

# GOOD PRACTICE EXAMPLE

Quality management and quality assurance of  
wood chips at biomass trade center Leoben



## 1. General

The biomass trade center Leoben is an association founded in 2009 that currently involves 300 members who cultivate a total forest area of 13 700 ha. The center buys energy wood directly from its members and produces premium wood chips suited for the use in small-scale heating systems in private households as well as fire wood. Premium wood chips are sold to private customers, small to medium-scale commercial end users as well as to medium and large-scale heating plants, whereas each group represents about one third of the customer segment (Metschina 2012).

Quality management plays an important role in the wood chip supply chain. Besides grain size and fines, water content is the most important parameter, directly influencing energy content and storage properties of the wood chips.

Quality management is carried out according to EN 15234-1 resp. 15234-4 and involves the following processes:

1. Storage of round wood
2. Chipping
3. Storage of wood chips
4. Selling of wood chips by weight and moisture content

The quality management enables the production of high-quality wood chips and guarantees a constantly high fuel quality with low moisture content to the customer. The right storage of round wood already leads to an increase in quality through natural drying, which provides an ideal basis for the production of premium wood chips. In addition, selling wood chips by water content and weight ensures a transparent and fair method of invoicing.

In the process chain of quality management, the manager and an employee of the biomass trade center, as well as a chipping company and a hauler (for round wood and /or wood chips) are involved.

## 2. Right storage of round wood

After round wood has been delivered and stored at the BTC, it is stored outside for 14 to 18 month. On one hand, the storage increases security of supply and provides a buffer function, while on the other hand the quality of the wood is increased through natural drying. The outside storage reduces the water content of the wood to 27 % or lower, which increases the heating value and therefore has a positive influence on efficiency of heating systems, which on the other hand reduces the amount of wood chips needed. In addition, this leads to a better utilization of the transport capacity of the transport vehicle and therefore reduces transport costs.

While storage also leads to some mass loss due to natural decomposition processes, the loss lies between 1-3 % of dry matter per year and is relatively low compared to storage of moist wood chips, which can lead to substantially larger mass and energy losses depending on storage conditions (Golser et al. 2005).

The storage of green wood chips can lead to additional problems such as mould growth, self-heating and even self-ignition due to micro-organic activities. The storage of wood chips takes up more space than round wood. Therefore, the storage of round wood provides the best alternative. Important factors for good drying results are the right location, which should be sunny and windy, as well as the right kind of storage, especially the required ground clearance and the right stacking of the logs (Kühmaier et al. 2007).



Roundwood is chipped after the right kind and duration of storage © WV Stmk

## 3. Chipping

The chipping process mainly influences grain size and fines of the produced wood chips. Especially in small-scale applications, a uniform grain size and a low content of fines are required to allow for an undisturbed operation of the heating system. The chipping is carried out by external companies at the storage area of the biomass trade center with large-scale mobile chippers which can produce wood chips in the required quality. If possible, round wood is chipped directly into a transport vehicle to avoid intermediate storage and handling. Since also a certain stock of wood chips is required and the chipper is usually chipping the whole day if on site, the chip depot is filled as well. In one day, up to 1000 bulk m<sup>3</sup> of wood chips can be produced. If the chipper is on site, usually two trucks are loaded directly and the chip storage depot is filled in one day.

## 4. Chip storage

After chipping, the produced chips are stored in a roofed depot, if the round wood was not directly chipped into a transport vehicle. The chips are so protected from weather conditions and re-moisturization, while the good ventilation leads to additional drying. Furthermore, security of supply, especially regarding short-term orders, is additionally increased. The storage depot can take up to 800 bulk m<sup>3</sup> of wood chips.

## 5. Selling of wood chips by weight and moisture content

Wood chips can either be traded by volume (bulk m<sup>3</sup>) by weight (t), by energy content (kWh) or by weight and moisture content (t dry matter).

Charging by volume is the easiest way and works relatively accurate if wood chips are produced from only one tree species. If wood chips from different species are sold, this method gets problematic as the energy content per volume can differ substantially between

tree species. Depending on moisture content, wood species and grain size and the corresponding bulk density, Energy content and weight per volume unit can differ substantially. One bulk m<sup>3</sup> can weigh between 250 and 450 kg and contain between 630 and 1 100 kWh of energy. If traded by volume, coarse wood chips are more expensive than finer material because of the larger pore volume. If traded only by weight, wet wood chips are more expensive than dry ones because of the higher weight. Therefore, charging by weight with additional determination of the moisture content provides a much more transparent and fair method, because it is paid only for the dry matter of the wood resp. the contained energy (Wittkopf 2004; Loibneggar 2011).

The water content is the most important quality parameter regarding wood chips, as it is not only crucial for the energy content but also for the storage properties of the chips. Green wood chips contain more than 50 % of water and are not suited for the use in small scale heating systems or longer storage periods. If wood chips have to be stored for longer durations, the water content has to be less than 30 %. If charging by moisture content and weight, the exact determination of the contained water is crucial, as an error of 10 % of water content already leads to a miscalculation of 20 % of the selling price. The required accuracy can only be achieved by the complete drying of a chip sample in a drying cabinet (Wittkopf 2004).



Determination of dry matter of a chip sample

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For the above reasons, wood chips are traded by weight with additional determination of the water content. For that matter, the empty transport vehicle is weighed on a calibrated weigh bridge, then the order amount of chips is loaded resp. chipped on the vehicle and it is weighed again before it leaves the biomass trade center. While the loaded vehicle is weighed, a chip sample is taken and dried to 0 % moisture in the drying cabinet. Afterwards, the dry matter of the sample is determined and the dry matter of the whole delivery is calculated, which provides the basis for invoicing with the customer.



The loaded vehicle is weighed

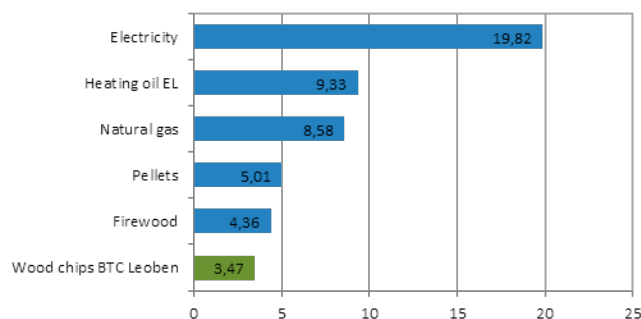
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## 6. Technical data

Technical data	
Annual wood chip production	23.000 - 28 000 bulk m <sup>3</sup>
Annual feedstock demand	10.000 - 12.000 solid m <sup>3</sup>
Chip storage capacity	800 bulk m <sup>3</sup>
Moisture content	23 - 27 %
Average grain size	30 mm
Bulk density	203 kg/m <sup>3</sup>
Energy content	3,79 kWh/kg

## 7. Economic data

Economic data	
Total investment costs	130 000 €
Investment costs weigh bridge	30 000 €
Investment costs drying cabinet	5 000 €
Chipping costs	2 - 3 €/bulk m <sup>3</sup>
Loading costs (wheel loader)	0,5 - 1 €/bulk m <sup>3</sup>
Price of wood chips	125 €/t dry matter
Transport costs to customer	2 - 4 €/bulk m <sup>3</sup>



Comparison of energy carriers in ct/kWh

Source: ÖBMV, proPellets Austria, Gaber; Status: August 2013

## 8. Environmental data

The delivery of wood chips to the customer is usually carried out regionally, within a supply radius of 30 km. Therefore, energy demand as well as emissions of CO<sub>2</sub> and other pollutants accompanying with transport can be kept relatively low.

## 9. Socio-economic data

Currently, two persons are employed at biomass trade center Leoben: a manger for one day per week and an employee for two to three days per week, depending on die particular season and order situation.

## 10. References

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