automatic box filling system by a moveable conveyor belt.
- Integrated sampling system.
- Spark detecting and extinguishing system.
- Plant control via tablet computer.
- Maintenance platform for service-friendly access to the twin-shaft pre-shredder.
- Dust suppression system on the TYRON.



„It was ideal timing. We at WERNER Entsorgt were just starting to plan the new waste wood recycling plant when HAAS GmbH presented its portfolio to us. We were already in talks with other companies at this time. We already had various plant concepts from all providers.
Sascha Kloft and Patrick Szubrin (HAAS GmbH) finally convinced us with the individual plant layout and various planning details.
In advance, we were able to personally convince ourselves of a large number of HAAS systems that have been already installed. We were already impressed by the compact design and the construction of the conveyor belts and chain conveyors. The performance of the systems was outstanding. The full package from HAAS convinced us! We feel we are in very good hands with HAAS and maintain a business relationship based on partnership".

Michael Völker and Ralf Berninger
WERNER RC GmbH /CUP Recycling GmbH

1 **TYRON 2000-E 2.0**
- The double shaft slow speed shredder
Shreds the mixed waste wood to an edge length of approx. < 300 mm.

2 **Heavy electro overband magnet with walkway**
The magnet, complete with maintenance / service platform, separates the exposed ferrous material.

3 **Belt conveyor (bi-directional)**
Discharge of the pre-shredded waste wood < 300 mm into a storage bay outside the building, or optionally feeding the ARTHOS 1600-E hammermill.

4 **ARTHOS 1600-E Hammermill incl. ballistic chute and quick-change screen system**
With 315 KW power, the rotor of the hammermill shreds up to 40 t/h pre-shredded material to chips < 100 mm. Impurities are automatically separated by the ballistic chute. The quick-change screen system allows grain size changes within less than 30 minutes.

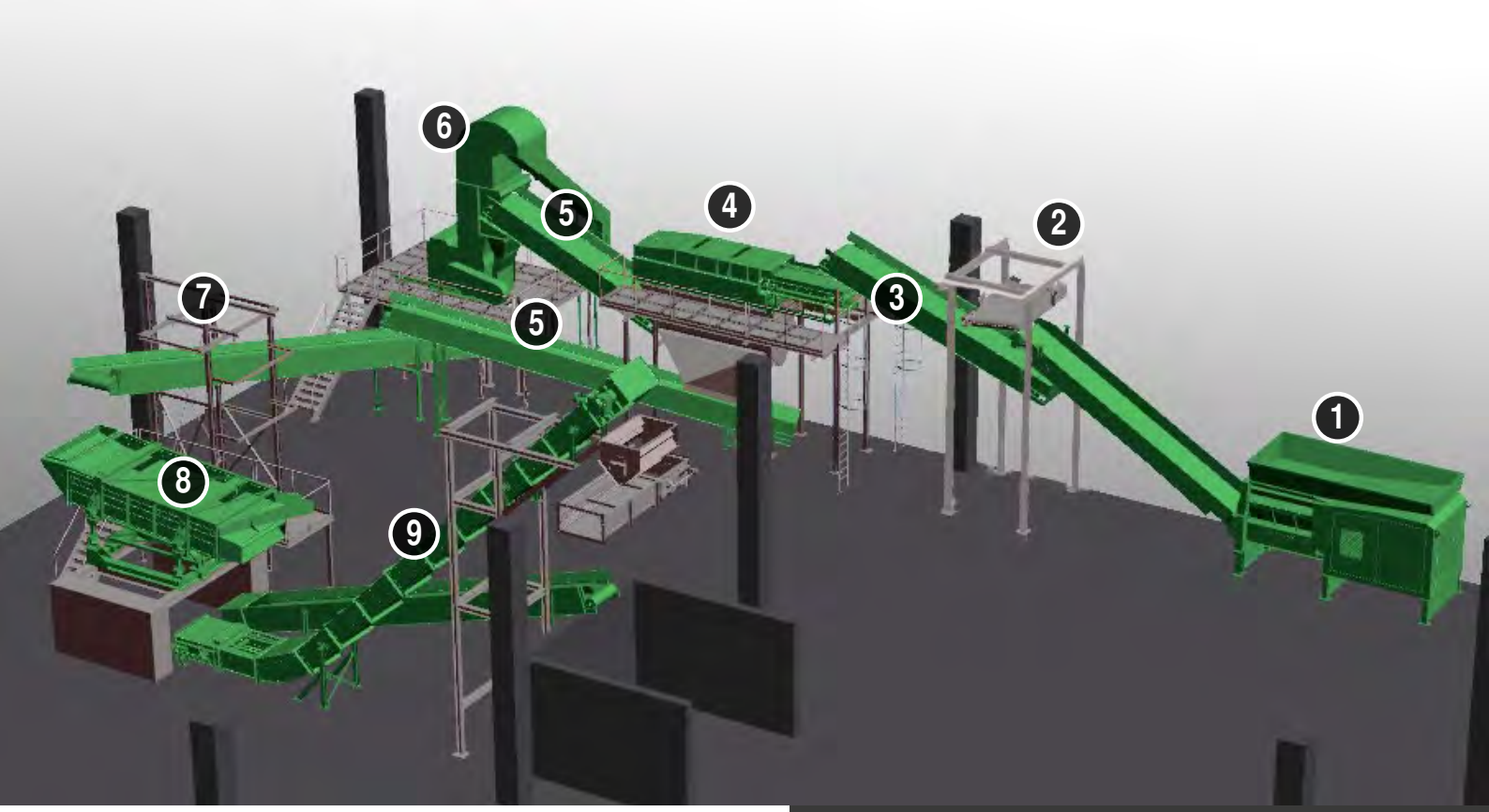
5 **Heavy chain conveyor**
Equipped with latest technology (automatic chain tensioning, automatic chain lubrication).
The shredded waste wood is transported dustfree to the non-ferrous separator.

6 **Non-ferrous separator with integrated magnetic drum**
Downstream the hammermill, the remaining iron and especially non-ferrous metals are separated from the wood.

7 **Screw conveyor (bi-directional)**
The material can optionally be discharged from the system by reversing operation (emergency discharge) or forwared to the distribution belt conveyors.

8 **Box filling conveyor belt(s)**
Fully automatic box filling of the four biomass fuel boxes incl. mist system to minimise dust emmissions.







Waste wood plant

The solution

Processing of 30 t/h roots and waste wood

Input material
Roots and waste wood, grade A, B and C

End product
Approx. < 70 mm

A turnkey HAAS processing line. With a pre- and secondary-shredder, magnet separators and different screens clean and high quality wood chips are produced. The high quality biomass chips are used as fuel in a power plant.











1 **TYRON 2000-E 2.0**
- The double shaft slow speed shredder
The pre-shredder easily shreds the untreated waste wood & roots. The pre-shredded material has an edge length of approx. < 300 mm.

2 **Overband magnet (neodym)**
The magnet, incl. maintenance / service platform, separates the exposed coarse iron parts.

3 **Belt conveyor, stone trap**
Transports the pre-shredded material to the hammermill ARTHOS 1600-E, bigger stones etc. are automatically separated due to the inclination angle of the conveyor.

4 **Starscreen ALVA**
The pre-shredded material is separated into two fractions </> 50 mm.
- Chips 0 - 50 mm are bypassing the hammermill and are mixed back into the material flow after the mill.
- Chips > 50 mm are conveyed to the hammermill.

5 **2 Conveyor belts (conveying technology)**
The fraction 0 - 50 mm is conveyed directly to the flat screen.
The fraction > 50 mm is conveyed to the hammermill for secondary shredding.

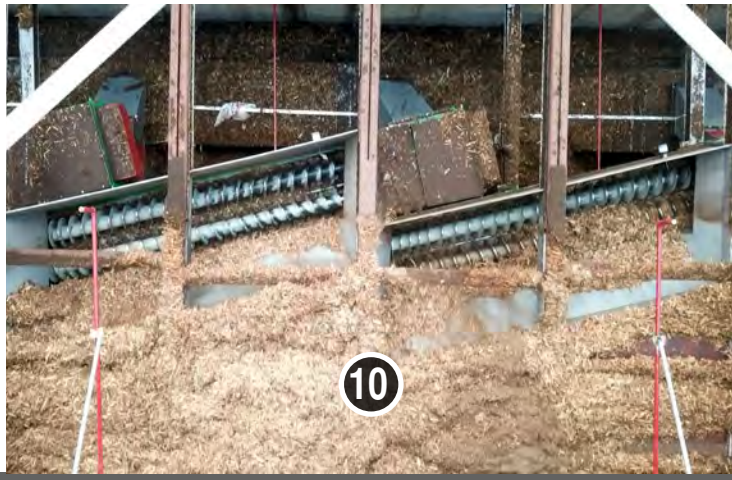
6 **ARTHOS 1600-E hammermill incl. ballistic chute and quick-change screen system**
The pre-shredded material is reduced to the desired particle size < 70 mm. Impurities are automatically separated by the ballistic chute.

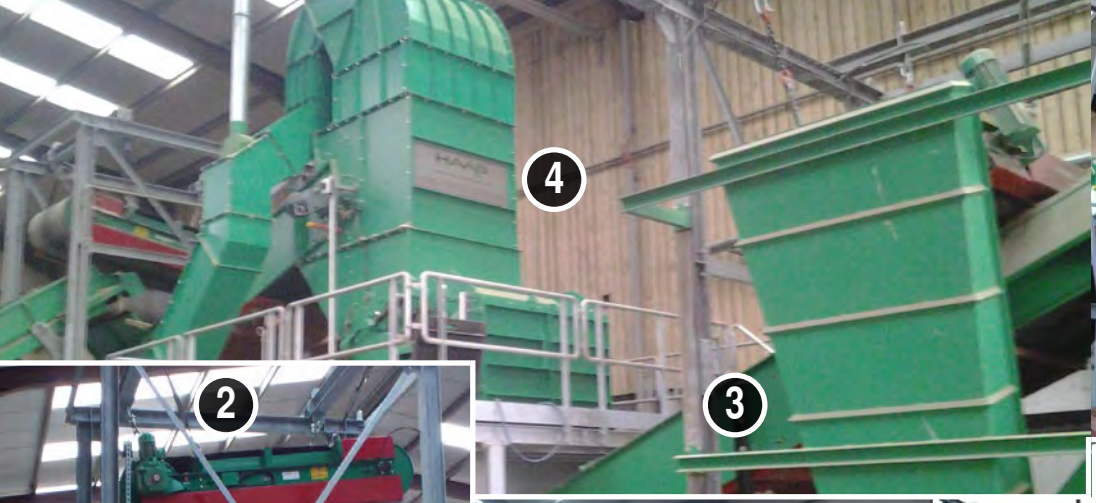
7 **Permanent overband magnet (neodym)**
Separates the remaining ferrous metals.

8 **Flat screen HPS 125**
Splits the waste wood and roots into three fractions:
- Fines: 0 - 10 mm
- Mid fraction: 10 - 70 mm
- Oversize: > 70 mm (re-processed)

9 **Storage bays / walking floor**
The different fractions are distributed by chain conveyors to a total of six storage bays and optionally to four walking floors.

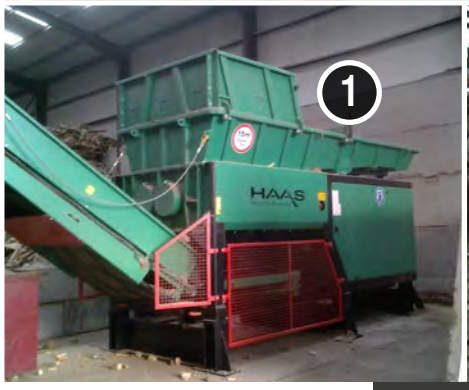
10 **Double screw conveyor**
The discharge of the walking floors is dosed by double screw conveyors. Chain conveyors transport the middle fraction to the power plant.













Waste wood plant

Processing of 15 t/h waste wood

Input material
Waste wood, grade A

End product
0 - 9 mm
(0 - 3 mm, 3 - 9 mm)

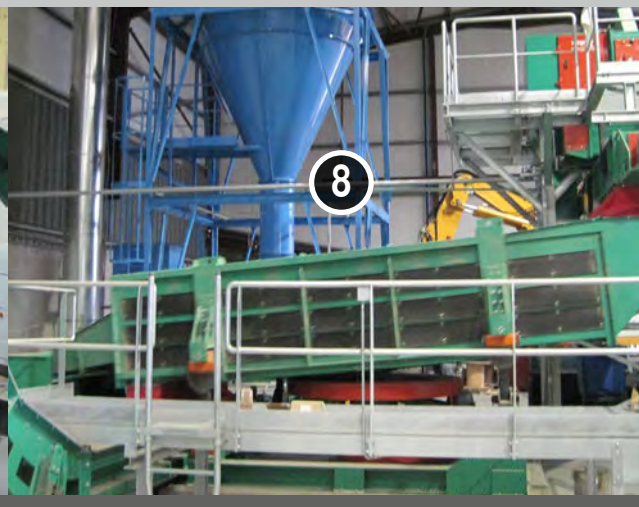
The solution

A customised HAAS waste wood processing plant for the production of fine chips 0 - 9 mm. The chips are used as animal bedding and for the production of wood briquettes.

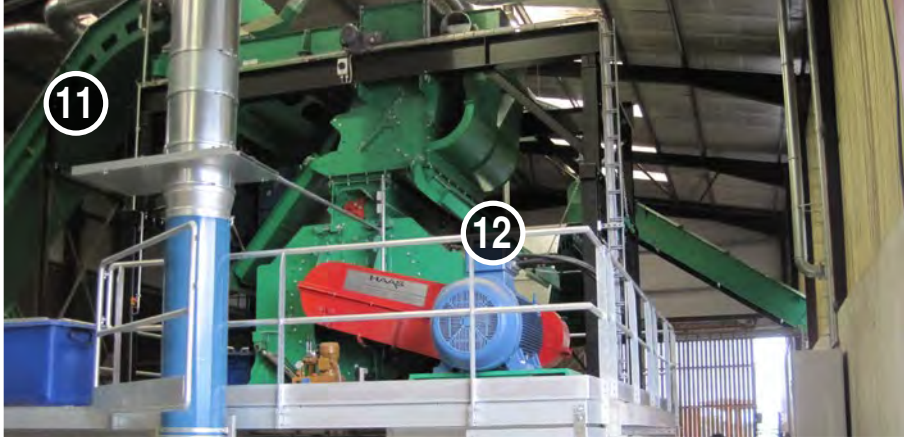
Highlights

- Optionally, the end product 0 - 9 mm can be conveyed directly into a box OR alternatively screened into two fractions (0 - 3 mm animal bedding / 3 - 9 mm wood briquettes) and then stored.
- Intermediate material storage bunker provide a constant flow of material and thus the most efficient operation of the system.











1 **TYRON 2000-E**
- The double shaft slow speed shredder
Shreds the waste wood grade A to an edge length of approx. < 300 mm.

2 **Electro overband magnet**
Separates the exposed ferrous material.

3 **Conveyor(s)**
Transports the material to the hammermill and then on to the non-ferrous separator.

4 **ARTHOS 1600-E hammermill incl. ballistic chute**
Pre-shredded waste wood is reduced to wood chips < 40 mm.
Due to the ballistic chute, impurities are automatically separated.

5 **Overband magnet**
Separates the exposed ferrous material, mainly nails and screws.

6 **Eddy Current Separator**
Separates the non-ferrous metals.

7 **Screw conveyor HFS**
Connects the eddy current separator with the HPS flat screen.

8 **Flat screens HPS 125**
Splits the material -separated from ferrous and non-ferrous- into three fractions:
- Fines: 0 - 9 mm (are conveyed to a storage bay or to the fine screen)
- Middle fraction: 9 - 40 mm (is conveyed to the fine hammermill)
- Large grain: > 40 mm (is fed back into the process)

9 **Chain conveyor HRKF**
Conveys the material either into a box or to the further process, depending on the grain size.



Fraction 9 - 40 mm

10 **Screw bunker**
Intermediate material storage bunker (9 - 40 mm fraction) to provide a constant material flow to the following fine hammermill.

11 **Chain conveyor HRKF**
Transports the material to the fine hammermill.

12 **Fine hammermill HSZ-R 500 x 1800 with vibratory feeder, magnetic drum and heavy particle separator**
Suitable for the fine shredding of wood 9 - 40 mm to a size < 9 mm. The fine wood chips are conveyed back to the flat screen by chain conveyors.

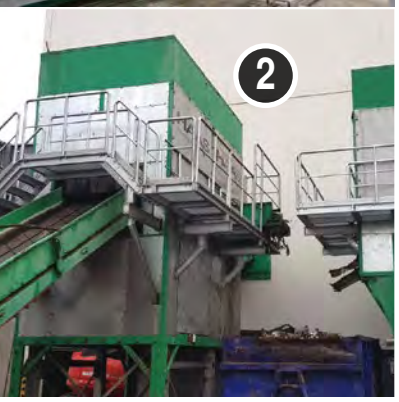
13 **Chain conveyor HRKF**
Depending on the grain size the material is transported to a storage bay or to the further process.

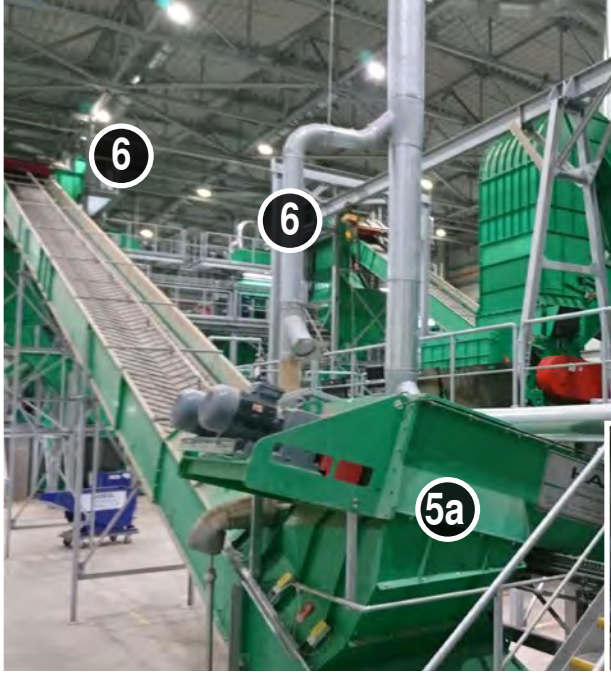
Fraction 0 - 9 mm

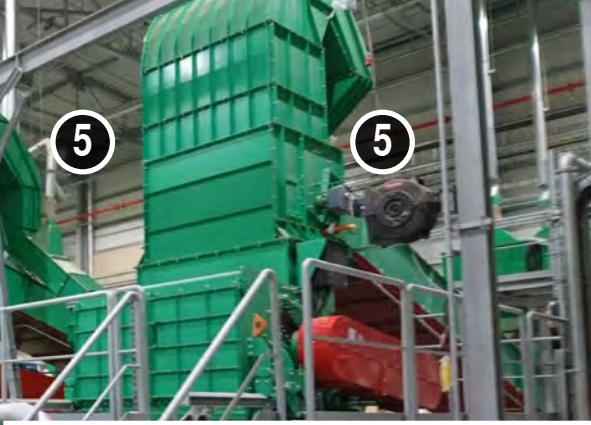
14 **Mogensen fine screen**
The end product 0 - 9 mm can be conveyed directly into a storage bay OR alternatively screened into two fractions (0 - 3 mm animal bedding / 3 - 9 mm wood briquettes) and then stored.

15 **3 Storage bays**
The material is transported via further chain conveyors into the individual storage bays:
0 - 9 mm OR 0 - 3 mm and 3 - 9 mm.

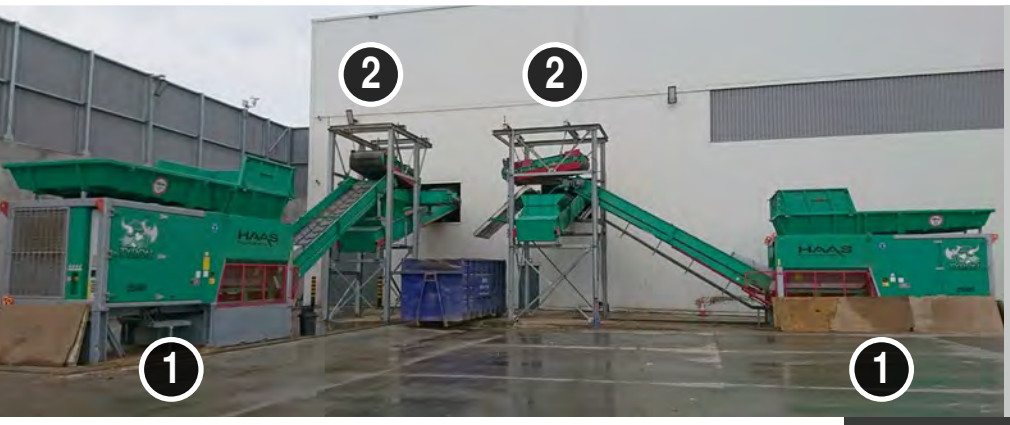






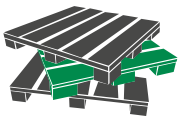






Highlights

- Two redundant lines. HAAS guarantees an output of 120 t/h with both lines in operation!
- The fine fraction is loaded via low-dust truck loading systems.



Waste wood plant

Processing of 270.000 t/year waste wood

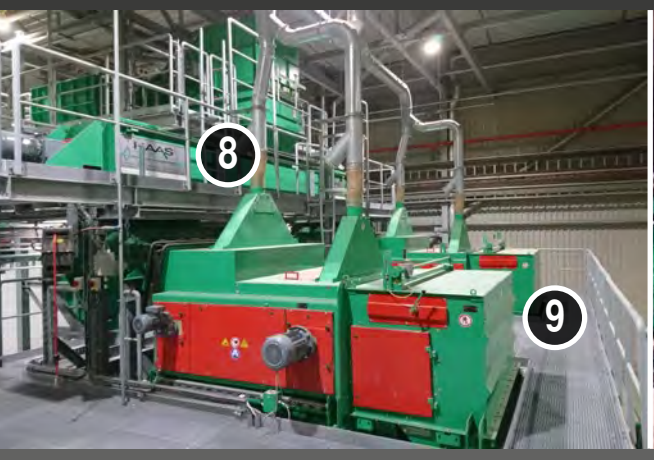
Input material
Waste wood, grade A, B and C

End product
High-quality biomass fuel to produce heat and power. 0 - 5 mm, 0 - 100 mm, > 100 mm

The solution

A HAAS waste wood processing plant with two redundant lines. Each line has a guaranteed capacity of 60 t/h. The design of both lines is identical. The total capacity of the plant is an outstanding 120 t/h.

Stobart Biomass











1 **2x TYRON 2500-E**
- The double shaft slow speed shredder
Shred the untreated waste wood to an edge length of approx. < 300 mm.

2 **2x Housed electro overband magnet**
Seperate the coarse ferrous material.
The completely enclosed overband magnets are optimally accessible via a maintenance platform.

3 **2x ECOSTAR Dynamic disc screen**
Separate the pre-shredded waste wood into two fractions </> 80 mm.

4 **1 Wind sifter**
Heavy particles such as stones, glass, etc. are separated from the fraction < 80 mm and the chips are fed back into the main material flow.

5 **2x ARTHOS 2000-E hammermill incl. ballistic chute and quick-change screen system**
The pre-shredded waste wood 80 - 300 mm is reduced to high-quality recycled chips < 100 mm. The hammermill processes peaks of up to 100 t/h. Impurities are automatically separated via the ballistic chute. The screen change with the quick-change system can be carried out within 30 min. A double **screw conveyor (5a)** ensures a constant discharge and material flow to the downstream sorting and separating equipment.

6 **2x Permanent overband magnet (neodym)**
Separate the exposed ferrous material, mainly nails and screws.

7 **2x Magnetic drum (neodym)**
In addition to the upstream electro magnet, the material stream passes through a neodym magnetic drum. Remaining iron parts are sorted out.

Divided material flow

8 **2x Distribution screw**
A distribution screw then distributes the chips evenly to two non-ferrous separators.

9 **2x 2 Non-ferrous separator 2000**
Two non-ferrous separators each line separate the non-magnetic metals, mainly aluminium. Upstream vibrating conveyors distribute the material over the working width of the non-ferrous separators.

10 **2x 2 Flat screens HPS 125**
Two screens per line separate the wood chips into three fractions:
- 0 - 5 mm fine fraction: loading onto trailer by **truck loading station(s) (10a).**
- 5 - 100 mm middle fraction: **Heavy chain conveyors** transport the end product to the CHP plant.
- > 100 mm: The large grain is conveyed to an intermediate storage bunker and from there fed back into the process again by wheel loader.

11 **2 Extraction systems**
Two extraction systems with a volume flow of 40.000 m³/h each extracts the fine dust and ensures an almost dust-free process.

12 **Switch & control board**
The switch and control system ensures that the processes run properly.



Waste & Waste wood plant

Processing of 40 - 45 t/h industrial waste or 40 t/h waste wood

Input material
Industrial waste / C&D
waste wood, grade A, B and C

End product
0 - 300 mm shredded industrial waste
0 - 120 mm waste wood

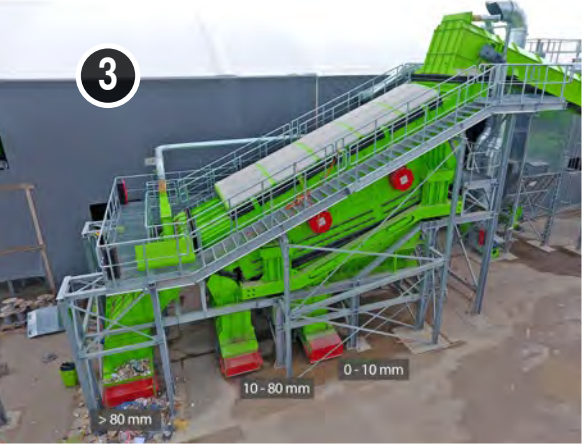
The solution

Maximum flexibility: In addition to the processing of industrial waste, the customised HAAS recycling plant enables the pre- and secondary shredding of waste wood.

SORTERA®

Highlights

- State of the art installation.
- Individually controllable and usable conveyor belts. The material flow can thus be guided or freely combined at any time.
- Integrated sampling system.
- The entire conveyor technology is enclosed.







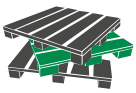


1 **TYRON 2500-E**
- The double shaft slow speed shredder
Reduces commercial and industrial waste or waste wood to a particle size approx. < 300 mm.

2 **Housed electro overband magnet**
Seperates the coarse ferrous material.



Conveyors



3 **3D Combi-Flip-Flow-Screen**
Separates the material into three fractions:
- Fine fraction 0 - 10 mm (is transported into a storage bay)
- Mid fraction 10 - 80 mm
- Coarse fraction > 80 mm.

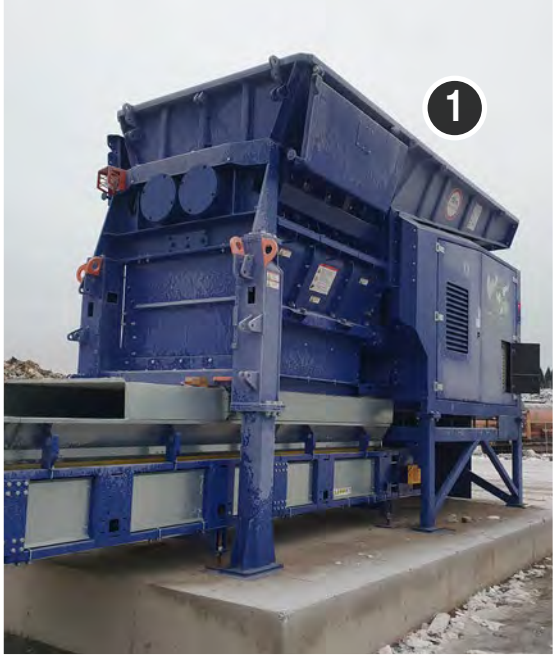
4 **2 Windsifters 1400 incl. filter system and maintenance platform**
Separate the heavy from the light fraction out of both material streams 10 - 80 mm and > 80 mm. An overband magnet separates ferrous material from the heavy fraction as well.

5 **Conveyor belts (reversible)**
The material 10 - 80 mm and > 80 mm can be conveyed separately into storage boxes or, optionally, both material streams can be brought together again and stocked.

6 **ARTHOS 1600-E hammermill incl. ballistic chute and quick-change screen system**
In the second shredding stage, the pre-shredded waste wood is reduced to recycling chips < 120 mm. Impurities are automatically separated by the ballistic chute. The maintenance platform ensures excellent service access.







Waste & Waste wood plant





Processing of 25 t/h
waste wood & industrial waste

Input material
Waste wood, grade A, B and C
& industrial waste (energy waste)

End product
< 80 mm

REVISOL

The solution

A compact system for the processing of waste wood and industrial waste (energy waste). Pre- and secondary shredding is performed by a TYRON pre-shredder and an ARTHOS hammermill.



1 **TYRON 2000-E XL 2.0**
- The double shaft slow speed shredder
Shreds the waste wood and industrial waste to an edge length of approx. < 300 mm.

2 **Electro overband magnet**
Separates the coarse ferrous material.

3 **ARTHOS 1600-E hammermill**
The pre-shredded material is reduced to a grain size of < 80 mm.

4 **Electro overband magnet**
Separates the exposed ferrous material, mainly nails, screws and staples.

5 **Eddy Current Separator 2000**
incl. magnetic drum
Finally, the non-ferrous metals are separated by a 2 m wide separator. An integrated magnetic drum separates the remaining ferrous parts.



Special applications

Processing of 12 t/h
Aluminium profiles

Input material
Aluminium profiles

End product
300 - 400 mm

The solution

The TYRON 2000-E XL 2.0 tears apart even the most heavily compressed bales. The compact unit separates aluminium from composites such as rubber and/or plastics. Containing residual ferrous material is separated.

„We had been looking for a suitable shredder for our requirements for a long time. The stationary HAAS TYRON, with its 2.0 update package, convinced us."

Carlos Kampen, E-MAX BILLETS

1 **TYRON 2000-E XL 2.0**
- The double shaft slow speed shredder
Shreds the various aluminium materials to an edge length of approx. 300 mm.

2 **Overband magnet (neodym)**
Separates ferrous material from aluminum.

3 **Conveyor belt**
Transports the pre-shredded material to the non-ferrous separator.

4 **Non-ferrous separator**
Separates aluminium from composites such as rubber and plastics.

Highlights

- Feeding of complete aluminium bundles or compacted aluminium bales.
- Separates 95 % of all contaminants and foreign objects.
- Separate powerpack with rain cover.
- Maintenance platform for service-friendly access.







Waste & RDF

Processing of min. 125 m³/h or 55 t/h Municipal Solid Waste

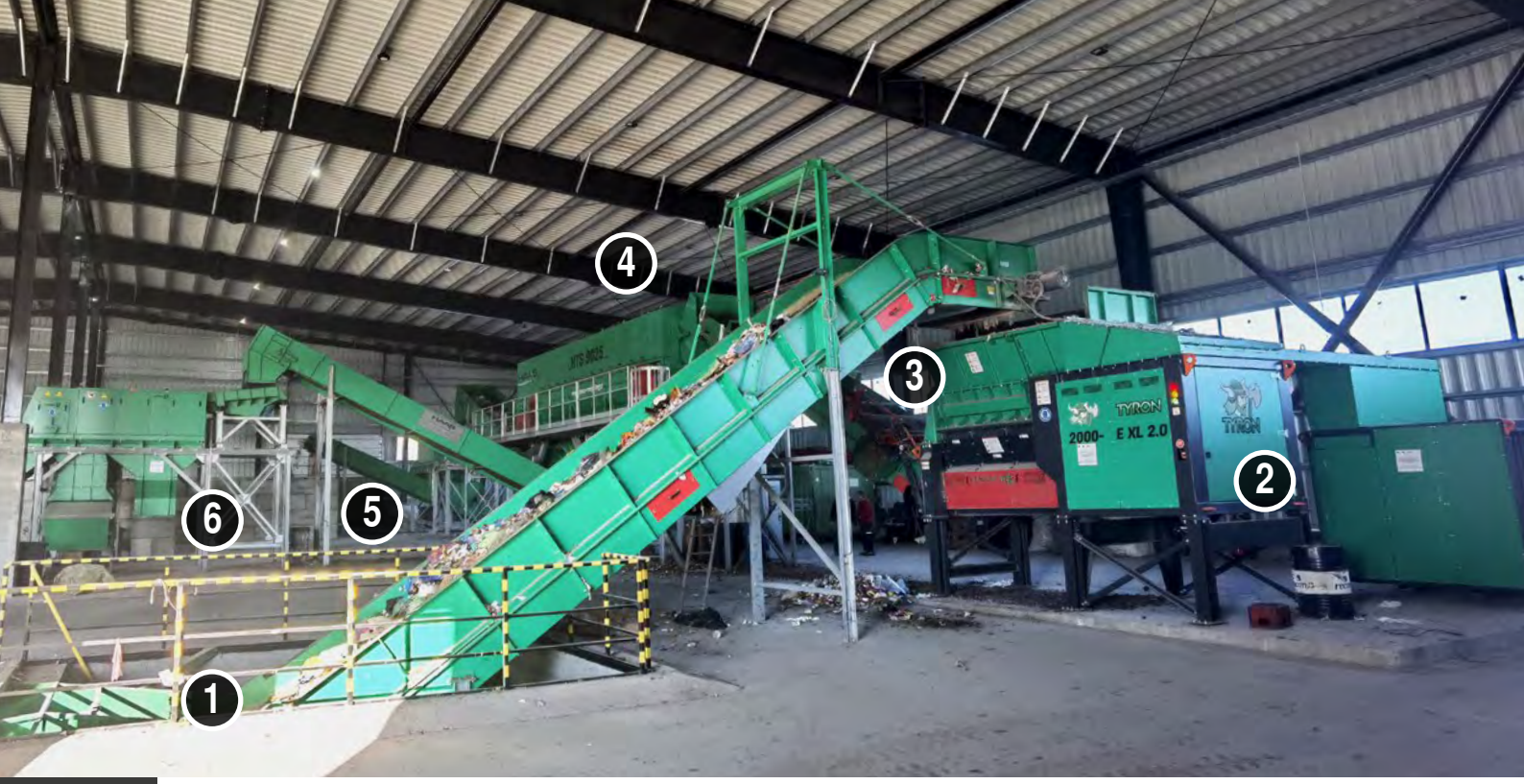
Input material
Municipal Solid Waste (MSW), household waste

End product
</> 80 mm refuse derived fuel for cement kilns and power plants

The solution

A mechanical HAAS waste treatment line, consisting of a HAAS TYRON pre-shredder, a stationary drum screen and ferrous as well as non-ferrous separators, results in a „high calorific value“ fraction that is used for energy recovery.





1 **Feed hopper embedded in the floor incl. a chain belt conveyor.**
Household and municipal waste is fed into the mechanical treatment process by wheel loader.

2 **TYRON 2000-E XL 2.0**
- The double shaft slow speed shredder
The input material is pre-shredded to a particle size approx. < 300 mm.

3 **Overband magnet (neodym)**
Separates the exposed ferrous material.

4 **Drum screen HTS 9025**
The pre-shredded material is separated into two fractions </> 80 mm.

5 **Eddy Current Separator 2000**
Non-ferrous metals are separated from the coarse fraction > 80 mm consisting of foils, paper, plastics, nappies, etc.

6 **Eddy Current Separator 1500**
Non-ferrous metals are also separated from the fine fraction < 80 mm, which is mainly organic.

This is where the process ends. The fine fraction mainly organic material is forwarded for further biological treatment. The coarse fraction, light stuff such as film, foils, plastics etc. is supplied to cement kilns and RDF power plants for energy recovery.

The modular design of the plant allows an expansion to include additional process steps such as windsifting and secondary shredding.







Waste & RDF

Processing of 20 t/h mixed industrial waste. The existing on-site extraction system needed to be integrated into the new plant.

Input material
Industrial waste

End product
< 250 mm as refuse derived fuel

The solution

The existing HAAS plant from 2006 was replaced after 14 years of operation.
A new treatment plant was installed taking into account the „Minimum Technical Requirements for Pretreatment Plants“. The existing on-site extraction system was integrated.

Highlights

- The fresh air supply for the engine compartment prevents the usual soiling of the radiator. The usually regularly required cleaning work on the radiator is no longer necessary.
- When planning and designing the sorting cabin, the new version of the Technical Instructions on Air Quality Control (TA Luft) was implemented. The cabin with ventilation system meets the latest technical standards.



„We decided to buy a HAAS system back in 2006. The system has been running reliably and with low maintenance costs for 14 years. It was obvious that, based on our experience, we would like to invest in a system concept from HAAS again. The solution for integrating our existing extraction system is perfect for us.“

David Wedemann,
WKE Entsorgungs- und Recycling GmbH

1 **TYRON 2000-E XL 2.0**
- The double shaft slow speed shredder
The input material is shredded to a particle size approx. < 250 mm.

2 **Overband magnet (neodym)**
Separates the ferrous material.

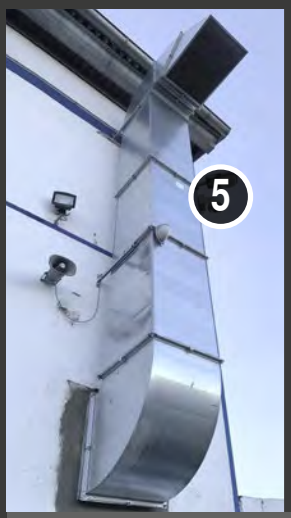
3 **ECOSTAR HEXACT 2000**
dynamic disc screen
Separates the material into 2 fractions:
- Fine fraction: < 30 mm
- Coarse fraction: 30 - 250 mm

4 **Sorting cabin**
Allows space for two workers to sort re-usable materials from the shredded waste.

5 **Fresh air supply**
A ventilation duct supplies the primary shredder's radiator with fresh air that is drawn in from outside the processing building.

6 **Exhaust air duct**
The additional exhaust duct allows the excess air to flow out of the engine compartment again.

Fresh air supply for TYRON engine compartment





Exhaust air duct





Waste & RDF

Processing of 50 t/h MSW from landfill deconstruction

Input material
(MSW) Municipal Solid Waste

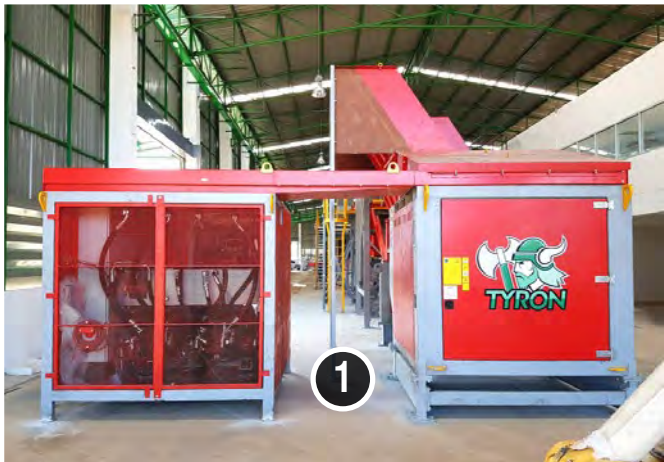
End product
< 300 mm

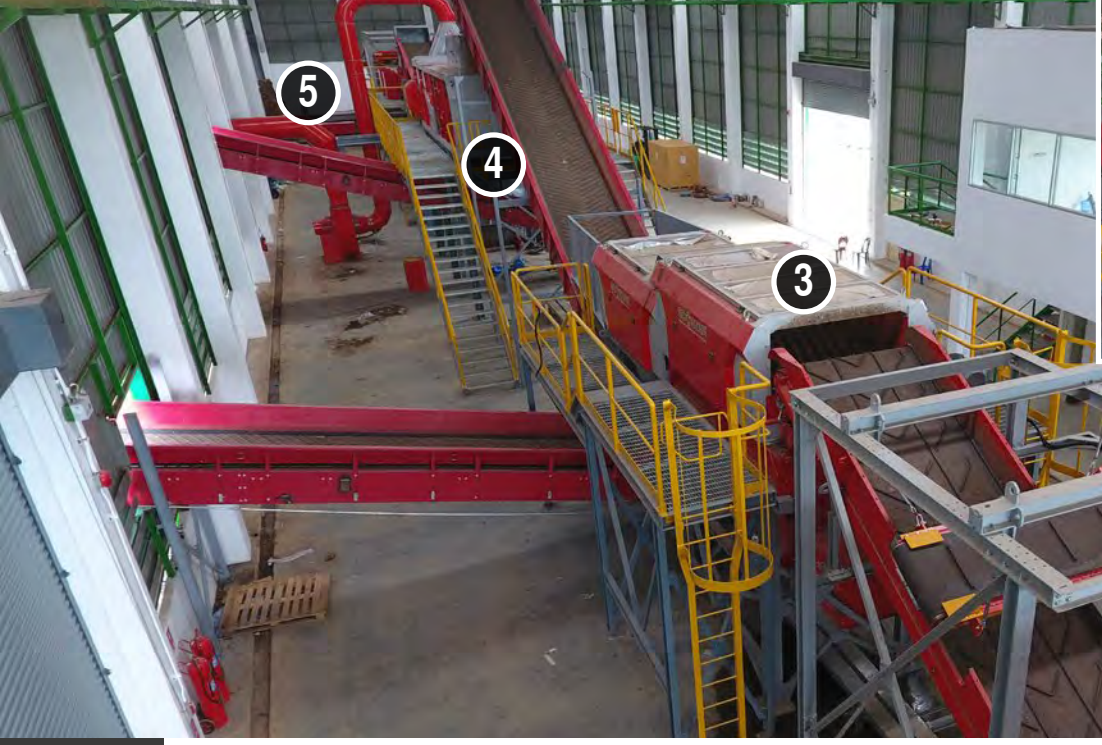
The solution

A customised HAAS household waste processing system. Up to 50 t/h of untreated household waste is processed into high-quality fuel.

Highlights

- The separate powerpack of the TYRON pre-shredder allows easy access for maintenance. The powerpack is protected from dust and dirt.
- Dynamic disc screen - with patented self-cleaning system.







1 **TYRON 2000-E 2.0**
- The double shaft slow speed shredder
The pre-shredder with separate powerpack shreds the mixed waste to a length of approx. < 300 mm.

2 **Overband magnet (neodym)**
Separates the exposed ferrous material.

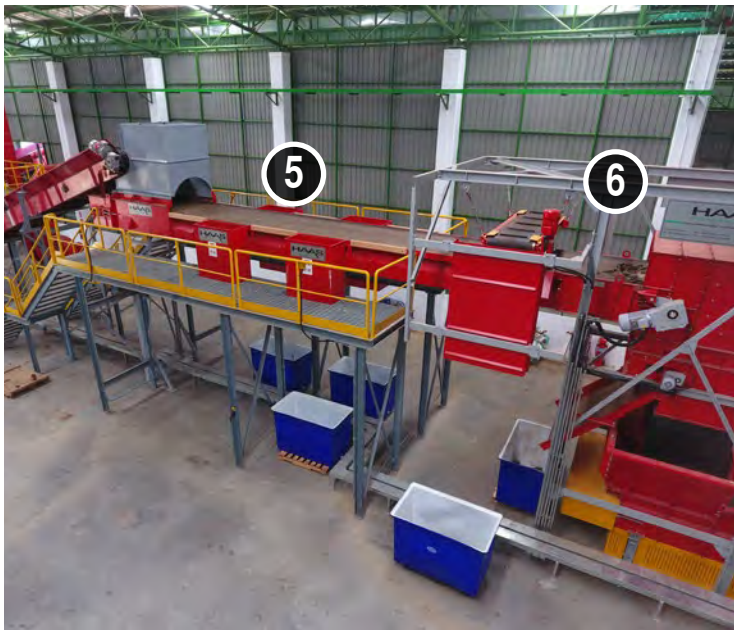
3 **ECOSTAR dynamic disc screen**
The pre-shredded material is separated into two fractions </> 80 mm.

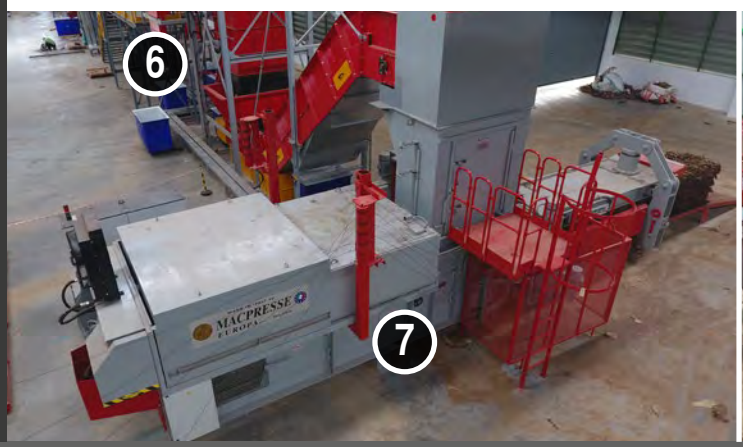
4 **Windsifter**
Separates the heavy fraction e.g. stones, glass etc. from the light fraction.

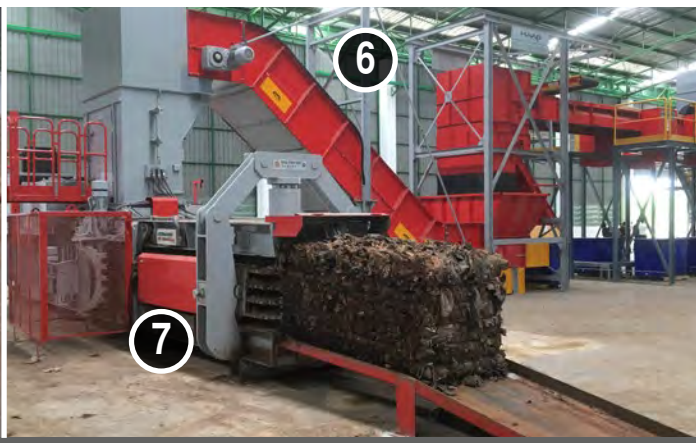
5 **Handsorting platform**
Four workstations for manual sorting of re-usable stuff.

6 **Overband magnet & additional magnetic drum**
To separate the remaining ferrous parts.

7 **Baler**
Compresses the remaing high caloric product into comfortable bales.









Waste & RDF

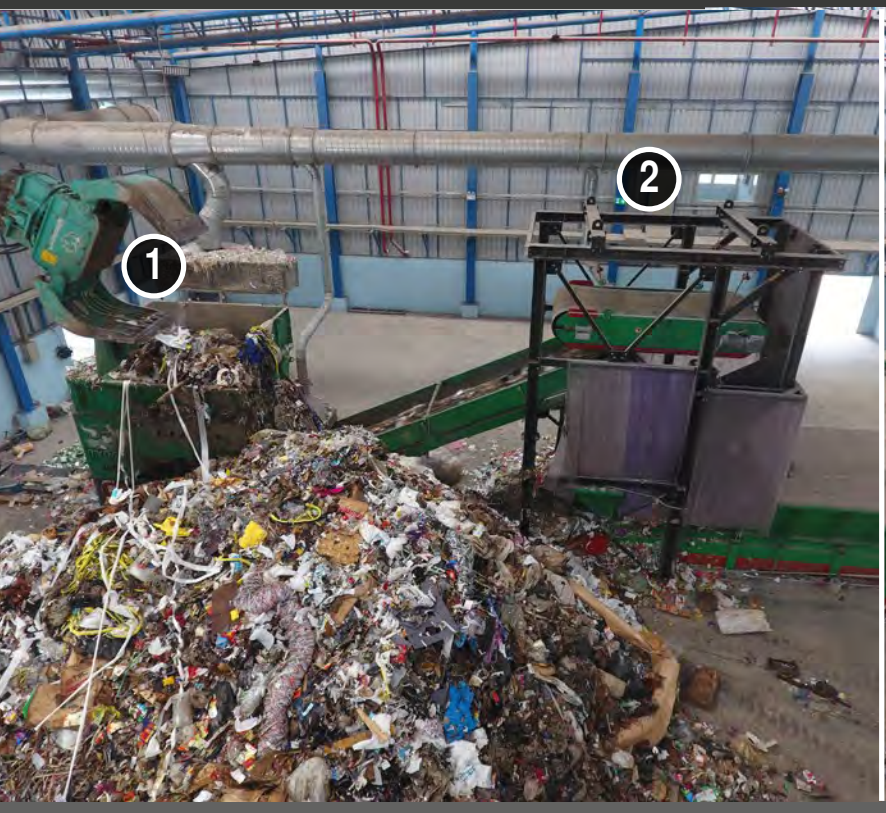
Processing of 25 t/h
Industrial waste

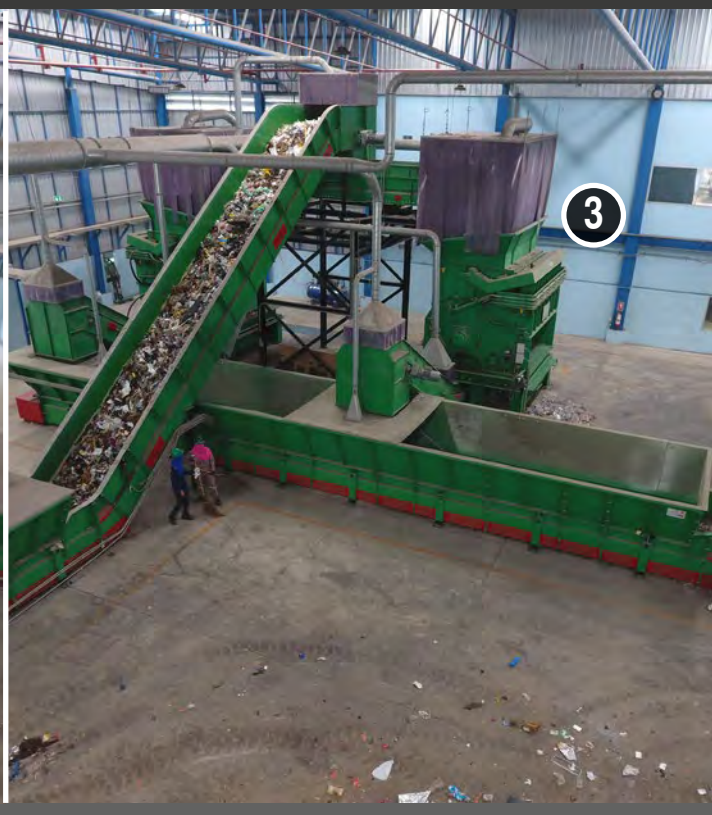
Input material
Industrial waste

End product
< 50 mm

The solution

The easy and compact HAAS waste treatment line includes among others a HAAS TYRON pre-shredder, magnet separators and two fine shredders.
The fine shredded RDF is packed by baler incl. bale wrapper are into „high calorific value“ RDF bales that is used in cement kilns.







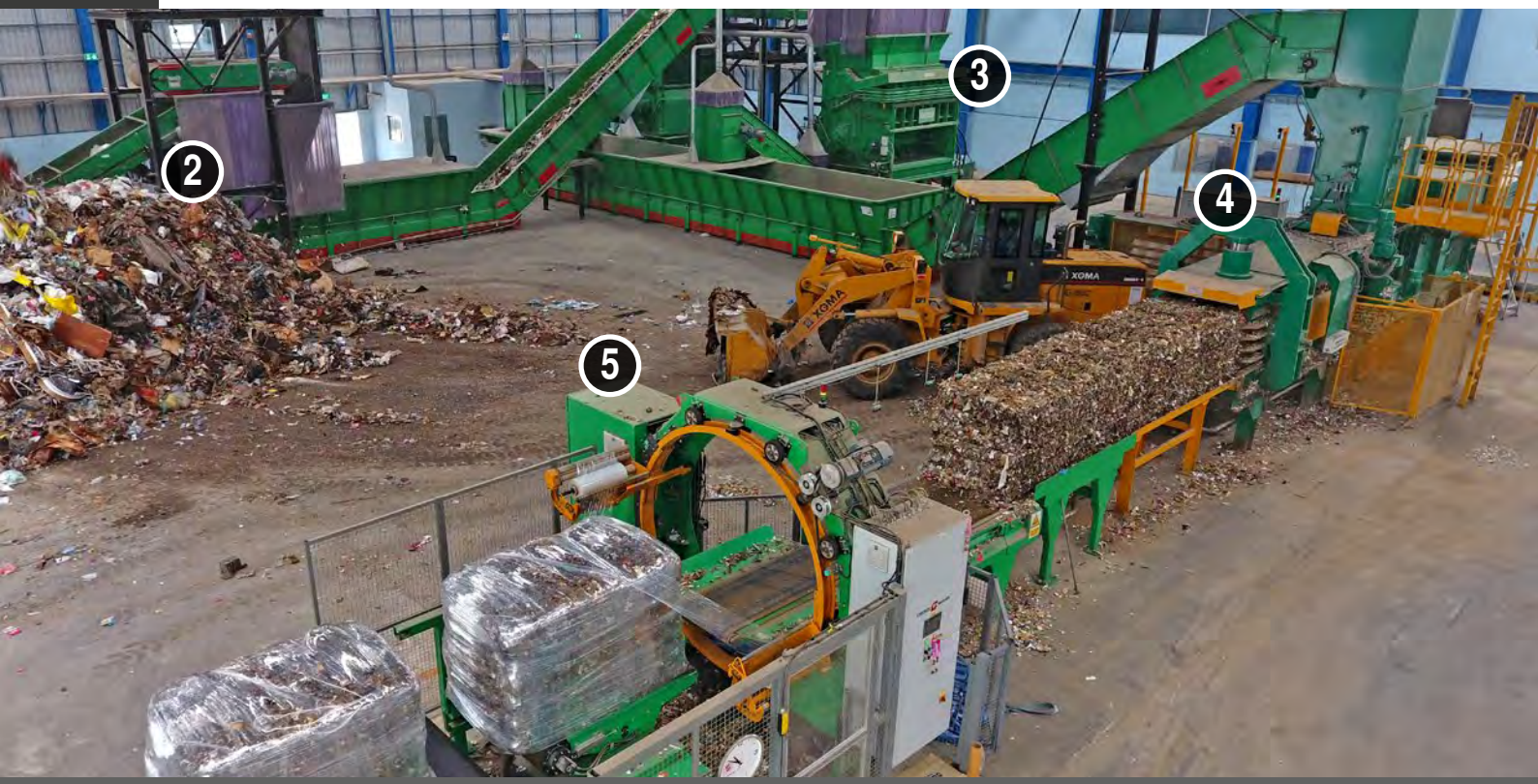
1 **TYRON 2000-E XL**
- The double shaft slow speed shredder
The shredder is fitted with a separate powerpack. The mixed waste is pre-shredded to a size of approx. < 300 mm.

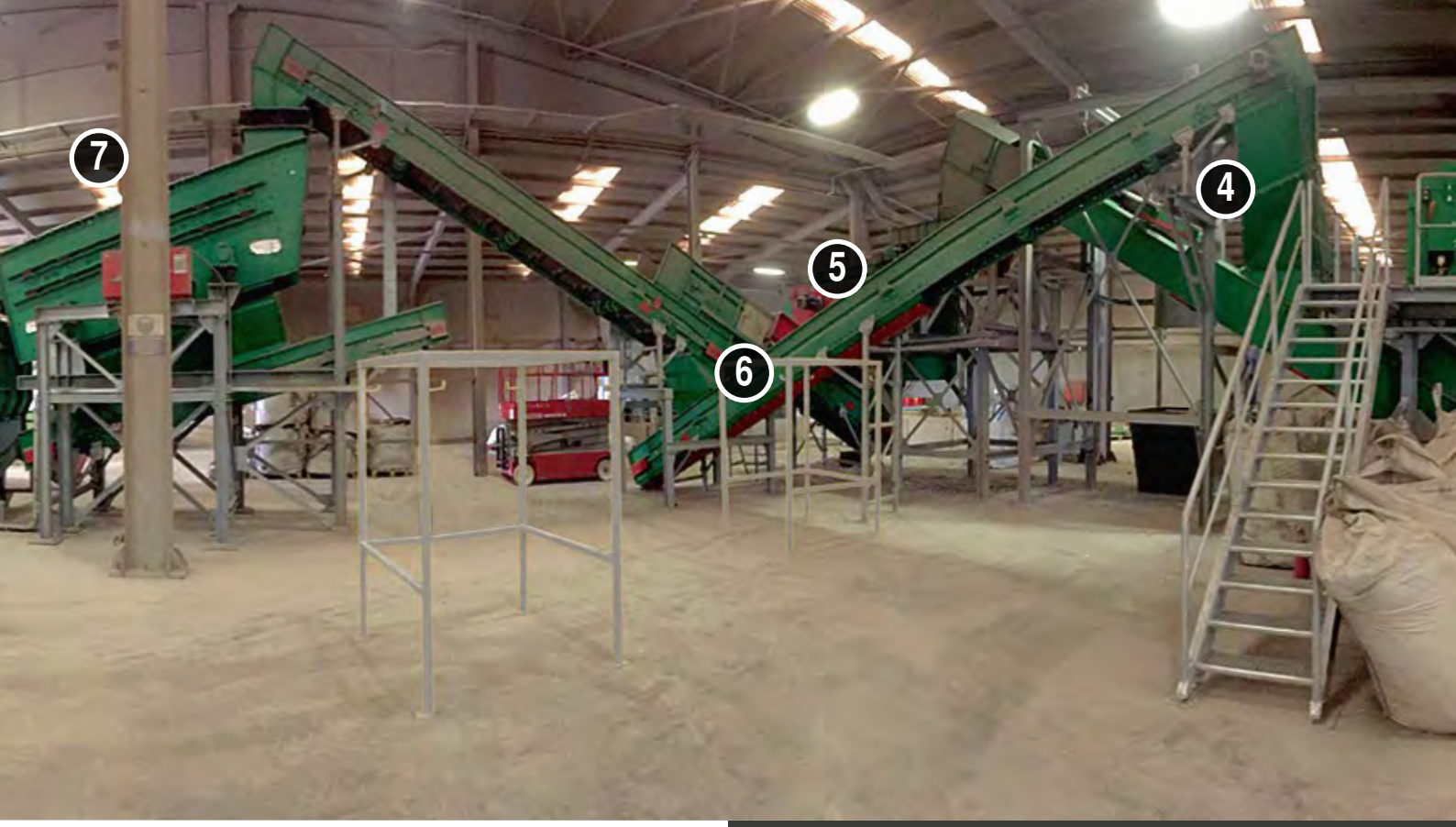
2 **Electro overband magnet**
Separates the ferrous metals to protect the following fine shredders.

3 **2 Fine shredders**
Secondary shredding of the pre-shredded material to particles smaller than 50 mm.

4 **Baler**
Compresses the end product into comfortable and easy to transport bales.

5 **Wrapping machine**
Wraps and packs the bales.





3 PVC & Plastics

PVC

Processing of 10 t/h window profiles

Input material
Window profiles incl. fittings

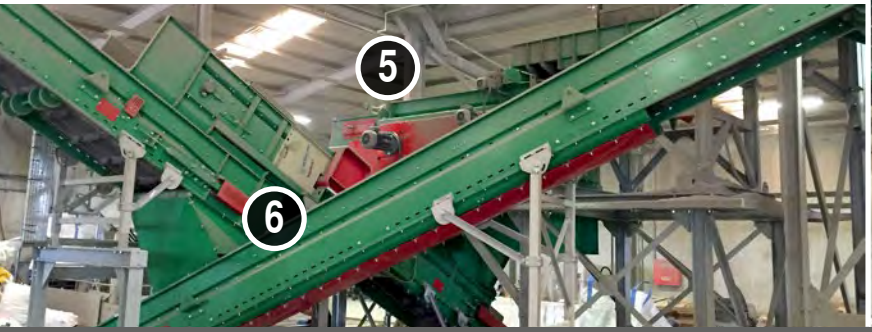
End product
approx. 8 mm

The solution

A mechanical HAAS sorting and processing plant in a compact design, including among others a TYRON pre-shredder and a ARTHOS secondary shredder. Downstream the ferrous and non-ferrous separator the granulators finally are producing a clean PVC granulate from the original end of life PVC frames. This is optimally prepared for the next processing steps into secondary raw material for the PVC industry.

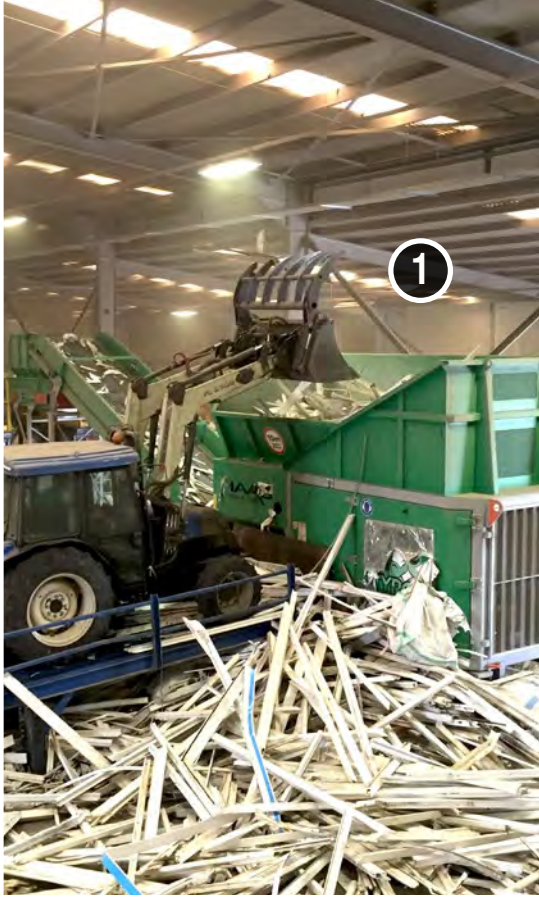
Highlights

- End of life PVC window and door frames, including fittings, are separated from ferrous and non-ferrous metals and shredded to granule size. Thanks to the built quality and wear resistant design wear is reduced to a minimum.









1 **TYRON 1500-E**
- The double shaft slow speed shredder
The PVC window and door frames are shredded to an edge length of approx. < 300 mm.

2 **Sorting platform**
Provides space for two sorting workplaces. Impurities, such as film and cardboard, are manually separated.

3 **ARTHOS 1300-E hammermill**
In the second step the pre-shredded window frames are shredded to a size < 60 mm.

4 **Overband magnet**
Separates the exposed ferrous metals.

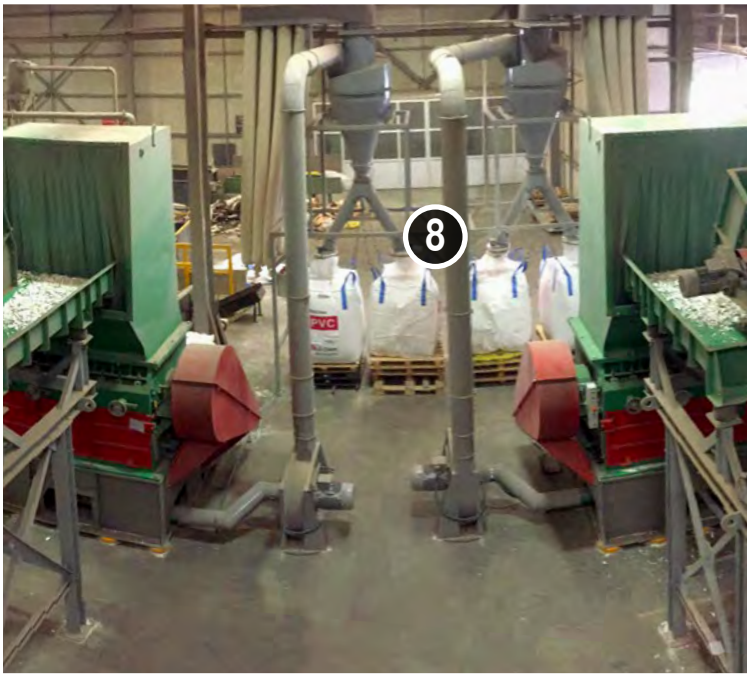
5 **Eddy Current Separator 1500**
Separates the exposed non-ferrous metals.

6 **Metal detector**
Metal detection to protect the granulators, incl. automatic material return to the magnet and non-ferrous separator.

7 **Screening machine**
Separates the fines, mainly dust and dirt 0 - 5 mm.

8 **2 Granulators**
Ultra-fine shredding to approx. 0 - 8 mm.

9 **Big bag filling**
Extraction of the produced granulate and filling of big bags.

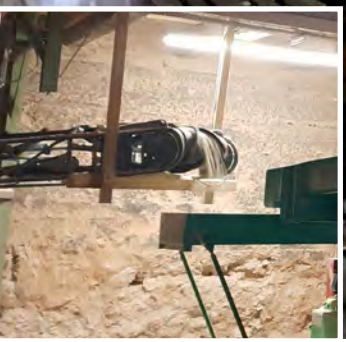


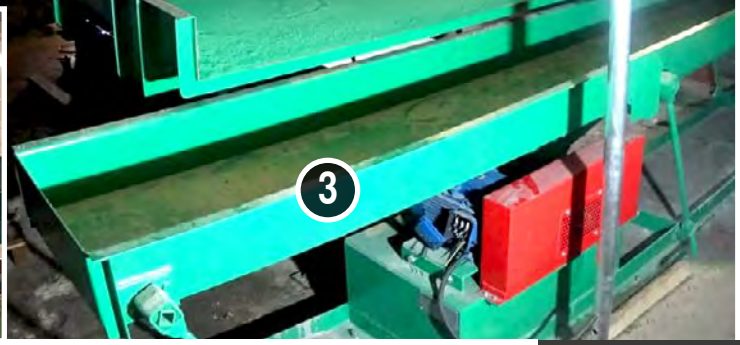


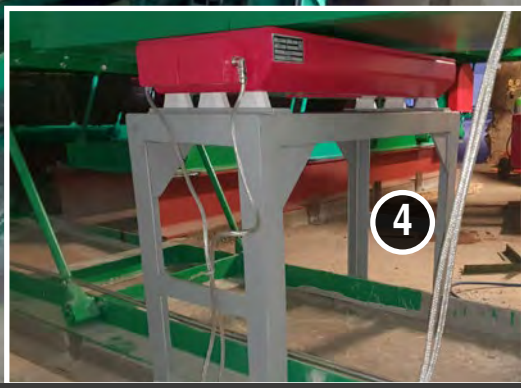












Sawmill & Residual wood

Processing of 10.000 solid cubic metres of splinters and slabs per year

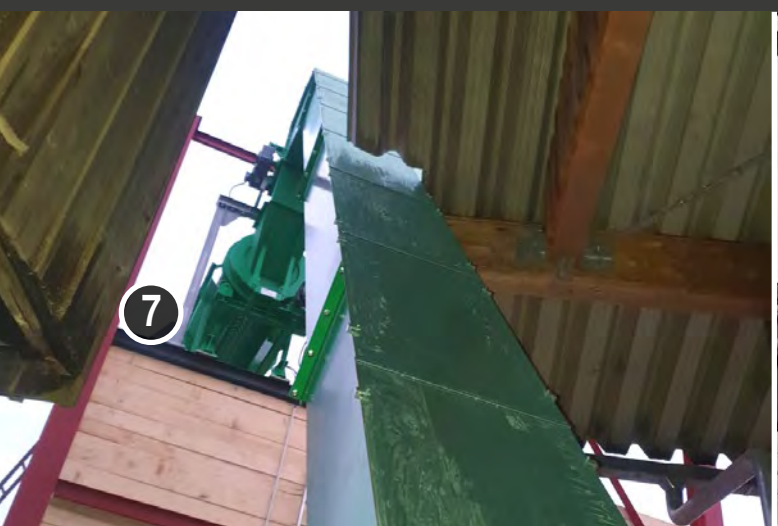
Input material
Splinters and slabs

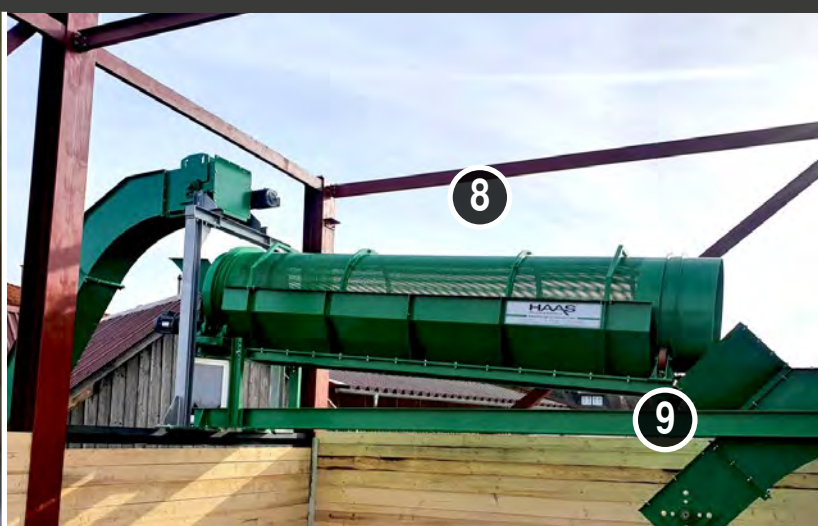
End product
Sawdust and wood chips approx. 30 mm

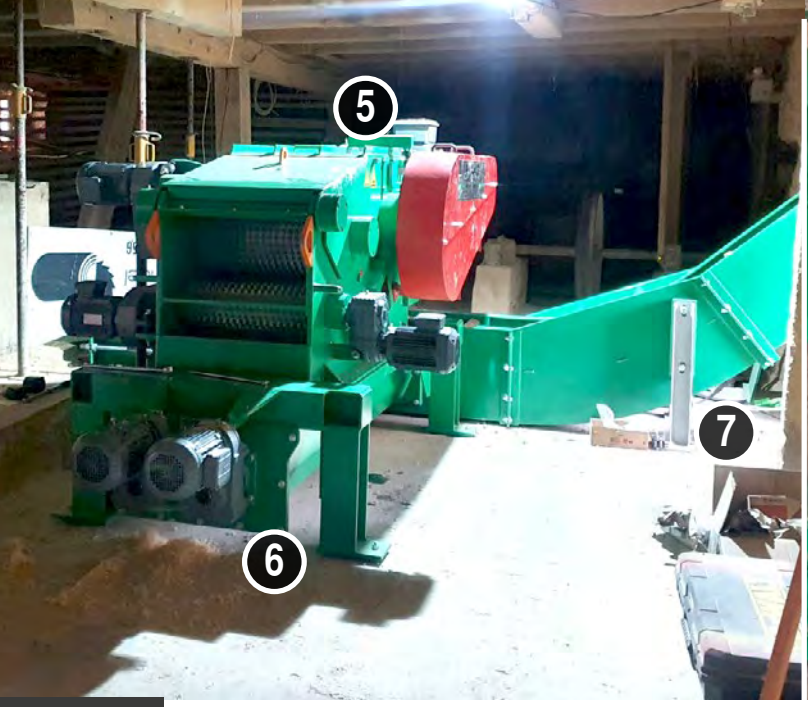
The solution

An individually designed solution was installed in a very tight space, taking into account service comfort and maximum accessibility.

Sägewerk Hensler









1 Conveyor belt
Splinters and slabs come from the edger via the vibrating table in the outer area onto the conveyor belt. The belt transports the material to the following vibrating table in the inner area.

2 Vibrating table
Dosed transfer to the following vibrating conveyor.

3 Vibrating conveyor incl. screening area
Separates the residual wood into two fractions </> 15 mm:
Particles already < 15 mm pass by the drum chipper and are mixed back into the material flow downstream the chipper. The bigger wood waste > 15 mm is conveyed to the chipper.

4 Metal detector
Detects ferrous impurities and stops the infeed to the chipper to protect the knives and the rotor from damages.

5 Drum chipper HTH 200 x 600 L3WV
Produces approx. 30 mm wood chips.

6 Double screw conveyor
Conveys the wood chips from the drum chipper to the chain conveyor.

7 Chain conveyor
Collects the < 15 mm material from the above mentioned vibrating conveyor and the wood chips from the chipper to feed the drum screen.

8 Drum screen
With 9 mm screen perforation. Separates the material in two fractions </> 9 mm. The particles < 9 mm, mainly sawdust, are falling in a storage bay underneath the drum screen.

9 Chain conveyor
Distributes the wood chips > 9 mm to individual storage bays.





Sawmill & Residual wood

Processing of approx. 80 m³/h

Input material
Splinters and slabs

End product
Sawdust and wood chips approx. 30 mm

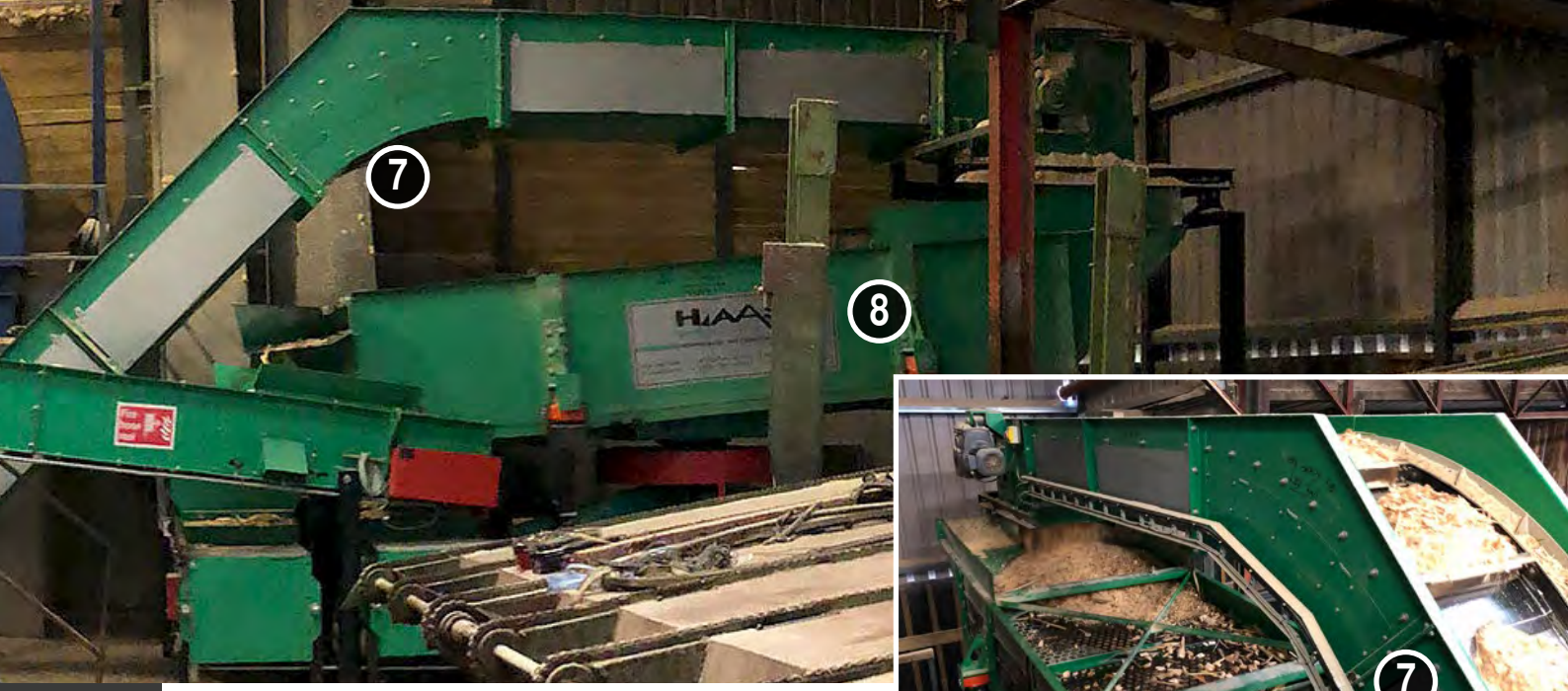
The solution

A customised HAAS waste wood disposal system including drum chipper, screening machine and a box filling system. The HAAS planning concept especially construction and installation combines individual customer requirements with a customised system.

WOODFAB TIMBER Ltd







1 **Upper trough chain conveyor**
Sawdust & wood chips disposal under the sawing line.

2 **Vibrating conveyor**
Transports the material from the edge breaker to the drum chipper.

3 **Vibrating table**
Picks up the slabs and transports them to the drum chipper.

4 **Metal detector**
Detects ferrous impurities and stops the feed unit if necessary, thus protecting the drum chipper from damage and wear.

5 **Drum chipper**
Produces wood chips with a length of < 30 mm.

6 **Double screw conveyor**
Controlled transfer of chips under the drum chipper to the downstream chain conveyor.

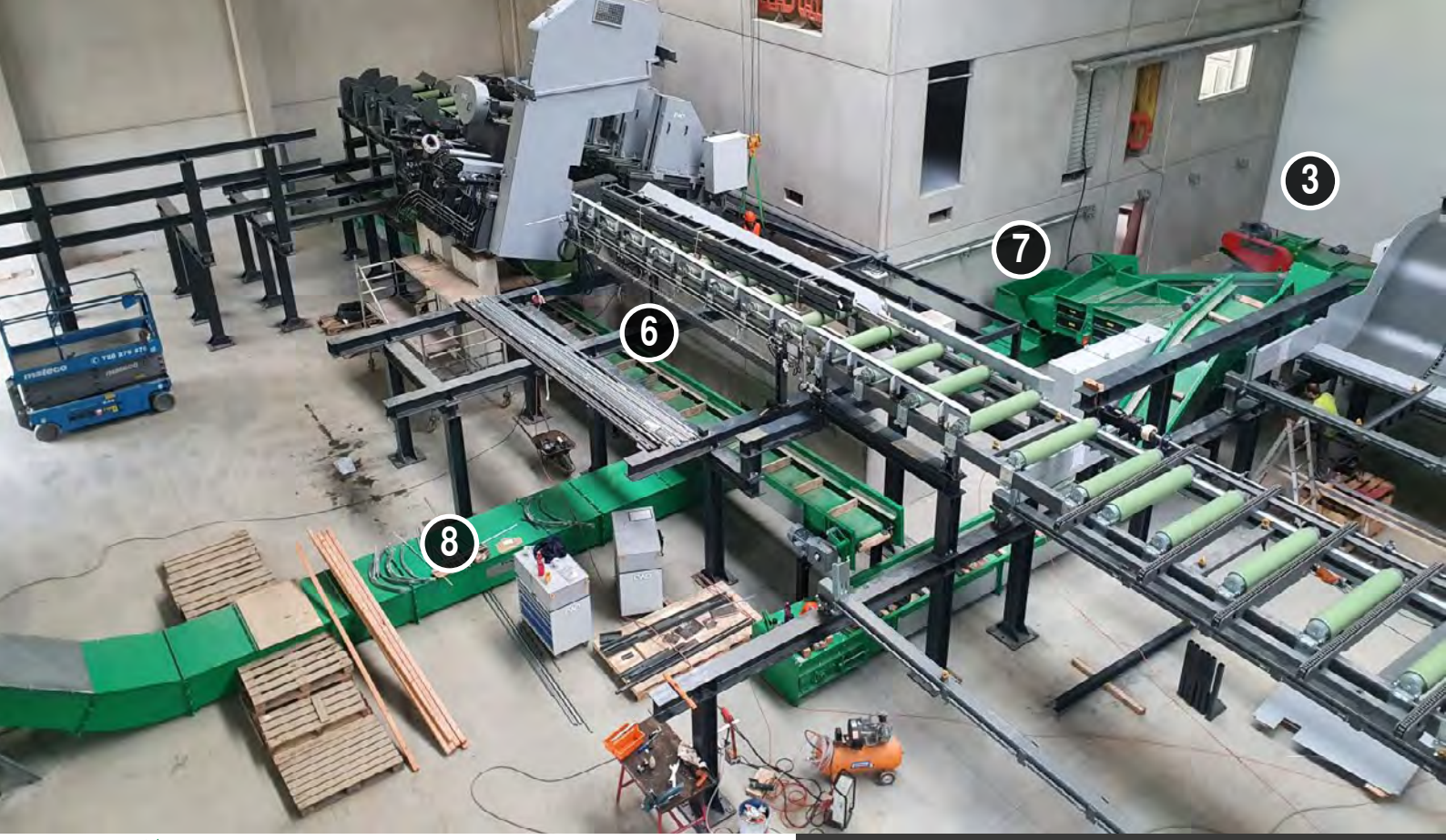
7 **Chain conveyor**
Conveys the material flow to the flat screen.

8 **Flat screen HPS 85**
Separates the wood chips / sawdust mix into three fractions:
- Sawdust
- Wood chips
- Oversize
  (is fed back into the drum chipper)

9 **Chain conveyor for box filling**
Distributes the individual fractions (sawdust and wood chips) into the material boxes. The oversize material is fed back into the drum chipper.







Sawmill & Residual wood

Preparation of splinters and slabs. The total annual sawing capacity is 30.000 solid cubic metres

Input material
Round coniferous wood (splinters & slabs)

End product
Sawdust and wood chips approx. 30 mm

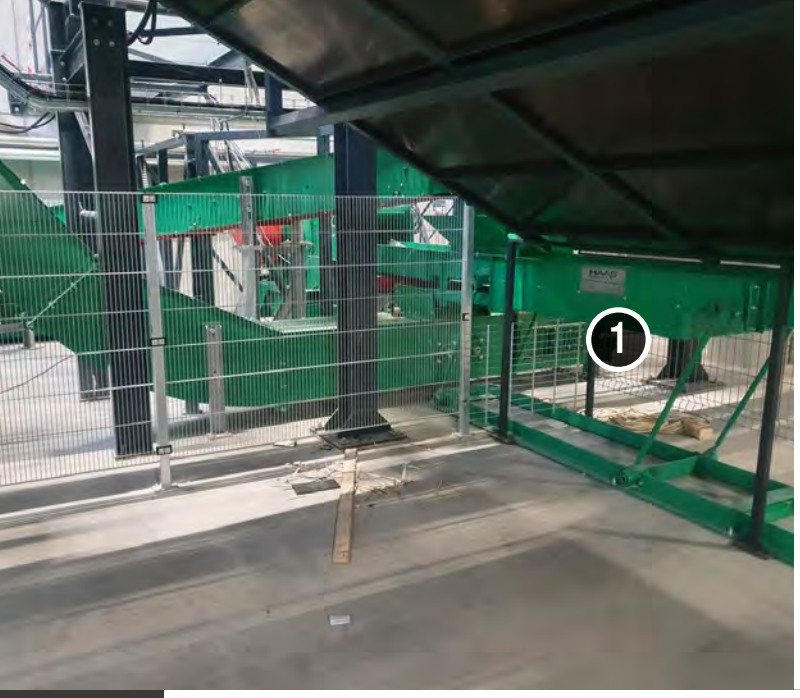
The solution

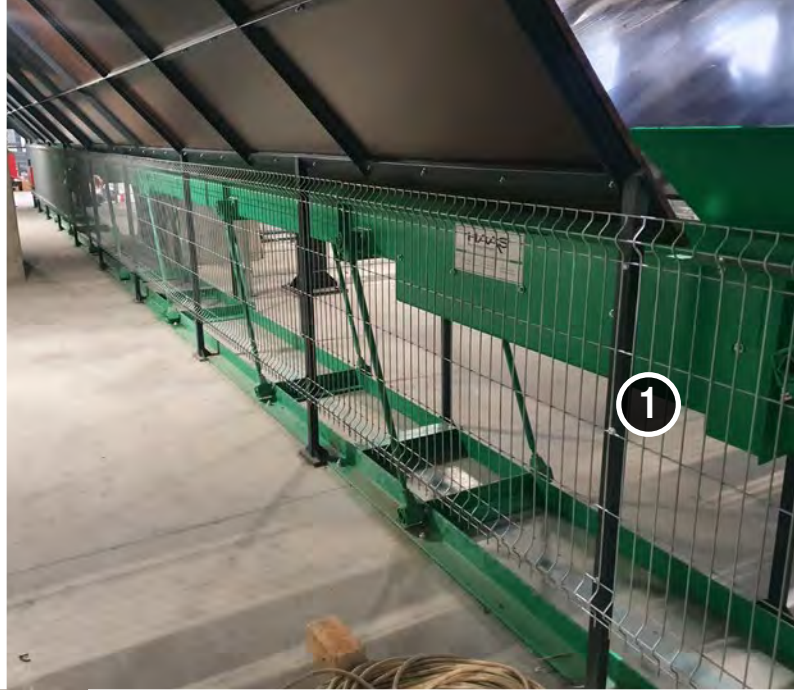
A turnkey HAAS residual waste disposal system complete with drum chipper, screening machine and box filling system. A customised installation.

Arcibiskupské lesy a statky Olomouc s.r.o.









1 **Vibrating conveyor**
Transports the material from the slab flap and the hemmer, as well as the splinter separator to the drum chipper.

2 **Metal detector**
Detects ferrous impurities, stops the feed unit if necessary, and thus protects the drum chipper from damage and wear.



3 **Drum chipper HTH 200 x 500 L2WV**
Produces wood chips with a length of < 30 mm.

4 **Double screw conveyor**
Metered transfer of the chips from under the drum chipper to the downstream chain conveyor.

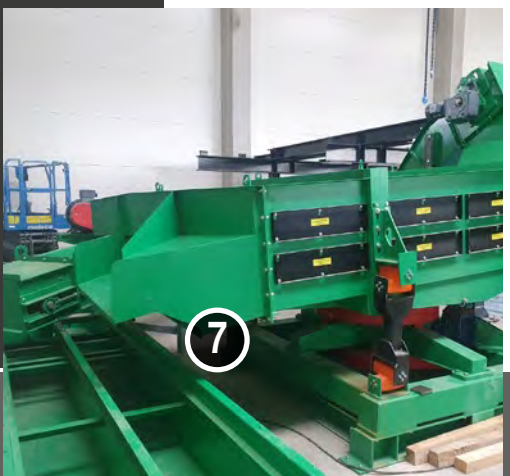
5 **Chain conveyor**
Conveys the material flow to the flat screen.

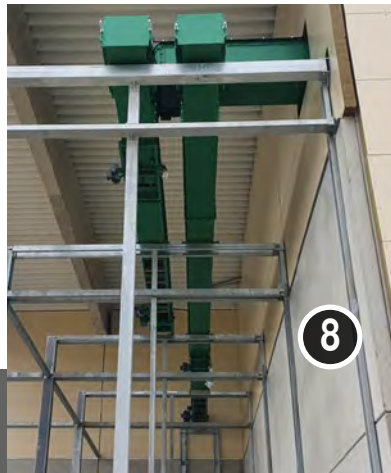
6 **2 Upper trough chain conveyor**
Convey the material from the log band saw and flaker to the flat screen.

7 **Flat screen HPS 45**
Separates the cleaned residual wood into three fractions:

- Sawdust
- Wood chips
- Coarse fraction (is fed back into the drum chipper via a conveyor belt)

8 **4 Chain conveyors for box filling**
Distribute the individual fractions (sawdust and wood chips) into the material boxes and into the outdoor storage area.





Special mobile solutions



TYRON & ARTHOS The mobile hammermill shreds pre-shredded waste wood, green waste, RDF - Refuse Derived Fuel and PVC waste thoroughly and quickly.



TYRON & ALVA The mobile ALVA starscreen is the perfect screening system for, among others, green waste and waste wood. A defined particle size is separated and the oversize is returned to the pre-shredder.



TYRON & HEXTRA Ecostar's patented „dynamic" screen guarantees maximum performance even with materials that are difficult to separate. With this screening machine you can produce either two or alternatively three fractions.

Experience HAAS live

- **Visit HAAS production facilities**
- **Tours to existing plants**
- **Inhouse workshops**
- **Machine demonstration at your site**
- **Fairs national and international**

Look & Feel – in detail

Experience our products at close range. On-site you have the opportunity to see everything in detail and we can explain everything to you.





Online meetings & webinars

Face to face meetings are not always possible. For this reason, we are also available to you for video meetings and webinars. Please feel free to make an appointment with us!



Live demonstration at your site

HAAS on tour - with our „HAAS Roadshow“ we are on a demonstration tour through Germany. Your preferred machine, your input material, your location.



Service guarantee

Customised systems also need a service that is tailored. With us, you don‘t have to choose between predefined service packages. We tailor your individual service package that is optimally adjusted to your requirements - tailor-made and fairly priced!

Communication

Service begins even before the first installation and before any difficulties arise. Customer service is a constant element throughout the entire customer communication process. We always have an open ear for you and your concerns. Contact us by phone, online meeting or e-mail - we are happy to be there for you!

+49 2661 9865-0
info@haas-recycling.de

www.haas-recycling.de/en

HAAS Holzzerkleinerungs-
und Fördertechnik GmbH
Unter den Weiden 6
56472 Dreisbach / Germany

Installation and start-up

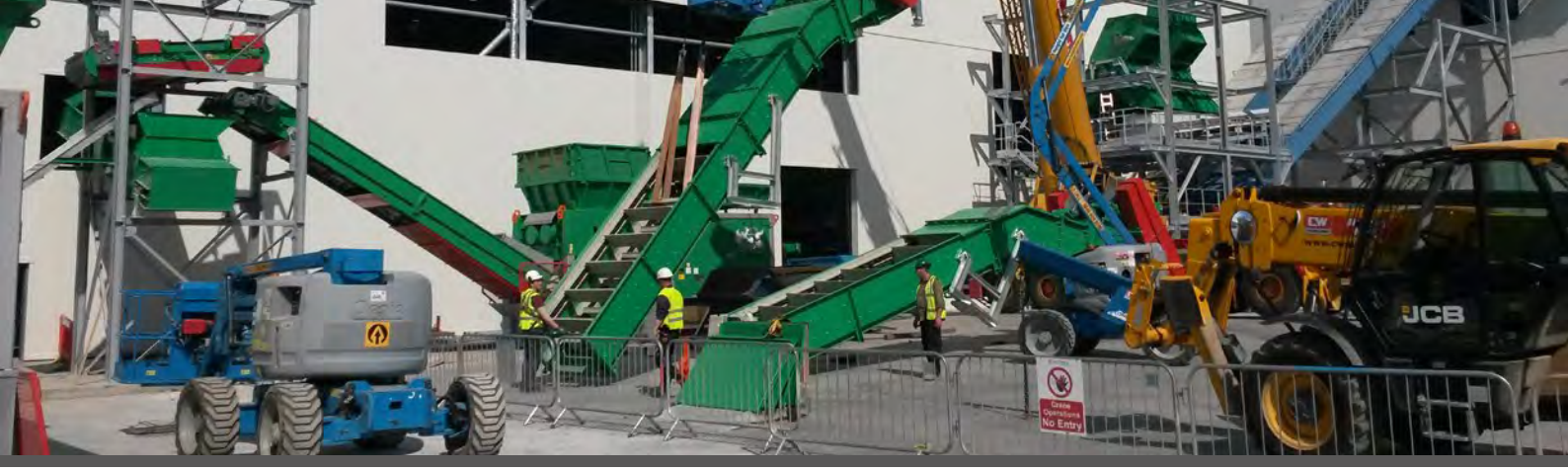
We provide certified training for the best possible start-up and long-term operation of your HAAS equipment.

Operator training for your staff

Our customised training content is tailored to your staff and the requirements of your day-to-day business. This ensures higher efficiency of your system, as well as reduced downtime and the possibility of quick self-help.







Maintenance

Regular maintenance (HAAS machines and plants convince with user-friendly service intervals) ensure the long-term reliability and high availability of your recycling system: In other words **you benefit from greater productivity of your system.**

After-sales service & support

You receive **immediate help** from our technical team. In the event of an unexpected breakdown of your system, we are prepared to react directly.

Original HAAS spare and wear parts

Only with the original you are on the safe side. **HAAS spare parts are high-quality parts from state-of-the-art production.**

Hardfaced - a standard feature ex works

HAAS shredding tools are armoured ex works as standard. This preventive measure helps you to save costs and working time compared to tools that need subsequent hardfacing.

Refurbishment

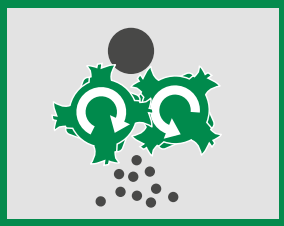
Wear parts of shredding machines are subject to extreme forces. For long-term, consistently good shredding results, we recondition your HAAS shredding unit if required. This optimises your productivity and reduces at the same time your wear and tear costs.

HAAS Tracking Portal

The HAAS tracking platform allows both, you and us, to check the operating status of your HAAS machines and plants. In the event of an unexpected failiure, we can help you by remote diagnosis in a cost-effective, fast and uncomplicated way! Also, no inspection or maintenance will be forgotten.

Service hotline

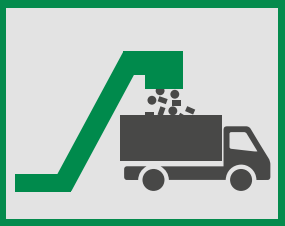
Technical problems? You urgently need spare parts? Our service staff are at your disposal and coordinate the service trips of our service technicians. We can ship spare parts within 24 hours on request due to excellent availability! +49 2661 9865-0



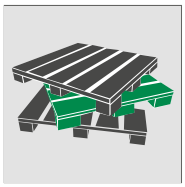
Shredding

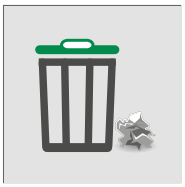


Screening & Separating Technology

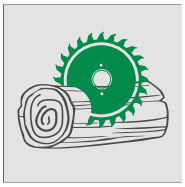


Loading & Unloading Systems









HAAS Recycling-Systems

HAAS Holzzerkleinerungs-
und Fördertechnik GmbH
Unter den Weiden 6
56472 Dreisbach / Germany

Tel.: +49 2661 9865-0
E-mail: info@haas-recycling.de

Overview

Waste Wood & Biomass

	t/h	A I	A II	A III	A IV	Endprodukt	Seite
AVG Ressourcen GmbH	30 t/h	▪	▪	▪		< 80 mm	8
AVG Baustoffe Goch GmbH	60 t/h	▪	▪	▪	▪	5 - 100 mm	10
MILLFARM Recycling	35 t/h	▪				0 -5 mm, 5 - 20 mm, 20 - 50 mm	12
renewi	70 - 80 t/h	▪	▪	▪	▪	< 5 mm, 5 - 100 mm	14
ECOWASTE Industries Ltd	30 t/h	▪	▪	▪	▪	< 80 mm	16
BWE Balthasar GmbH	20 t/h	▪	▪	▪		< 120 mm	18
CUP Recycling GmbH	30 t/h	▪	▪	▪	▪	0 - 100 mm & 0 - 300 mm	20
Altholzrecycling	30 t/h	▪	▪	▪		ca. < 70 mm	22
Mc Kinstry Skip Hire LTD	15 t/h	▪				0 - 3 mm & 3 - 9 mm	24
Stobart Energy	2x 60 t/h	▪	▪	▪	▪	0 - 5 mm, 0 - 100 mm, > 100 mm	26
SORTERA Recycling AB	40 - 45 t/h	▪	▪	▪		0 - 120 mm	28
Revisol Oy	25 t/h	▪	▪	▪		< 80 mm	30

Waste & RDF

	t/h	Haushaltsabfälle	Gewerbeabfälle	Endprodukt	Seite
SORTERA Recycling AB	40 - 45 t/h			0 - 300 mm	28
Revisol Oy	25 t/h		▪	< 80 mm	30
Girexim Universal SA	55 t/h	▪		</> 80 mm	32
WKE GmbH	20 t/h		▪	< 250 mm	34
SIAM Power	50 t/h	▪		< 300 mm	36
BWG PCL	25 t/h		▪	< 50 mm	38

PVC & Plastics

	t/h	Fensterrahmen	Endprodukt	Seite
Kunststoffrecycling	10 t/h	▪	ca. 8 mm	40

Sawmill & Residual Wood

	t/h	Splinters and slabs	End product	Page
Sägewerk Hensler GmbH & Co. KG	10.000 fm/year	▪	ca. 30 mm	42
Woodfab Timber Ltd.	ca. 80 m^3/h	▪	ca. 30 mm	44
ALSOL s.r.o.	30.000 fm/year	▪	ca. 30 mm	46

Special Applications

	t/h	Aluprofile	Alubündel	Endprodukt	Seite
E-MAX BILLETS	12 t/h	▪	▪	300 - 400 mm	31