Setting the scene, wood for energy in Europe

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Consumption of wood for energy

- 60 % of all primary wood harvested in the world is used for energy!
- And that is without post consumer wood!!

Wood for energy in Europe

Different countries

- Different methods
- Different fuels
- Different scale of installations
- Different stages of development

Different countries

- Traditional home wood burners: Austria, Switzerland, Southern Germany, the Baltic countries
- Well advanced large scale: Denmark, Austria, Sweden, Finland, Germany, Northern Italy
- Starting up: Netherlands, Ireland, Belgium, France, UK

Different fuels

- Denmark: whole tree chips from thinnings, roundwood chips and wood pellets
- Germany: post consumer wood, wood pellets, firewood
- Sweden/Finland: chips from logging residues, wood pellets, black liquor
- Ireland: roundwood chips, wood pellets, firewood
- UK: stumpwood, logging residues, sawmill residues

Size of installations

- Denmark, Sweden, Finland, Austria: district heating and CHP
- Germany: electricity plants and households
- Ireland: hotels, households
- UK: electricity production, no CHP

Stages of development

- Long time wood for energy users, large scale: Austria, Denmark, Sweden, Finland, settled market
- Long term wood for energy users, small scale: Austria, Switzerland, Southern Germany, Baltic countries, wood from own forest
- Starting up: Ireland, UK, Netherlands, market under development

Equipment

- Small handfed tractor mounted chipper, for household use
- Medium crane fed chipper for commercial use, small contractor
- Large self propelled machines for industrial use, large contractor
- Industrial scale truck mounted machinery for industrial use, large contractor

CAT

Installations

- Domestic use: up to 100 kW
- Commercial use: from 100 kW to 1 MW
- District heating: from 1 MW to 20 MW
- Combined heat and power: up to 50 MW
- Electricity production: up to 300 MWe

Domestic boilers 1

- For domestic use, either firewood in a modern batch fed gassifier boiler or automatic boilers on dry wood chip or wood pellets.
- Wood chip need to be dry (less than 30 % moisture content) and of an even small size: M30, P16
- Preferred fuel: dry firewood, wood pellets or dry wood chip

Domestic boilers 2

- Simple logistics
- Low investment
- Fuel produced locally (if chips or firewood) by owner installation
- Efficiency 70-85%

Commercial boilers 1

- Commercial installations (schools, hotels, offices) have a larger capacity and thus a higher fuel through put and can as such handle a large wood chip
- Commercial installations exist in a dry and wet fuel version
- Wet fuel version is more expensive, but fuel is cheaper

Commercial boilers 2

Preferred fuel for commercial boilers:

- Wet wood chip (30-55% MC)
- Dry wood chip (<30 %)
- Wood pellets

SO M30-M55, P45

Commercial boilers 3

- Fuel produced in the area of the consumer
- Fuel produced by a small contractor
- More complicated logistics, because of multiple customers
- Medium investment
- Efficiency 80+ %

CHP CHPP

- Large consumption of wood of low quality
- Not sensitive to moisture content
- Not sensitive to particle size
- Wet fuel only (hogfuel, wood chips)

- So M55, P63

CHP CHPP 2

- Harvested in a large area around the consumer
- Very high investment in harvesting equipment
- Several machine units needed
- Very complicated logistics
- High efficiency, 80-110%

Electricity production only

- Low demands on fuel quality
- Large consumption of wood (chips or hogfuel)
- Not sensitive to particle size or moisture content

Electricity only 2

- Harvested in a large area around the plant
- Very high investment in harvesting equipment
- Several machine units needed
- Very complicated logistics
- Low efficiency (max 35 %)

What are the pitfalls 1?

With small and medium consumers:

- Small and relatively frequent delivery amounts
- High demands on quality (moisture and size distribution)
- Difficult delivery

Small and frequent deliveries

- The cost is the same whether one delivers 10 or 40 m3 chips (or 1 or 4 ton wood pellets)
- Storage space at the customer is the problem. Single household uses about 30-40 m3 of chips a year, 2-3 ton wood pellets

High demands on quality

- The small and medium boilers need a regular high quality fuel of even size, no oversize
- The moisture content has to be low, which is difficult to achieve

Good and bad large chips

Difficult delivery

- Hardly ever possible to tip into a pit
- Many times blowing in needed (40-50 m3 chips takes 1.5-2 hours to blow in)
- Blowing in will cost £40 per load, while tipping would only cost £15
- Hotels: parked cars in the way

Delivery problem/solution

Pitfalls large customers

- Often requiring too good fuel
- Unloading space is often restricted, making it necessary to space the trucks or have them wait
- Weather can cause problems (rain or snow)
- Machine failures
- Back up needed

Considerations 1

- Very small machines only suited for very small customers
- Medium machines need many medium customers, but can deliver to small and big
- Large machines need big customer and/or medium customers, cannot deliver to small

Considerations 2

- Roundwood can be naturally dried down to the required moisture content for small customers, but takes time and money
- Whole trees cannot be dried down sufficiently for medium and small customers, but enough for big customers
- Stumpwood hogfuel cannot be delivered to small and medium customers because of sand content and size distribution

Considerations 3

- Logging residues cannot be delivered to small customers and hardly to medium ones because of size distribution
- Chips cannot be actively dried economically
- Wet chips cannot be stored
- Stored wet chips will form mould spores and health risks

Solutions, small scale

- Small installations best be supplied with wood pellets
- Or: dry chips either from locally produced chips by small machines or by regionally produced chips from an adjusted medium machine
- Best source carefully naturally dried roundwood

Solutions medium scale

- Best fuel wet wood chips, but more expensive boiler
- Next best dry wood chips from carefully stored roundwood
- Chips produced by medium or adjusted large machines

Solutions big scale

- Should be able to take any moisture content (within reason) and any size distribution and any source of fuel
- Work as a “dustbin” for all fuels that are not suited for other installations
- Can absorb extra production capacity if the machines are not occupied with producing fuel for the medium installations

THE SCENE IS SET

You have the scenery!