Fugitive Emissions Management Plan: GET Alloys Aluminium Foundry, Parow

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Enviroprac Reference Number: GETA Parow

The Environmental Practice

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1. INTRODUCTION AND TERMS OF REFERENCE

The Environmental Practice has been appointed by GTT Alloys (Pty) Ltd (GET Alloys) to compile a Fugitive Emissions Management Plan for their aluminium alloying foundry in Beaconvale, Parow.

The Fugitive Emissions Management Plan is required to fulfil the requirements of the City of Cape Town's Air Quality Directorate and will:

a) Identify all possible sources of fugitive emissions within the site;
b) Detail the best practicable measures to be undertaken to mitigate the fugitive emissions;
c) Detail an implementation schedule;
d) Identify the person responsible for implementation of the measures.

2. DETAILS OF ENVIRONMENTAL CONSULTANTS

GET Alloys has appointed Colleen McCreadie of The Environmental Practice to compile this Fugitive Emissions Management Plan. Colleen is a registered Environmental Assessment Practitioner with EAPASA (Reg. No. 2018/166); a member of the South African branch of the International Association for Impact Assessment (IAIA); the National Association for Clean Air (NACA); and the Institute of Waste Management of South Africa (IWMSA). Colleen has over fifteen years' experience in the field of environmental management and impact assessment in South Africa.

3. SITE LOCATION

The GET Alloys facility is situated at No. 13 Glenhurst Street in the industrial area of Beaconvale, Cape Town. The facility is surrounded by industrial and commercial properties. Beyond the industrial and commercial precinct lie residential areas, including Parow East, Bishop Lavis, Elsies River and Bellville South. The closest residences are some 200m north-east of the GET Alloys facility.

Figure 1 Site Locality

Image courtesy of Google Earth 2021

4. ALLOYING PROCESS DESCRIPTION

GET Alloys undertakes a process of scrap aluminium refining through the application of heat, in order to produce aluminium alloys.

Clean scrap is delivered to site and stored in the main store. The alloying process then takes place in the foundry, where the scrap is melted in one of four oil-fired reverberatory furnaces. The melt is tested and additives are added according to customer requirements.

The melt is then poured into moulds to produce ingots,. The ingots, are cooled and then bagged and stored in the main store.

By-products of the process consist of dross. Residual aluminium is recovered from the dross that is produced during aluminium melting. The recovered ross is returned to the melt.

Figure 2 Foundry operation process flow diagram

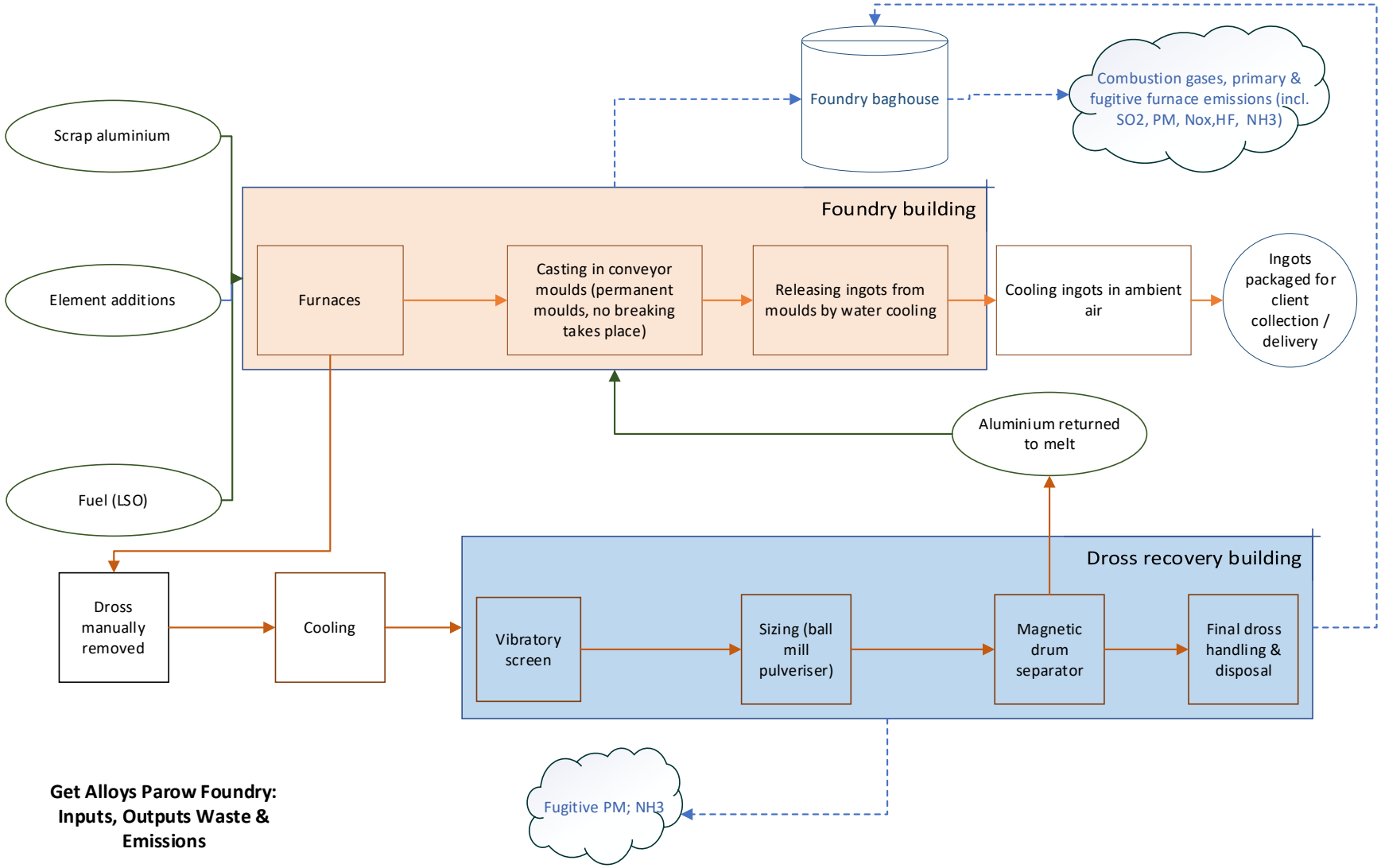
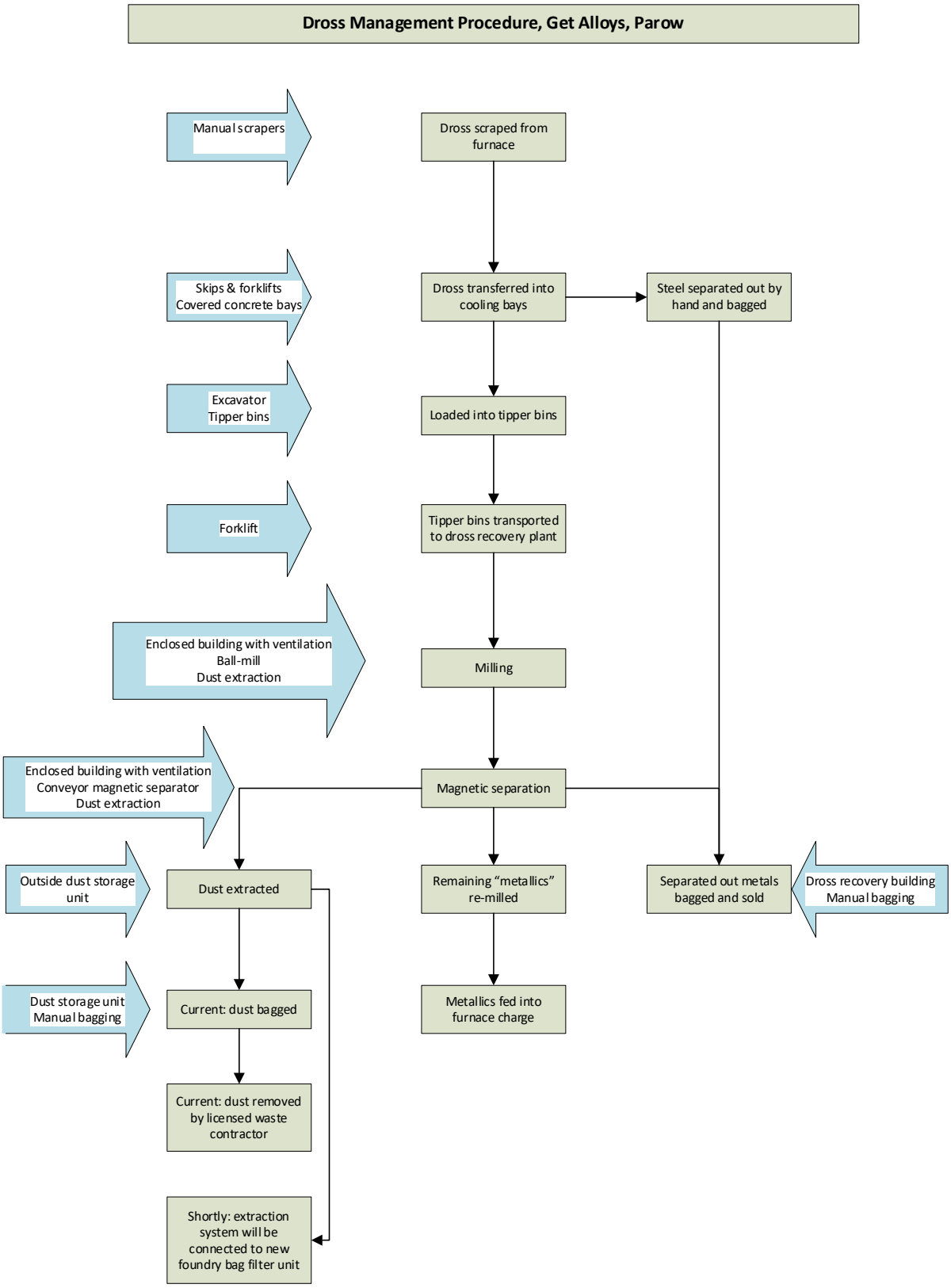


Figure 3 Dross management procedure process flow diagram



5. POTENTIAL FUGITIVE EMISSION SOURCES

Emissions associated with the alloying process include particulate matter (PM), hydrogen fluoride (HF), ammonia (NH3), and volatile organic compounds (TVOC). Combustion emissions (PM, sulphur dioxide (SO2) and oxides of nitrogen (NOx)) are also emitted. These are considered as "point source" emissions – emitted from the furnaces and generally exiting the foundry building via the chimney / stack. These emissions need to be controlled in terms of the Minimum Emissions Standards, and GET Alloys is in the process of installing an upgraded extraction system, together with a bag filter system, at the stack for emissions control.

The entire alloying operation does, however, include activities which can generate fugitive emissions, such as Particulate Matter (PM) and ammonia (NH3).

Fugitive emissions sources identified are:

5.1. The handling and storage of aluminium dross:

The dross comprises chunks of material, as well as powdered material that can be a source of windblown dust. Dross reacts slowly with water to release ammonia, hydrogen and methane - flammable gases with the potential for explosion. Fire will produce corrosive, irritating and / or toxic gases[1]. The dross therefore needs to be handled carefully, with emphasis on adequate ventilation as well as weatherproofing.

Dross management procedures in place at the Get Alloys foundry are as follows:

- Dross is scraped from the furnace melt manually and loaded into skips.
- Dross is tipped from the skips into a series of concrete bays. Bays are situated under an afdak.
- Steel chunks are separated out by hand and bagged and resold to scrap dealer.
- Cooled dross is loaded by excavator into tipper bins.
- Tipper bins are transported by forklift to dross recovery plant.
- Dross recovery plant is enclosed with suitable ventilation and dust extraction.
- Dross is milled in a ball mill. Dust is extracted to an outside unit.
- Milled dross is loaded onto a conveyor on which metals are separated out magnetically. Dust is extracted to an outside unit.
- Separated-out metals such as steel are bagged and sold as scrap.
- Remaining dross is called "metallics". Metallics is re-milled. Dust is extracted to an outside unit.

[1] https://cameochemicals.noaa.gov/chemical/19097

- Re-sized metallics is stored in the foundry building and is fed in small batches into each new furnace charge.
- Extracted dust is bagged and removed by licensed waste contractor.
- In due course, the dross recovery plant extraction system will be connected to the new foundry bag filter system (see Section 6.1).
- All dross management areas (cooling bays, recovery plant) are swept and kept clean on a continuous basis.

5.2. Fugitive emissions from the foundry building

In the event of a failure of the emissions extraction system for the foundry building and the loss of negative pressure, combustion gases and furnace emissions, including SO2, NOx, PM, HF and NH3, can escape the building doorways as fugitive emissions.

5.3. General waste storage

Any industrial facility generates general waste such as packaging and floor sweepings. The waste storage area can be dusty.

5.4. Handling of scrap aluminium input

Scrap aluminium that is delivered to site is sourced from scrap dealers and industrial facilities and will not be dust-free. The scrap comprises solid articles of varying sizes. There is a possibility that offloading the scrap at the storage area, and transporting the scrap by forklift to the furnaces, could be sources of dust. This possible dust source is considered negligible, however, and so mitigation is not required.

5.5. General manufacturing activities

Any industrial facility generates dust from overall activities. The site surfaces can become dusty.

6. MEASURES TO MITIGATE FUGITIVE EMISSIONS

6.1. Abatement system

GET Alloys' emissions abatement system is in the process of being installed. The system will consist of two main sections: the furnace hall extraction system and the bag house filter system. The system has been designed for modular deployment and future expansion.

The overall extraction system will operate with dual fans in a negative pressure system and will also include an apex extraction system.

The system is described by the designers and manufacturers, Turnkey Modular, in the section below:

Hall Fume Extraction:

Each furnace will have its own dedicated hood extraction system with additional capacity for future furnaces included. Each of the hood extraction elements will feed to a central extraction manifold where the air will serve as the primary flue gas cooling medium. Each hood includes an automated pneumatic valve system that will increase the extraction velocity whenever a furnace door is operated.

In addition to the individual furnace extraction hoods there will also be an apex extraction system that will the capture any fumes that have escape the hood system.

The dross recovery plant will be tied into the extraction and filter system.

Baghouse Filtration:

Two standard 15,000 Nm^3/h baghouse units that will operate in parallel. The system is modular and can be easily upgraded if needed. Each of the baghouse units will be equipped with 81 filtration elements offering a total filtration area of 160 m^2 per unit. The system will be equipped with a reverse pulse bag cleaning system and hopper units for dust recovery.

The filtration media will be Crosible Nomex with PTFE membrane and is used in applications operating between 200°C – 220°C.

Table 1 Filtration media summary.

CLOTH STYLE:	NX550 with PTFE membrane
Composition Felt:	Nomex with PTFE membrane
Composition Scrim:	Aramid
Weight:	550 g/m^2
Air Permeability:	2 - 5 $m^3/m^2/min$@12.7mm H2O
Finish:	Heat set & singed & Calendared. Cake side Teflon PTFE membrane
Continuous Service Temperatures:	204°C
Maximum Surge Temperatures:	240°C
Breaking Strength:	≤25% (N/5cm)-MD ≤45% (N/5cm)-CMD

Flue Gas Extraction:

Furnace flue gases will be consolidated and blended into the main extraction system. This blending ratio will ensure that gas temperatures entering the baghouse filter will be below 180° C.

The primary extraction fans will be located between the baghouse filtration and the stack. This will ensure negative pressure throughout the extraction system and the filtration of all air prior to expulsion.

A section of large non-lagged ducting will be reused to increase the dwell time of the consolidated flue gases, allowing further cooling prior to blending with the Hall Fume cooling gases and air.

System Capacities

The system will be capable of extracting 30,000 Nm^3/h air per hour and upgradable in 15,000 Nm^3/h increments. This exceeds the current requirements and would accommodate some of the shorter-term expansion options. Currently no emergency bypass stack extraction and this option has been considered.

Please see attached **Appendix A** for further design specifications

6.2. Fugitive emissions management and mitigation

Table 2 includes measures to mitigate the identified fugitive emissions, including an implementation schedule as well as who is responsible for implementation.

Table 2 Fugitive emissions management and mitigation

Fugitive emission source	Mitigation	Implementation schedule	Responsibility for implementation
Dross handling, storage and recovery	Implement dross recovery procedure	Daily checks	Production manager
	Install Turnkey Modular extraction and filter system.	By **30/04/2022**	GET Alloys senior management
	Check on correct operation of extraction and filter system.	Daily checks	Maintenance manager
	Preventative maintenance of extraction and filter system: system manufacturer to supply a Preventative Maintenance Plan for GeT Alloys' implementation	According to Preventative Maintenance Plan	Maintenance manager
Fugitive combustion and furnace emissions from foundry building	Install Turnkey Modular extraction and filter system.	By **30/04/2022**	GET Alloys senior management
	Check on correct operation of extraction and filter system.	Daily checks	Maintenance manager
	Preventative maintenance of extraction and filter system: system manufacturer to supply a Preventative Maintenance Plan for GeT Alloys' implementation	Per Preventative Maintenance Plan	Maintenance manager

Fugitive emission source	Mitigation	Implementation schedule	Responsibility for implementation
Dust from general manufacturing activities and waste storage	Sweep site daily	Daily sweeping	Production manager
	Enforce speed limit of 10km/h	Regular checks throughout the day	Production manager
	Good housekeeping to avoid difficulties with sweeping and cleaning	Regular checks throughout the day	Production manager
	Remove waste regularly to prevent build-up of dust.	Regular waste removal	Production manager
Fugitive ammonia emissions	Ensure that dross is kept weatherproof and dry throughout handling process	Daily checks	Production manager

7. RECORD KEEPING

It is recommended that, for auditing purposes, GET Alloys populates logbooks / checklists when undertaking the recommended fugitive emissions mitigation actions, such as use of the extraction and filtration system, and implementation of preventative maintenance. The relevant staff member can sign (including date and time) the logbook or checklist when completing the mitigation action.

8. COMPLAINTS INVESTIGATION AND RESOLUTION

If fugitive emission management measures are not successful, it is very likely that neighbours will complain of adverse impacts due to dust or fumes escaping. GET Alloys' complaints register should be kept updated, and any complaints should be recorded in detail. An investigation of the possible cause of the dust or escaping fumes should be documented, as well as the actions taken to resolve the complaint.

9. CONCLUSION

The GET Alloys aluminium alloying facility includes activities with the potential to emit dust and fumes. In order to avoid negative impacts on air quality and on the health and wellbeing of neighbours and staff, fugitive emissions should be prevented or mitigated.

It is anticipated that the measures recommended for fugitive emissions management are adequate to minimise potential negative impacts. Compiling records of implementing these measures, together with a thorough investigation of any fugitive emission-related complaints that may be received, will assist to determine their efficacy going forward.

Colleen McCreadie
The Environmental Practice