

SUSTAINABILITY & ENERGY STRATEGY: PROPOSED PLASTICS RECYCLING & PROCESSING FACILITY

GOATMILL ROAD | MERTHYR TYDFIL | CF48 3TD



PREPARED BY



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PREPARED FOR



Jayplas | Unit 15 |
Saxon Way East | Oakley Hay Industrial Estate |
Corby | NN18 9EX

REPORT NUMBER

JAY1001/SES

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-

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DRAWING SCHEDULE

Appendix No.	Title
JAY1001/04/13	Indicative Combined Heat and Power Unit Details

APPENDIX SCHEDULE

Appendix No.	Title
1	Technical Description of Indicative CHP Generator



1. INTRODUCTION

1.1.1 Jayplas, a trading name of J & A Young (Leicester) Ltd, is seeking planning permission to construct and operate a plastics recycling and processing facility on land off Goat Mill Road, Merthyr Tydfil.

1.1.2 The application site covers an area of 14.6ha and comprises a vacant, previously disturbed site situated off Goat Mill Road which is designated for employment use within The Merthyr Tydfil Replacement Local Development Plan. The site is situated within an industrial setting with an established industrial estate located to the north of the site.

1.2 THE PROPOSAL

1.2.1 The proposed development is for the construction and operation of a plastics recycling and processing facility and associated infrastructure. The proposed site, when fully operational, will accept and process c. 150,000 tonnes of plastic materials per annum with the object of recovering value from materials destined for landfill and thus reducing the amount of waste being disposed by landfill.

1.2.2 The proposal will include two industrial warehouse units with internal office accommodation which will be used for the recycling and processing of plastic materials, a reserved expansion area for a third warehouse unit, an external storage area, car parking, weighbridge, combined heat and power unit, surface water lagoon, lighting and landscaping.

1.2.3 Phase 1 of the proposed development includes a Plastics Recycling Facility (PRF) which will take in the mixed rigid plastics collected by waste collection operators, such as local authorities. The PRF then separates the plastics into different types of plastics (HDPE, PET, PP etc.) and for HDPE and PET separates further for colour. Other plastics fractions (e.g. black trays) will be segregated and baled for onward treatment at other Jayplas sites or by a third party.

1.2.4 Phase 2 of the proposed development includes the polymer wash plants. Once separated the output materials from the PRF are transferred to either the HDPE, PET or LDPE wash plants. The PET wash plant takes PET bottles etc. through a process where caps, labels and other contaminants are removed to leave food grade PET flake and pellets which are baled and either transported to another Jayplas site or sold onto the open market. The HDPE does the same function for that material. An LDPE wash plant will wash and granulate material with the end product being a plastic granulate for use in the production of new plastic film products i.e. Bags for Life as dispensed by supermarkets.

1.2.5 The closed loop cycle is a sustainable approach to materials management and will help the transition to a zero-waste ecology.

1.3 SUSTAINABILITY & ENERGY STRATEGY

1.3.1 Under the adopted proposals map, the site is located within a Heat Priority Area. Policy EcW9 District Heating states that:

“The use of combined heat and power (CHP), combined cooling heat and power (CCHP) and district heating will be encouraged.

Within the Heat Priority Areas listed below, major development will be expected to incorporate, where viable and technically feasible, infrastructure for district heating and to connect to existing systems where available. Developers should submit an energy strategy along with their application. The following are identified as Heat Priority Areas:

- ...Goat Mill Road...”

1.3.2 District heating is not considered to be viable for the proposal. The proposed development is for a recycling and processing facility rather than energy from waste for instance, therefore by-products of the proposals process do not generate heat.

1.3.3 Jayplas are proposing to include a combined heat and power unit as part of the proposed recycling and processing facility to provide power and hot water for the washing processes within Building 2.

- 1.3.4 This Sustainability and Energy Strategy has been prepared by Sirius Planning to satisfy Policy EcW9 and provide further details on the proposed combined heat and power unit within the facility.



2. SUSTAINABILITY & ENERGY STRATEGY

2.1 ENERGY STRATEGY

2.1.1 As the detailed internal plant design within each industrial warehouse is still to be confirmed, it is not possible to make an estimation of energy demand upon the site at present. However, the proposals include a combined heat and power unit which will significantly reduce the energy demands on site.

2.1.2 A more detailed review of the energy strategy for the facility will be undertaken during the detailed design of the internal plants.

ENERGY EFFICIENCY MEASURES

2.1.3 Energy efficiency can be achieved by following the energy hierarchy which can help to guide which energy efficiency measures will have the most effect. Figure 2.1 below illustrates the Energy Hierarchy.

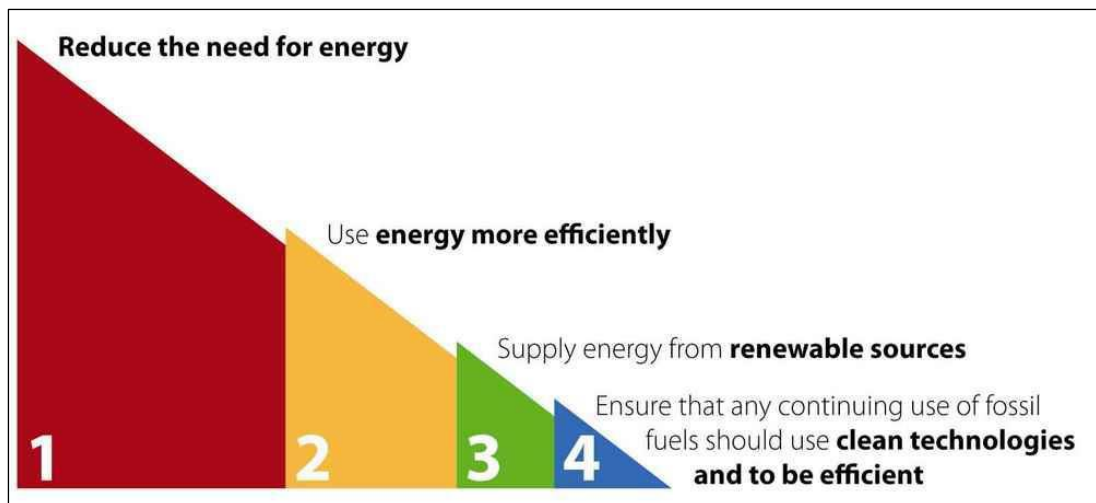


Figure 2.1: The Energy Hierarchy

2.1.4 Reduction in energy demand in the first instance can be achieved by using passive measures such as:

- Reducing air permeability and therefore heat or cool air loss. An airtight building will be more thermally efficient;
- Optimise the u-values – heat transfer coefficients of the buildings will keep heat in but also allow the buildings to remain cool in the summer; and
- Orientation of buildings to make the most of daylight.

2.1.5 Using energy more efficiently in the second instance can be achieved through the use of low-energy systems and equipment such as:

- Low energy internal and external lighting;
- Insulation should be as good as possible within the design, both in walls as well as windows to reduce solar gain during summer months; and
- Active ventilation, the use of very low extractor fans and passive ventilation system that use natural stack effect to extract air through ducts to the roof. Ventilation should be controlled by humidity sensors to reduce energy demand.

2.1.6 A passive design analysis will be undertaken for the facility to determine design measures to reduce building energy consumption and associated carbon emissions. Energy efficient appliances and measures will be integrated into the facility where feasible.

2.1.7 The use of renewable energy sources is limited due to the size of the site and minimal non-operational areas.

Combined Heat and Power Unit

- 2.1.8 Combined heat and power (CHP) is the simultaneous cogeneration of electricity and heat and is a highly efficient process that captures and utilises the heat that is a by-product of the electricity generation process. By generating heat and power simultaneously, CHP can reduce carbon emissions by up to 30% compared to the separate means of conventional generation via a boiler and power station.
- 2.1.9 The proposed combined heat and power (CHP) unit forming part of the proposed development will be located between the two buildings on site, as identified on Drawing no. JAY1001/04/06. The CHP unit comprises a gas-powered combustion engine to generator electricity whilst also capturing useable heat that is produced in the process therefore negating vast amounts of heat being wasted.
- 2.1.10 It is anticipated that the proposed CHP unit will be used for Building 2 to provide power and hot water for the washing processes. The CHP generator will connect to the heating system to provide hot water and power a self-sufficient generator via a heat exchange system.
- 2.1.11 Indicative details of the CHP generator are illustrated in Figure 2.2 below and on drawing no. **JAY1001/04/13** and the technical description of the CHP unit accompanies this Sustainability and Energy Strategy.

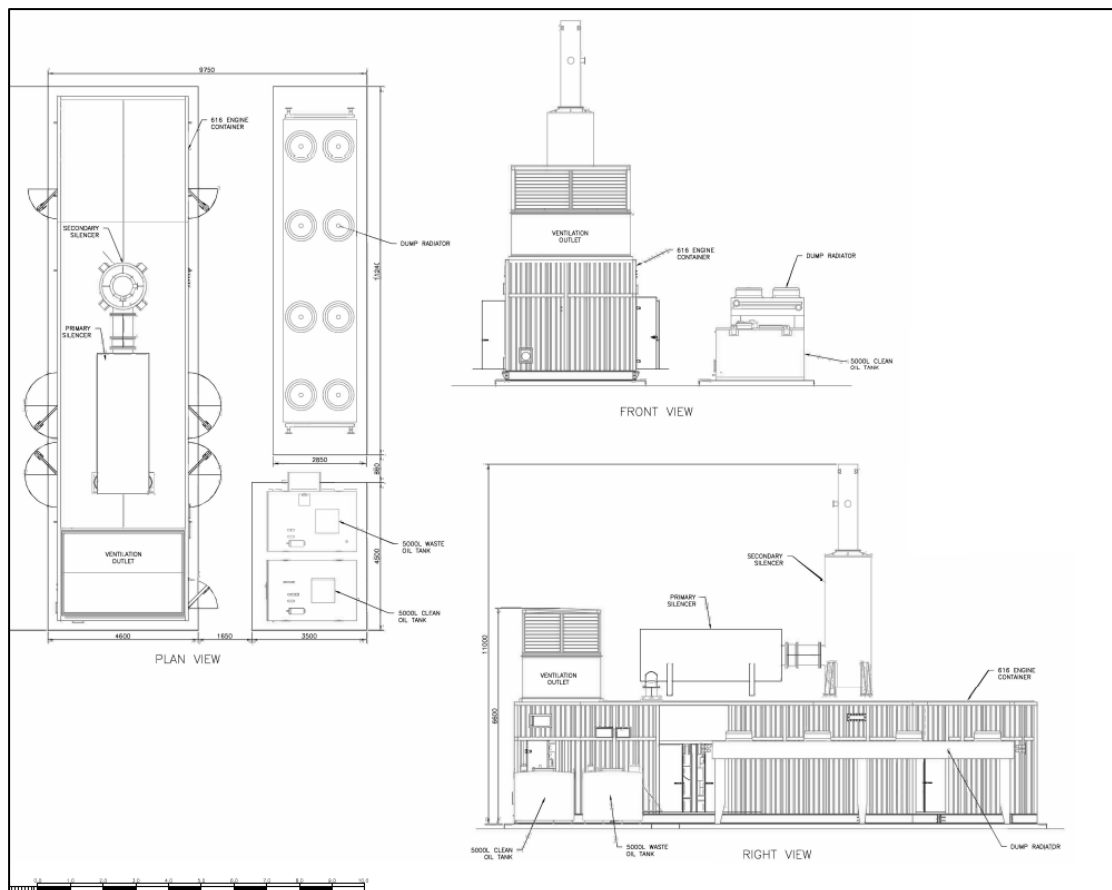


Figure 2.2: Indicative Combined Heat and Power Unit Details

- 2.1.12 At present, the CHP details are indicative as the wash plant for Building 2 has not yet been fully designed and therefore the actual required sizing and final details of the proposed CHP unit will be confirmed prior to the development of Building 2.
- 2.1.13 The unit will be fitted with effective silencers to minimise the humming noise produced by the cooling fans.

- 2.1.14 The accompanying technical and environmental appendices to this planning application assess any potential impacts from the CHP unit. Noise mitigation measures have been recommended for the CHP unit including a CHP enclosure / container and 3m high acoustic screen on the eastern side of the CHP unit. The noise assessment concludes that the proposed operation of the site, with the implementation of recommended mitigation measures, would not be significant or generate any adverse impacts. The Air Quality assessment concludes that the CHP unit would have an insignificant effect on local air quality.

CARBON SAVINGS

- 2.1.15 Once fully operational, the facility will help to reduce the carbon footprint of Wales.
- 2.1.16 The facilities operations will help reduces the carbon footprint throughout the whole lifecycle of plastics. The bulk of carbon savings comes from the 'avoided burden' of producing virgin plastics through the recycling process. In addition, the facility offsets transport and the need to export plastics externally out of the UK and disposal issues of plastics and the recycling prevents plastics being littered into oceans and the environment. It is anticipated that the facility operations will have an annual carbon saving of 155 tonnes which is equivalent to 62,249 cars being taken off the road.

2.2 SUSTAINABILITY CONSIDERATIONS

- 2.2.1 The concept of sustainable development is intended to consider the relationship between environmental, social and economic systems. Thoughtful design can increase the sustainability of the development and therefore improve the environmental performance of the development, and thus increase the quality of life for the surrounding communities.

- 2.2.2 Aspects of the proposed development which support the principles of sustainable development are listed below.

Sustainable Waste Management

Construction Waste

- 2.2.3 During construction a Site Waste Management Plan (SWM Plan) will be implemented to ensure that opportunities for reusing and recycling waste, both on and offsite are maximised. The SWM Plan will also describe the details in relation to the type and description of waste removed from site, the identity of the carrier removing waste from site, and their waste carrier registration number. It will also include details of the site the waste will be taken to, and details of its permit or exemption. Importantly, it will also include details of how the waste hierarchy; eliminate, reduce, reuse, recycle, recovery and dispose will be applied. It will set out the design and management measures to reduce waste, and the measures on site for the segregation, reuse and recycling of site gained materials. It will also include an analysis of the waste generated during the construction stage, and steps to identify lessons learnt for use on future developments to reduce waste.

Operational Waste

- 2.2.4 The proposed development will divert 150,000 tonnes of plastics from landfill each year, creating a close loop cycle and a sustainable approach to waste management that will help the transition to a zero-waste economy. In addition, the facility will provide an additional source of recycled packaging in Wales.

Previously Disturbed Site

- 2.2.5 The proposal uses a previously disturbed vacant site which is allocated for employment use within the adopted Local Development Plan therefore not requiring the take-up of greenfield land.

Transport

- 2.2.6 The sites' location provides a reasonable level of opportunity to travel sustainably.
- 2.2.7 A draft Travel Plan accompanies the planning application and demonstrates how the development will seek to promote the use of sustainable modes of transport including walking, cycling and public transport. It is intended that the Travel Plan will be further developed following discussions with the Local Authority and other relevant bodies once the site is fully operational and specific traffic needs are identified.
- 2.2.8 The draft Travel Plan contains the following provisional targets:
- No less than 15% of travel to work journeys to be undertaken by active travel (walking or cycling);
 - No less than 10% of travel to work journeys to be undertaken by public transport (bus or rail);
 - No less than 25% of travel to work journeys to include car sharing; and
 - No less than 50% of travel to work journeys to be single occupancy vehicle trips.
- 2.2.9 The measures set out in the draft Travel Plan will help to reduce the reliance on the private car, particularly single-person car trips and increase the use of sustainable forms of transport. A programme of monitoring and review will be implemented by a Travel Plan Co-ordinator to generate information by which the success of the Travel Plan can be evaluated.

Materials

- 2.2.10 In order to reduce the environmental impact associated with the specification and use of materials, as part of the detailed design Jayplas will consider specifications in terms of the quality, durability and appropriateness to the context and also the amount of embodied energy within materials. An important way that embodied impacts can be reduced is through the use of secondary materials, sources of which will be investigated as part of the design process. Wherever possible, Jayplas will also utilise recycled materials during construction.
- 2.2.11 Jayplas will also seek to source materials locally where possible, in order to reduce transportation distances. Contractors will also be sourced from the local community.

Water

- 2.2.12 A SuDS proposal for the site has been prepared for the management of surface water, ensure local water quality is not adversely affected and that the risk of flooding is not increased downstream. This includes the following:

Collect for Re-Use

- Rainwater harvesting system incorporated into Building 2 which contains the wash plants. The SAB full application will include details of the rainwater harvesting once the detailed internal design of the buildings has been finalised.

Discharge to a Surface Water Body

- Attenuation storage in a surface water lagoon with a capacity of ~8,000m³, 2.60m deep with 300mm silt allowance and 300mm freeboard with restricted discharge via a vortex flow device to watercourse.
- 2.2.13 The adoption of the proposed SuDS features for the site represents an enhancement from the current conditions as the current surface water runoff for the site is uncontrolled, untreated, unmanaged and unmitigated. A detailed surface water management scheme will be separately submitted to the SAB Authority for approval.

Lighting

- 2.2.14 An exterior lighting strategy has been prepared for the facility in order to facilitate safe working and movement within the storage yard.
- 2.2.15 All proposed lighting utilises an LED light source to avoid light sources with high UV content. Optics have carefully been selected to avoid glare and light spill as much as possible whilst achieving the required lighting levels. Columns close to ecological sensitive areas have rear shields proposed to further reduce rear light spill.

Noise

- 2.2.16 The proposed buildings are situated within the northern part of the site to be furthest away from the residential receptors to the south and west. In addition, the buildings have been positioned so that the front of the buildings face east, towards the storage yard in order to minimise any noise emissions associated with the movement of materials in and out of the buildings.

Biodiversity and Landscaping

- 2.2.17 The proposal site comprises an open mosaic of sparsely vegetated substrate, grassland and marshy grassland surrounded by broadleaved woodland plantation. Small pockets of scattered scrub, bare ground scattered trees were located centrally within the site.
- 2.2.18 The site qualifies as Open Mosaic Habitat due to the industrial history of the site and the mix of habitat present. However, detailed botanical surveys have identified that the site is in a deteriorating condition with scrub encroachment and grassland establishing across the site. Under current management, the Open Mosaic Habitat is likely to be lost to established permanent grassland and scrub.
- 2.2.19 The proposed scheme retains the majority of broadleaved woodland plantation and a significant area of grassland. Open Mosaic Habitat will be retained, managed and enhanced both in the north and south of the site. Key bat habitat features will be retained and subject to restricted lighting. A surface water lagoon will be provided as part of the proposals, giving ample opportunities for aquatic habitat creation and enhancement. Further enhancements have been proposed including the management of the retained woodland, and a bat and bird box scheme. Further details of the biodiversity and landscape proposals are contained within the Construction Landscape and Ecological Management Plan presented in Appendix E.

2.3 CONCLUSION

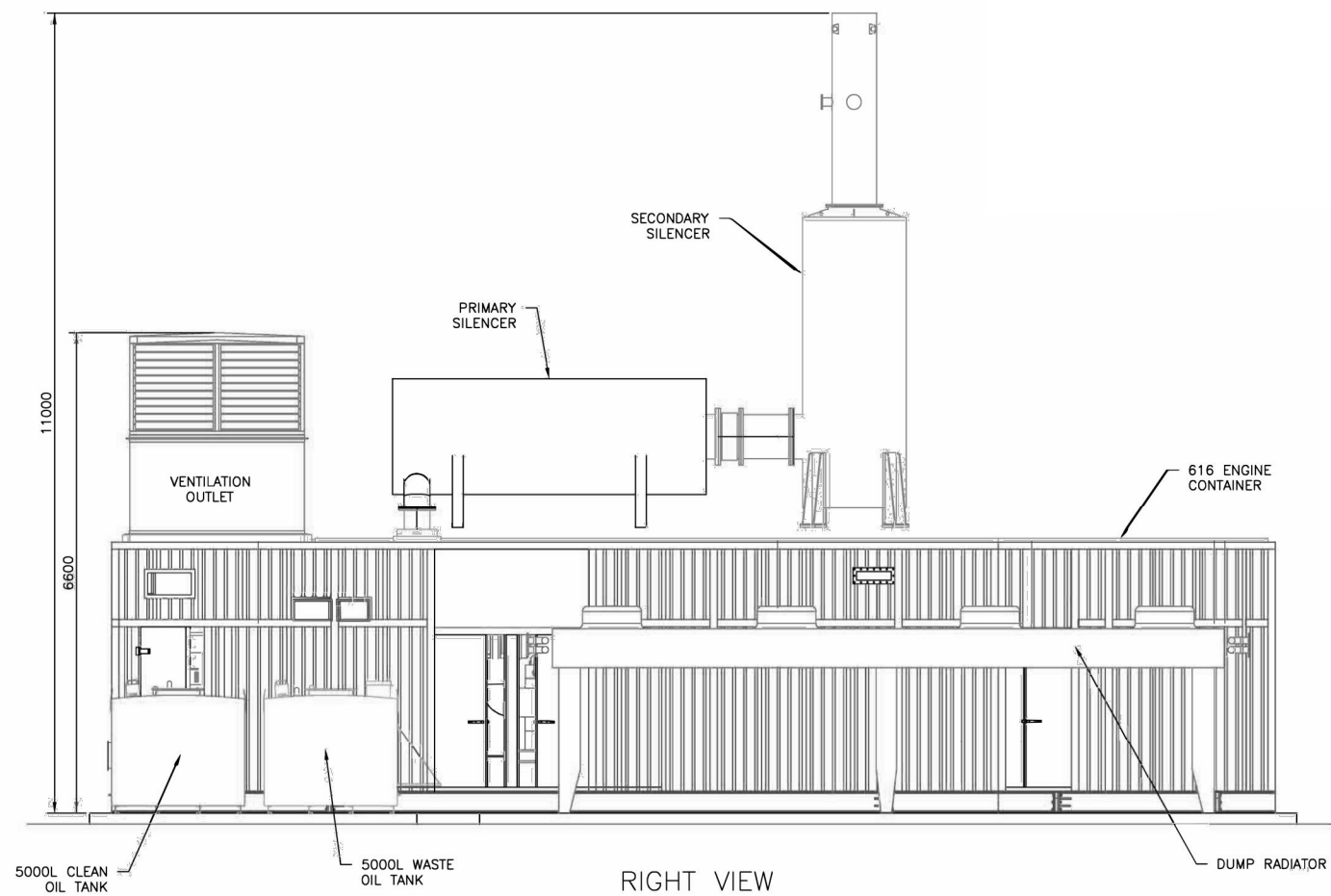
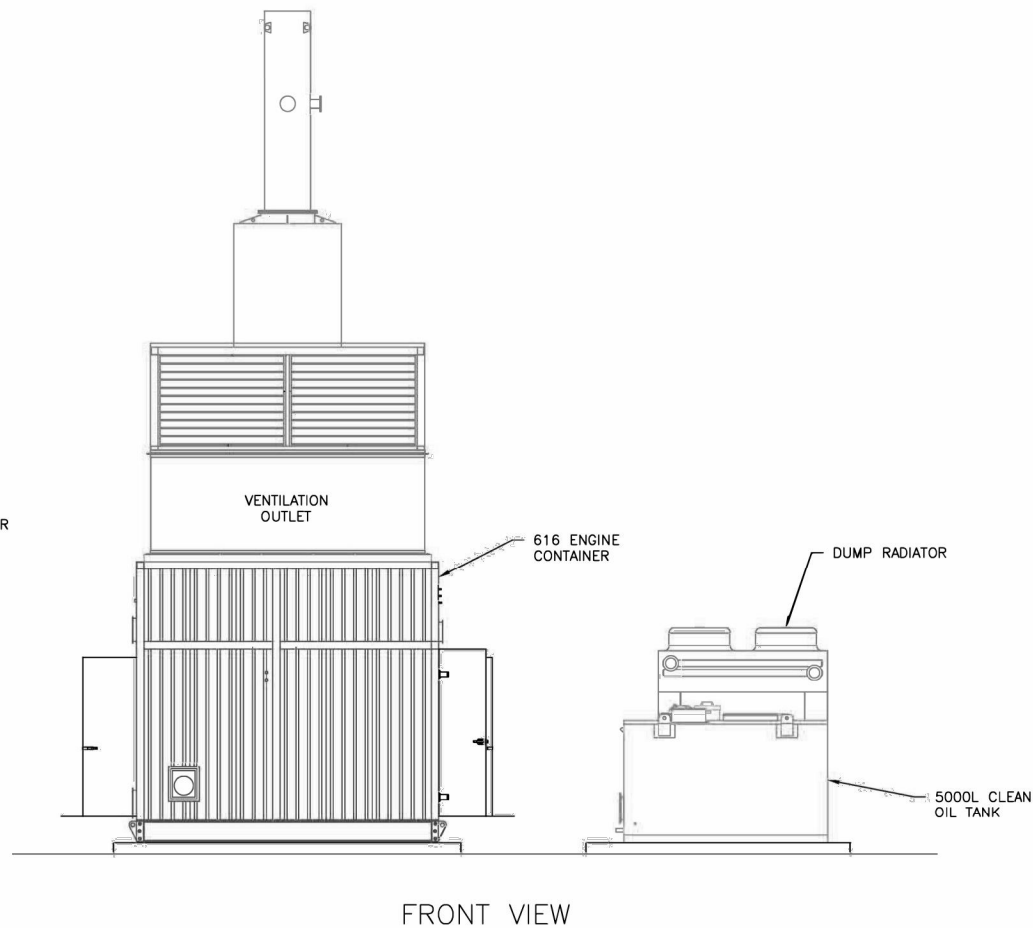
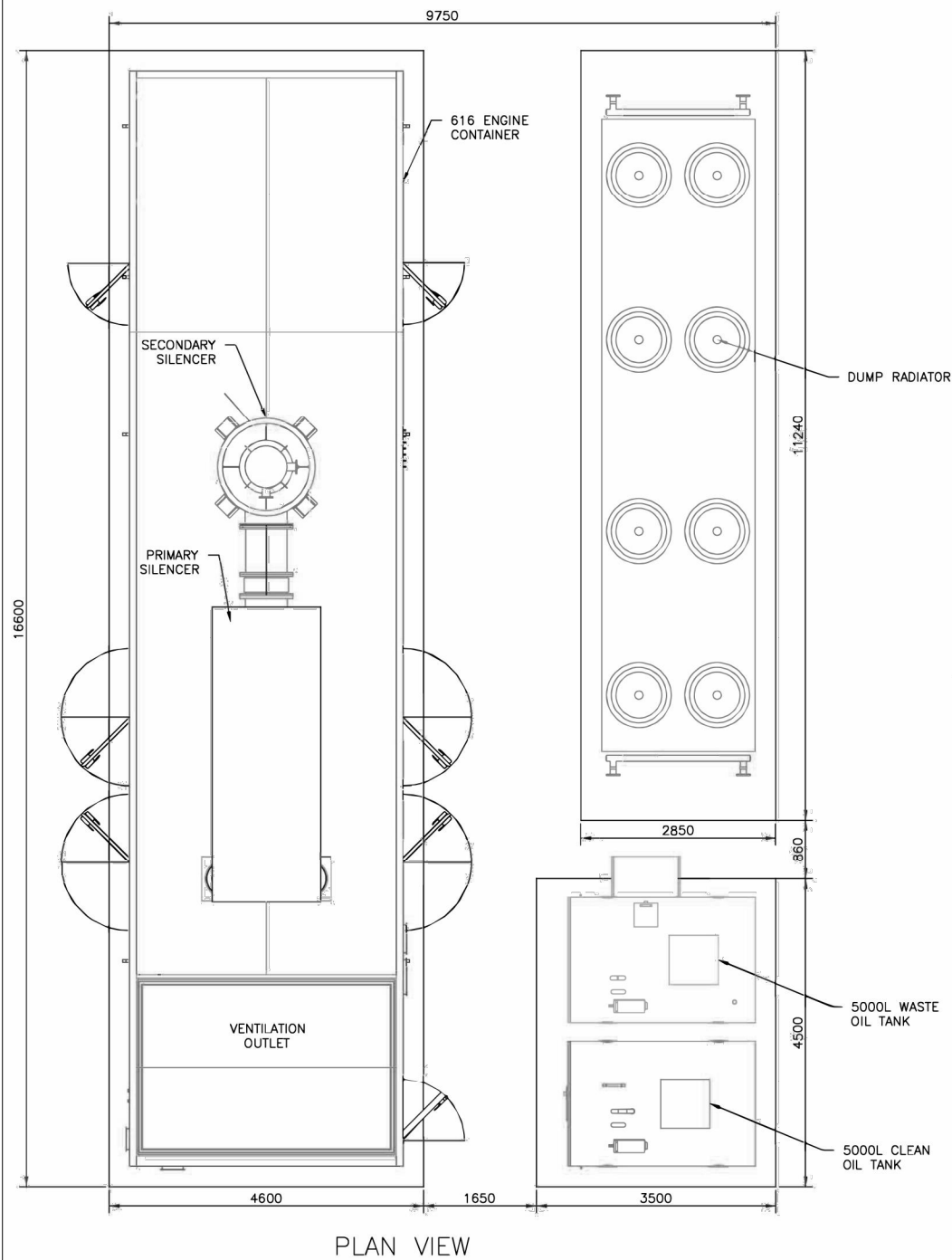
- 2.3.1 This Sustainability and Energy Strategy describes the energy efficiency measures and sustainability considerations which have been taken into account during the design of the proposed plastics recycling and processing facility.
- 2.3.2 A more detailed review of the energy strategy for the facility will be undertaken during the detailed design in the internal plants and prior to the development of the site.



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NOTES

1. ALL DIMENSIONS IN MILLIMETRES
2. DO NOT SCALE FROM THIS DRAWING.



REV	DESCRIPTION	DATE	BY
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JOB TITLE

GOAT MILL ROAD,
MERTHYR

DRAWING TITLE

COMBINED HEAT AND
POWER UNIT DETAILS

DRAWN	DATE	APPROVED	DATE
S.T	25/2/2022	F.W	25/2/2022
SCALE	SHEET	DRAWING NUMBER	REVISION
1:100	A3L	JAY1001/04/13	0

Technical Description

Cogeneration Unit JMS 616 GS-N.L

dyn. GC Profile 1 (150ms/30%)

Jayplas Merthyr



Electrical output	2676	kW el.
Thermal output	2697	kW

Emission values

NOx < 250 mg/Nm³ (5% O₂) | < 95 mg/Nm³ (15% O₂)

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0.01 Technical Data (at module)

			100%	75%	50%
Power input	[2]	kW	6,075	4,659	3,243
Gas volume	*)	Nm³/h	639	490	341
Mechanical output	[1]	kW	2,745	2,058	1,372
Electrical output	[4]	kW el.	2,676	1,998	1,319
Recoverable thermal output					
~ Intercooler 1st stage	[9]	kW	860	473	188
~ Lube oil		kW	282	238	205
~ Jacket water		kW	425	369	309
~ Exhaust gas cooled to 120 °C		kW	1,130	992	790
Total recoverable thermal output	[5]	kW	2,697	2,072	1,492
Total output generated		kW total	5,373	4,070	2,811
Heat to be dissipated (calculated with Glykol 37%)					
~ Intercooler 2nd stage		kW	131	101	64
~ Lube oil		kW	---	---	---
~ Surface heat	ca. [7]	kW	185	~	~
Spec. fuel consumption of engine electric	[2]	kWh/kWel.h	2.27	2.33	2.46
Spec. fuel consumption of engine	[2]	kWh/kWh	2.21	2.26	2.36
Lube oil consumption	ca. [3]	kg/h	0.55	~	~
Electrical efficiency			44.0%	42.9%	40.7%
Thermal efficiency			44.4%	44.5%	46.0%
Total efficiency	[6]		88.4%	87.4%	86.7%
Hot water circuit:					
Forward temperature		°C	90.0	85.4	81.1
Return temperature		°C	70.0	70.0	70.0
Hot water flow rate		m³/h	115.8	115.8	115.8
Fuel gas LHV		kWh/Nm³	9.5		

*) approximate value for pipework dimensioning

[] Explanations: see 0.10 - Technical parameters

All heat data is based on standard conditions according to attachment 0.10. Deviations from the standard conditions can result in a change of values within the heat balance and must be taken into consideration in the layout of the cooling circuit/equipment (intercooler; emergency cooling; ...). In the specifications in addition to the general tolerance of +12/-8 % on the thermal output a further reserve of +5 % is recommended for the dimensioning of the cooling requirements.

Main dimensions and weights (at module)

Length	mm	~ 8,300
Width	mm	~ 2,200
Height	mm	~ 2,800
Weight empty	kg	~ 30,500
Weight filled	kg	~ 31,500

Connections

Hot water inlet and outlet [A/B]	DN/PN	150/10
Exhaust gas outlet [C]	DN/PN	600/10
Fuel Gas (at module) [D]	DN/PN	100/10
Water drain ISO 228	G	½"
Condensate drain	DN/PN	65/10
Safety valve - jacket water ISO 228 [G]	DN/PN	2x1½"/2,5
Safety valve - hot water	DN/PN	50/16
Lube oil replenishing (pipe) [I]	mm	28
Lube oil drain (pipe) [J]	mm	28
Jacket water - filling (flex pipe) [L]	mm	13
Intercooler water-Inlet/Outlet 1st stage	DN/PN	100/10
Intercooler water-Inlet/Outlet 2nd stage [M/N]	DN/PN	65/10

Output / fuel consumption

ISO standard fuel stop power ICFN	kW	2,745
Mean effe. press. at stand. power and nom. speed	bar	22.00
Fuel gas type		Natural gas
Based on methane number Min. methane number	MZ	70 70 d)
Compression ratio	Epsilon	11.5
Min. fuel gas pressure for the pre chamber	bar	4.29
Min./Max. fuel gas pressure at inlet to gas train	bar	4.1 - 8 c)
Max. rate of gas pressure fluctuation	mbar/sec	10
Maximum Intercooler 2nd stage inlet water temperature	°C	45
Spec. fuel consumption of engine	kWh/kWh	2.21
Specific lube oil consumption	g/kWh	0.20
Max. Oil temperature	°C	~ 80
Jacket-water temperature max.	°C	~ 95
Filling capacity lube oil (refill)	lit	~ 648

c) Lower gas pressures upon inquiry

d) based on methane number calculation software AVL 3.2 (calculated without N2 and CO2)

0.02 Technical data of engine

Manufacturer		JENBACHER
Engine type		J 616 GS-J12
Working principle		4-Stroke
Configuration		V 60°
No. of cylinders		16
Bore	mm	190
Stroke	mm	220
Piston displacement	lit	99.80
Nominal speed	rpm	1,500
Mean piston speed	m/s	11.00
Length	mm	4,894
Width	mm	1,886
Height	mm	2,503
Weight dry	kg	12,500
Weight filled	kg	13,500
Moment of inertia	kgm ²	64.96
Direction of rotation (from flywheel view)		left
Radio interference level to VDE 0875		N
Starter motor output	kW	20
Starter motor voltage	V	24

Thermal energy balance

Power input	kW	6,075
Intercooler	kW	991
Lube oil	kW	282
Jacket water	kW	425
Exhaust gas cooled to 180 °C	kW	855
Exhaust gas cooled to 100 °C	kW	1,222
Surface heat	kW	97

Exhaust gas data

Exhaust gas temperature at full load	[8] °C	362
Exhaust gas temperature at bmep= 16.5 [bar]	°C	~ 405
Exhaust gas temperature at bmep= 11 [bar]	°C	~ 459
Exhaust gas mass flow rate, wet	kg/h	15,396
Exhaust gas mass flow rate, dry	kg/h	14,488
Exhaust gas volume, wet	Nm ³ /h	12,149
Exhaust gas volume, dry	Nm ³ /h	11,019
Max.admissible exhaust back pressure after y-pipe	mbar	50

Combustion air data

Combustion air mass flow rate	kg/h	14,958
Combustion air volume	Nm ³ /h	11,575
Max. admissible pressure drop at air-intake filter	mbar	10

basis for exhaust gas data: natural gas: 100% CH₄; biogas 65% CH₄, 35% CO₂

Sound pressure level

Aggregate a)			dB(A) re 20µPa	102
31,5	Hz		dB	83
63	Hz		dB	90
125	Hz		dB	96
250	Hz		dB	98
500	Hz		dB	97
1000	Hz		dB	95
2000	Hz		dB	94
4000	Hz		dB	94
8000	Hz		dB	92
Exhaust gas b)			dB(A) re 20µPa	119
31,5	Hz		dB	109
63	Hz		dB	119
125	Hz		dB	128
250	Hz		dB	117
500	Hz		dB	115
1000	Hz		dB	114
2000	Hz		dB	111
4000	Hz		dB	106
8000	Hz		dB	91

Sound power level

Aggregate	dB(A) re 1pW	124
Measurement surface	m ²	149
Exhaust gas	dB(A) re 1pW	127
Measurement surface	m ²	6.28

- a) average sound pressure level on measurement surface in a distance of 1m (converted to free field) according to DIN 45635, precision class 3.
- b) average sound pressure level on measurement surface in a distance of 1m according to DIN 45635, precision class 2.
- The spectra are valid for aggregates up to bmep=20 bar. (for higher bmep add safety margin of 1dB to all values per increase of 1 bar pressure).
- Engine tolerance ± 3 dB

0.03 Technical data of generator

Manufacturer		Leroy-Somer(-0,925cap) e)
Type		LSA 54 ZL105 e)
Type rating	kVA	3,785
Driving power	kW	2,745
Ratings at p.f. = 1,0	kW	2,676
Ratings at p.f. = 0.8	kW	2,657
Rated output at p.f. = 0.8	kVA	3,321
Rated reactive power at p.f. = 0.8	kVar	1,993
Rated current at p.f. = 0.8	A	174
Frequency	Hz	50
Voltage	kV	11
Speed	rpm	1,500
Permissible overspeed	rpm	1,800
Power factor (lagging - leading) (UN)		0,8 - 0,95
Efficiency at p.f. = 1,0		97.5%
Efficiency at p.f. = 0.8		96.8%
Moment of inertia	kgm ²	149.00
Mass	kg	9,950
Radio interference level to EN 55011 Class A (EN 61000-6-4)		N
Cable outlet		left
I _k " Initial symmetrical short-circuit current	kA	2.08
I _s Peak current	kA	5.29
Insulation class		H
Temperature (rise at driving power)		F
Maximum ambient temperature	°C	40

Reactance and time constants (saturated) at rated output

x _d direct axis synchronous reactance	p.u.	1.814
x _d ' direct axis transient reactance	p.u.	0.163
x _d " direct axis sub transient reactance	p.u.	0.083
x ₂ negative sequence reactance	p.u.	0.082
T _d " sub transient reactance time constant	ms	10
T _a Time constant direct-current	ms	30
T _{do} ' open circuit field time constant	s	1.76

e) JENBACHER reserves the right to change the generator supplier and the generator type. The contractual data of the generator may thereby change slightly. The contractual produced electrical power will not change.

0.04 Technical data of heat recovery

General data - Hot water circuit

Total recoverable thermal output	kW	2,697
Return temperature	°C	70.0
Forward temperature	°C	90.0
Hot water flow rate	m³/h	115.8
Nominal pressure of hot water	PN	10
min. operating pressure	bar	3.5
max. operating pressure	bar	9.0
Pressure drop hot water circuit	bar	1.40
Maximum Variation in return temperature	°C	+0/-5
Max. rate of return temperature fluctuation	°C/min	10

General data - Cooling water circuit

Heat to be dissipated (calculated with Glykol 37%)	kW	131
Return temperature	°C	45
Cooling water flow rate	m³/h	30
Nominal pressure of cooling water	PN	10
min. operating pressure	bar	0.5
max. operating pressure	bar	5.0
Loss of nominal pressure of cooling water	bar	~
Maximum Variation in return temperature	°C	+0/-5
Max. rate of return temperature fluctuation	°C/min	10

Exhaust gas heat exchanger

Type	shell-and-tube
------	----------------

PRIMARY:

Exhaust gas pressure drop approx	bar	0.02
Exhaust gas connection	DN/PN	600/10

SECONDARY:

Pressure drop hot water circuit	bar	0.20
Hot water connection	DN/PN	100/10

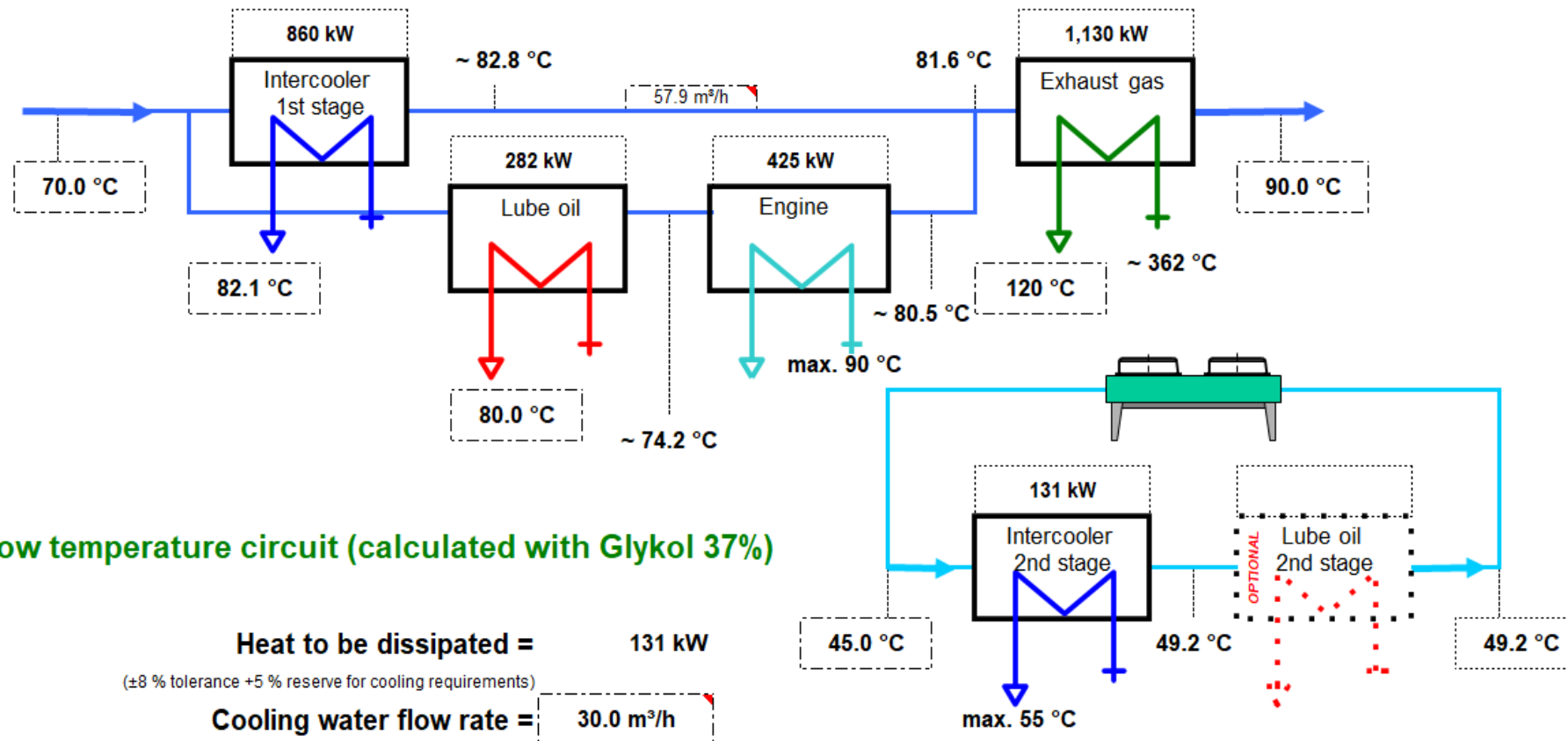
The final pressure drop will be given after final order clarification and must be taken from the P&ID order documentation.

Hot water circuit

Recoverable thermal output = 2,697 kW

(+12/-8 % tolerance +5 % reserve for cooling requirements)

Hot water flow rate = 115.8 m³/h



Low temperature circuit (calculated with Glykol 37%)

Heat to be dissipated = 131 kW

(±8 % tolerance +5 % reserve for cooling requirements)

Cooling water flow rate = 30.0 m³/h

0.10 Technical parameters

All data in the technical specification are based on engine full load (unless stated otherwise) at specified temperatures and the methane number and subject to technical development and modifications.

All pressure indications are to be measured and read with pressure gauges (psi.g.).

[1] At nominal speed and standard reference conditions ICFN according to ISO 3046-1, respectively

[2] According to ISO 3046-1, respectively, with a tolerance of **+5 %**.

Efficiency performance is based on a new unit (immediately upon commissioning). Effects of degradation during normal operation can be mitigated through regular service and maintenance work.

[3] Average value between oil change intervals according to maintenance schedule, without oil change amount

[4] At p. f. = 1.0 according to VDE 0530 REM / IEC 34.1 with relative tolerances, all direct driven pumps are included

[5] Total output with a tolerance of **+12/-8 %**

[6] According to above parameters [1] through [5]

[7] As a guiding value at p.f. 0.8 and only valid for (engine, generator, TCM). Other peripheral equipment is not considered.

[8] Exhaust temperature with a tolerance of **±8 %**

Note: an optimised operating mode to minimise methane slip can result in changed exhaust gas data (exhaust gas temperature, NOx emissions, etc.) and must be taken into account in the design of the exhaust gas aftertreatment

[9] Intercooler heat on:

* **standard conditions** - If the turbocharger design is done for air intake temperature **> 30°C** w/o de-rating, the intercooler heat of the 1st stage need to be increased by **2%/°C** starting from **25°C**.

Deviations between **25 – 30°C** will be covered with the standard tolerance.

* **Hot Country application (V1xx)** - If the turbocharger design is done for air intake temperature **> 40°C** w/o de-rating, the intercooler heat of the 1st stage need to be increased by **2%/°C** starting from **35°C**. Deviations between **35 – 40°C** will be covered with the standard tolerance.

Radio interference level

The ignition system of the gas engines complies the radio interference levels of CISPR 12 and EN 55011 class B, (30-75 MHz, 75-400 MHz, 400-1000 MHz) and (30-230 MHz, 230-1000 MHz), respectively.

Definition of output

- ISO-ICFN continuous rated power:

Net break power that the engine manufacturer declares an engine is capable of delivering continuously, at stated speed, between the normal maintenance intervals and overhauls as required by the manufacturer. Power determined under the operating conditions of the manufacturer's test bench and adjusted to the standard reference conditions.

- Standard reference conditions:

Barometric pressure: 1000 mbar (14.5 psi) or 100 m (328 ft) above sea level

Air temperature: 25°C (77°F) or 298 K

Relative humidity: 30 %

- Volume values at standard conditions (fuel gas, combustion air, exhaust gas)
 Pressure: 1013 mbar (14.7 psi)
 Temperature: 0°C (32°F) or 273 K

Loss of engine performance

a) Performance reduction due to gas quality

If the reference methane number is not reached and the knock control responds, the ignition timing at full performance is adjusted in conjunction with the engine management system; only then is performance reduced.

H₂ admixtures in the range of 3–5 Vol% into the natural gas network are generally regarded as non-critical. Prerequisites for this are rates of change according to TA 1000-0300, as well as the knock resistance (minimum methane number) of the natural gas-H₂ mixture according to the specification. For reliable compliance with required NO_x emissions, the JENBACHER LEANOX^{plus} control is recommended (measurement of NO_x emissions and correction of the LEANOX controller). Higher H₂ addition rates into the natural gas network must be assessed on a project-specific basis.

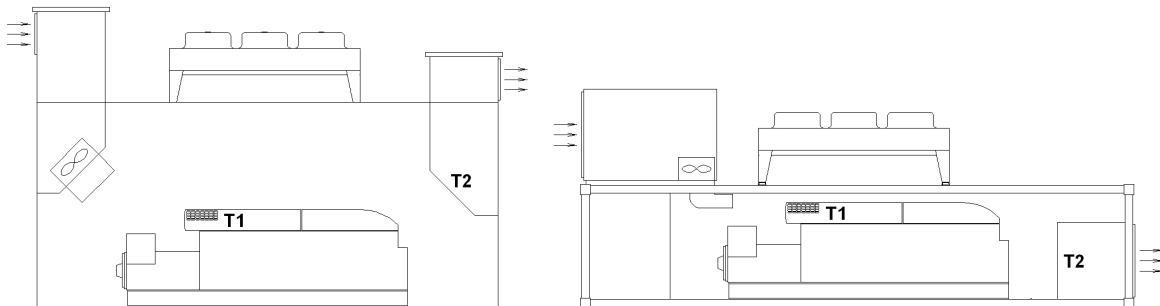
b) Performance reduction due to voltage and frequency limits

If the voltage and frequency limits for generators specified in IEC 60034-1 Zone A are exceeded, performance is reduced.

c) Performance reduction due to environmental conditions

Standard rating of the engines is for an installation at an altitude ≤ 500 m and combustion air temperature ≤ 30 °C (T₁)

Engine room outlet temperature: 50°C (T₂) -> engine stop



The minimum recommended air change ratio (C) must be observed to maintain the required air quality and prevent unwanted gas accumulations (refer to Section ⇒ Potentially explosive Atmospheres as per TA1100-0110). The calculation is based on TA 1100-0110 and is $C_{min} = 50h^{-1}$ for JENBACHER modules.

Parameters for the operation of JENBACHER gas engines

The genset fulfils the limits for mechanical vibrations according to ISO 8528-9.

The following forms an integral part of a contract and must be strictly observed: **TA 1000-0004, TA 1100 0110, TA 1100-0111, and TA 1100-0112.**

Transport by rail should be avoided. See **TA 1000-0046** for further details

Failure to adhere to the requirements of the above-mentioned TA documents can lead to engine damage and may result in loss of warranty coverage.

Parameters for the operation of control unit and the electrical equipment

Relative humidity 50% by maximum temperature of 40°C.

Altitude up to 2000m above the sea level.

0.20 Mode of Operation

Grid Parallel Mode

The genset is running in parallel to the utility. The unit load can be adjusted via its power control set point or designated option.

Procedure in the event of mains failure:

When the mains monitor relay (protective relay ANSI No. 27, 59, 81, 78- provided either by JENBACHER or the customer) is activated due to a mains failure, the engine is isolated from the mains by opening the generator breaker. The module is shut down without any cool-down run.

Island operation is not available in this case!

The module can be restarted following the restoration of mains power after a 5-minute mains stabilization period.