ROOIKAT
RECYCLING

ROOIKAT RECYCLING PLASTIC PROCESSING FACILITY

PROJECT DESCRIPTION

Abstract

Rooikat recycling is planning to establish a plastic processing facility in the Garden Route. The aim of this document is to give insight into the planned activities to ultimately recycle residential waste (80%+ plastic) and tyres

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1. Introduction

Rooikat Recycling (RR) has a passion to preserve the environment and this led Rooikat Recycling to find an environmentally responsible solution for waste processing, especially plastic and tyres.

Plastic has formed such an enormous part of our everyday life and it is hard to avoid. Landfill sites are becoming overfilled with the large amount of waste generated by households and businesses and RR believes there is a more efficient way to treat residential waste (80%+ plastic).

Waste separation and recycling projects has been successful in the Eden district, but only a small fraction of the plastic is reprocessed into other plastic goods. The majority still ends up in landfill sites. This is because the recycling of plastics is not as easy as melting everything together and making useful items. – All plastics are not created equal and the contaminants in plastics makes the processing of it challenging.

Although tyres are being recycled, most of the rubber in the tyres are unused and stored. These cannot be landfilled and there is a need to find alternative uses for these tyres.

RR has identified a method of converting plastic and shredded tyres into valuable products with minimal impact on the environment and can thus support municipalities and industries..

RR plans to construct a plastic processing plant in the Garden Route for general processing (plastic and tyres). By using processing and separation technologies, RR can process discarded plastic and recycled tyres to ultimately produce fuel (heavy fuel oil). The plastic does not have to be separated into the different types of plastic and typically non-recyclable plastics can now be converted into fuel without adding strain on the environment. The process is a closed loop system and the generated off gasses are used internally for energy production. Two products are produced, fuel and carbon black (which is a substitute for coal and can be used as a pigment).

Once the HFO production is established, it is planned to add processing steps to ultimately produce diesel.

2. Process/activity description

RR plans to construct a new processing plant with a processing capacity of 10 tons per day 20 tons per day residential plastic/tyres. The plant will first be commissioned with a 10 tons per day capacity as a pilot plant to prove and test the concept locally. This will then be later ramped up to 20 tons per day.

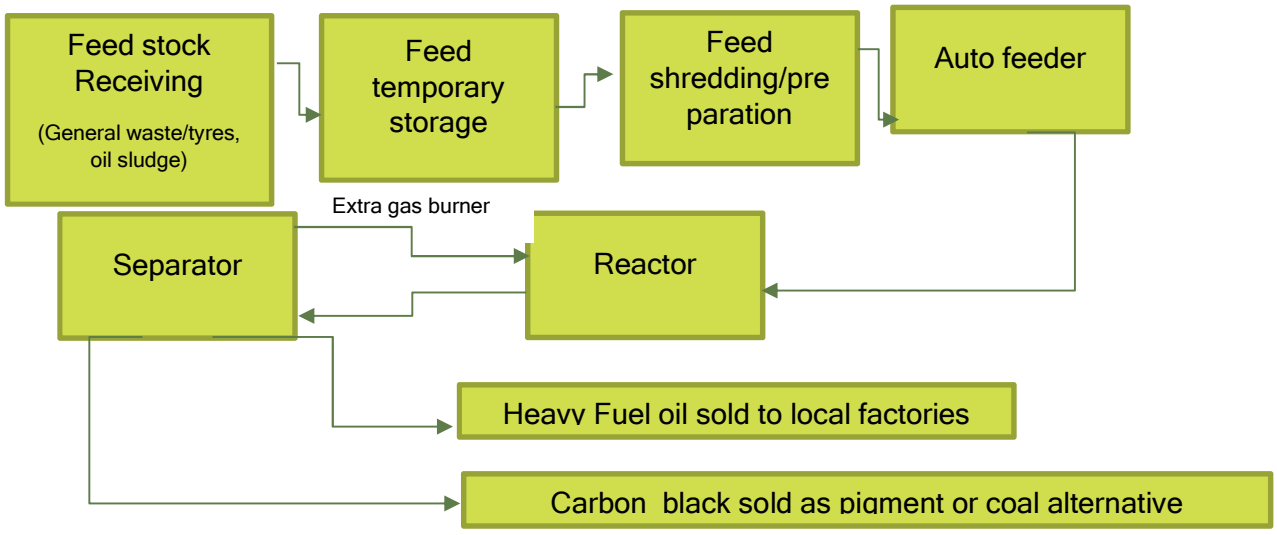
As the process and business becomes established, it is planned to expand operations. The maximum processing capacity of residential waste is estimated to be in the order of 20 000 tons per annum.

2.1 Process breakdown

Please refer to the schematic below and the section below for more detail.

Feedstock will be received at the facility. The facility will not serve as a long-term storage site, only the feed to be processed will be at the facility.

The feed will be manually loaded into the auto feeder from where it will be loaded into the reactor. The reactor will operate on the gas and HFO produced by the process. The reactor product will be cooled and separated into three streams. The gas stream will be routed to back to the reactor for energy generation and the resulting HFO and carbon black will be sold as products. The process thus has no waste streams.



2.1.1 Receiving of General waste and Hazardous waste

• All waste will be delivered to the site for processing. Loads will be weighed in order to ensure that complete batch sizes are ready for processing

• All waste made ready for process will be stored on cemented surfaces

2.1.2 Storage of waste

• Tyres will be stored in accordance to the Waste Regulations. Note that this will not be a long term storage site and that only waste to be processed will be on site.

• All waste will be stacked in skips in a central area where the stock of at least 1 – 2 days

may be accumulated.

• All general waste stored will be cleaned prior to stacking to avoid dirty run-off water forming

• All tyres to be used will be cut up into smaller pieces prior to being loaded into the reactor chamber.

2.1.3 The Process

• The reactor chamber will be loaded by a hydraulic loader to ensure a firm stacking and avoid space being underutilized.

• Heating will initially be by LP Gas or heavy fuel oil until the depolymerization process generates its own gas and fuel oil. This gas and oil will then be piped to the heating chamber and used as heating fuel.

• All off gas will pass through a water operated scrubber system to be cleaned prior to release. Due to the heat steam will be formed that will be released.

• In the condenser the gasses will be turned back to liquid to form oil .

• The system will not use flare-off to rid the system of unwanted gasses. -The gasses will be used internally for heating of the reactor but in case of emergency the off gasses will be burned.

• Carbon Black will be dumped in an underground bunker from where it will be moved mechanically to be bagged for use off site.

• Steel from the tyre casings and tins will be removed and sold off as scrap metal (should it be present).

2.1.4 Products of the Pyrolysis Process

• **Carbon Black** – will be moved from the reactor chamber into an underground bunker from where it will be mechanically lifted to be bagged/pellitized and sold off. Carbon Black is used extensively in the rubber; plastics and ink industries. It can also be sold as a coal alternative.

• **Oil/HFO** - Condensable gases are passed through the condensers and form oil. These oils are sought after as industrial or heating oil. Further processing will be required to yield high value oil or fuel. The oil will be stored temporarily in an above ground storage facility. No long term storage.

• **Steel** - The steel is the high quality steel rings that make up around 10% of the total make-up of tyres. Steel will be stored in skips on-site in a designated area for regular collection by a reputable scrap metal dealer.

• **Gases** - Condensable gases passed through the condensers and are condensed into oil. The non- condensable gases are re-routed back to the heating chamber and are used to heat the process and replace the use of LPG gas. After burning the off gas is cooled, scrubbed and released into the atmosphere.

NOTE: Gases will only be flared in the unlikely event of an emergency being detected by the computerised control system.

2.1.5 Waste Streams

• **Waste Water** – All gasses are scrubbed and will produce a sediment in the waste water on site. This sediment will be removed on a regular basis and used back into the heating process of the process. A secondary condenser will turn steam back to water that will be reused in the process. All water will follow a close looped system in order to facilitate optimal reuse practices.

• **Emissions** – The reactor combusts the fuel to supply heat to the process. These combustion gasses are identified as an emission. The fuel consumption per ton feed is estimated as follows :

Gas (internally produced): 95kg/ton of feed
HFO (product): 76kg/ton of feed

The emissions are estimated based on scientific articles (Plastics to oil report attached). It is therefor required to verify the emissions in the pilot phase of the project. For the pilot and full capacity stages of the project the fuel consumed in combustion is as follows:

The reactor will not be in full 24/h operation, heating will be done for 10 hours a day. The fuel requirements are thus as follows:

Table 1: Internal fuel consumption

	10 tons per day	20 tons per day
Gas	950 kg	1900 kg
HFO	760 kg	1520 kg

The flue gas generated will be scrubbed. The scrubber will remove the particulate matter. The emissions anticipated will be

- CO_2

- Water
- Traces of CO and particulate matter (scrubber systems will remove the praticulates)

The stationary combustion emission factors were estimated as follows:

Table 2 : Emission factors

	CO_2 (kg/ton)	CH_4 (kg/ton)	N_2O (kg/ton)
Gas (other biogas)	2751	0.252	0.00504
HFO (other bio fuel)	2181	0.274	0.01644

Based on the stationary combustion emission factors and the fuel consumption estimates, the emissions for **20 tons per day** are approximated as follows:

Table 3: Estimate emissions at a 20 ton per day processing rate

	CO_2 (kg)	CH_4 (kg)	N_2O (kg)
Gas	5226,9	0,4788	0,009576
HFO	3315,12	0,41648	0,0249888
Total (kg/day per 20ton per day processing rate	**8542**	**0,895**	**0,0346**

Note that during the initial pilot phase, the emissions will be half of the calculated values above.

• **Stormwater** – Storm water will be collected in a storm water sump with a oil separation weir to ensure no dirty water run off. All process equipment will be on cemented surfaces with sumps around them

• **Alternative electricity supply** – should the power supply from ESKOM fail, an alternative mobile generator set will provide back-up power. The cost of running such a unit is economically and environmentally acceptable

2.2 Location

The facility is planned to be constructed in the Grootbrak. The site will be in an industrial area classification zone 3. Currently there are other factories in the area. Operations in the area include a brick factory, paving manufacturer and saw mill.

The maps below aim to give the reader a better understanding of the location of the site. A portion od land owned by Mobicast will be rented on a long term lease.


Search Google Maps
See travel times, traffic and nearby places
Wolwedans residential
Grootbrakrive
Greenhaven residential
Landfill
WOLWEDANS
GREENHAVEN
Saw mill/pole yard
Grootbrak rivier town
Existing Mobicast
BERGSIG
Avondans residential
Proposed site
Rheebok stene brick factory
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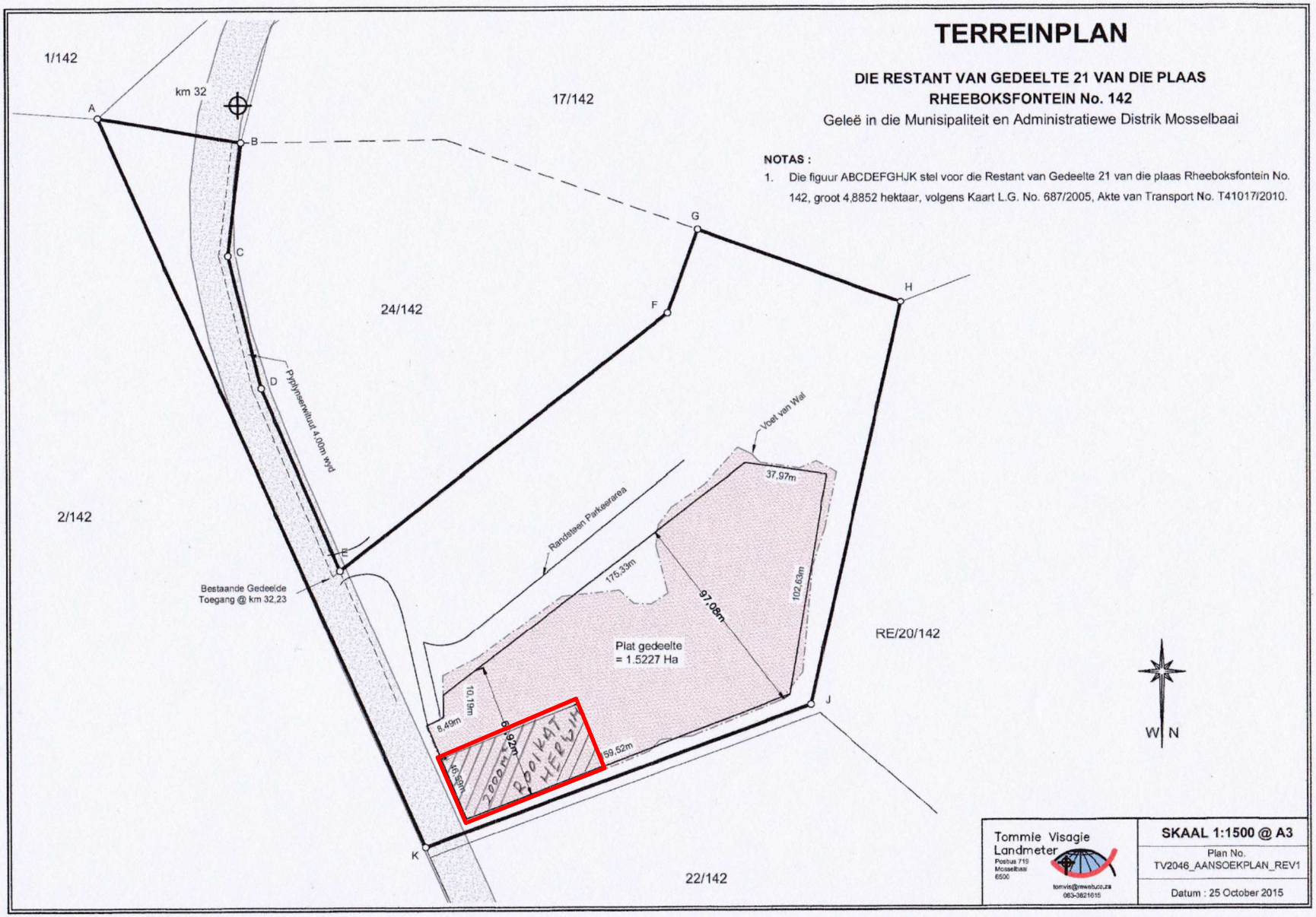
Proposed site
Rheebok stene brick factory
Map
Google
3D


Search Google Maps
See travel times, traffic and nearby places
Proposed site
2000m3
Google
Map
3D


TERREINPLAN
DIE RESTANT VAN GEDEELTE 21 VAN DIE PLAAS
RHEEBOKSFONTEIN No. 142
Geleë in die Munisipaliteit en Administratiewe Distrik Mosselbaai
NOTAS :
1. Die figuur ABCDEFGHJK stel voor die Restant van Gedeelte 21 van die plaas Rheeboksfontein No. 142, groot 4,8852 hektaar, volgens Kaart L.G. No. 687/2005, Akte van Transport No. T41017/2010.
1/142
17/142
24/142
2/142
RE/20/142
22/142
km 32
A
B
C
D
E
F
G
H
J
K
Pypliniserwituut 4,00m wyd
Voet van Wal
Randstein Parkeerarea
Bestaande Gedeelde Toegang @ km 32,23
Plat gedeelte
= 1.5227 Ha
37,97m
175,33m
97,08m
102,63m
10,19m
8,49m
59,52m
46,92m
2000m²
ROOIKAT HERWIN
W
N
Tommie Visagie
Landmeter
Posbus 719
Mosselbaai
6500
tomvis@mweb.co.za
083-3821615
SKAAL 1:1500 @ A3
Plan No.
TV2046_AANSOEKPLAN_REV1
Datum : 25 October 2015