Biomass Workshops

Section 2 – Harvest, Store and Deliver

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Energy Solutions 7th September 2007

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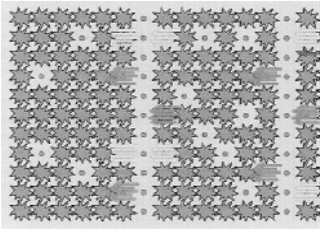
Harvesting

- Normally is a line and selection
- Harvested material is felled, cross cut into various products and stacked to the side
- Extracted to roadside by a forwarder
- Pulpwood is best stacked in a open area where the wind and sun can dry the logs



Storage

To produce good quality chips

- the logs and piles must be kept free from dirt, stones
- raise above the road to avoid splashing and ensure drainage
- sawn ends facing SW
- preferable covered
- the road must be serviceable at all times of the year

Storage

The purpose of storage is allow the logs to dry to the required moisture content. This is typically about 45% for a medium sized boiler 200kW to 550kW. Under Irish conditions this will take between 6 and 9 months

Logs stored in the round are easier to handle and transport.

Roundwood will not deteriorate if air can circulate through the storage pile

Chips above 30%MC will deteriorate (compost, reduces energy content) and heat if piled. Piles have been known to catch fire. 3 to 4 weeks storage max at heights less than 3m, will need to be turned (adds to cost)

Health hazard due to fungal spores from wet chip heaps

Chipping

Golden Rule – <u>Not all chippers are the same. Some were designed as fuel wood chippers; others (cheap ones) were not.</u>

Fuel wood chippers have screens to ensure chip sizes meets standards

without own chassis to truck

tandem axle chassis to tractor

tandem axle chassis self-propelled (300 hp)

feeding table

changing of the screen

removing of the knives for sharpening

Photos: Kesla Oyj

Delivery and on Site Storage

The fuel reception area and its design impacts on the cost of wood fuel.

The delivery system must be;

- Simple
- Accessible
  - Turning space
  - Reception point capable of handling delivery in fast efficient manner
- Flexible accommodate various trailer options
- Store must hold 10 days supply when running at peak

Delivery Systems – Bunker Type

Purpose built bunker type fuel store;

Adv.

- Quick delivery
- Most flexible special trailers not required

Dis.

- Expensive to build
- Requires space

Delivery Systems – Walking Floor

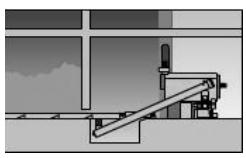
Walking Floor normally built above ground delivery wagon tips on to floor of the shed

Adv.

- Quick, flexible delivery
- Cheaper than below ground

Dis.

- Construction costs
- Space



Delivery – Silos blown storage

Grain type above ground silos.

Adv.

- Cheap to install
- Require small foot print

Dis.

- Can be tied to single supplier
- Slow delivery increases delivery cost

Delivery - Bins

Container bins

Adv.

- Cheap to install
- Quick deliveries
- Very clean

Dis.

- Requires special truck but bins can be filled by any chipper.
- Require space

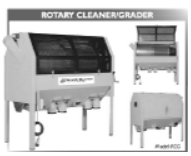
Quality – chip size

Various standards in place CEN and Onörm each set the allowed particle size, moisture content, ash fraction and emissions.

Quality Issues -

Chip Size

- Over sized chips will block or bridge an auger
- Dust will extinguish the flame
- Dirt or excessive bark causes problems with emissions
- Gate hangers not acceptable

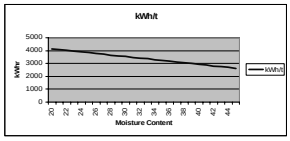


Example - Onörm

Parameter	Measure	G30	G50	G100
Max Cross	cm²	3	5	10
Max length	cm	8.5	12	25
Coarse Material 20%	Sieve Mesh	16	31.5	63
Main Material 60 – 100%	Sieve Mesh	2.8	5.6	11.2
Fine Material 20%	Sieve Mesh	1	1	1
Dust 4%	Passing Sieve	1	1	1

Quality – Moisture Content

- Moisture content and energy yield are closely linked
- Boilers will not reach required efficiency if the moisture content of the chips is outside of their range



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Section 3 – Example

(The Non-Technical Version)

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Example

What is the energy yield for a 10ha block of first thinnings;
Area 10ha
DBH 14cm
Yield per ha 70m³
Pulpwood = ?m³ @ 55%MC
Tonnes of woodchips at 40%MC =
Energy Yield = ?kWh

Solution – calculate harvested volume

Total Volume: 10ha x 70m³ = 700m³

Pulpwood fraction @ dbh 14cm = 70%

700m³ x 0.7 = 490m³

490m³ / 1.2 = 408t

Solution – Calculate Energy Yield

490m³ @ 40%MC = ?t

490m³ / 1.5 = 326t

kWh per t @ 40%MC = ?kWh

326 X 3000 = 978,000kWh