GLJ Recycling Ltd
Permit application supporting documents

4 - Technical Summary

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Issue and Revision Record

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Contents

1 Technical summary of metal shredding process

1.1 Overview of Existing installation

The installation consists of a metal shredding process currently carried out using a mobile Bonfigioli Drake 16 1000hp shredder.

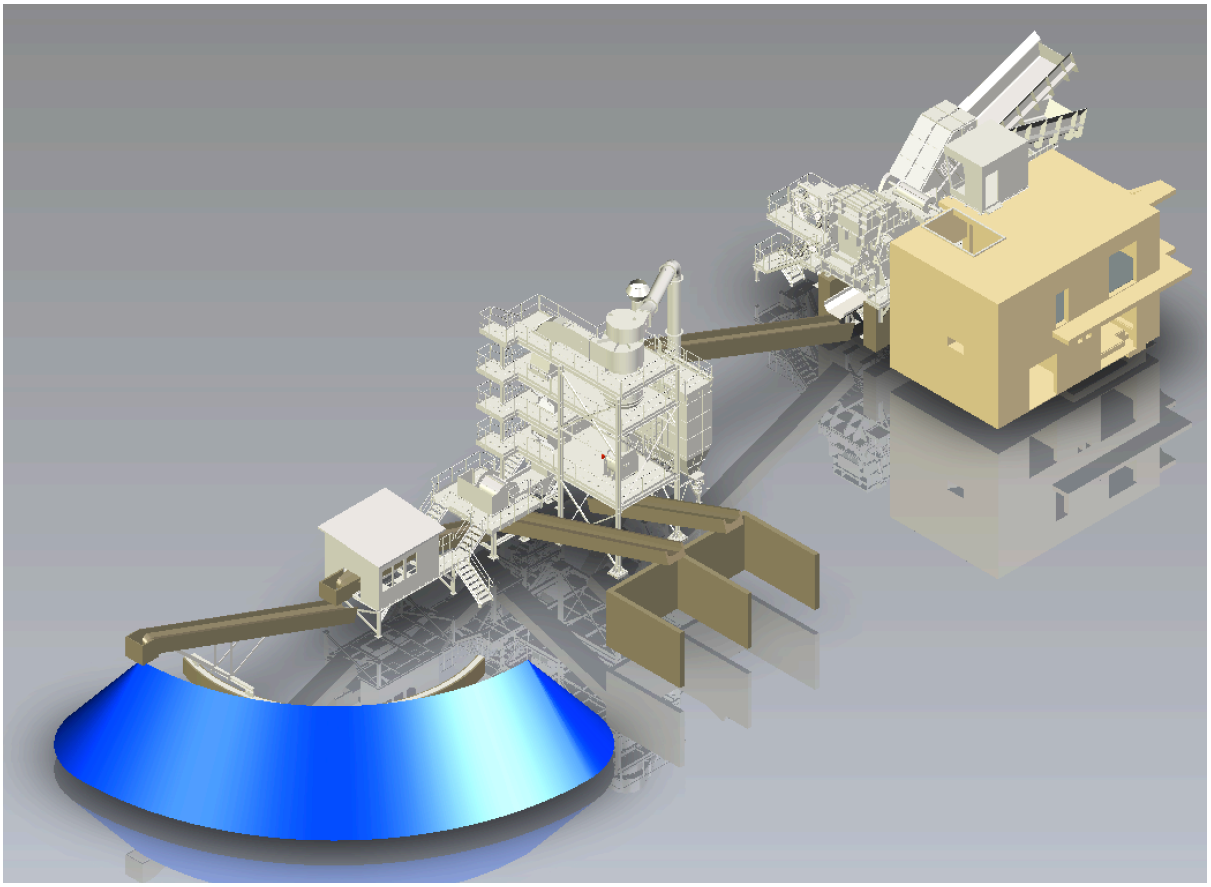
Figure 1: Bonfigioli Drake 16 shredder

Associated waste operations are also carried out to maximise the recovery of waste within the facility.
The waste recovery processes carried out are illustrated in the process flow displayed within this document. Figure 5, Page 8

1.2 Overview of Planned installation

The planned installation consists of a metal shredding process carried out by a Danielli DCR 1822 1400HP Shredder and downstream processing plant.

Figure 2: Danielli DCR 1822 1400HP Shredder and downstream processing plant.



The new plant incorporates the most up to date shredding and processing technology.

- Been able to use less power than conventional shredding plant.
- Better recovery of products that normally end up as waste.
- Noise reduction technology
- Closed loop air cleaning system.
- Electrically driven.
- Anti-Vibrations Shredder Mounts

The above ensures a more efficient, environment friendly full metal recovery process.

Associated waste operations are also carried out to maximise the recovery of waste within the facility.
The waste recovery processes carried out are illustrated in the process flow displayed within this document. Figure 9, Page 13.

1.3 Waste reception

Upon arrival at the site entrance all waste is weighed using a weighbridge adjacent to the site office. This weighbridge is routinely calibrated for trade use in accordance with national Weights and Measures legislation.
The weighbridge staff are responsible for inspecting the incoming waste to ensure it conforms with the site's permit and dealing with payments to customers. An appropriate waste transfer document is issued alongside the weighbridge ticket at this point. Individual items of non-ferrous metal (for example copper tanks) are placed directly into the non-ferrous storage building (see Figure 3).

Figure 3: Non-ferrous storage building / ELV depollution

All other metal scrap is deposited into the metal reception area, which is a concrete-surfaced yard with sealed drainage.
This material is then fed into the infeed line of the metal shredder at the required rate using a mechanical grab (pictured in Figure).
Only fully depolluted ELVs are brought into the metal reception area. Undepolluted End-of-Life Vehicles (ELV's) processing takes place in a designated ELV shed (pictured in Figure 2) and all Undepolluted ELVs would be stored within this segregated area prior to processing.

Figure 4: Mechanical grab working in metal reception area

1.4 EXISTING Metal shredding

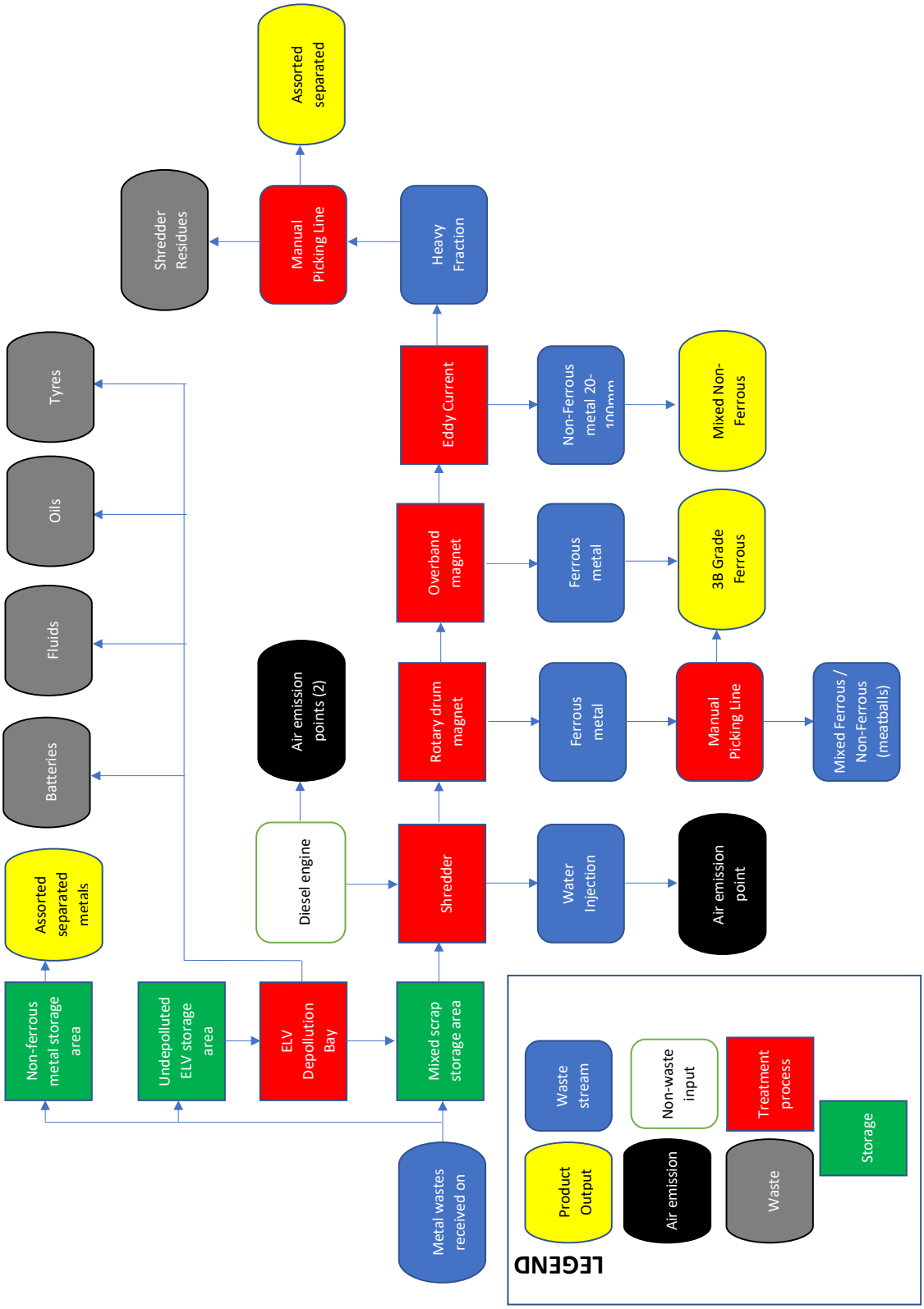
The Bonfigioli shredder is powered by Diesel engine.
Scrap metal material is placed into the shredder via mechanical grab. Air containing metallic and non-metallic particulates is dampened down with a water injection system into the shredding chamber.

Shredded metal then passes through a rotary drum magnet system, with ferrous metal carried across into a manual picking station where any residual contamination and 'meatballs' (mixtures of ferrous and non-ferrous metal) are pulled out by hand and dropped into dedicated bins below the picking station.
Ferrous metal remaining on the conveyor after passing through the picking station is then deposited in a bay as 3B-grade ferrous metal (defined as *Fragmentised, old light steel arisings fragmentised into pieces not exceeding 200mm in any direction*) which has approximate density of 1 tonne per cubic metre. This is sold to metal furnaces for recycling.

The residual waste from the rotary magnet system is carried via 'covered' conveyor to an Eddy current separator system which removes Non Ferrous materials from the residual waste stream. Remaining waste passes through a picking station for final removal of any "missed"

metals and deposited into a walled concrete storage. The ‘waste’ is removed from the bay by a registered waste carrier on a daily basis and sent for further recovery by a third party.

Figure 5: Existing Metal recycling process flow diagram



1.5 PROPOSED Metal shredding

The Danielli shredder is powered by an electric motor being a clean drive system, the control firmware of the drive system has many energy saving characteristics. Studies have shown that there is an estimated saving of 8 to 10% of power usage, as well as being able to efficiently decrease the motor speed for various types of scrap increases wear life of approximately 10 to 15%.

The scrap metal is placed into the shredder as per the existing shredder.
Once the Shredded metal is discharged, the material then passes through a metals air cleaning system, this separates all the waste (lights) materials from the metals (heavies). The air utilised in this process is further passed through a self cleaning filter system ensuring all emissions are below 10µm. The advantage of this system is the better liberation of the waste

for a ‘cleaner’ waste, minimising further processing or landfill. The filter system had a continuous monitoring system that measures the pressure differential and alarming if the filter efficiency decreases at all.
The residual waste from the metals cleaning air system is carried via ‘covered’ conveyor to an Eddy current separator system which removes Non Ferrous materials from the residual waste stream.

Once cleaned the metals pass through a rotary drum magnet system, with ferrous metal carried across into a manual picking station where any residual contamination and ‘meatballs’ (mixtures of ferrous and non-ferrous metal) are pulled out by hand and dropped into dedicated bins below the picking station.
Ferrous metal remaining on the conveyor after passing through the picking station is then deposited in a stocking area as 3B-grade ferrous metal (defined as *Fragmentised, old light steel arisings fragmentised into pieces not exceeding 200mm in any direction*) which has approximate density of 1 tonne per cubic metre. This is sold to metal furnaces for recycling.

The residual waste from the rotary magnet system is carried via ‘covered’ conveyor to an Eddy current separator system which removes Non Ferrous materials from the residual waste stream.

Both remaining waste streams are deposited into a walled concrete storage. The ‘waste’ is removed from the bay by a registered waste carrier on a daily basis and sent for further recovery by a third party.

As you can see the system works in a very similar way to the existing shredder. However, there are several technologies that improve the process:

- Clean energy efficient drive system.
- Air containing metallic and non-metallic particulates is dampened down with an AUTOMATIC water injection system into the shredding chamber. The auto system only injects water when it is required by reading the load of the shredder, minimising the water usage. (Figure 6)
- High efficiency Separation systems to further reduce metals in the waste, reducing landfill.
- The new material cleaning and separation system, efficiently clean and separate the pulverised material discharged from the shredder. Leading edge technology (including state of the are hybrid magnets) ensure full recovery minimising the waste. Utilising a closed loop air system with automatic cleaning baghouse filter to clean any air emissions to below 10µm. (Figure 7)
- Noise reducing enclosures.(Figure 8)
- Shredder mounted on Anti Vibration System (Figure 9)

Figure 6: Automatic water injection system

Pos’n1 + 2 = Fire fighting, 3 = Water Injection System

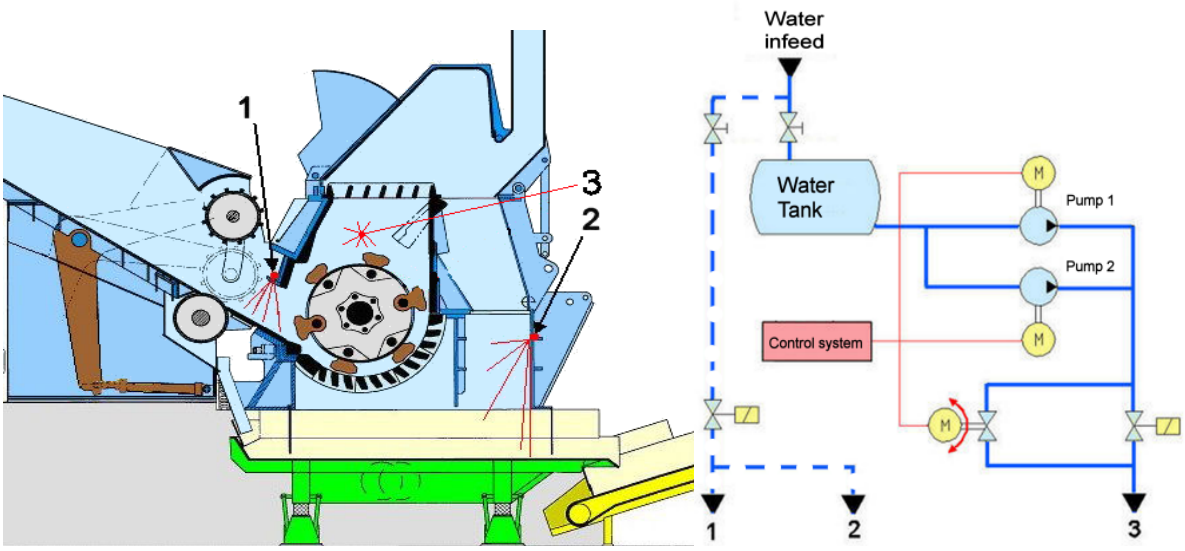
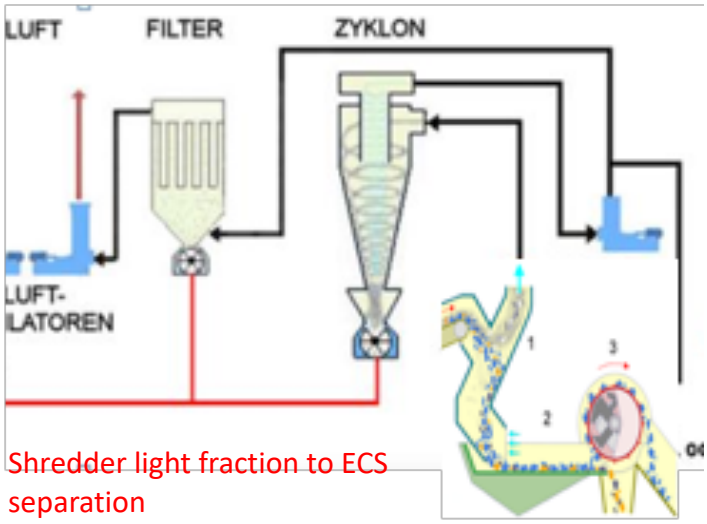


Figure 7: Material cleaning and separation

Dust content of exhaust air <10mg/Nm3

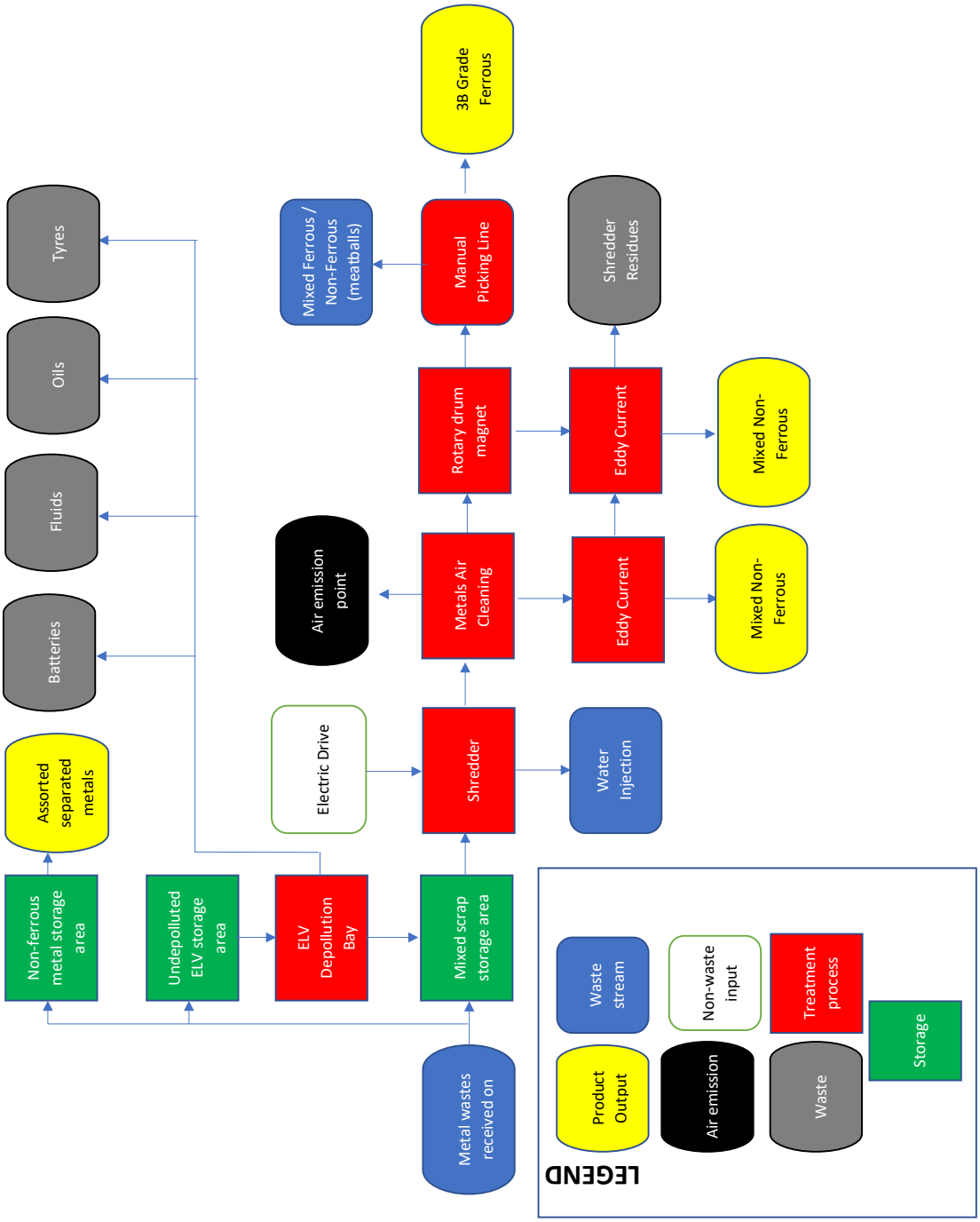


Shredder light fraction to ECS separation

Figure 8: Typical Noise reducing enclosure

Figure 9: Shredder Anti Vibration System

Figure 10: Proposed Metal recycling process flow diagram


Metal wastes received on
Non-ferrous metal storage area
Undepolluted ELV storage area
ELV Depollution Bay
Mixed scrap storage area
Assorted separated metals
Batteries
Fluids
Oils
Tyres
Electric Drive
Shredder
Water Injection
Air emission point
Metals Air Cleaning
Eddy Current
Mixed Non-Ferrous
Rotary drum magnet
Eddy Current
Mixed Non-Ferrous
Mixed Ferrous / Non-Ferrous (meatballs)
Manual Picking Line
3B Grade Ferrous
Shredder Residues
LEGEND
Waste stream
Non-waste input
Treatment process
Storage
Product Output
Air emission
Waste

1.6 Training requirements

Metal recycling operations are supervised at all times by a site manager, whose role is to ensure that all aspects of plant operations are carried out efficiently, take action in the event of process failure or mechanical breakdown and ensure permit compliance. The site's technically competent manager provides oversight to the site manager.
Staff are trained in accordance with the site's environmental management system, which includes a training matrix detailing minimum requirements for all managers and operatives involved in company operations.
Operatives are trained to identify non-conforming waste entering the site and to raise the alarm in case of fire, or where a risk of fire is observed. All staff also receive mandatory Health & Safety training as part of their role.

2 Technical summary of wider site waste management process

A number of processing operations take place on site, which include:

- Shredding of ferrous/non-ferrous scrap in the metal shredder
- Shearing of ferrous metals using a shear
- Accepting and storing of lead acid batteries
- Depollution of ELV (End of Life Vehicles) (not currently undertaken)
- Acceptance and storage of WEEE (Waste Electrical and Electronic Equipment)
- Storage of metals.

These processing operations and carried out using on-site plant including:

- A 360° grab crane
- A bucket Loader
- A telehandler
- A Bobcat loader
- Forklift trucks
- Bonfigiolli metal shredder
- Metal shear
- Metal baler.

To enable these processes to be carried out in a safe and environmentally sound manner, the following procedures are followed.

2.1 Shredding ferrous/non-ferrous scrap in the Bonfigiolli metal Shredder

The shredder hammermill (the part of the machine that crushes the metal) is the noisiest part of the plant. This plant is placed adjacent to a concrete wall to provide an acoustic barrier between it and surrounding receptors.

The shredder-loading procedure is as follows:

1. Material is fed into the shredder from the feed stockpile. This pile is adjacent to the shredder so there is minimal movement of plant and materials.
2. The 360° crane grabs material from the top of the pile. This prevents the pile collapsing. The crane then lowers the material into the infeed hopper.
3. When placing metal into the shredder infeed hopper, the grab is lowered into the hopper 0.5m above from its bed, where the grab opens and deposits the metal onto the hopper floor. This process is then repeated with another load of metal throughout the working day.
4. Metal is pushed into the hammermill via a pusher ram inside the hopper.
5. Once the material has been crushed and shredded it proceeds along a conveyor belt to the various magnetic sorting systems, as described in Section 1.4.
6. Material is the deposited into various bays (depending on the type produced).

2.2 Shearing of ferrous metals in the Shear

The shear cuts in-fed metal into designated lengths. Initially, metal is compacted into a rectangular tube before passing through an end door. At the end door, a blade guillotines the metal into designated lengths. The primary emission from the shear is noise from the engine, which is completely enclosed but for an exhaust outlet, so that noise emissions are reduced. The machine also has silencing equipment fitted to it to reduce the noise from the exhaust of the shear.

The procedure for loading and operating the shear is as follows:

1. The shear wings on the top of the unit are opened, exposing the body of the shear
2. The crane grabs material from the top of the adjacent stockpile of ferrous metal
3. The crane lowers its grab into the body of the shear, releasing the metal 0.5m above the floor of the shear's bay
4. Once the crane grab has been removed, the crane operator then operates the shear via the remote control from the cab.
5. Shear wings are closed, compacting the material
6. A pusher ram engages and pushes the material to the end door.
7. Once at end door, the shear blade raises and metal is pushed into the shear throat.
8. Blade descends and cuts metal into designated sizes.
9. Processed material is then moved, using the crane, to the appropriate stockpile.
10. The process is repeated throughout the working day.
11. Any oil spills identified are cleaned up immediately using site absorbent granules; the crane driver can contact the yard manager via radio to request a spill clean-up.
12. The shear is located on an impermeable surface with sealed drainage to the site's interceptor.

Figure 5: Shearing process

2.3 Acceptance and storage of batteries

The site is permitted to accept all kinds of batteries, though the site only accepts lead acid batteries in practice. Lead acid batteries pose environmental risk through the unintended discharge of battery acid. Batteries also have the potential to cause fire that could have significant environmental impacts around the site. The Company's storage arrangements for these batteries are as follows:

- Batteries are stored under cover in a designated area remote from other wastes or flammable materials
- Batteries are stored in a non metallic container.
- No other material may be stored in the battery storage area
- Should they be stored outdoors for any reason (e.g. awaiting collection), batteries must be covered to prevent rainwater ingress to the battery container.
- Batteries must be removed from site within two months
- Storage times are monitored via regular stocktake by site management.

The procedure for accepting and storing lead acid batteries is as follows:

- Lead acid battery(ies) are brought to site by customer
- Each battery is weighed using small scales outside the main office, supervised by a member of staff
- Once weighed, the batteryis placed into a lidded, leak-proof plastic battery box, located next to the small scales
- Batteries are placed inside, not dropped, with the terminals facing upright
- Once full, the battery box's lid is removed and the open top of the battery box is covered with shrink wrap. This forms an impermeable lid encasing the batteries and preventing water ingress
- The full box is then taken, by forklift, to the battery storage area which is located at the rear of the site
- A new empty battery box then replaces the full one at the small scales and the lid is put onto it
- It is ensured that all batteries that are received from non-domestic sources are accompanied by a hazardous waste consignment note. Consignment notes also accompany all batteries that are removed from the site
- Battery stocks are monitored via monthly stock takes. This is carried out by the Directors and documented in the site diary
- No batteries are stored for longer than the 62 days
- A load of batteries is collected once per month by a registered waste carrier.

Where customers deliver batteries to the site pre-packed, boxes are checked to ensure that they are in good condition and the contents visually inspected for any other battery types.

On the rare instance that other battery types arrive at site:

- The weighbridge staff seeks to identify the battery type
- These batteries are then stored in a separate leak-proof box.
- Only like batteries are to be stored with like batteries.
- These battery boxes, when full, are stored at the rear of the site a minimum of 3m away from the other batteries.

Figure 6: Battery Storage