

Bio-Energy:

Implementation of Bio-Heat Types and Scale



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Renewable Heat and Bio-Heat

- Renewable heat
 - Air/heat pumps
 - CHP
- Bio-heat
 - Wood chip and pellet boilers
 - Biomass/biogas based CHP
 - Aerobic digesters
- Bio-heat producing/upgrading bioenergy
 - Driers
 - Biochar

-> Focus on third bullet point

Motives for Implementation

- Compliance
 - Insufficient on-site digestate storage facilities
- Commercial
 - Additional income stream in an ‘ever-shrinking FIT world’
 - Demand for wood chips, pellets
 - Fertiliser substitute in estate/farm nutrient management plans
- Circular Economy and Carbon
 - Circular material management
 - Replacement of industrially manufactured fertilizer
 - Soil improvement

Process Inputs

- Wood-based material
 - Landscaping material: wood chip, etc.
- Digestate
 - Whole digestate
 - Separated digestate: solid or liquid factions
- Bulk material
 - To raise dry matter content to required level

Case 1 – Wood Chip Drier

- Input material:
 - Several types of wood chip, wood shavings, saw dust
 - Minimum 50% DM
 - Throughput 2.2 t/h at 8,000 operating hours p.a.
- Operation:
 - 1 MW th thermal requirement
 - Thermal medium: water at 95 deg C
 - 30 kW el parasitic demand at full load
 - 900 – 950 kg/h water evaporation

Case 1 – Wood Chip Drier

- Output material:
 - 85% DM
 - 1.2 - 1.5 t/h
- Use:
 - Sold for heating purposes
- Project:
 - NEWeco-tec Verfahrenstechnik GmbH
 - UK

Case 2 – Digestate Drier

- Input material:
 - Separated digestate, liquid fraction only
 - Initially 6% DM, first batches to provide bulk material for 9% DM
 - Throughput 7.4 t/d or 2,700 t/a
 - NPK: N: 5.7 kg/t, P: 2.2 kg/t, K: 8.1 kg/t
- Operation:
 - 470kw th thermal requirement
 - Thermal medium: water at 95 deg C
 - 50 kW el parasitic demand on full load
 - 0.9t/d water and 90 kg/d sulphuric acid

Case 2 – Digestate Drier

- Output material:
 - Granulate at 85% DM: 0.52 t/h or 190 t/a
 - Ammonium sulphate: 0.45 t/d or 164 t/a
- Use:
 - Solid digestate faction on own land, granulate sold to farmers
- Project:
 - BTS Biogas Ltd
 - UK

Case 2 – Digestate Drier

- NPK output of dried material:
 - 24.5 N kg/t 4.7 N t/a
 - 31.4 P kg/t 6.0 P t/a
 - 114.7 K kg/t 21.8 K t/a
- NPK output of ammonium sulphate:
 - 60.0 N kg/t 9.9 N t/a
- Losses:
 - 1.1 N t/a

Case 3 – Digestate Drier

- Input material:
 - Whole digestate
 - 9% DM
 - Throughput 470-480 kg/h or app. 3,800 t/a at 8,000 ops hours p.a.
- Operation:
 - 550 kW th thermal requirement
 - Thermal medium: water at 95 deg C
 - 23 kW el parasitic demand at full load
 - 420 kg/h water evaporation

Case 3 – Digestate Drier

- Output material:
 - 85% DM
 - 50 - 100 kg/h
- Use:
 - Some used on own land, surplus sold to farmers
- Project:
 - NEWeco-tec Verfahrenstechnik GmbH
 - UK

Case 4 – Biochar Unit

- Input material:
 - Carbon based material
 - Calculations done at 100% DM, life feed minimum 50% DM
DM reduction, in- and output volumes not in linear correlation
 - Throughput 120 kg/h or 960 t/a
- Operation:
 - t.b.c. kW th thermal requirement (fluctuating feedstock)
 - 10 kW el parasitic at full load
 - Propane/butane/biogas for start-up, ca 45 min

Case 4 – Biochar Unit

- Output material:
 - ‘Organic’ coal or biochar
 - 40 kg/h
- Use:
 - Soil improvement, fertiliser, livestock feed supplement, AD plant supplement, de-odourisation, etc

Case 5 – Biochar Unit

- Botanical Garden Berlin
 - Feasibility and operational study, publically available
- Input material:
 - Garden waste, wood, sewage, dirty water
- Output material:
 - ‘Organic’ coal or biochar
- Use:
 - Soil improvement, fertiliser

Dryer – Types and Scales

- Dryers
 - Classical all-round driers
 - Designs originally for grain/grass and sludge drying
 - Purpose-made designs for wood-chip and/or digestate
 - Differentiation in e.g. sulphur stripping and drying method
- Biochar
 - One industrial, bankable model
 - Two small/medium scale models
 - Experimental designs in development
 - High end micro/community scales

Lessons and Challenges

- Data
- Seasonal parasitic demand variance
 - Summer – winter
 - Day – night
- Streamlining cascading applications:
 - Ensure constant supplies (e.g. digestate)
 - Coordinate CHP downtime with dryer unit availability
 - Varying uptime guarantees
- Feedstock variations
- Regulations and markets (think ‘outside of UK’)
- Biochar might(!) be viable without subsidies

Acknowledgements

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NEWeco-tec - www.new-eco-tec.com

BTS Biogas Ltd – www.bts-biogas.com

Pyreg – www.pyreg.de

Biomacon – www.biomacon.com

Thank you for your attention

Stand A20



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- Reports
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See you there!