Exner E-Waste Processing Inc.

Mechanical treatment of electronic scrap and other metal containing scrap

SEPTEMBER 2014

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Contents

1. Introduction

Exner E-waste processing Inc, intends to set up and operate a plant at the site in Elie, Manitoba, for the processing of E-waste or other metal ferrous wastes and metallic composites. The usable waste components – predominantly metals – have to be separated through several suitable procedures and thus the amount of waste disposed are minimized according to the Waste Management legislations.

With the help of this bigger facility the valuable materials, especially metals are recycled again in the cycle of matter. The residues are carried into the regular disposal, if they cannot be recycled. However an increase amount of recycling of product is anticipated or projected.

It should be noted that the entire installation model intends to facilitate exclusive mechanical-physical procedures, such as destructions, sorting, screening, and separation procedures for generating recyclable substances.

Thermal procedures are not planned.

It is planned to extract usable materials (recyclable materials) by feeding the input materials (metallic composites) into the plant through appropriate procedures based on their properties. Non-recyclable materials are separated and sent to the proper downstream/disposal. The extracted materials, which are marketable, are made available in the market for material recycling (Ferrous metals, possibly plastics) or smelting (secondary fuels from the components with high-metal-value).

1.1 Details on the suitability of the site

This building was designed for manufacturing of Isoboard in 1995. It offers Exner E-Waste Processing the necessary foundation and steel walls to be able to process electronic scrap. Total fenced compound consist of 26 acres.

1.1.1 Given Structure

The Structure of the walls are metal clad inside and out with insulation inside. Some concrete block walls for partitions but are not load bearing. All floors are concrete even upstairs office with tile on top. Gross footage of the building is 214,000 sq.ft. and 12,000 sq.ft. of mezzanine, for a total of 226,000 sq.ft..

1.1.2 General Data

This building is located 48 Km West of downtown Winnipeg. The property is a total of 68 acres with gravel and concrete parking. There is a turn off the Trans Canada Highway 1, allowing truck access roads yeararound. It is located two miles east of Town of Elie. Area occupied by Exner E-Waste Processing Inc. will be 63,187 square feet, of this square footage approximately 2,500 sq.ft. is dedicated to office space, the remaining is for the operation and processing equipment.

Water is supplied to the facility from the town of Elie. It is a 4” main line specifically put into the building for the prior use of the building (straw board). The site has its own groundwater drainage system that is collected and pumped into the pond on site. This system was designed for the original project and is still maintained at the site.

The sewer is controlled through holding tanks which are pumped out when required.

1.1.2.1. Legal Site Description

The legal description of the property is as following:

11 Woodstalk Way
Elie, Manitoba R0H 0H0
Lot 1 Plan 33714 PLTO in NE ¼ 1-11-3 WPN

1.2 Owner of the Site

Landlord:	3409377 Manitoba Ltd.
Address:	Box 23, RP 514, RR5
	Winnipeg, MB R2C 2Z2
Phone:	204-697-7640
Fax:	204-224-6250

Current tenants on site are:

1. Truss Fab Inc.
2. River City Mfg.

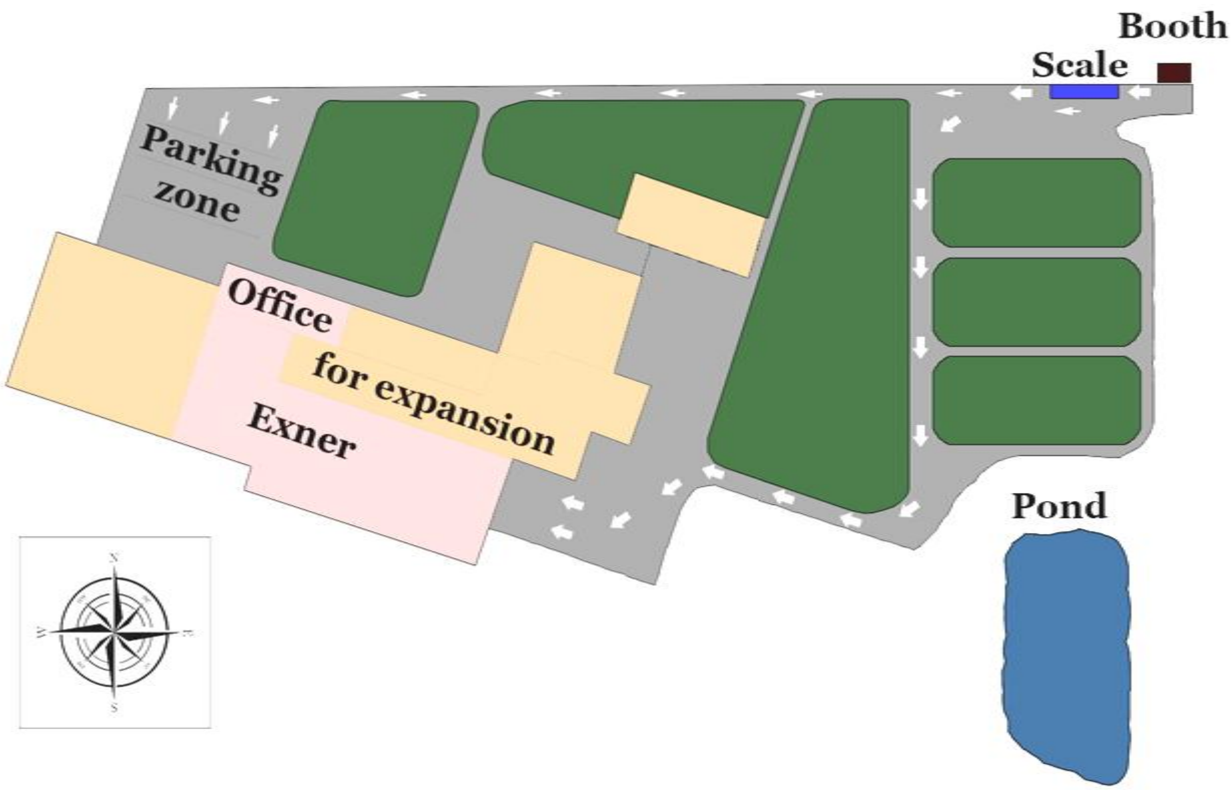
Tenants are not affecting the process and operation intended by Exner E-Waste Processing Inc.

1.3 Land Map

Arial map of Site:

Imagery @2014 Cnes/Spot Image, DigitalGlobe, Map Data @2014 Google

Layout of the facility compound and Exner's leased space:



1.4 Infrastructure

1.4.1 Road Connection

The building is located on Woodstalk Way, Elie, off Main Street/Road 61N that has an exit off Trans Canada Highway 1.

1.4.2 Electrical Supply

Power is provided by Manitoba Hydro. Power is unlimited. It has 6 runs of 4160 kva running into the building and is stepped down 800/600/460/240/120.

Energy Demand:

The following table shows the installed capacities of the respective lines, given in KW at peak.

Consuming group	Installed Power in kW	Power Drawn in kW
Shredder	570	430
Hammermills	715	540
Air Jig	30	25
Magnetic Separator	80	60
Electrostatic Separator	20	15
Screening Machine	7	2
Total	**1422**	**1075**

1.4.3 Water Supply

The system works without industrial water and therefore has no water supply requirements.

1.4.4 Water for fire fighting

Since wastes such as metallic composites are mainly processed, significant proofing is required. The plastics contained in electrical waste are separated as soon as possible in the process and are usually equipped with flame-retardant materials.

In the area near the hammermill the increasing wear and tear of grinding tools can lead to rise in temperature and caking of plastic materials. Therefore, a portable fire suppressant is located at the hammermill as prevention. Also in the shredder and the associated filter equipments a fire risk cannot be completely ruled out. Portable fire extinguishers are placed near all the processing equipment, in the event of a fire.

There is also a sprinkler system throughout the entire building which was designed for the strawboard plant. The system primary supply is from the town of Elie, in addition to an onsite pond if required. The pond, sprinkler system and sprinkler diesel pumps are maintained by the building maintenance manager as well, BDR Services on a scheduled basis.

1.4.5 Waste Water Disposal

The waste water comprises of sanitary sewage, compressor condensates and if applicable, cleansing water, which is discharged into the existing sewage line. Other wastes do not occur.

The sewer is controlled through holding tanks which are pumped out when required.

1.4.6 Telecommunication

The communication in the plant facility is via MTS telephone and internet system, which has extensions in all the respective areas of the facility.

2. Description of Operation

2.1 Delivery

The entrance area consists of the driveway for incoming vehicles and the administration building with a manual operated gate.

The entrance is secured with a sliding gate, which is closed after the operating hours or receiving hours. The entire facility is fenced with an industrial fence.

Delivery hours are Monday to Friday from 7:00 A.M. to 5:00 P.M.

The reception area is locked at closing time by a reception and supervisor.

The working area is adequately illuminated. Spot lights are fixed in addition. Driveways are also lit up.

Access into the facility that will be occupied by Exner E-waste will be controlled with the use of security ID badge scanners.

The scale at the entrance allows as control for cargo weights entering into the facility.

The incoming deliveries are attended by the staff at shipping and receiving area and are registered. All cargo is signed in and approved prior to unloading and weighing the incoming material. As well, incoming wastes will be subject to undergo a validity check to identify the cargo.

Where appropriate, the cargo is rejected, if the waste in cargo cannot be treated in the plant.

The arrival and departure is designed as a circular street, so that there will be no traffic issues. The arrival is on the southern entrance and the exit is on the northern driveway. The entire driving surface will be cleaned by means of a sweeping machine every work/production day or as and when required.

2.2 Processing of metallic composites

2.2.1 General

The heterogeneity of the input materials to be processed (see list of wastes) requires multiple stages of separation and dissolution depending on the compatibility.

The plant is designed in such a way that a wide range of metallic composites can be processed. In addition to marketable end products intermediates are generated, which can be further processed in downstream processing without problems. Great importance is laid on a safe removal of impurities, which can lead to failures in the following separation stages. This is of one of the most important stages in the whole procedure; else long term operation in a trouble-free manner is not possible.

The treatment plant consists of 2 separation stages, each of which use unique integrated dust and grist separation through the requisite filtration and sorting steps. Care has been taken during this process, that certain separations function, only in the free flow of materials after every separation step. The final refining process using the air jig is not an integral part of the procedural flow but is a separate stage, which can be fed batch- wise and therefore can be adjusted exactly as per the required parameters.

The preparation of the metallic composites consists of the following methods and workflows:

The feed material must be pre-sorted in an appropriate manner, to minimize the procedure costs, as well as to achieve the highest possible value from the acquired products. It is thereby assumed that the feed material will be received in a dry state into the system. With metallic and hard input materials some residual moisture is possible; some dissipation of any moisture is possible by the built –in energy connected to the section system.

Larger, more bulky materials are pre-chopped in a scrap shearing machine externally by a third party. Input material is checked for possible impurities before treating it in the shredder. Substance of concerns is removed from the waste stream, for example batteries, mercury tubes, leaded glass, phosphor powder and ethylene glycol.

The feed material is crushed into specific grain sizes through various stages of separation, which is then compatible with the material that is going to be processed. In order to decompose the metallic portions, i.e. to overcome adhesion to foreign particles, which can be acquired from the bulk, materials on the separation units installed. Thereby a high pressure is avoided from particles that are very course and significantly bigger than the actual grate opening of the separation machine.

The necessary energy consumption for separation and as well as the general wear and tear of the separation machines as well as any down time due to any additional maintenance is minimized at the same time.

2.2.2 Equipment Requirements

The preparation of the metal grouped AM is divided into the following process stages:

1. Pre-sorting and disassembly AM0
2. Shredder pre-separation stage with grist sifting AM1
3. Hammermill coarse-particles separation stage with grist sifting AM2
4. Hammermill fine- particle separation stage with grist sifting AM3
5. Air jig AM4
6. Magnet separator AM 5
7. Electrostatic separator AM6
8. Screening machine AM7

2.2.2.1 Presorting and disassembly

The delivered electrical and electronic waste and also the bulk materials containing different metal scraps are examined for hazardous components which are then removed.

For electrical and electronic wastes all contaminants and recyclable materials is removed as much as possible before the separation stage, this is only possible during disassembly. For this reason, contaminated material such as, capacitors, toners and hard steel are separated before this process. Recyclable materials such as aluminum or plastic are separated in order to relieve the separation stage process and enable a higher more efficient performance.

2.2.2.2 Shredder with grinding AM1

The feed material is emptied by means of wheel loaders from a storage box and is slowly loaded into the feeder belt H1.1. Alternatively the shredded materials can be loaded in the feed hopper B1.1. From there the material feed is filled into the Shredder Z1.1. By means of heavy rotating hammers the material is broken apart and macerated, brittle materials are smashed and ductile metals are consolidated and removed. Crushed materials are carried through the grate openings into an output vibration chute H1.2 and carried further into box B1.2. The feed is monitored on a PLC Controls to ensure the shredder is not overloaded. The shredder is accommodated in an accessible sound-proof cabin reducing the noise emissions are reduced to a permissible value (approx. 8odB A-decibels of sound in air-Lex -the level of a worker’s total exposure to noise averaged over the entire work day.

The shredder Z1.10 is exhausted by the ventilating fan V1.1, so that emissions from the inlet aperture are minimized and a sufficient cooling of the interior of the shredder is ensured.

The dust and fluff proportion absorbed from the shredder Z1.1 is subsequently absorbed by a separator using a cyclone effect F1.1. A huge amount of film, lint and fine dust are separated and carried onto an air lock X1.1and is then filled into Big-Bags for safe disposal. The presorting of these materials is essential to the actual filtration unit; otherwise a blockage can occur due to the high amounts of dust. The fine dust removal of the airflow occurs in the jet filter F1.2, the filter material is discharged into an airlock X1.2 then into a Big-Bag.

The cleaned exhaust air is blown outwards by the ventilating fan V1 0 in a common chimney A1.1 with exhaust hood. By means of a valve, the exhaust capacity of the ventilating fan can be adjusted according to the requirements respectively.

The material from box B1.1 will be forwarded to hammermill AM2.

2.2.2.3 Hammermill 1 AM2 (Flowchart 900-045.10.02.01)

The Hammermill 1 spherodizing stage helps to macerate the heavier material groups which are separated from the shredder pre-separation stage, the valuable metallic substances can be separated from the most complicated plastic mixtures over the next sequence of separation stages. Simultaneously thin, and hooked ductile metals is separated so they can then be released from their adhesions and be separated through their narrow cross sectional flow area by high specific density of the remaining admixtures. This is attained in a double rotor hammermill where the material is extremely stressed by the hammers with an anvil effect from the separation tools and thereby the required results are achieved.

However, it should be noted that thick thermoplastic materials, which are mostly used for encasing machines, gets crushed under the hammermill on less than 20 mm, because the shear force of the hammers drops heavily on the plastic as a result of the working gap between hammer circuit and the mill circuit. If the material cannot leave the mill through sufficiently big delivery slots, the mill interior gets heated up, which then leads to melting of the plastics with complete blockage of the mill that leads to mill failure and could result in significant fire risk. Therefore such plastics are removed as much as possible within the scope of screening and disassembling AM0>.

For safe separation of thermoplastic materials essential delivery slots of the mill are mostly sufficient for the separation of thin metals or thick wires. However for a complete separation of the coil wires they are too big.

For this material a separate hammermill II AM 3 stages with smaller delivery slots. The construction of both the hammermill separation stage is otherwise identical.

Another possibility is also that the grist may get carried back again to the hammermill 1 and 2 stage, so that the material is led several times batch-wise in the mill flow, until the desired spherodizing effect is attained and the material can be discharged.

Very high precious metal components in the by-products containing dust are carried in the cyclone and the filtration unit, they are also marketed and therefore captured separately and sorted in the fine-particle spherodizing stage.

The feed material is added to the feed hopper B 2.1. From there the material is drawn off by means of an adjustable feed-regulating belt H 2.1 and is placed on the vibration chute H2.1 and carried into the vibration chute H2.2 to manual separated unrequested material. A output paddle X2.1 in the outlet of the conveyor belt provides for a uniform discharge of material at the dropping edge of the discharge belt.

After the vibration chute H2.2 the materials end up on the feeding belt H2.3. From there it passed to the screw conveyor H2.4 that takes the material into hammermill Z2.1. with this process the cautious material can go into the hammermill without creating a fire hazard.

An overload of the mill is avoided with the help of a PLC control.

The hammermill is accommodated in an accessible sound proof cabin, so that the noise emission is reduced to a permissible level of 80dBA Lex. Both mill apertures can be opened by means of hydraulic door. A safety interlock ensures both the driving motors are shut down and de-energized before any maintenance work or pre-star up inspections are carried out.

In the double rotor hammermill the metallic components are macerated into composite material to a great extent and are compacted and separated on a rotating mill due to the heavy stress impacted. Through the extreme mechanical stress of the metal parts, thermal heat from this process can lead to amalgamation with existing plastic particles. To avoid this grinded material is fed on a valve switch H2.5, which takes the grinded material directly into a connected zigzag-sifter F2.2 and sifts into 2 fractions.

The resulting fractions, ZZS-heavy material and ZZS-Sifter light material are processed separately.

The quality of the sifting can be adjusted with a fireplace damper handle. The discharge of ZZS-Heavy material occurs over the air lock X2.2 on the vibration chute H2.6, it is then distributed evenly, cooled and carried to a magnetic drum separator F2.3. The magnetic Fe components are lifted and discharged via chute into a storage box 2.3.

The non-magnetic material is forwarded to the belt conveyor H2.7 and the screening machine F2.7 it is classified into 4 fractions (3,3-10, 10-20, and >20mm round hole-screening size) and is delivered in stack boxes. The over-sized or/and medium-sized grain is carried on the conveyor belt H2.8 back into hammermill Z2.1.

By non-sufficient spherodizing the bigger screening fractions are lead back to the hammermill II AM3. The material is circulated until the requested size of the material is received.

The small grain will be added to the electrostatic separator AM 6 to be separated by material type.

The light fluff material will be forwarded to a multiconsifter F2.5, where the light and fine material with additional air through the air regulator. The dust collected through the air regulator and air lock X2.3 are forwarded to the screening machine F2.6 (<3, >3mm screen size). The small fractions -3mm leave on the vibration chute H2.9, where it will be flat divided and passed to the magnet drum separator F2.7. The light material will be filled into a box 2.9 and transferred to the electrostatic separator AM6. The magnetic FE-Materials are exhausted and sent via a chute into a storage box 2.8.

The course fraction>3 is either disposed off or by higher metal value added back into the hammermill AM2 or AM3.

The separated dust and lint proportion of the sifting is finally absorbed by a cyclone separator F2.8. There, a majority of the film, lint and fine dust is separated and carried over the air lock X2.4 and is filled in Big Bags through a double Big-Bag filter unit 2.11. This pre-separation of such materials prior to the actual filtration unit is necessary; else they can lead to a blockage problem. The fine dust removal of the air flow occurs in the filter F2.9. The filter material is carried over a screw conveyor H2.12 and air lock X2.5 into Big-Bag 2.12 and is disposed.

The cleaned air is blown outwards by the ventilation fan V2.2 in the common chimney with exhaust hood A2.1. The suction of the fan can be adjusted to the respective requirements using and air pressure regulating valve.

2.2.2.4 Hammermill II AM3 (Flowchart 900-045.10.03.01)

The materials feed is added into feed hoppers B3.1. From there the material is drawn off by means of adjustable feed-regulating conveyor H3.1 and is fed from the feeding vibration chute H3.2, (alternative) where the non requested material is forted and excluded.

An output paddle X3.1 manages the out sourcing of the adjustable feeding belt so that the material can be equally exited on the output belt.

After the feeding vibration chute H3.2 is the material put onto the feeding belt H3.3, from there it carried on the screw conveyor H3.4 over the output air lock X3.2 and entered into the hammermill Z3.1. With this the critical material entry into the hammermill can be encapsulated by this method to a great extent. There is also no fire risk for the feeder-belt with the burning splatter from the hammermill.

An overloading of the mill is avoided with the help of PLC controls.

The hammermill is accommodated in an accessible sound proof cabin, so that noise emission is reduced to a permissible level. Both mill apertures can be opened by means of hydraulic door openings. However this is possible with a safety interlock only after shutdown of both the driving motors.

In the double rotor hammermill the metallic components are macerated by composite materials to great extent and are compacted and separated on a rotating mill due to the heavy stress impacted. Through the extreme mechanical stress of the metal parts, they get heated up and it can lead to amalgamation with the existing plastic particles. To avoid this, grinding material is fed on an output vibration chute H3.5, which takes the grinded material directly into a connected zigzag-sifter F3.2 and sifts into 2 fractions.

The resulting fractions ZZS-Heavy material and ZZs-Sifter light material are processed separately.

The quality of the sifting can be adjusted with a Fireplace damper handle. The discharge of ZZS-heavy materials occurs over the air lock X3.3 on the vibration chute H3.6. It is distributed there evenly, cooled and carried to a magnetic drum separator F3.3. The magnetic Fe components are dug up and delivered into a chute in a storage box 3.3.

The non-magnetic material is forwarded to the belt H3.7 and the screening machine F3.4 and is classified into 4 fractions (3, 3-10, 10-20 and >20 mm round hole sifting size) and is delivered in stack boxes. The over sized or/and medium-sized grain is carried on the conveyor belt H3.8 beck to the hammermill Z3.1.

The middle screened grain size are carried to the Air Jig AM4 and sorted into light and heavy material.

The fine grain material is separated based on metal type in the electrostatic separator AM6 or disposed off.

The light fraction of ZZS-sifting, capable of flying, is fed into multiconesifter F3.5, where the light and fine feed material is removed by supplying extra air through an air control shutter and carried over the feeding vibration chute X3.4 onto the screening machine F3.6 (2,2-6,+6mmmm perforation). The fine fraction – 2mm is delivered in a stack box and is supplied to the electrostatic separation stage AM6. The course fraction is either disposed, of if the metal component is on higher side, then it is carried back again to the hammermill Z3.1.

The separator dust and lint proportion of the sifting is finally absorbed by cyclone separator F3.7. A huge part of the foils, lint and fine dust is separated there and carried over the air lock X3.5 and filled in Big-Bags 3.11

through a double Big-Bag filter unit. This pre-separation of such materials before the actual filtration unit is necessary; else they can lead to blockage problems there. At last the fine dust removal of the air flow occurs in the filter F3.8. The filter material is carried over air lock X3.6 or X3.7 in a Big-Bag and is disposed.

The cleaned air is blown outwards by the ventilation fan V3.2 in common vent with an exhaust hood A3.1. The suction of the fan can be adjusted to the respective requirements using an air pressure regulating valve.

2.2.2.5 Metal Separation Air Jig AM4 (Flowchart 900-045.10.04.01)

The air table separator stage is required for the separation of grain groups, which clearly differ in their specific density. Prerequisite for good separation results are similar grain size and grain form.

Since these requirements are satisfied in the hammermill separation stage, it is possible to separate metals and plastic from each other.

The de-dusted medium sifted-fraction, which resulted from the hammer mill separation, is fed into the feed-regulating hopper B4.1 batch-wise in stack boxes by means of fork lifter. The material is pulled over an adjustable vibration feeder H4.1 and is evenly divided and directed to the magnet drum separator.

The magnetic FE material is carried on the conveyor belt to the air jig tableF4.2 where it is separated into light and heavy material and stored in boxes.

The exhaust air from the air jig separator is absorbed through a ventilation fan V4.1 and is cleaned in a jet filter dust is carried onto an air lock X4.1 and is delivered to the disposal.

2.2.2.6 Magnet Separation Stage AM 5 (Flowchart 900-045.10.04.01)

The heavy and light material from the air jig fractions found in storage boxes are disposed on the adjustable feeding belt B5.1 with the help of the forklift. The output vibration chute H5.1 under the output leads the adjusted amount of material to the magnetic drum magnet F5.1. The magnetic FE-material are extracted and lifted over a chute into an input feeding hopper.

From here the fraction on the output belt are carried to the magnetic separator F5.1, were below the magnet drum are located. The drums of the magnetic separator simply turn towards each other to achieve the desired effect. In this area the magnetic drum is energy collected NE-grain (round material) that is put between the two magnetic drums and in the middle of the belt carried over a chute into box B5.2.

Material that does not take energy such as rubber and plastic are carried away on a belt as finished plastic regrind material.

2.2.2.7 Electrostatic Separation Stage AM 6 (Flowchart 900-045.10.06.01)

During the fine-grinding of printed circuit boards, connectors and coiled wires, significant proportion of very fine metallic particles are produced, which cannot be processed by means of electrostatic separation procedure, especially by and electrostatic Corona drum separator.

In the corona separation the material fed into a rotating drum is sprayed with electrical charges by means of the corona electrode standing under high voltage. Conductive particles, like most metals, can immediately transfer these charges to the earthed drum. Their drop trajectory of the drum is not influenced or only marginally influenced. However the non-conducting particles cannot transfer the charges or transfer only very slowly to the drum. An electric field can therefore develop around these particles, which induces an opposing field on upper surface of the drum. Because these fields attract, the non-conducting particles free themselves later on the drum's upper surface or not free themselves at all and must be removed mechanically with a conducting brush from the upper surface. This depends on the difference of the resultant electrostatic magnetic force and centrifugal forces caused by the rotating drum.

For an effective separation, uniform feeding in a mono layer is an absolute requirement. For every fraction and separation, feed optimum drum speed, electrode distance and electrode angle has been given. The electrode voltage is around 30kV.

The ESTA separation is applicable for granular products, with a density of 1-3g/cm3, in a grain size range of 0.1 – 3mm. Panel shaped plastics are separated in grains by up to 10mm.

The below product codes hold good:

- L-Fraction= Conducting fraction
- HL-Fraction= Semi-conducting fraction
- NL-Fraction= Non-conducting fraction

In the first stage a pure L-Fraction is obtained as Cu/Al-mixed concentrate.

The resulting HL-Fraction is purified later.

The feeding is done on the hopper B6.1. The output screw conveyor H6.1 carries the material into an electrostatic drum magnet separator F6.1. From there the material is distributed and uniformly fed by means of an adjustable chute of the first separation stage of electrostatic separator. A level control sensor ensures that the filling level in the feed-funnel is always within the permissible filling state.

In the first separation stage the feed material is distributed to two drums, which separate a pure metal fraction, which consists of mixture of aluminum and copper with various precious metal components. The NL-fraction is carried over screw conveyor H6.2 in a boxes B6.3. The HL-fraction is dropped into the distribution channel and is supplied to the third drum in the second separation stage. A second pure metal fraction is obtained there. Resultant NL-and HL products are carried over the screw conveyors H6.3 and H6.4 in box 6.4.

Since partly very fine grain feed materials still show partly little dust adherence, which is in harmony with the operation of ESTA-separators through increased high-voltage, the distribution channels on the separating drums are exhausted through increase high-voltage, the distribution channels on the separating drums are exhausted through a ventilating fan V5.1 and the dust is separated in a filter F2.2.

2.2.2.8 Screening Machine AM7 (Flowchart 900-045.10.07.01)

Input material that easily separates and do not need to be processed at the hammermill, are disposed of on the adjustable hopper B7.1.

The adjustable output chute carries the material onto the belt conveyor H7.2 and further to the screening machine F7.1, where it is classified in 4 fractions and placed in boxes.

The screen fractions are processed further at the air jig AM4 or magnet separator AM5.

The dust during screening is collected over a ventilator fan V4.1 and cleaned in the jet filterF4.3. The filter dust is carried over an air lock X4.1 and disposed off.

2.3 Organizational requirements

2.3.1 Staffing

The personnel requirement includes staff required or the storage of the respective material flows. The staff requirement is mainly represented on the basis of a single shift.

Personnel	Number
Operations Management	2
Receiving	1
Plant operator	1
Forklift Driver	3
Sorting staff	10
Feed machine operator	2
Mechanic	3
Electrician	1
Custodian	1
Total	24

This results in staffing approximately 25 per shift.

2.3.2 Documentation

Extensive documentation is produced about the wastes handled and processed. The weight of the incoming waste materials is determined by the weighing system and is thus assigned to every batch and waste code number. The internal material flows are documented on intermediary weighing.

2.3.3 Transport Volume

With an estimated throughput for the plant of about 5 tons/hr, a two-shift operation with approximately 15 hour plant operation (approximately 1hr setup/ maintenance time), a production rate of 75 tones per day is expected to be processed. With a load capacity per truck on an average of about 10 tones, this represents approximately 8 trucks per day or 1 truck every 2 hours for delivery.

Provided the waste collection is done by separate trucks, it amounts to 8-9 trucks per day. Thereby it totals to approximately 2 trucks per hour on average.

However, this incoming number is compared with the operation of the former processing plant, to control significant loads coming in.

2.4 Safety & Health

2.4.1 General

An Environmental, Safety & Health Management System has been developed for the Safety and Health of all staff employed by Exner E-Waste Processing Inc.

As per Workplace Safety and Health Regulation, M.R. 2017/2006.

The following regulations were taken into consideration for planning and execution:

1. The general rules for worker's safety
2. The appropriate methods for prevention of an incident or accidents(protection while operating rotary or moving parts, emergency stop systems)
3. Pedestrian walkways in the production area to separate pedestrians from forklifts
4. Full equipped emergency first aid room
5. Lock out tag out LOTO equipment and training for maintenance staff
6. Machine guarding and interlocks
7. Fall protection
8. Arc flash – training and awareness - PPE
9. The necessary illuminations of rooms and outdoor area.
10. All employees are provided with personal protective protection equipment PPE.

11. Sufficient numbers of en-suite facilities to maintain personal hygiene with amenities available for employees comprising of a clean lunch area with refrigerators and microwaves .

2.4.2 Waste receiving and processing

In the waste receiving and treatment area it is well ventilated with exhaust system, to minimize the accumulation of exhaust fumes from trucks, forklifts etc. or any dust or other airborne emissions are produced.

Non-stop working areas are the sorting areas and the driver cabin of wheeled loader or lift truck used for the material feed.

The more noise-emitting units are accommodated within the production area. Furthermore the Shredder and the hammermill are accommodated in individual sound –proof cabins, reducing the noise exposure to the operator. The sorting places are fully enclosed and are temperature controlled.

The HVAC system in the sorting area meets the following requirements:

- Filtering of outside air
- Air heating inside the room in winter to a minimum of at least 18 C
- Air cooling inside the room in summer with a maximum room temperature of 26 C.
- Complying noise levels at work place
- Draught-free vents

2.4.3 Maintenance

A maintenance program has been developed to ensure safe lock out tag out LOTO procedures are in effect when performing repairs on the equipment.

The removal, connecting and disconnecting of electrical and mechanical protective equipment or machine guarding is only permissible by qualified and trained personnel.

The relevant instructions in the operation manual must be followed.

After finishing any maintenance work, a pre-use inspection is to be carried out before restarting the equipment to ensure it has been properly installed and is safe to operate.

2.4.4 Accident/Incident Reporting

All staff has received training in the event of an accident or incident to immediately report it, to ensure proper procedures are taken and the correct emergency response is affected. There is at least one trained first aider on staff to assist in the event of an injury.

2.5 Air Quality

A third party company is hired on annual basis to conduct an internal air quality test for heavy metals and any airborne particulates that may pose a hazard.

Controls are in place to control the dust levels at all times during processing, through filters/vacuums and mechanical sweeper.

Absorption points and disposal

Basically it is absorbed as heavily as possible at the source of the emission, whereby the technical operations do not get disturbed by it.

- Structural Units
- Belt transfer points

During the processing of metal groups, which happens in multiple stages all corresponding units are encapsulated and are absorbed as much as required.

Thus avoid unnecessary high air flow rate and the emissions, the material processed in every separation stage de-dusted immediately after delivery from the shredder in a cross-current sifting, so that a load is minimized of dust in the following units.

A very high amount of air flow is set over the suction unit that is dispensed into a separate suction in the production area.

The ventilation of the production area is ensured through the circulation fans of the plant. During the processing of the metal groups which happens in multiple stages all relevant units are encapsulated and are exhausted air flows are carried over Multiconsifter, Cyclone and fine dust filter (<10mg / m3), before they are released directly through the chimney above the roof.

The disassembly area is enclosed and equipped with separate incoming air supply, which can be heated.

2.6 Technical Requirements

2.6.1 System Engineering

The machines and components being used and components offer high availability rate. That is, available of at least 85% of the possible application time shall be fulfilled. The time required for security, cleaning and inspection is also included in this.

The operation is fully automatic. And the individual stages can be carried on independent of each other. Other than the staff for material feeding, sorting personnel within the sorting cabin and container handling no other persons are required during the operation.

The systems are designed with at most low maintenance costs and low-wear. The energy consumption is minimized were reasonable and practible. That means, units that are not required should it be shutdown under permissible circumstances. The cleaning costs should be reasonable. The dust-emitting places are sealed and transfer points are exhausted.

Smooth belts with gradients more than 25 are avoided or designed as tunnel belts.

All types of servicing, inspection or cleansing are easy to accomplish. Elevated checkpoints are easily accessible by the stairs, stages or ladders and wide enough gang boards with fall protection barriers.

2.6.2 Electrical Engineering

The feeding happens with the consent of the network operator through the existing equipments and installations. If the supply is not enough it is increased accordingly.

The main segments are supplied with current through a central low-voltage distribution with sub-distribution boards. The sub-distribution boards are positioned in such a way that the cable paths are minimal. The following sub-distribution boards are provided:

The electrical engineering is equipped with suitable surge and lightning protection equipments.

An emergency power supply is not provided.

2.6.3 Control System/EDV

The individual units are controlled through an PLC for each of them.

However every plant unit features onsite-operational controls, which enable to run the units only partially or individually in manual operation.

The plant control system runs over push button panels on the switch cabinet. An operating PC or visualization is not provided.

Failure reports are acknowledged with a receipt in the on-site control cabinet to continue with the process.

2.6.4 Security System

2.6.4.1 Lock Out/Tag Out

If any inspection work or maintenance work is to be carried out, the maintenance technician will ensure a planned shutdown is scheduled and the lock out tag out procedure is followed and in place, the relevant documentation is completed and the system is tested to ensure it is properly de-energized.2.6.4.2Fire Protection.

As per The Manitoba Fire code and the Manitoba Building code the facility is equipped with a sprinkler system and portable fire extinguishers.

2.6.4.3 Explosion Control

Precautions for explosion control are generally not necessary if the input material feed is humid. However it cannot be eliminated that the metallic containers with ignitable liquids (e.g. the aerosol cans), which are not fully emptied can come into the plant. If these are opened up during the separation process, it can create an atmosphere prone to explosion. If it ignites the explosive mixture with the sparks coming out during the separation, the impact must be mitigated and achieved by the chopper that burst prevention outlets, However, the processing volume is relatively low and the possible consequences of deflagration is controllable.

The processing of dust-producing goods is carried out with special precautions with respect to explosion control.

Flowing dusts or loaded exhaust air are absorbed as quickly as possible and separated safely. This is done using Cyclone and tube filter or vibrating filter. The conveyor speed within the tubing system is at least approximately 8 m/s if a dust deposition within the tube is avoided. The air flow direction is chosen in a way that no depositions can take place within the tubes for e.g. in troughs (low points). An explosion risk is minimized by the right choice of electrical equipments. The absorption and filtering equipment have burst prevention devices on the outside. The plant is cleaned regularly to minimize dust deposition. In areas with increased dust generation, each of the electrical equipment is equipped according to the explosion protective requirements (for instance,>IP 54) of each and every explosion protective zones.

2.6.4.4 Emergency Exits

There are emergency exists in the outside as well as in secured areas. All Exits are lit to be easily identified. Staff is trained in emergency preparedness and emergency evacuation.

2.6.4.5 Emergency stop circuits

Emergency push buttons are installed at all significant places of the plant for the safety of the employees and are with-in the operators reach,

2.7 Logistics

The delivery of metal scraps and electronic equipments shipped via the appropriate site entrance. After weighing the delivery, the vehicle is directed to the shipping and receiving area. The vehicles are unloaded by forklift truck inside the plant/production area. Bulk materials are dumped and handled with wheeled loaders or forklifts in flat bin area. The tipping height is limited to the production ceilings height. After unloading, the deliverer drives out of the back exit from the site building. Weighing the returning cargo may also be done at the exit.

After the processing in the finished products are intermediately stored till the transportation is arranged. In addition storage systems will be provided, e.g. for Big-Bags.

The iron fraction produced primarily after the separation in shredder, which represents the bulk of the products, is transported to the container loading after the separation.

2.7.1 Categories of materials and containers

Because the waste is delivered or produced in different consistencies and types, different types of containers are used are maintained or handled. The following kinds of materials are used with respect to it:

- Heavy bulk products
- Packaged products
- Fine-grained products
- Metals with high bulk densities

This should be followed with the choice of internal transport vehicles. So primarily the following vehicles should be used:

- Wheel loaders
- Forklift trucks

Data sheets are attachment in appendix 6.These vehicles must be able to handle the following containers or waste:

- Bulk materials
- Mesh pallets
- Big-Bags
- Tilting containers

This is possible with the above mentioned vehicles. The respective vehicles can be also modified by using suitable attachments, e.g. the wheel loader can be equipped with fork tines etc.

Heavy trucks are required to handle bigger containers or troughs which are ordered from third parties (e.g. Container Services, etc.)

2.7.2 Storage Area

The respective qualities of the waste or the containers must be taken into account in the storage areas.

Nearby flat bins areas are placed within the facility in addition to the ones outside. Because of the storage outside, it cannot be completely ruled out that the rain water from the storage areas and driving surfaces is fully drained. For instance, the disposal generated from waste-treatment plants contained in steel waste bins may leak if there are holes in the bin. To minimize the risk, bins stored outside are required to contain no holes. All electronics are to be stored within the facility.

2.7.3 Traffic outflow

The purpose of the logistic concept is to keep the waiting time of the delivery vehicles on the site as minimum as possible. Furthermore the entrance and departure should be possible in a procession without turning or shunting maneuvers.

Therefore, an additional lane must be created on the driveway for handling of deliveries to make the weighing at the exit as simple as possible. In this regard it is significant to note that the driveway is also used for the delivery vehicles of the neighboring property.

The factual contexts are organized in a way that no overlapping traffic issues arise as much as possible. Thus the delivery or pickup trucks should ideally not have criss-crossing traffic through fares with the loaders or forklifts.

This was accomplished by having the delivery separated from the collection.

3. Building description

Exner will be renting approx. 63,000 square feet of the formally know Isoboard Plant. There are two loading docks on the facing east as well 4 large overhead doors on the south east side of the building.

4. Description of waste received

4.1 Waste products

The following wastes are to be processed in the plant:

Description	Description of the waste categories
Electrical and electronic devices (EAG) and device components	Electrical and electronic devices and device components (e.g. Home appliances and kitchen appliances, Audio and Video devices, cables and cable scraps)
Shredder fraction	Specific shredder residues from the preparation of waste metals with high proportion of scrap metal
General Scrap	Sections of plastic components, metallic production waste, metal alloys with other solid or liquid impurities
Metal alloys	Solid composites of different materials with metal contents
Wire Scrap	Metal containing wires

Table 1: Description of types of waste

It is implied that the plant input feed is not more the max. 30kg weight per piece.

Bigger pieces must be externally crushed before feeding, after an inspection and substance of concerns have been removed.

Cathode ray tube (CRT) devices are processed manually to remove the CRT and separate the glass into its components. The chassis of the TV are then fed into the mechanical processing line.

Plasma and Flat screen devices are manually processed to safely remove the mercury containing fluorescent tube. The remaining is processed mechanically for plastic, ferrous and non-ferrous metal separation.

4.2 Waste quantities

Of the above mentioned categories of waste, a maximum of 20.000 metric tonnes/annum should be processed based on an input capacity of 5 metric tonnes/hr.

The storage capacities cannot be interpreted for the daily output, because many departments and intermediary storages must be created and managed in the storage areas, which can be processed only when a sufficiently large quantity is available in certain similar types of loads, in order to process them in a cost- efficient manner.

With a loading capacity of 5-10 tones per vehicle, this corresponds to a traffic volume of approximately 7-14 vehicles is met per day or 1 vehicle per hour.

If the waste pick-up is carried out with separate vehicles, the vehicle load doubles from 1 to approximately 2 vehicles per hour.

4.3 Composition

The composition of the waste should be known for designing the individual process steps. Thus specifics parameters like particle-size distribution, bulk density and the content of the respective fractions as well as their impure or hazardous content are the deciding factors for the type of treatment.

With regards to the metal groups, there are different compositions that arise depending on the input material. This is illustrated in the following table

Thus the metallic components fluctuate often considerably depending on the type of equipment.

Details in %	Fe-Metals	NE-Metals	Plastic	Electronics	Miscellaneous
Visual display Units	8.7	1.5	8.1	19.2	62.5
Accessory devices	35.2	13.5	8.2	28.0	15.1
Telephones	5.0	16.4	37.0	32.0	19.6
Telefax machines	10.0	43.0	24.0	20.	3.0

4.3.1 Processing method

Metal groups are found primarily in electrical appliances and also in all other products containing electrical components. After the end of the product life cycle they have to be disposed accordingly. Thus an extensive recycling of the metallic raw materials is of great importance.

To be able to regain the metallic raw materials back, separation of the different materials is needed. However this can happen only after separating the composites.

Several separation steps are necessary depending on the piece size. After every separation step it must be followed by a separation of different metal kinds (Fe and Ne metals). Furthermore the other composite materials such as plastics or wood must be separated from their casings. The ultimate goal is to obtain clearly segregated groups as much as possible. While the compact metals can be separated by suitable composite method relatively easily through inductive or magnetic procedures, it does not happen very easily e.g. for cable strands. These are separated in the respective separation stages. That is, these ductile metals are deformed under the effect of mechanical forces in such a way that they can be separated as spherical agglomerates.

This is also done with thermo-plastic materials contained inside it, which are granulated into spherical forms, or palletized. But plastics with valuable contents like ABS are obviously sorted into clearly segregated factions before a separation. This can be done manually or by separation of screen after separation.

During the course of the process many intermediary products are obtained and separated into intermediate bunkers which then have to be fed into corresponding processing machine again, in order to obtain the expected degree of purity through another process cycle.

An effective dust removal process with restoration of the absorbed products containing metal components is important in processing the metal groups. Only the fine dust particles are disposed later, unless they have a high precious material content in them and they also need to be processed.

5. Description of water protection measures

5.1 General

Due to the building's condition the possibility of water pollution control is limited. However there is no sewage present in the plant, so a contamination of protected materials can possibly occur only during abnormal situations such as fire or flood.

5.2 Prevention of waste water

The sewer is controlled through holding tanks which are pumped out when required. Water is not used in the processing of waste.

5.3 Handling of water-polluting substances

Materials that are hazardous to water are arrested in the following areas or they can result from the following areas.

- Bunker Areas
- Hydraulic oils
- Cleaning and degreasing agents
- Vehicle tanks and batteries
- Extracted from hazardous materials

5.4 Water protection measures

The whole plant's operating surfaces and driving are sealed. The driving surfaces is concrete and is drained via the slope into local drainage. The operating surfaces are either concreted (15 cm of thickness) or asphalted and completely sealed. The existing floor drains are closed.

No rain water, which can dissolve or release water-polluting materials, can get into the waste. Free fluids are absorbed with binding agents if these are hazardous to water.

5.4.1 Bunker Area

Bunker areas are marked by surfaces sealed with asphalt or concrete. Some areas for different metal wastes are separated by movable wall partitions (bunkers) made of concrete.

5.4.3 Emergency spill in maintenance and storage area

In the event of an emergency spill, employees are trained in the clean up procedure. Spill kits are available in the shipping/ receiving and in maintenance area of the plant. All large storage barrels of fluids for example has a means of containment that meets regulations requirements of 110% capacity. Spill cleanups are manages as per the Workplace WHS Act and WHS Regulation.

5.4.4 Storage for water-polluting fluids

The hydraulic oil tanks of the units are to be set up in suitable troughs made of metal which can hold the volume of the biggest container. The collecting troughs are monitored regularly for leakage. This also applies for the hydraulic hose connections.

5.4.5 Water for fire-fighting

The facility is set up with a sprinkler system that is activated in the event of a fire. The system runs off town water, with additional water from a pond if required. The sprinkler system is pumped using diesel pumps that are located onsite and are inspected and tested by qualified building maintenance.

In addition the facility is equipped with portable fire extinguishers as per code.

6. Description of emissions and residues

6.1 General

All plant units are shown below with regards to possible emissions to be expected. These are valued and measures for prevention are described.

The release of exhaust air outwards happens after dust removal at <10 mg / m3 in chimney with an outlet height of approximately 10 m.

Noise bearing units (>80 dB(A)) are sound insulated or accommodated in sound- proof cabins.

The following section discussed these possible emissions:

- Waste water
- Exhaust air

- Noise
- Odor
- Gaseous emissions
- Heat
- Light
- Radiations
- Percussions/Vibrations

6.1.1 Driveway

Water dripping from the delivery vehicles: Water dripping from delivery vehicles are discharged into the local drainage when there is rain.

Noise: Noise emissions are expected from the engine uproar of the delivery vehicles. There are no working environments in this area.

Exhaust air: The combustion gases of the delivery vehicles are absorbed through open door i.e., the cascade ventilation of the processing unit and are discharged out of the building.

6.1.2 Production area

Dust: Dust may arise while handling bulk waste materials. When necessary the dust depositions will be removed with cleaning equipments.

Sewage of the treatment plant: Compressor condensates are discharged into the local drainage after treatment. Cleaning of the hall is done without using water. Other sewage does not emerge.

Exhaust air, odor and gaseous emission: Emissions come exhaust gases of the delivery vehicles, from dust with the engulfing waste and processing materials and also occasionally from softening of plastics etc. with the separation process, if the tools have worn out.

Due to the intense air circulation with the subsequent dust removal, a detection of emissions and a harmless discharge is assured.

The units are intensely exhausted. The absorbed air is de-dusted and conditioned over multiple stages according to the relevant procedure. The last step is a fine filtration (bag filters) before the purified air is delivered outwards through a chimney above the roof.

The fresh air is obtained from the outside via air intakes that are situated in a location so that they do not intake any exhausted or ventilated air from the plant. The separation units are run by strong extraction and regulated feed so that no decomposition or stripping of other gaseous form of materials. However a formation of decomposition products occur locally in the hammer mill, they are generally adsorbed to the dust particles and these are separated from them and disposed.

Noise Operational noise can be caused by the following machines or operations:

- Shredders
- Blowers
- Screening machines
- Conveyor belts
- Loading and unloading activities
- Chute activities

An effective reduction of noise level is achieved primarily by the low-noise producing construction of the units. Since in this case not all shredders could be designed as slow-speed machines, they are encapsulated systematically and surrounded with accessible sound insulation cabins to keep the noise level low. The blowers similarly encapsulated as much as needed. The dropping heights of chutes or drop shafts are reduced in a way that no excessive noise emissions are anticipated.

Furthermore an effective reduction of the noise level is attained by sealing the hall.

Waste heat: Waste heat can be generated only by thermal radiations of the units which are absorbed through the exhaust system.

Light emission: The hall and the driveways around the hall are illuminated outside with the available light sources. The lighting within the hall is not felt disturbing from the outside, especially at nights, as there's no work happening and hence not laminated.

Radiation: Generally no radiation goes out from the waste and the plant technology.

Vibration: The possible dynamic loads of the plant units are discharged into the foundation, so that no vibrations are felt outside the plant.

6.1.3 Transportation areas

The rain water falling on the transportation areas can be polluted by wastes or other contaminates. Therefore, the transportation areas are cleaned regularly in dry weather.

6.1.4 Remnants and residues

The composition of the respective waste help primarily in evaluating the remnants and residues. The composition of the waste was exemplarily given already given.

A representation of material groups is necessary for the evaluation of remnants and residues, which are separated within the context of preparation.

Thus most different material groups are produced, which are supplied to as far as all the utilizing areas and to the market.

The following are the ones:

- Fe-Metals (Ferrous metals)
- NE-Metals (Non-ferrous metals)
- Plastics
- Platinum fragments
- Glass

Material groups, which cannot be used are therefore incinerated or used in landfills:

- Plastic regrind and textile mixtures
- Mineral residues
- Wood of televisions/speaks
- Other non recyclable material

At this point, an incineration device is not intended to be installed at the Elie, MB site for the purpose of processing electronic waste. Upon a downstream approval from the recycler qualification office, Exner may use the service of an existing inclination plant.

6.1.5 Measures for prevention or utilization of residues

To treat the waste received with possibly high recovery and utilization potential. That is to bring in a large percentage into reutilization. Thereby waste is principally rejected or is supplied to the material or energetic utilization.

The quality standard is the deciding factor for the optimum utilization. However the production of the pure fractions involves high costs and energy supply which partially ruin the ecological and economic effects. Therefore on a case-by-case basis and depending on the quality of the different waste it requires a consideration with further processing.

Thus it can be more sensible to supply waste with a high percentage of usable materials (e.g., Platinum fragments) to another recycler who is better equipped or it.

6.1.5.1 Utilization of the fraction rich in heat value

The separated waste streams rich in heat value are separated from adhesions and contaminates in such a way that they can be used in an eddy current heater designed accordingly. A substitution of primary energy sources is possible by this.

6.1.5.2 Utilization of the metal factions

The purpose of the plant is to separate the metals from the different metal composites and without mixing a lot of pollutants again in the material cycle as far as possible. Primary raw materials often have to be obtained through energy-intensive processes (e.g. aluminum), can be substituted by the application of recycled materials.

6.3 Traffic Control

On the basis of evaluation in chapter 2.4.3 it was found that the traffic appears to be approx. 1-2 vehicles per hour in future for handling all the masses mentioned.

7. Safety analysis and action plan

7.1 Methodology for safety analysis

In the given case, two methods were used in order to carry out simultaneous consideration of the hazards and accident conditions, and better information on relevant accident causes and accident impact.

Scope of the safety analysis to be performed:

Only those sources of risk should be considered, which can trigger an accident or an incident on their own or in its concurrence. **The Sources of risk which can endanger merely the product quality or the production equipment are not taken into consideration.** In the safety analysis the following risk sources are considered:

- **Internal (within the plant unit) sources of risk**
- **External (outside the plant unit) sources of risk and**
- Unauthorized interventions associated with the risk sources

Not all the conceivable sources of risk need to be taken into consideration with regards to the fulfillment of responsibility as per ordinance on hazardous incidents, but only those which cannot be reasonably ruled out.

2 methods can be characterized briefly as follows:

1) **Checklists**
   Systematic inventory of potential risks and risk factors or combinations, which are significant for the safety of the plant.
2) **Hazard and risk assessments**

Examination of the individual plant units or components of the entire plant on possibilities of failure and their consequences, whereby on hand countermeasures can be taken into consideration.

7.1.2. Plant units, materials

The detailed description of the plant units is given in the project description under chapter 1 and 2, the description of the sources of risk and the presuppositions is given in tabular form under chapter 9.6.

The chemical name of the substances which could exist in the intended operation of the facility are given in the waste catalogue (see also chapter 3) under waste concepts.

7.1.3 Proper risk analysis

In the course of the following security analysis, all plant units were examined for their risk propensity. The sources of risk, effects of incidents and the ways to detect the incidents were also investigated systematically in the course of following safety analysis.

The safety analysis includes the sources of risk:

- **Internal sources of risk** (e.g., power failure, leakages, accidents in the internal transport, operating errors, etc.) are described in the tabular form in the following pages. They represent the main risk sources which can lead to the occurrence of an incident.
- **External sources of risk** (e.g., transportation in neighboring facilities or industrial plants, air traffic, etc) have limited risk sources like power failure and external risk sources due to the location and exposure of the plant area.

External natural sources of risk**:**

- Flood:
  A flood situation is not expected given the altitude of the site.
- Landslide
  The plant area lies on a leveled surface and is therefore not prone to be damages by landslide.
- Lightning
  Damages and accidents resulting along with it are prevented by lightning arrester devices.
- Earthquake
  According to map of the central institute for meteorology and geodynamics the plant location is not located in seismically active zone, which needs to be equipped with safety techniques. For this reason, the seismic hazards like earthquake were not taken into consideration.
- Tornados
  Tornados have been reported in the area in the past, early warning devices are now in place to minimize the risk of injury or fatality

Interventions of unauthorized persons can be excluded with countermeasures like fencing of the area, lockable entrance gate, access control and vigilance of the staff.

7.1.4 Material flows- flowchart

Chapter 2 refers to the representation of the complex mode of action of the processing unit.

7.1.5 Safety analysis and action plan-Table

The table shows the core of safety analysis. The building and plant units that are considered a risk and possible damages, risk sources and damaging incidents are shown in the table clearly. The measures for preventing hazardous incidents and limitation of the consequences are also mentioned in short, which are described later along with the action plans.

7.2 Action plans

7.2.1 General

The action plan provides for a plan on the safety analysis of supporting operate-specific measures for accident prevention and to minimize or eliminate the effects of incidents.

The action plan is divided as follows:

- Measures to prevent accidents
- Measures to limit the impact of accidents
- Measures to eliminate the effects and consequences of accidents
  In the following sub-points (a to j), fundamental measures or process methods are enumerated, which hold good for all plant units:
  a) **Examination of the delivered wastes and their properties as well as inspecting hazardous materials in the treatment process**
  b) **Inspection of the plant units which require safety techniques e.g., security checks, functional tests, compatibility checks, recurring inspections, leakage checks, density checks**
  c) **Maintaining the plant units and operating equipments which require safety checks in expected load (e.g., dynamic loads, temperature loads etc.) to an adequate extent. The test intervals and maintenance intervals given by the respective manufacturers need to be followed, which are administered using computers.**
  d) **Regular maintenance work**
  e) **Immediate damage repair or renovation in case of damages in plant units during operation**
  f) **Exclusive operation by authorized and trained personnel**

g) **Precautions to avoid operational errors and prevention of failure by personnel trainings and instructions especially with regards to:**
-its intended operation
-Deviations from the intended operation and hazardous incidents

h) **Documentation of incidents and outages, maintenance work and training**

Operations Log:

- **Operation of the units, in a way that the operational safety is always followed.**
- **Quality assurance of all processes concerning the susceptibility**

7.2.2 Measures to prevent accidents

7.2.2.1 Constructional measures

a) Construction on basis of volumes handled in the intended operation

b) Additional safety costs in view of high volumes

7.2.2.2 Organizational measures

a) **Inspection patrols** (visual inspection of approved waste fractions, registration of lift truck scales, sorting of hazardous waste and review)

b) Regular **patrols** by the plant staff particularly at the beginning and ending of working hours every day).

c) Repetitive **training for the staff** in dealing with the fire extinguishers and fire-fighting equipments and protective clothing.

d) **Deliveries** which **do not comply with the consensus** are rejected.

e) Use of plant units only **in provided area at the plant.**

f) **Observance of the safety regulations of the plant units and operating equipments requiring safety-techniques** with appropriate technical guidelines and regulations.

g) Speed limit on 10 km/h and one-way regulation on the driveways when required

h) **The road traffic regulations are applicable** on the **driveways** site

i) **Regular maintenance of all equipments and machines**

j) **Stocking and restocking** (e.g., after consumption in the case of damage) of binding agents for mineral oil or hydraulic oil.

7.2.2.3 Fire Safety measures

a) Structural fire prevention by use of suitable building materials, e.g., concrete

b) Containment of fire zones and additional measures for fire detection and firefighting

c) Operational fire prevention for the obstruction of a fire outbreak through organizational measures:

--Emergency planning and evacuation

--Repetitive training for the operating staff

--Fire detector

Maintaining of positive pressure in emergency stairwells

7.2.2.4 Explosion prevention measures

a) **Absorption** and subsequent removal of dust from exhaust air streams

b) Sufficient air flow rate in the directions of absorption, so that no **depositions** can be formed.

c) Dust filter systems or dust absorption systems have **burst prevention outlets mostly on the outside.**

d) Critical peripheral speeds of separation units are to be avoided and suitable discharge devices for sparks will be installed.

e) Dust-filled machines will be cleaned regularly to avoid secondary reactions, e.g., Dust deflagrations.

f) The units and their electrical equipments should be protectively maintained in hazardous areas respectively (at least IP 54)

7.2.2.5 Warning alarm and security equipments

a) Fire detector, which detects the occurrence of fires

b) Temperature sensors which switches off the concerned unit before it gets overheated.

c) Detection of belt-alignment running off-track, which helps to prevent heating up of inflammable materials by timely reaction.

d) Programmed safety shutdown in case of excess pressure differences in absorption systems.

e) Supply of power independent of network and thereby safe shut down and supply of the emergency lighting

f) Equipment of the plant with emergency-stop systems as well as emergency stop rip cords on the conveyor belts.

7.2.2.6 Measuring, controlling and regulating devices

a) Overload protection for the switch boards

b) Un-interrupted power supply of the plant control system

c) Equipment with lightning arrester systems inside and outside (Ring foundation earth etc.)

d) If conditions permit, hard-wired emergency equipments

7.2.2.7 Protection measures against unauthorized interventions

a) Construction of a relatively high fence, a lockable gate as well as putting up a sign boards

b) Training and instructing of the plant staff for being more alert during the operational hours.

7.2.3 Measures for limitation of accidents

7.2.3.1 Constructional measures

a) Fire-resistant building techniques

b) Sufficient number of emergency exits with lightning independent of electrical network and emergency exits with possibly shorted distance into the open or into another fire compartment

c) Sufficient roads to access the fire station and ring roads

7.2.3.2 Safety Equipments and technical protection measures

a) Collecting rooms for hydraulic units and oil storages and barrels

b) Supply of sufficient portable extinguishers at appropriate places

c) Fire detector in every area of the plant as per building and fire code of Manitoba

7.2.3.3 Organizational protection measures

a) Operative alarm and contingency rescue plans

b) Appointment and backup of the presence of an expert who knows the place and procedure very well for consultation of defensive operations in case of an accident

c) Identification of the plant units where safety techniques are very significant

d) Immediate availability of appropriate fire-fighting equipment

e) Provisions of personal protective gear/clothing

f) Posters of emergency phone numbers at appropriate places

g) Posters of instructions on “Things to do in case of an emergency or accident”

7.2.3.4 Fire-fighting measures

a) Continual training of all the staff on fire-fighting

b) Immediate availability of appropriate fire-fighting equipment and fire-extinguishers

c) Equipment of the administration building with a radio telephone connection for alarming the authorities responsible for general disaster relief in case of hazardous incident, which is available for use any time and protected against misuse.

d) Sufficiently wide streets and surfaces on the site for fire-fighting relief activities

e) Coordination or necessary measures with external fire-fighting forces for effective emergency planning (coordination with local fire station)

7.2.4 Measures for rescue operations

a) Supply of binding agents

b) Immediate availability of necessary mobile pumps and tubes

c) Exhaustion and absorption equipments

d) Precautions for safe temporary storage and information about the disposal of hazardous materials damaged in an incident, as well as about emerging wastes and contaminated grounds and plant units.

8. Insurance, Closure and Contingency Plan

8.1Insurance

8.1.1 Liability Insurance

Exner E-Waste will maintain a minimum of $5,000,000 liability at all times during its operation at this new facility.

8.1.2 Insurance Bond

Exner maintains an insurance bond of $200,000.00 which will be transferred from the current location in Morden to Elie.

8.1.3 Worker Compensation Board of Manitoba

Exner is registered with the workers compensation board of Manitoba. Account: 162435-2

8.2 Closure Plan & Contingency Plan

The Environment, Health and Safety Management System implemented at Exner covers the procedure for the closure and contingency plan for the company.

Appendix:

I. **Site Plan**
II. **Flowchart for Machine Process**
III. **Environment Policy**
IV. **Safety & Health Policy**
V. **Title of Ownership of Property**