

MEMORANDUM



SUBJECT:	ATR Plant Process Sampling & Monitoring Plan
DATE:	December 2022

INTRODUCTION

Rainbow Mountain Renewable Energy Limited (RMRE) have lodged consents for the trial of an Anaerobic Thermal Reduction Plant (ATR). Whilst this is not new technology, this process is not widely used within New Zealand and therefore RMRE have elected to apply for a 6-month consent to undertake trialling and testing of the plant to ensure it is commercially and environmentally viable. As part of the trial, RMRE will set out a Sampling and Monitoring Plan (S&MP) to test the relevant parts of the process.

The objective of the S&MP is to confirm the nature of the discharges from the ATR Plant and to prove the effectiveness of the mitigation systems installed to prevent pollutants being discharged from the process. The sampling will confirm the efficacy of each treatment stage under full-scale working conditions. Substantial investment has been made into the latest technology of emissions treatment relative to the process that will be undertaken and therefore the trial process is essentially calibrating the equipment to the optimal operating conditions of the plant.

Trials will progress from no plastics/empty reactor through to 100% known source-separated plastics (SSPs) – both homogenous and mixed, then progressing to 100% mixed automotive plastics (MAPs). The SSPs will include polyethylene, polyurethane and polypropylene. They will be trialled both as discrete fractions and mixed.

PROPOSED METHODOLOGY

An overview of the methodology is as follows:

- Sampling ports will be provided at the relevant points shown in the diagram below where either gas / oil / emissions can be captured. The exact location and physical form of monitoring ports will be confirmed prior to commissioning when the plant is installed. This will be confirmed in a final operative version of the S&MP.
- Sampling of the oil will be undertaken once during a single process from the oil condensation tanks.
- Syn-gas will be tested a number of times through a process as well as ongoing visual monitoring of the furnace where the syn-gas will be combusted.
- Emissions and Stack testing will take place throughout a trial and is likely to monitor for longer periods of up to an hour to determine consistency of emissions. This testing will be conducted post the WESP and before the exhaust gases are discharged to atmosphere.
- During the trial periods continuous ambient VOC sampling will be undertaken at a single location down wind of the ATR plant. Meteorological data will also be collected at this location.
- During plant operation trials, odours assessments will be undertaken at sensitive locations down wind of the site (FIDOL assessments).
- At this stage samples will be tested offsite through a laboratory provider such as Hill Laboratories, noting RMRE may invest in analytical equipment to allow faster results and long-term testing options.

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- Once a trial is completed, a new trial is unlikely to commence until results have been analysed and any required calibration or amendment of The Plant is undertaken.
- The S&MP will remain a live document where changes may be made during the trial period to ensure the methodology is fit for purpose.
- Reporting of results will be made available to Council on request. Any long-term consent application will include detail on the results of the sampling and monitoring.

Sampling and Data will be collected from the following key areas of the plant during the production trials.

1. Vapour - between reactor and condenser.	Hydrocarbons, halides, temperature, and volumetric flowrate
2. Post condenser – condensate	Hydrocarbons, halides, temperature, and volumetric flowrate
3. Post condenser - syngas	Hydrocarbons, halides, temperature, and volumetric flowrate
4. Post-combustion – raw exhaust	Total VOCs and combustion by products (O ₂ , CO ₂ , CO, NO _x and SO ₂), temperature and volumetric flowrates
5. Scrubbing – post cooler	Total VOCs and combustion by products (O ₂ , CO ₂ , CO, NO _x and SO ₂), temperature and volumetric flowrates
6. Scrubbing – post alkali scrubber	Total VOCs and combustion by products (O ₂ , CO ₂ , CO, NO _x and SO ₂), temperature and volumetric flowrates
7. Scrubbing – post acid scrubber	Total VOCs and combustion by products (O ₂ , CO ₂ , CO, NO _x and SO ₂), temperature and volumetric flowrates
8. Scrubbing – post electrostatic wet precipitator at the stack	VOCs, acids gases, dioxins & furans, total particulates, halides, aldehydes, PAHs, metals, sulphur dioxide, nitrogen oxides, carbon monoxide, velocity, temperature, volumetric flowrates and moisture content
9. Baghouse – carbon black handling system	Total particulates (assume total is PM ₁₀), temperature and volumetric flowrates.

The emission testing method requirements (primarily for sample locations 8 and 9) are detailed in the table below.

Parameter	Test Method	Stack test requirements
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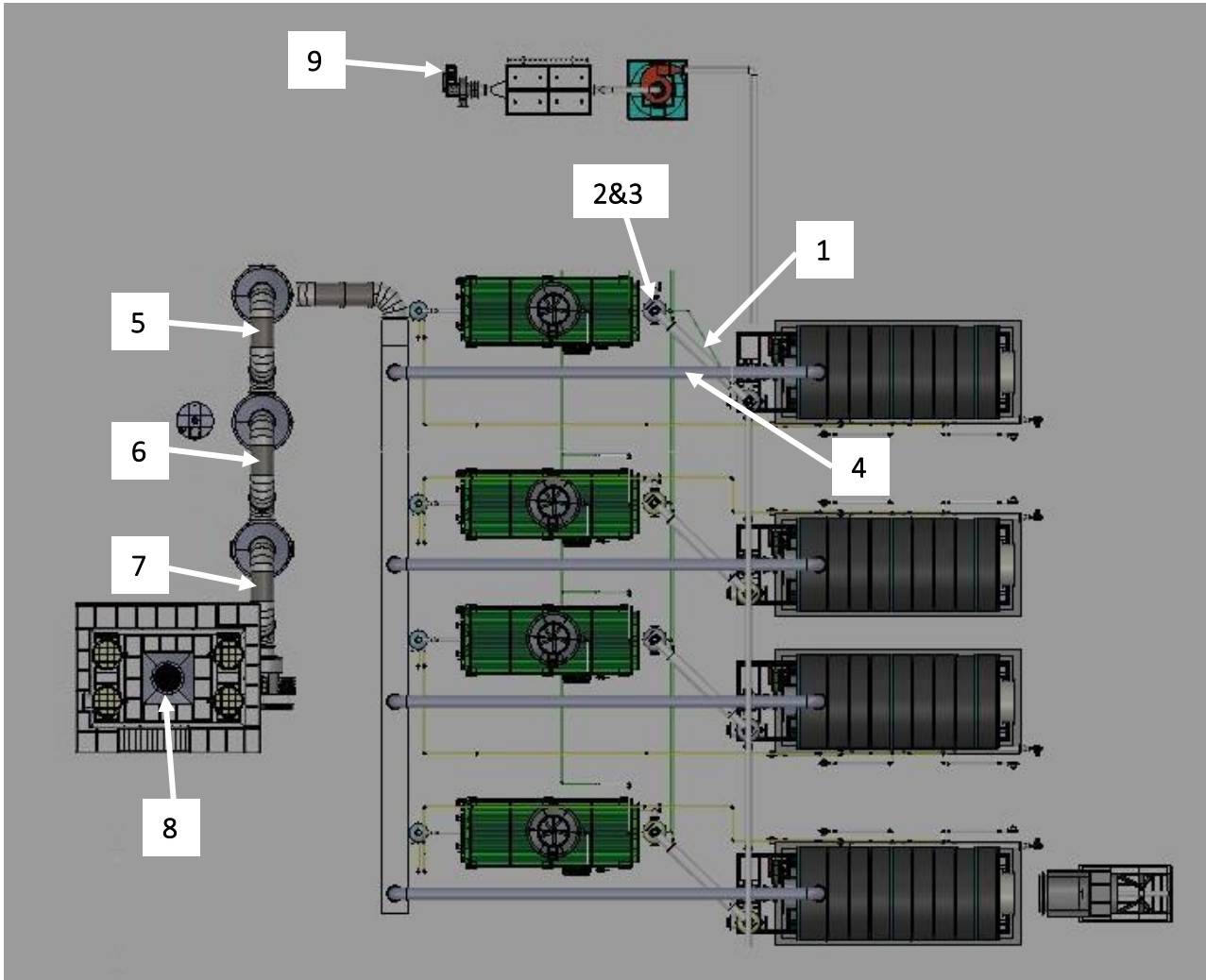


Total particulates (assume total is PM ₁₀)	USEPA Method 5	3 x 60 minutes
Halides – HCl and HF	USEPA Method 26a	3 x 60 minutes
VOC (as total organic carbon)	USEPA Method 18	3 x 60 minutes
Sulphur dioxide (SO ₂)	USEPA Method 6	3 x 60 minutes
Nitrogen oxides (as NO ₂)	USEPA Method 7c	3 x 60 minutes
CO	USEPA Method	3 x 60 minutes
Metals – Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V, Hg, Cd, Tl	USEPA Method 29	3 x 120 minutes
Aldehydes	USEPA Methods 0011	3 x 60 minutes
Poly aromatic hydrocarbons (PAH)	USEPA Method 23	3 x 120 minutes
Dioxins and Furans (as I-TEQ)	USEPA Method 23	3 x 360 minutes

Note: All emission concentrations will be express at Standard Temperature and Pressure (STP) (0 °C, 1 atmosphere), 11% Oxygen and dry gas basis.

All other sampling locations will be measured using a combination of grab samples for laboratory analysis, extractive gas analysers (PID, IR, and electro chemical), digital manometers, digital thermometers, and dataloggers.

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The MAPs are known to include PVC up to 12%wt/wt. This generates the potential to release chlorine through the ATR Plant which may result in corrosion and for chlorine to carry through to the condensate and the syngas.

There are several mitigations designed into the plant and several catalysts that can be employed to enhance the effect of those. This forms a critical part of the trial and will determine the viability of processing feedstocks containing pvc's, noting any corrosive environment or unacceptable contamination of the oil / gas outputs will terminate testing of pvc's.

In addition, RMRE is continuing consultation with our experts and the manufacturer of the plant which may result in excluding any feedstocks containing pvc's from the process at the outset.