

FEEDSTOCK

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Energy Crop	Ryegrass
Dry Matter Yield	12.7 tDM/ha/yr
Organic Dry Matter Yield	11.3 tODM/ha/yr
%TS	20.0 %
%VS	89.0 %
Area of land	100.0 hectares

Ryegrass

Mass	122.1 tonnes/week
%TS	20.0 % TS
%VS	89.0 % VS
Dry Solids	24.4 tonnes/week
Volatile Solids	21.7 tonnes/week
%VSD	64.5 % VSD
Volatile Solids Destroyed	14.0 tonnes/week

Total Organic Waste

Mass of Organic Waste	122.1 tonnes/week
%TS of Organic Waste	20.0 % TS
%VS of Organic Waste	89.0 % VS
%VSD of Organic Waste	64.5 % VSD
Dry Solids of Organic Waste	24.4 tonnes/week
Volatile Solids of Organic Waste	21.7 tonnes/week
Volatile Solids Reduction of Organic Waste	14.0 tonnes/week

TREATMENT

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Feedstock Conditioning & Storage

Mass of Organic Waste	122.1 tonnes/week
Process Water	0.0 tonnes/week
Total Mass	122.1 tonnes/week
Dry Solids	24.4 tonnes/week
Volatile Solids	21.7 tonnes/week
Capacity of Conditioning Tank	0 m3
Storage Time Available in Conditioning Tank	0.0 days
% Organic Material Rejected as Inert	0.0 %
Mass of Inert Rejects	0.0 tonnes/week
%TS of Inert Rejects	80 %
%VS of Inert Rejects	25 %
Dry Solids of Inert Rejects	0.0 tonnes/week
Volatile Solids of Inert Rejects	0.0 tonnes/week
Mass of Digester Feedstock	122.1 tonnes/week
Dry Solids of Digester Feedstock	24.4 tonnes/week
Volatile Solids of Digester Feedstock	21.7 tonnes/week
Specific Gravity of Feedstock	0.80 tonnes/m3
Volume of Digester Feedstock	152.6 m3/week
Capacity of Raw Waste Buffer Tank	0 m3
Storage Time in Available in Raw Waste Buffer Tank	0.0 days

Anaerobic Digestion

Mass of Digester Feedstock	17.4 tonnes/day
Volume of Digester Feedstock	21.8 m3/day
%TS of Digester Feedstock	20.0 % TS
%VS of Digester Feedstock	89.0 % VS
Dry Solids of Digester Feedstock	3.5 tonnes TS/day
Volatile Solids of Digester Feedstock	3.1 tonnes VS/day
Capacity of Digester	907 m3
Volatile Solids Reduction	2.00 tonnes VSD/day
Specific Biogas Production	1.00 m3/kg VSD
Volume of Biogas	2,003 m3/d
% Methane	53 % CH4
Specific Gravity of Biogas	1.30 kg/m3
Mass of Biogas	2,607 kg/d

Hydraulic Retention Time

42 days

%TS of Digester Feedstock

20 % TS

Specific Loading Rate

3.4 kg VS/m3/day

Biogas Production per day : Digester Capacity

2.2 m3/d/m3

Biogas Production : m3 Digester Feed

92 m3/m3

Biogas Production : Tonnes of Organic Waste

115 m3/tonne

Methane Production : Tonnes Organic Waste Organic Dry Matter

342 m3/tonneODM

Mechanical Press

Mass of Digester Output	14.8 tonnes/day
%TS of Digester Output	5.9 % TS
%VS of Digester Output	56.5 % VS
Dry Solids of Digester Output	0.9 tonnes/day
Volatile Solids of Digester Output	0.5 tonnes/day
Specific Gravity of Digester Output	1.02 tonnes/m3
Volume of Digester Output	14.5 m3/day
% Digestate Dry Solids in Fibre from Separator	50 %
% Digestate Volatile Solids in Fibre from Separator	50 %
Mass of Digestate Fibre	1.8 tonnes/day
%TS of Digestate Fibre	25 % TS
%VS of Digestate Fibre	56.5 % VS
Dry Solids of Digestate Fibre	0.4 tonnes/day
Volatile Solids of Digestate Fibre	0.2 tonnes/day
Mass of Digestate Liquor	13.1 tonnes/day
%TS of Digestate Liquor	3.4 % TS
%VS of Digestate Liquor	56.5 % VS
Dry Solids of Digestate Liquor	0.4 tonnes/day
Volatile Solids of Digestate Liquor	0.2 tonnes/day
Specific Gravity of Digestate Liquor	1.01 tonnes/m3
Volume of Digestate Liquor	12.9 m3/d
Capacity of Digestate Storage Tank	1,057 m3
Storage Time in Digestate Storage Tank	82 days

ENERGY

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Biogas

Biogas Production	2,003 m3/day
Biogas Flow	83 m3/hour
% Methane	53 % CH4
Calorific Value of Biogas (LCV)	18.9 MJ/m3
Fuel Value of Biogas	37,896 MJ/day
Fuel Value of Biogas	439 kWf

Combined Heat & Power

Fuel Value of Biogas	439 kWf
Electrical Efficiency	33 %
Thermal Efficiency	52.0 %
Electricity Output	145 kWe
Heat Output	228 kWth
Availability of CHP Unit	95 %
Annual Electricity Output	1,205 MWh/yr
Annual Heat Output	1,898 MWh/yr

Gas Boiler

Fuel Value of Biogas	439 kWf
Thermal Efficiency	85 %
Heat Output	373 kWth
Gas Boiler Operating Time	5 %
Annual Heat Output	163 MWh/yr

Heat Requirement

Volume of Digester Feedstock	22 m3/day
Temperature of Digester Feedstock	0 °C
Temperature of Digester	37 °C
Temperature of Outside Air	0 °C
Heat Input to Digester Feedstock	3,381 MJ/day
Total Surface Area of Digester	443 m2
Thickness of Insulation	100 mm
Average Thermal Conductivity of Insulation	0.034 W/m.°C
Digester Heat Loss	482 MJ/day
Total Digester Heat Requirement	3,862 MJ/day
Total Digester Heat Requirement	44.7 kWth
Volume of Pasteurisation Feedstock	15 m3/day
Temperature of Pasteurisation Feedstock	37 °C
Temperature of Pasteurisation Tank	37 °C
Temperature of Outside Air	0 °C
Heat Input to Pasteurisation Feedstock	0 MJ/day
Total Surface Area of Pasteurisation Tank	0 m2
Thickness of Insulation	100 mm
Average Thermal Conductivity of Insulation	0.034 W/m.°C
Pasteurisation Tank Heat Loss	0 MJ/day
Total Pasteurisation Heat Requirement	0 MJ/day
Total Pasteurisation Heat Requirement	0.0 kWth
Total Heat Requirement	3,862 MJ/day
Total Heat Requirement	392 MWh/yr

Electricity Balance

Electricity Output	1,205 MWh/yr
% Parasitic Electricity	3 %
Electricity Consumption of Plant	33 MWh/yr

Net Electricity Output**1,172 MWh/yr****Heat Balance**

Heat Output	2,061 MWh/yr
% Parasitic Heat	19 %
Heat Consumption of Plant	392 MWh/yr

Net Heat Output**1,670 MWh/yr**

MASS BALANCE**Digester Inputs**

Organic Waste	122.1 tonnes/week	6367 tonnes/yr
Total	122.1 tonnes/week	6367 tonnes/yr

Digester Outputs

Biogas	18.3 tonnes/week	952 tonnes/yr
Digestate	103.9 tonnes/week	5416 tonnes/yr
Total	122.1 tonnes/week	6367 tonnes/yr

Digester Mass Balance

0.0	0
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Mechanical Press Inputs

Digestate	103.9 tonnes/week	5416 tonnes/yr
Total	103.9 tonnes/week	5416 tonnes/yr

Mechanical Press Outputs

Digestate Fibre	12.3 tonnes/week	644 tonnes/yr
Digestate Liquor	91.5 tonnes/week	4772 tonnes/yr
Total	103.9 tonnes/week	5416 tonnes/yr

Mechanical Press Mass Balance

0.0	0
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Overall Inputs

Organic Waste	122.1 tonnes/week	6367 tonnes/yr
Process Water	0.0 tonnes/week	0 tonnes/yr
Total	122.1 tonnes/week	6367 tonnes/yr

Overall Outputs

Biogas	18.3 tonnes/week	952 tonnes/yr
Inert Rejects	0.0 tonnes/week	0 tonnes/yr
Digestate Fibre	12.3 tonnes/week	644 tonnes/yr
Digestate Liquor	91.5 tonnes/week	4772 tonnes/yr
Total	122.1 tonnes/week	6367 tonnes/yr

Overall Mass Balance

0.0	0 tonnes/yr
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CHP Fuel Inputs

Oxygen	21.2 tonnes/week	1108 tonnes/yr
Nitrogen	69.9 tonnes/week	3646 tonnes/yr
Air	91.2 tonnes/week	4754 tonnes/yr
Biogas	18.3 tonnes/week	952 tonnes/yr
Total	109.4 tonnes/week	10461 tonnes/yr

CHP Exhaust Outputs

Carbon Dioxide	27.5 tonnes/week	1436 tonnes/yr
Water	11.9 tonnes/week	623 tonnes/yr
Sulphur Dioxide	0.0 tonnes/week	1 tonnes/yr
Nitrogen	69.9 tonnes/week	3646 tonnes/yr
Total	109.4 tonnes/week	5707 tonnes/yr

CHP Mass Balance

0.0 tonnes/week
