



BEACON+ Collaborative R&D Project:

EcoDyfi

Production of pellets from dried clover & alder brash

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Project aim: to dry, shred and pelletise clover and alder brash

Material:

- 5 x 'dumpy' sacks of Clover brash
- 4 x " " Alder brash

Equipment:

Alvan Blanche biomass dryer

Briton hammer mill

Simon-Barron pellet mill

Process:

1. Clover and alder brush dried in biomass continuous feed hot air dryer, using steam as heat source.
 - a. Sample material was dried over night in an oven to determine moisture content:
 - i. Clover, initial material. Moisture content: 70%
 - ii. Clover, post-drying material “ “ 5%
 - iii. Alder: initial material “ “ 63%
 - iv. Alder: post-drying material “ “ 15%
 - b. Approximately 3 sacks of dried clover material retrieved from dryer and 2 sacks of Alder
 - c. Process took place over two days, of which actual process probably occupied ~6 hours -say 4 hours' clover and 2 hours' alder drying time

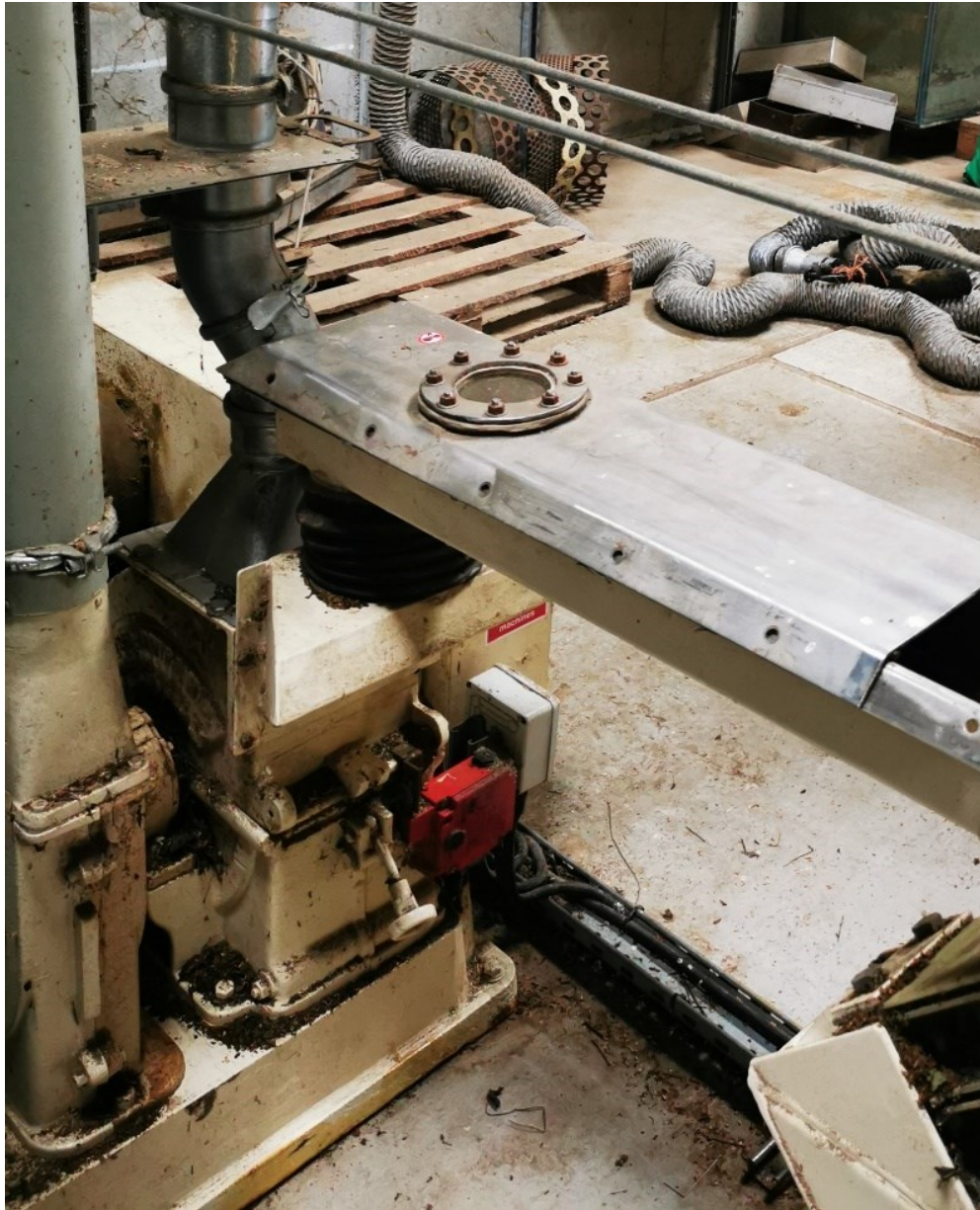
(note: as regards total amounts of pre-dried and post-dried material the client may have better data.)



Alvan Blanche large biomass dryer

2. Dried clover and alder leaves hand-separated from larger twigs. This done by client who wished to optimise nutrient content from material.

3. Clover and alder leaves milled to coarse powder in 'Briton' hammer mill.
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|--|----------|
| a. Weight of dried clover, pre-milling | 38 kg |
| b. Weight of milled clover | 31.5 kg |
| c. Weight of dried Alder | 17 Kg |
| d. Weight of milled alder | 15.02 kg |



Briton hammer mill

4. **Clover** 'flour' pelletised in 'Simon-Barron' pellet mill
- a. Material pelletised in 6 x ~5kg batches
 - b. For pelleting, the material is required to be: 15% moisture.
 - c. Moisture content of milled clover: 12.3%
 - d. Pelleting process requires addition of 6% by weight oil
 - e. Therefore to each 5kg batch:
 - i. 150ml of water added
 - ii. 300ml of oil. (Oil used "BlodynAUR" Welsh rapeseed oil.)
 - f. Final total weight of pellets **32.28 kg**



Simon-Barron pellet mill

5. **Alder** 'flour' pelletised in 'Simon-Barron' pellet mill
 - a. Material pelleted in 3 x ~5kg batches
 - b. For pelleting, the material is required to be: 15% moisture.
 - c. Moisture content of milled Alder: 12.3%
 - d. Pelleting process requires addition of 6% by weight oil
 - e. Therefore to each 5kg batch:
 - i. 150ml of water added
 - ii. 300ml of oil. (Oil used "BlodynAUR" Welsh rapeseed oil.)
 - f. Final total weight of pellets **16.04 kg**

6. Energy usage data:
 - a. Biomass dryer
 - i. Drying process time for *each* product was around 4 hours
 - b. Briton hammer mill.
 - i. Hammer mill process for clover was approximately 1 hour
 - ii. Hammer mill process for alder was approximately ½ hour
 - iii. Mill drew 10A per phase, therefore 6.5 kW power draw
 - c. Pellet mill
 - i. Pellet milling for clover took approximately 1 hour
 - ii. Pellet milling for alder too approximately ½ hour
 - iii. Mill drew 40A per phase, therefore 25 KW power draw

Conclusions:

- Drying in the Alvan Blanche biomass dryer was effectively achieved over the space of two days
- Pre-shredding hand separation issue: this was time consuming. Client to assess alterations to brash collection and separation.
- Milling: the hammer mill was fed by hand as the twiggy material was not practical to load into this design of mill. Would recommend conveyor and wide-mouth mill intake for upscaled operation
- Pelletising in Simon-Barron pellet mill produced successful pellets.