Determination of an Application for an Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2016

Notice of decision to refuse application for a permit

The application reference number is: E3/1/157

The Applicant is: Tyregen UK Limited

The Installation is located at: Byass Works, Dock Road, Port Talbot, SA13 1RS.

Type of proposed installation: Small Waste Incineration Plant

What this document is about

This is a decision document, which explains how we have considered the Applicant's application, and why we are **refusing to issue a permit**.

We prepared a draft decision document which was open to consultation between 8th October and 2nd November 2018. We received one response from the applicant. We have considered this response and our overall decision remains unchanged. We believe we have covered all the relevant issues and have reached a reasonable conclusion.

You have a right of appeal to the Planning Inspectorate, guidance about how to do this can be found here:

https://www.gov.uk/government/publications/environmental-permit-appeal-form

Recommendation made by:

Signed :…….  **Date: 26/11/2018**

Martin Hooper – Pollution Control Officer

Recommendation approved by:

Signed :…….  **Date: 26/11/2018**

Nicola Pearce – Head Of Planning

Tyregen Limited Permit Determination

Legislative background

Local authorities by law must regulate certain types of factory and other activities. This is to reduce any pollution that they may cause and in particular to help to improve air quality.

Businesses which operate these premises must have a permit.

Local authorities decide whether to give a permit. If they do so, they must write down how the pollution is to be prevented and where this is not possible, minimised.

Some activities are called “part B” and local authorities can only deal with air pollution from them. Many different sorts of pollution are controlled at “A2” and SWIP installations. SWIP stands for Small Waste Incineration Plant.

The types of installations which require a permit are defined within the Environmental Permitting Regulations 2016 and subsequent amendments. These regulations implement certain European Community Directives e.g. the Industrial Emissions Directive (IED). These regulations fall under the Pollution Prevention and Control Act, 1999. SWIPs are “regulated facilities” under the IED.

The operator must apply for a permit and pay a fee for doing so. The fee is to cover the regulator’s costs.

The regulator must consider the application and decide whether it is “duly made”. For this to be the case, an application must include the fee, a completed application form and the necessary accompanying information. If any of these critical components are not present then the application is returned.

If the application is “duly made” then the regulator may consult relevant members of the public and other organisations.

If the regulator decides to issue a permit, it must include conditions. These conditions will say how pollution is to be prevented or minimised. The regulator must give consideration to any consultation responses and government guidance that may be available in writing permit conditions.

If a regulator decides not to issue a permit, a business can appeal to Government. A business may also appeal if it receives a permit, but does not agree with any of the permit conditions.

The specific Legislation and Guidance used in arriving at this particular decision are:

- Industrial Emissions Directive
- Environmental Permitting Regulations 2016 (as amended)
- Environmental Permitting Regulations - Schedule 13
- Environmental Permitting General Guidance Manual on Policy and Procedures for A2 and B Installations (GGM)
- Reference Document on the Best Available Techniques for Waste Incineration- August 2006 (BREF Notes)

Background

A visit to the site was conducted on 1st December 2014, at which time the plant was already installed. An application for a SWIP environmental permit was received from Egan Tyre & Plastics Recycling Limited on 19th December 2014. This application was refused on 6th January 2015 because it was considered to be not duly made as key information required in the application form was omitted.

On 20th April 2015 a second SWIP application was submitted by Egan Tyre and Plastics Recycling and the applicant was informed that it was considered to be duly made two days later. The application was refused on 6th November 2015 for a variety of reasons including inadequate operator technical competence.

The current application was received from Tyregen UK Limited on 1st May 2018. A site visit was conducted on 14th May 2018. This showed that the plant had been operated illegally (i.e. without a permit) at some previous time. There was some evidence of more recent vandalism and dumping of plastic waste from electrical cable stripping.

The application was considered to be duly made on 18th May 2018 following subsequent receipt of the application fee. The application included a request to maintain certain information in the application as confidential. On 31st May 2018 the Council rejected this request for confidentiality.

The application is for a Small Waste Incineration Plant (SWIP), in which waste tyres are pyrolysed to produce oil, char, steel and syngas. The tyres are heated in a sealed chamber (retort) in the absence of oxygen. Over time, the tyres are broken down producing a gas (syngas), some of which is used to heat the retort, the remainder being used to produce oil. At the end of the process, the retort will contain solid char, which can be used to produce carbon black, and steel from the tyre structure.

The application is for a SWIP under Schedule 13 of the Regulations i.e. the incineration of non-hazardous waste at a rate of no more than 3 tonnes per hour. The plant is designed to process approximately 20 tonnes of tyres per day in three batches.

It was considered that insufficient technical information and detail was provided in the application. Consequently, an information notice was served on the applicant on 21st June 2018 with the a minimal response received on 13th July 2018. The response is shown as Appendix 1.

Schedule 13 requires that the requirements of Chapter IV and Annex VI of the Industrial Emissions Directive (IED) are complied with. As such the requirements of article 44 of the IED must also be met. This covers matters such as the proper design, maintenance of the plant, heat recovery, minimisation of residues and the disposal of residues.

A Consultation was carried out in accordance with guidance on 22nd June. The following organisations were consulted: Natural Resources Wales, Health & Safety Executive, Local Health Board, Fire & Rescue Service and Food Standards Agency. Details were also placed on the Council website and notices were posted on lamp posts in the streets nearest the installation. A notice was also placed in the Evening Post.

Responses were received from Natural Resources Wales and Public Health Wales. Approximately 114 responses were received from members of public or public representatives. Due consideration was given to these comments in coming to the draft decision to refuse the permit, which was made on 8th October 2018.

The draft decision was advertised on the Council's website and consultations invited on the document to be made by 2nd November.

One response was received from the applicant, the content of the main document (not the appendices) is attached as Appendix 3.

The Determination Process

The Council has commissioned an assessment of the application from Martin Cranfield Associates Limited (MCAL), a consultancy with 25 years' experience in environmental permitting. The report from MCAL is attached as Appendix 2.

MCAL have shown that the emission monitoring report on the Chinese plant contained a number of apparent issues.

- The report used an out of date standard.
- The report used the wrong standard.
- Only one period of sampling was conducted, but this showed that the daily average emission limit was breached.
- The temperature for dioxin measurement is too high to permit capture of dioxins.
- The method of abatement used in the Chinese report is unknown, but the exit temperature appears to be inconsistent with the wet arrestment method used in this case.

Tyregen in their response to the draft decision stated that the plant which was tested used coal as a source of heating and not that described in the application. Tyregen supplied a stack test report for another UK based plant apparently identical to the Tyregen one. However, the stack test report clearly shows that the plant was based in China. The moisture content of the stack emissions in this case were only 3%, which does not appear to be consistent with the temperature of the scrubber liquid stated in the application.

It should be noted that the change of fuel to LPG that Tyregen propose is significantly different to that described in the permit application. There is no way that the Council can confirm whether LPG was used as a fuel in this case or whether the abatement plant is the same as in the application.

The stack test reports for aromatics, Nox and SO_2 provided by Tyregen as part of the consultation response are not legible and it is not possible to determine whether emissions are compliant.

The application is rejected as the applicant has not demonstrated that the requirements of Annex VI can be met.

The dispersion modelling is inadequate because:

- the wrong exit temperature has been used.
- the efflux velocity for the wet scrubber is probably wrong and would be inappropriate being likely to entrain pollutants resulting in localised fallout.
- nearby residences at Green Park Street have not been considered. These are only about 125 metres from the plant.

In the consultation response, Tyregen agrees with the Council's assessment of the inadequacy of the dispersion modelling provided with the application. Tyregen states that further dispersion modelling will be carried out at some future date.

The application is rejected because the dispersion modelling supplied to the Council is inappropriate and insufficient to determine the impact of emissions from the plant.

In the application, Tyregen requested a derogation to article 50 of the Industrial Emissions Directive (IED), which requires that the combustion temperature must meet 850 Celsius for 2 seconds. This was because the applicant considered that the wet arrestment system would capture all of the emissions.

However, the capture and subsequent disposal of toxic waste arising from wet arrestment contravenes Article 44(c) of the IED.

Also, as previously stated, the quoted efflux velocity of the wet abatement system is likely to entrain these pollutants in the plume, in contravention of Article 44(c) and Article 51(2).

In the consultation response to the draft decision, the applicant has withdrawn the request for a derogation, another significant change to the application.

The application is refused due to the changes to the application as described in the response to the draft decision being too substantial and should be considered as part of a fresh permit application.

In answer to the information notice, Tyregen stated that some 6.3 tonnes of syngas would need to be flared each day. However, in response to the draft decision, Tyregen now states that the amount of Syngas produced will be 350 to 700 kg, an order of magnitude less. The marked difference between these figures points to a lack of operator technical competence.

The applicant has stated that this gas will be flared, but flares are designed for the destruction of gases in an emergency scenario and not for the routine disposal of toxic waste gas.

The applicant has not demonstrated that the routine flaring of syngas will comply with the emission standards of Chapter IV and Annex VI of the IED. Consequently the application is rejected.

Question 23 of the information notice requested that the shape of the syngas combustion zone should be provided. This was not provided. In response to the draft decision, Tyregen state that there are two combustion zones. However these are not described and no information is provided about how and which burners will fire into them in each case. No details are provided about where the temperature sensors are located. Details of the internal dimensions are also required in order to verify the claim of a 3 second residence time for the combustion chamber, which is based upon a quoted volume of 4.14 m^3. This information amounts to a significant change to that provided in the application and again points to a lack understanding of the process by the applicant. It is not clear how the maintenance of a temperature of 850C in the combustion zone (around the pyrolysis retort) is consistent with the maintenance of an inner retort temperature of 200-320C, which Tyregen requires for good pyrolysis.

No evidence of conformity to CE marking or other certification (e.g. TUV) for the plant has been provided. The operator does not have an operating manual for the plant.

The application is refused on the basis that operator technical competence is considered to be inadequate.

Appendix 1 – Applicant's response to the information notice

Loku Ranasinghe,

Environmental Health Section,

Neat Port Talbot County Borough Council,

The Quays,

Brunel Way,

Baglan Energy Park,

SA11 2GG

Date: 13th July 2018

Our Ref: SOL1802TG01

Your Ref: DPR 18 AB/AQ5

Dear Mr Ranasinghe,

RE: Tyregen SWIP Application, Byass Works: Schedule 5 Further Information Notice

Further to your email dated 21st June 2018, please find our formal responses below.

1. Page 2 of SOL802TG01_CiC (CiC hereafter) mentions manufacturer training and on-site support for 6 months, but elsewhere it is mentioned that the engineer from China is at site for only 2 weeks. Please clarify.

At present it is envisaged that a representative of the Chinese manufacturer will be onsite for up to six months, though will be available for longer if considered necessary.

2. Page 3 CiC states "Any residual (heavy grade) oil is directed back to pre-pyrolysis stages for reprocessing". Similar statement is made on Page 5, but the flow chart shows this as going back to the burner. Please clarify.

All residual oil from the pyrolysis burners will now be exported offsite for further processing and recovery. This has been clarified within the updated Application Support Document provided in Annex A.

3. The oil processing part is not represented in the schematic / flow chart. Please include this / provide in a separate schematic.

Processing of the residual oil will now take place offsite, with the only onsite process being the manual removal of bitumen from the oil within the holding tank, prior to export offsite. The Application Support Document and Process Schematic have been updated to reflect this and are provided in Annex A.

4. Provide a process schematic representing the equipment and their connections (for example the ID fan mentioned in page 9).

A schematic showing the equipment set up has been provided in Annex B to this response

5. Page 4 CiC states that the pyrolyser feed mechanism will create an air seal. Again at Section 5.3 / Table 5.2 Page 40 mentions the need for airtight charging – what is the mechanism that achieves this?

The pyrolyser feed mechanism creates an air seal primarily by virtue of the compaction process during loading of the feedstock and by way of the hydroseal. During charging of the chamber both the valve on the feeder and the vapour valve into the hydroseal (at the other end of the chamber) are open. As feedstock is loaded into the chamber, air is pushed out into the hydroseal.

6. Tyres – secondary stage reduction mentions “wind separation” and cyclone dust separator. Please include these in the flow chart / schematic we have requested. Please also explain what wind separation is.

The ‘wind separation’ referred to in the secondary stage tyre reduction is to remove fibres using an industry standard piece of density separation equipment. The updated process schematic is provided in Annex C and included within the updated Application Support Document (Annex A).

7. According to Page 9 CiC, any syngas produced when plant is cooling will be flared. How often and what volumes do you expect to flare within a 24 hour period?

Tyregen expect volumes of approximately 6.3 tonnes per day of syngas to be flared during the plant cooling period which would take place over three times a day following each feedstock batch.

8. Please provide details of flare type / design and stack height for flare if used.

The flare system is a 3m3 refractory lined chamber with a fully enclosed flame.

9. Figure 1.2/Pg 17 – Site Layout, identified a recovered oil tank as externally located but page 9 contradicts this.

Locations of the other tanks are not indicated either. Please clarify and provide locations in the site layout.

Tyregen confirm that the oil tank located external to the building in the position identified on the site layout is for the holding of residual oil from the pyrolysis process, prior to its export offsite. This is within a suitably constructed bund with adequate layers of containment protection. The layout of the internal tanks has yet to be finalised, with both 7,000 litre oil storage tanks located within proximity to the pyrolysis unit. Prior to operation of the plant, a site layout detailing exactly where all tanks are located will be submitted to the Council for approval.

10. Annex G Management structure – what personal specifications (experience / qualifications) would you expect from the Plant Manager, Works Director and Health and Safety Manager? Will there be a bar against anyone with convictions for environmental offences working at the site?

The following minimum qualifications and years’ experience would be expected from the named employees:

• Plant manager – WAMITAB certification (bespoke) and 2 years industry experience (minimum);

• Works Director – WAMITAB certification, 5 years industry experience; and

• Health and Safety Manager – NIBOSHH Diploma, Registered with IOSHH, 5 years experience.

In addition, Tyregen will not directly hire any persons who have been previously convicted for any related environmental offence to work on site.

11. Burners – how is oxygen / air supply controlled?

The combustion air supply system will be monitored using automated flow sensing and measuring valves and controlled via a Siemens SCADA and PLC system. The air flow will be regulated by automated valves and increased and decreased through the use of variable speed controllers. There is also the ability to manually check the system and increase or reduce air flow accordingly.

12. Please provide a copy of the Operations Manual for the plant.

This is currently under review and finalisation. Once completed this will be immediately provided to Neat Port Talbot County Borough Council. It is suggested that this could be incorporated into the permit as a Pre-operational Condition, preventing operation of the plant prior to the Councils approval.

13. Explain choice of abatement equipment with special reference to BAT.

Please refer to Section 5 (page 34) of the updated Application Support Document which sets out the BAT appraisal for the sites technology including the abatement (packed tower scrubber) plant.

14. Table 5.1, Page 31 – the justification for relaxation / derogation – is there a technical constraint that prevents the plant form achieving 850℃/ 2 secs in the waste gases as required under Article 50 of the IED?

The purpose of seeking a derogation from the temperature and residence time 850℃ / 2 seconds constraint is that the optimum temperature for the treatment of tyres in the pyrolysis unit is 320℃. As the plant is able to me et the emission limit values set out in Chapter IV of the IED at this temperature, it is not considered necessary to raise the temperature of the plant to 850℃ at any point duri ng the process.

15. Page 32 re Article 51 – you are requesting a derogation from Article 50. It appears that what you are asking for is a relaxation / change of operating condition, and as such you are contradicting your request of pg 31, at pg 32. Please confirm amendment as necessary.

The document has been amended to reflect that the operators are seeking a derogation under Article 50 of the IED [Chapter IV time and temperature (850℃ / 2 seconds) requirements].

16. Page 34 re Former WID Art11(3) – mentions validation of residence time through combustor above 850℃. This again contradicts the r equest mentioned above. Please confirm amendment as necessary.

The document has been amended to reflect that the operators are seeking a derogation under Article 50 of the IED [Chapter IV time and temperature (850℃ / 2 seconds) requirements].

17. Page 35 re Former WID Art11(7) – you mention sampling twice a year. Are you aware that the first year of periodic tests will involve four tests a year for metals, dioxins and furans (and potentially PCBs and PAHs)?

Tyregen confirm that they are aware that the tests will be quarterly within the first year of operation before potentially lessening to twice a year based on the performance of the plant.

18. Please explain what costs you envisage with the sampling mentioned above?

Tyregen have made provisional contact with SOCOTEC, an appropriately qualified, MCERTS accredited contractor and sampling laboratory and can expect a cost of approximately £3,300 per sampling round based on SOCOTEC undertaking the works.

19. Page 36 – please explain the shut down procedure for exceedance of Continuous Emission Limits?

Should the continuous emissions limits be exceeded, the CEMS equipment alarm will automatically sound. This will allow the shut down procedure to be initiated by the operative which will shut down the draft fan, ceasing the furnace room operations and operating the flare.

20. Page 38, Section3 – mentions that the application relates only to the gasification of a fuel prepared in another activity, please clarify.

The aforementioned sentence has been removed.

21. Please explain the purpose of the hydroseal?

The hydroseal, in conjunction with the compaction feed mechanism, allows the creation of air tight space within the pyrolysis chamber after loading.

22. What will be the composition of the liquid within the abatement plant?

The scrubbing liquor within the packed tower is mains water, which is used to dissolve any acid compounds within the combustion products of the combustion chamber. These emissions are low in acid compounds and therefore not required to be pH balanced or treated with alkali reagents.

The scrubber is of a counterflow, packed tower design that is packed with ceramic media for the maximisation of contact time (and hence scrubbing efficiency) within the vessel.

The combustion gases then travel through a second scrubbing tower to maximise removal of acid gas contaminants within the final emissions.

Water from the scrubbers is collected within water tanks which is recycled back through the towers. This water is changed every 3 days with the waste water removed offsite via tanker.

23. Please explain the shape / structure of the area in which combustion of syngas takes place? (using a diagram will be preferable).

Please see diagrams of all the main equipment provided in Annex D to this response.

24. Has the carbon black met the end of waste test? If yes, please provide proof of third party certification.

As End of Waste is not required in Wales, the company has not undertaken to garner regulatory opinion in respect to the carbon black product. Prior to the sale of any product Tyregen intend to have registered the product with the REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) programme.

Should you have any further questions in relation to the above please do not hesitate to contact me.

Yours sincerely,

Matthew Peacock

Appendix 2 – Martin Cranfield Associates (MCAL) Report.

Martin Cranfield Associates Limited
Friars Gate Farm
Mardens Hill
Crowborough
East Sussex
TN6 1XH
01892 611 377

28th September 2018

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1.0 Introduction

Martin Cranfield Associates Limited (MCAL) have been requested by Neath Port Talbot County Borough Council as the Regulator for the provisions of the Environmental Permitting (England and Wales) Regulations 2016 (As amended) (the EP regulations) to review the application by Tyregen UK Limited for a Tyregen Pyrolysis Tyre Recovery Facility, with special reference to the compliant operation of the proposed regulated facility and appropriate permit conditions.

MCAL has 25 years' experience of permitting industrial installations and currently act as authorised officers for over 20 Local Authorities; this includes undertaking all their statutory duties in respect of the Environmental Permitting (England and Wales) Regulations 2016, including assessing and permitting new installations, within this are a number of applications for Small waste incineration plants and pyrolysis plants.

2.0 The proposed regulated facility

The proposed regulated facility is defined in Regulation 8 of the EPR regulations as a small waste incineration plant and as such must comply with the requirements of Schedule 13 of the EPR regulations.

Schedule 13 requires that the requirements of Chapter IV of the Industrial Emissions Directive (IED) are applied and complied with for every small waste incineration plant or co-incineration plant.

And in respect of the application for the grant of an environmental permit, that the information required by Article 44 of the IED is included. This requires that an application for a permit for a waste incineration plant or co-incineration plant shall include a description of the measures which are envisaged to guarantee that the following requirements are met:

(a) the plant is designed, equipped and will be maintained and operated in such a manner that the requirements of this Chapter are met taking into account the categories of waste to be incinerated or co-incinerated;

(b) the heat generated during the incineration and co-incineration process is recovered as far as practicable through the generation of heat, steam or power;

(c) the residues will be minimised in their amount and harmfulness and recycled where appropriate;

(d) the disposal of the residues which cannot be prevented ,reduced or recycled will be carried out in conformity with national and Union law.

(a) the plant is designed, equipped and will be maintained and operated in such a manner that the requirements of this Chapter are met taking into account the categories of waste to be incinerated or co-incinerated;

The application includes some details of the design of the plant there are however areas of the design that are missing from the application, and whilst the application states that the plant has been "designed to comply" with European CE Marking Directive, evidence in the form of certification in accordance with the Directive has not been provided.

i). Design of the plant to meet Chapter IV and Annex VI of the IED –Emission monitoring report

The applicant has included a Chinese emission monitoring report (Annex C) of extractive sampling of a pyrolysis plant operating in China. There are a number of issues with this report and its use in this application and these are set out below.

1. The report uses an out of date monitoring standard. (Method GB/T 16157-1996, superseded in 2017 by GB/T 16157-1996/XG1-2017)

2. The report uses the wrong standard. The standard used is for emission concentrations of particulate above 20mg/m^3 and not the standard to be employed if the emission concentration is less than or equal to 20mg/m^3 (HJ836 Stationary source emission-Determination of mass

concentration of particulate matter at low concentration-Manual gravimetric method.) When the concentration determined by using this standard, is less than or equal to 20mg/m^3, the determination is expressed as "<20mg/m^3"

3. Only one sampling period is reported and that exceeds the daily average emission limit value (10mg/m^3) by more than 50% and if expressed as in 2 above a 100% exceedance of the daily average emission limit. The Environment Agency's M2 guidance requires sampling to be representative and sufficient samples need to be taken to demonstrate this.

4. The gas exit temperature (106^{O}C) is above boiling point and if used with a packed tower would result in a significant steam plume. This together with a humidity of 5% indicates that this monitoring may have been undertaken from a plant fitted with an alternative abatement method. There is no description of the plant or the abatement used within the monitoring report.

5 The reported temperature at the gas meter (106^{O}C) for the Dioxin monitoring is too high for dioxin capture.

6. The temperature at exit in respect of the proposed abatement plant is stated as 25^{O}C and involves a secondary packed tower. (Section 2.7 of the application) This is not the temperature of discharge that has been used for the dispersion modelling, where the 106^{O}C has been employed taken from the SGS monitoring of the Chinese plant.

7. An efflux velocity of 20.1m/s has been employed which with a packed tower can lead to re-entrainment of droplets this together with the low exit temperature will lead to local fall out of droplets containing pollutants and acids. Secretary of state Guidance Notes for part A and B processes requires a less than 9m/s efflux velocity from wet scrubbers, as below from PG1/12 (13) Statutory Guidance for the combustion of waste wood.

> "5.37 An exception to the above is where wet arrestment is used as the abatement. Unacceptable emissions of droplets could occur from such plant where the linear velocity in the stack exceeds 9m/s.
>
> To reduce the potential of droplet emissions a mist eliminator should be used. Where a linear velocity of 9m/s is exceeded in existing plant, consideration should be given to reducing this velocity as far as practicable to ensure such droplet entrainment and fallout does not happen."

ii). the design of the combustion systems.

The operator proposes to employ a "water condenser" to recover Syngas (the pyrolised gases from the breakdown of vulcanised rubber crumb) which will pass via a manifold that can send the syngas directly to the burner chamber or pass through a water cooled condenser to condense some of the syngas into waste oil which it is intended to burn in a chamber to raise the temperature of the pyrolyser and/or sent to a tank for removal from the site, the remainder will be sent to an enclosed flare.

The volume of gases going to the flare, following a request for information notice, has been stated as 6.3 tonnes per day of syngas to be flared, this equates to 2,1 tonnes per 7tonne charge. This cannot be regarded as a minor emission which is not required to be abated or meet the combustion conditions of Article 50.

The stated 2.1 tonnes per charge is also at odds with the Mass balance set out in Section 5.2 of the application as set out below.

Table A

Mass balance (from section 5.2 of the application)		
Component	**Yield per tonne (kg)**	**Yield Per batch (kg)**
Oil	550	3850
Carbon	360	2520
Syngas	90	630
Totals	1000	7000

There are therefore 2 separate combustion processes involving the recovered waste oil and syngas, and these are considered separately.

A) The use of syngas as fuel for the heating of the pyrolysis chamber.

The syngas is intended to be used after start up and until the cooling off period when it will be flared.

This is in accordance with Article 44 (b) which looks to recover heat generated.

The applicant has asked for derogation from Article 50 in that the combustion temperature cannot meet the 850^{O}C for 2 seconds requirement on the justification that the unburnt and part combusted emissions are removed from the final exhaust and collected within the scrubber wash water. This is in direct contravention of Article 44 (c) which requires residues to be minimised in both their amount and harmfulness, and recycled where appropriate. It is also in contravention of Article 51 2 Which stats *"For waste incineration plants, the change of the operating conditions shall not cause more residues or residues with a higher content of organic polluting substances compared to those residues which could be expected under the conditions laid down in Article 50 (1), (2) and (3)."*

The syngas is not passed through any abatement system prior to combustion and therefore will contain all the decomposition products from the pyrolysis. (Pyrolysis oil typically has over 100 breakdown compounds most of these are C5–C20 hydrocarbons which include polyaromatic hydrocarbons (PAHs), polyaromatic nitrogen hydrocarbon (PANH), and polyaromatic sulphur hydrocarbons (PASHs) Predominant aromatics include benzene, a known carcinogen, toluene, xylenes, styrene, limonene, and indene. The most abundant aliphatics will include straight chain alkanes (C6–C37), with lesser amounts of alkenes High sulphur content was also identified particularly where low temperatures were employed in the pyrolysis (under 400^{O}C)).

Allowing low temperature combustion in the burners for the direct heating the pyrolysis chamber would allow unburnt hydrocarbons and sulphur compounds to be emitted, not all would be contained within the packed tower abatement plant and those that are would be a

toxic residue which would then require disposal as toxic waste, which is not in compliance with the requirements of Article 44(c) or Article 51(2)

B) Flaring of excess syngas.

The applicant has confirmed the intention of flaring syngas at a rate of 6.3 tonnes per day by combustion in a flare box, without meeting temperature or residence times required by the directive and emitting the combustion gases direct to atmosphere. The use of a flare within any industrial process is normally regarded for emergency or safety concerns only, not to dispose of excess waste, or to allow a transfer of toxic waste products to another medium.

Where a flare is employed permits would normally restrict this to such emergency or safety operations, and would look to the best practice for the emission limits from the flare, in this respect the authority would expect the operator to meet the requirements of the Environment Agency's Guidance for monitoring enclosed landfill gas flares. LFTGN05 v2 2010

This would include meeting the requirements in Table B below and meeting the temperature and residence time which should be a minimum temperature of 1,000°C and 0.3 seconds retention time, at this temperature both combustion and temperature must be monitored continuously.

Table B

Summary of emissions testing requirements for enclosed landfill gas flares **Determinand**	**Reference method**	**Sampling and analytical technique**	**Minimum testing frequency**	**Emission standard (mg/m3)b LFTGN05 v2 2010**	**Emission standard IED Ch. IV**
NOx	BS EN 14792:2005	Chemiluminescence	Annually	150	200
CO	BS EN 15058:2006	Non-dispersive infra-red analysis	Annually	50	50
Total VOCs	BS EN 12619d BS EN 13526e	Extractive sampling and flame ionisation detector analysis	Annually	10	10

As can be seen above best practice for flaring excess gases is in relative accordance with the combustion requirements and emission standards of Chapter IV of the IED and as such, there appears to be no justification for an exemption from the emission standards or from the temperature and residence time requirements of the Directive.

Article 51 (4) requires Member States to communicate to the Commission all operating conditions authorised under paragraphs 1, 2 and 3 and the results of verifications made as part of the information provided in accordance with the reporting requirements under Article 72

It should be noted that Article 51 (4) is not exercised by the regulator (Neath Port Talbot County Borough), as this Article is not listed in Schedule 13, and the reporting to the commission is the responsibility of the Welsh Government via DEFRA. Therefore the operator would need to provide verification of compliance with any different conditions and operating parameters and

these would need to be approved by Neath Port Talbot, the Welsh Ministers and subsequently DEFRA.

As Article 51 (2) requirements are not met it is unlikely the Welsh Government and subsequently DEFRA would countenance communicating such a derogation to the European Commission.

3. Conclusions

From examining the application and the subsequent notice for further information it can be stated that:-

1 It is likely that the proposed plant will not meet all of the emission standards of Chapter IV and Annex VI of the Directive.

2. A questionable exit temperature and efflux velocity has been provided and employed in the modelling which could significantly alter dispersion.

3. The requested derogation from the temperature/residence time requirements does not comply with the requirements of Article 44 (c) and Article 51 (2)

Neath Port Talbot County Borough as the Regulator for the proposed Small Waste Incineration Plant it must comply with the requirements of Schedule 13 (3) of the EP regulations. In that Neath Port Talbot County Borough must exercise its relevant functions so as to ensure compliance with the listed provisions of the Industrial Emissions Directive.

Where the Regulator considers that these requirements will not be met it must refuse the application. ((Regulation 12) (1))

In view of the above the authority can have no confidence that the proposed plant will comply with the requirements of an environmental permit, and as such is bound to refuse the application.

Appendix 3 – Tyregen response to draft decision

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Gorseinon
Swansea SA4 4BL

Martin Hooper
Pollution Control Officer
Environmental Health Section
Neath Port Talbot County Borough Council
The Quays
Brunel Way Baglan
Energy Park Port
Talbot SA11 2GG

Dear Mr Hooper

16th November 2018

Application Reference Number E3/1/157

1. Introduction

This letter and submittal refers to the application by Tyregen for a SWIP permit to operate, Application Reference Number E3/1/157, accepted 18th May 2018. In particular, it further addresses the Draft Proposal by the Environmental Health Section of Neath Port Talbot County Borough Council (hereafter stated as the Council), not to grant a permit based on the information available at the time. That information was presented in the Council's Draft Proposal as Appendix 1 Applicant's Response to Information Notice reference DPR 18 AB/AQ5 of 21st June 2018, including responses 2018 SOL1802TG01 dated 18th July 2018.

2. Tyregen Response

In providing a formal response to the Council's proposed decision, Tyregen has assembled a team of expert consultants. This consultancy team include a consultant in oil, gas, refining and petro`chemical engineer (Robert Hughes), the Carbon Free Group (a multi`disciplinary engineering and programme management consultancy), and Anchem – a scientific and consultancy services provider, with a specific expertise in emissions monitoring. Robert Hughes has joined Tyregen as Technical Advisor for Pyrolysis and Carbon Black. He has managed major projects for companies such as BP and his CV included in Appendix 11.

The following is intended as a comprehensive response to concerns set out in the Council's proposed response, to demonstrate the professional approach that Tyregen will insist upon in its operations going forward, and the competency of the team.

The main concern of the Authority related to the statements made by your consultants that the information provided lacked sufficient detail, accuracy and consistency with regard to the rate of production and composition of gas (termed SYNGAS or Pyrolysis Gas), oil (Pyrolysis Oil) and the

exhaust combustion products stream emitted to the environment. The primary reasons presented by Tyregen for this are as follows:

- such information would normally be available from an operating plant whereas the Tyregen has not been operated to the collect relevant data.
- there were apparent misinterpretations of the process flow schemes presented with the original application by Tyregen.

Tyregen has since collated additional, more precise process data from an identical pyrolysis unit operated in the UK. The Tyregen pyrolysis process is depicted in the Process Flows Scheme (Appendix 1). The data was gathered by the third party operator using this process flow scheme and from the public domain technical literature. These updated data clarify and better represent the processing profile of solid, liquid and gas products with stream rates and their compositions expected of the Tyregen facility. They are presented as Appendices 2, 4, 5 & 6 with this letter.

A full list of Appendices included here are as follows:

- Appendix 1: Process Flows Scheme
- Appendix 2: Updated Overall Material Balance
- Appendix 3: Flow Chart of Identical UK Plant
- Appendix 4: Updated Emissions Analyses and Emission Limit Values (ELVs) expected of TYREGEN facility based on recent results from an identical production plant in UK
- Appendix 5: Aromatics within ELV
- Appendix 6: NOx, SO2, HCl, HFl & Dioxins within ELVs
- Appendix 7: Stack Gas Monitoring System : Permanently Installed
- Appendix 8: Burner Details
- Appendix 9: Residence time
- Appendix 10:
- Appendix 11: Bob Hughes CV

The sections below relate to specific points raised in the Council's response, and cross`reference to further detail in an appendix where appropriate. Tyregen believe these factors should be taken into consideration when the Council makes its final decision.

Tyregen has agreed Heads of Terms on a site at Newton Down Industrial Estate, Tythegston, Bridgend. The site has planning consent for gasification uses, and Tyregen will be submitting a permit application for the site shortly, and would anticipate beginning a SWIP operation on that site around July 2019.

3. Process Flow Scheme

Referring to Appendix 2, the corrected Pyrolysis produced gas rate (350 to 700 kg per batch) is an order of magnitude less than that stated in the original application (6300 kg per batch). The corresponding production rates of the Carbon Black and Diesel Grade (Pyrolysis Oil) products are approximately 4800 and 1700 kg per batch.

4. Operating Flow and Abatement

Appendix 3 refers to an identical third party operating flow scheme with an abatement system as in the Tyregen facility. The emissions results in Appendix 4, prepared by an independent specialist environmental monitoring company, present a comprehensive report on the actual quality and components in the exhaust gas from the third party plant. The same compositions can be expected from the Tyregen abatement unit.

They are also compared with the IED permitted values and shown to be well within the standard limiting values (ELVs). This is due to the referenced UK third party operator using LPG and treated recycle Pyrolysis gas for heating rather than heating with coal. The original submittal by Tyregen was based on data from an operator / equipment vendor using coal as a heat source, which grossly adversely affected stack gas quality and flow rates.

The fuels used in the heat chambers of the Tyregen facility are confirmed similar to the third party plant, namely LPG as start`up fuel and mixed as necessary for temperature control with treated / abated recycle gas during stable operation. This is a significant change to the original application to operate which included diesel as start`up / stable operation fuel.

Exhaust gases from the combustion chamber emitted to atmosphere from stack after processing in the quench coolers and wet scrubbers abatement equipment, already installed, are therefore expected to be cleaner than the original Tyregen submittal. Emissions are expected to be similar or better than the third party operating values and meeting ELVs requirements.

The discharge values, temperature and velocity at 20^{o}C and typically 2 to 5 m/s respectively from the Tyregen plant are expected to be lower than the third Party unit which operates at a higher throughput.

5. Updated Emissions Report (Appendices 4, 5 & 6)

The result of this updated significant emissions report (Appendices 4, 5 and 6) and clarifying the Council's consultant understanding of the flow scheme regarding SYNGAS / Pyrolysis Gas recycle from the Hydroseal with the existing abatement, is that earlier conclusions drawn by Council's consultant and staff are not consistent with the expected better actual performance of the Tyregen plant. This is with regard to emissions in particular.

6. Dispersion Modelling

Tyregen does concur with the issue of dispersion of gaseous emission raised by the Council's consultant and Tyregen will run further Dispersion Modelling checks to clarify the dimensional contours of concentration profiles of stack gas components emitted to atmosphere. This is an essential aspect of Tyregen providing ample evidence that the wet scrubber abatement system installed is sufficient to meet all the ELVs required. It would also enable Tyregen to specify and install any further abatement equipment if necessary.

7. Derogation

In view of the updated data and lack of dioxins and aromatics in the exhaust gases Tyregen no longer seek derogation of the combustion / incineration standards.

8. Automatic Control and Instrumentation

Tyregen has ordered from Siemens a Progammable Logic Controller (PLC), which will control temperature and pressure throughout the plant. Fully automated from panel, this ensures a safer, more productive and more efficient plant.

9. Exhaust monitoring and continuous OnTline analysis reporting

Tyregen has engaged with a local company (Anchem) specialising in emissions regulations, sampling, and consultancy to provide regular monitoring and analytical reports of the environmental impact of the plant. TYREGEN will include an MCERTs –TUV continuous stack gas monitoring system to detect any exceedances to standards and to take appropriate corrective abatement action. This, together with the Siemens PLC combustion chamber control will form the basis of the Tyregen Emissions Management System (EMS).

10. Stack gas emissions expected from the Tyregen Plant

The monitoring analyses and results presented in Appendix 4 were gathered and collated in the UK at a plant identical to the subject Tyregen plant. They were performed by a specialist MCERT qualified monitoring company (as shown in Appendix 4), and have been carried out under the relevant MCERT standards. Tyregen have engaged with Anchem, a MCERT qualified specialist environmental and facilities monitoring company local to the Tyregen facility, with MCERT qualified technicians, to provide their services during commissioning of the Tyregen plant.

Complying with the industry directive and the requirements of the Council, Tyregen will, at the start of and during the commissioning and optimisation period of about 13 weeks, utilise Anchem to periodically sample, analyse and report on the quality of the stack gases in particular. Also, Tyregen have engaged contractually with an online stack gas analysis / monitoring company (OPSIS) to permanently install its robust state of the art technology for stack gas analyses prior to the start of commissioning. Appendix 7 refers to the MCERTs and TUV classified equipment. The DOAS type, to be confirmed as a result of the stack gas monitoring by ANCHEM during the commissioning phase, is a fully automated, online computerised sampling, analysis and reporting unit. This will be housed in weather proof cabinets located adjacent to the exhaust stack.

The following are key process and set up details and features of the proposed Tyregen facility and its EMS in addition to those presented with the original application.

Tyregen seeks to clarify the potential risk of air in the pyrolysis system and its effective mitigation which is included in the TYREGEN Process. This is an important aspect because it drives the following:

- the integrity of the equipment / plant and containment / exclusion from the working environment
- the control of process safety
- the quality of produced gas and oil streams before abatement treatment for release to the environment.

11. **PreTCommissioning:**

When the Pyrolysis machine was constructed, the Chinese engineering company completed water testing up to a temperature of 320°C. By doing this the steam purges any air from the system up to 100°C. While steaming between 100`320°C the Chinese engineers checked and identified any joint leaks, and inspected and approved the expansion joints. This enables us to completely seal the systems to prove their integrity and containments preparation for the start`up to produce pyrolysis gas. This procedure will be repeated before the next start`up.

12. Commissioning / StartTup:

A standard 13`week Commissioning, Testing and Optimising period is envisaged for the Tyregen plant. The Tyregen EMS will be implemented during this period. Any additional corrective engineering will be identified during this Commissioning period with a priority given to the assessment of the impacts of monitoring and analysing the results of stack gas quality and rates.

Dispersion modelling of stack gases using actual data from the Tyregen facility will be performed using approved software during this commissioning period.

Steel and fibres will have been removed from recycled tyres in the upstream tyre handling unit to produce a basic rubber product as raw feed to the Pyrolysis unit. This rubber content will be further processed by shredding to 5cm, then grinding in stages through 12mm to 1`4mm, followed by washing and drying to 0.5% moisture. This will be the feed stock for the pyrolysis reactor chamber charged by screw conveyor at 7 tons per batch.

Each loading will take one hour by screw conveyor, while expelling residual air from the chamber via the manifold and vapour pipe to Hydroseal. The loading door will then be closed and sealed.

13. Outline Process Description

The burners of the combustion chamber around the pyrolysis reactor will be started with natural gas to raise the temperature of its contents to 200°C. Under these conditions, there are no dioxins and furans formed as the reaction zone is oxygen free. The pyrolysis cracking sequence continues from 200°C to a maximum 320°C. This produces Syngas / Pyrolysis Gas initially as a vapour stream only. The heavier hydrocarbons partially condense as oil in the reactor outlet pipe. Condensation of oil continues in the water`cooled Condensers Section and in the rapid quench Dual Scrubber Towers followed by a section packed with ceramic rings. The treated gas stripped of contaminants and

particulates flows to the Hydroseal which produces gas for use as fuel in the burners of the heating combustion chamber operating at 950`1200^{o}C.

The Syngas / Pyrolysis Gas from the Pyrolysis chamber flows to the manifold. The manifold separates the heavy oil and lighter Syngas / Pyrolysis Gas. The heavy oil drops from the manifold into a residual tank containing around 50 litres of bitumen, which is loaded into 205 litre drums. This tank is emptied when the gauge shows it is full. Bitumen is ladled out and the heavy oil is pumped to the external 28,000 litres holding tank – this is the same tank as the product Pyrolysis Oil tank.

From the manifold, light Syngas travels up and through a 10`metre pipe entering into two water` cooled condensers. On top of the manifold there is an MPA pressure switch and a temperature gauge. The plant is run the plant under low vacuum. If for any reason the pressure gauge rises, the gas temperature is reduced until the pressure gage is zero. Normally after this it runs by working on reduced pressure. The risk of any escape of excess flammable material is thereby eliminated by this procedure.

14. Condensers

The Syngas flows in two horizontal water`cooled condensers using pumped water recycling at 2,250 litres per hour from the outdoor cooling tower and 50,000 litre water pond.

The Syngas is condensed mainly to oil continuously throughout the batch starting at 200oC to finish at 320oC. Beneath the outlet of the condensers, there are 2x7,000 litre oil holding tanks to accommodate the condensed oil from each batch. The TPO (Tyre Pyrolysis Oil), is pumped to the outside 28,000 litre bunded oil tank.

15. Hydroseal

The vapour streams leaving the 7,000 litre oil tanks may still contain 5% of the total recoverable oil which does not drop out at the Condensers because they are unable to separate the lighter hydrocarbons as liquid. At the end of the 2 oil tanks there two pipes leading to the Hydroseal, which is half full of water. The light gas bubbles through the water and any condensable oil in the gas is retained with the water.

At least 50% of the gas, which is stripped of contaminants, is recycled to the gas burners chamber to heat the pyrolysis reactor. Excess recycle gas will be compressed to storage for use in heating each subsequent batch with or without fresh gas. In infrequent abnormal short duration operations treated gas may be sent to the concealed flare.

16. **Combustion Chamber Flue Gases Abatement Plant**

From the furnace burner chamber the exhaust gas is drawn through the water`cooled condensers by the draft fan at their exit to rapidly quench the gas stream temperature from 200 to 150^{o}C. This arrangement avoids conditions, which would otherwise extend the duration of risk of dioxins forming

at elevated temperature. The temperature sensor sited at the end of the water condensers is part of the Siemens PLC logic with a trip point set at 200°C to shut down the plant and maintain its integrity by avoiding damage if the fan blades are overheated.

From the draft fan, vapours flow to a steam chamber connected to the base of the towers. They are also connected to a 1,000 litre water tank below the towers. The associated packed bed of ceramic rings acts as a filter to retain smoke particulates together with any toxins adsorbed by them. A second tower scrubber in series with the first enhances the scrubbing action.

If as a result of commissioning testing, monitoring and analysis two towers are shown to provide insufficient quench cooling and scrubbing, then Tyregen can install a third unit. In addition, if proven necessary as a result of monitoring during operation, Tyregen would install additional abatement. This would include the possibility of installing a Reverse Jet Filter Unit or by using activated carbon beds. The Chinese manufacturers advised that the temperature with the second tower should be 30% lower than the calculation by SGS on the number 1 scrubber ` which read 106°C. With the second scrubber temperature reduced by 50%, the reading would be less than 50°C exhausted to atmosphere.

17. Details of Incineration in the Heater Chambers

Tyregen has contracted with SIEMENS to provide a bespoke Programmable Logic Control system (PLC) system to monitor and supervise the combustion temperature and pressure modes of the operation together with a number of other key parameters of the process.

The Pyrolysis process inside the Pyrolysis vessel operates devoid of oxygen and at a far lower temperature, typically 320°C to 420°C, than the 850°C required by the Waste Incineration Directive. There are two combustion zones in the heating chamber beneath and surrounding the reactor. The primary combustion zone fuelled by LPG or natural gas is not subject to the temperature requirement. The abated recycle Pyrolysis gases that the process produces, however, need to be raised to a temperature of at least 850°C in the secondary combustion zone, which is located beneath the vessel. This governs the specified locations of the temperature sensors within the chamber.

The Pyrolysis process itself requires the heating of the contents, once sealed and loaded, of the vessel to a point whereby the pyrolysis reaction begins, typically, around 180°C. Once this point within the vessel is reached the thermal decomposition of the tyres begins and gas production commences. The process requires that the temperature applied to the vessel, and therefore the temperature within the furnace, remains stable. When the temperature is stable the gas supply may be reduced and the reaction may be continued by the incineration of the abated recycle Pyrolysis gases alone. Continual temperature monitoring allows for the LPG / Natural gas supply to be re`introduced at 950°C should the temperature indicate signs of decline. No waste derived fuels are used in the start`up procedure but are used to maintain temperatures above the minimum required. This allows for the temperature to be maintained and the minimum temperature of 850°C to be achieved at all times.

The flows of gases are maintained by two fans, one of which is necessary for the LPG or Natural gas feed and the second is necessary for the pyrolysis gas feed. Each can be controlled individually or in tandem and ensure that the ingress of waste gases is both controlled and homogeneous. At such times if the temperature is showing signs of decline then the LPG / Natural gas fan will start when the gas supply is ignited and the Pyrolysis gas fan may cease. This pyrolysis gas production is used to continue the heating process instead of using the natural gas supply. The fuel used initially to commence the

pyrolysis reaction is LPG or Natural gas and can burn at up to 1980°C. The CE certified gas burners, RIELLO Blown Type 866T, MODEL RS250/M MZ, maintain the heat within the chamber and requires a mixture of gas in air in the range of 2% ` 10%. It is after the introduction of air and recycle gas that the temperature is to be monitored as specified in Article 6 of Directive 2000/76/EC 'Waste Incineration Directive' (WID).

The commissioning and start up schedule will include an optimization procedure. This enables the verification phase to complete the emissions monitoring, modelling, residence time and temperature profiles and to conform with the WID, which states:

> *'Incineration plants shall be designed, equipped, built and operated in such a way that the gas resulting from the process is raised, after the last injection of combustion air, in a controlled and homogeneous fashion and even under the most unfavourable conditions, to a temperature of 850°C, as measured near the inner wall or at another representative point of the combustion chamber as authorised by the competent authority, for two seconds.*
>
> *Each line of the incineration plant shall be equipped with at least one auxiliary burner. This burner must be switched on automatically when the temperature of the combustion gases after the last injection of combustion air falls below 850°C or 1100°C as the case may be. It shall also be used during plant start-up and shut-down operations in order to ensure that the temperature of 850°C or 1100°C as the case may be is maintained at all times during these operations and as long as unburned waste is in the combustion chamber.'*

To conclude, the heater combustion chamber furnace, will start up using LPG gas only and whilst unburnt waste remains in the combustion chamber, will maintain a temperature of at least 850°C. During the process, should the temperature show signs of decline, the auxiliary burner will automatically ignite at 950°C, which will ensure that, after the last injection of combustion air the temperature will be held at the required temperature for at least two seconds. The burners are set to continue to operate until the temperature falls to 1200°C. At this which point a burner will switch off and combustion can continue using the pyrolysis gas or a mixture of it and LPG gas. Control of this will be governed by the Siemens PLC plant automation and burner management logic. The details of the gas burners are given in Appendix 8.

18. Heater Chamber Temperature Sensors Locations

The temperature will be measured at a point after the last injection of combustion air or waste gases as described below in the Defra WID guidance:`

> *Combustion gas temperature should be measured near the inner wall or another representative point in the combustion chamber as authorised by the regulator. The temperature measurement point should be located after the last injection of combustion air, including secondary air and re-circulated flue gases where carried out.*

Four temperature monitoring points will be located within the furnace and used to measure and monitor temperature performance to ensure that the requirement for the minimum temperature is achieved. During the verification phase, temperature monitoring will be used to identify the most representative position for the temperature monitoring to take place.

19. Waste gas residence time

The residence time of gases in the combustion chamber has been calculated (as shown in Appendix 9) to be more than 3 seconds at peak heating rate.

20. Liquid waste streams

Mixed organic and aqueous process stream produced at various points in the plant are recovered to a sump tank and where they will be held for batchwise collection and disposal by a certified operator.

21. Conclusion of Clarifications and Request for Review of Council's Draft Permit Proposal

This Tyregen facility offers the means of converting recycled tyres into useable product carbon black sought by the tyre manufacturers and a quality of oil in the diesel range, which can also be recycled. The process is an air`free Pyrolysis process rather than an incineration / combustion process. This eliminates the chronic environmental effects of either burning the tyres or sending to landfill. It reduces overall energy while producing recyclable products rather than waste.

Tyregen presents the further clarifications above which address those key features raised by the Council. Together with the significance of the content of the updated data presented herein, in detail, quality and relevance, TYREGEN offers this further submittal to encourages the Council to reassess its draft proposal of refusal of permit to operate and revise to grant permit to operate. We would be obliged and would appreciate the opportunity of meeting your representatives and present this and further clarification you may require in support of our application for permit to operate.

Yours sincerely,

Matty Peacock

Director