

Info-sheet

SECURE-BIO-SUPPLY

No 2: March 2025

Moisture content of fresh wood

Time of logging and the moisture content of fresh wood

In Finland, logging has traditionally occurred at a higher rate in winter months compared to the rest of the year. This is due to the higher bearing capacity of forest sites when the soil is frozen. Wet unpaved roads in particular might not be able to bear heavy forestry machinery (Lehtonen et al., 2019). Furthermore, harvesting may be avoided in some areas during spring-summer due to the nesting season of birds. The **moisture content (MC)** is the most important factor determining solid biofuels' heating value and quality. By planning the supply chain, the MC can be optimized, and through drying, the fuel quality at the end-use point can be maximized. Natural drying is often used, which utilizes seasonal variations in sun and wind circumstances. But drying can also be done actively using waste heat, for example.

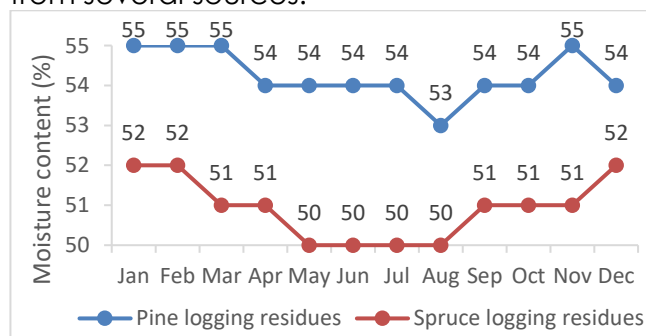
To evaluate the change in fuel quality after storage, it is important to know the initial MC.

The MC of freshly harvested wood varies throughout the year, it changes with the season, site fertility and climatic conditions (Lindblad et al., 2018). Hence, it may be advantageous to harvest wood when the fresh MC is at a lower level. The fresh MC may also vary from year to year depending on the weather conditions (Hakkila, 1962).

The MC of fresh wood varies based on the tree species, the wood density and the age of the wood (Jahkonen et al., 2012). The MC also varies between different parts of the tree. It tends to be the lowest in the butt of the stem and increase going towards the crown (Hakkila, 1962).

Monthly moisture content of fresh pine and spruce logging residues in Finland

Lindblad et al. (2018) compiled information on the average MC of fresh pine and spruce logging residues in Finland, based on data from several sources.



The moisture content of fresh pine and spruce logging residues in Finland by month (Lindblad et al., 2018).

Pine has the highest average MC. The decrease in MC of conifers begins in spring when water transpiration occurs in the needles during warmer weather while the



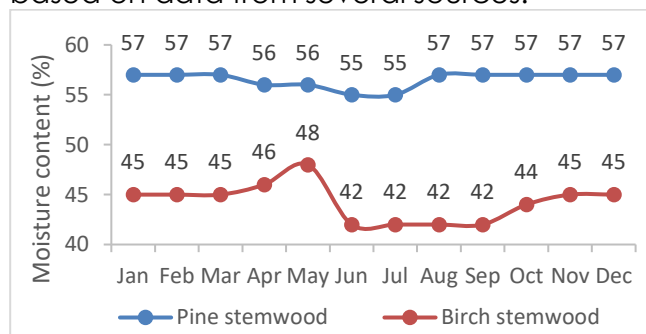
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ground is still frozen, and the root system is not yet active. In summer when needle transpiration is more active, the MC of the stem stays at a lower level compared to winter despite the unrestricted operation of the root system. In autumn the root system continues water uptake as long as the ground and the stem stay unfrozen, while transpiration slows down earlier, thus the MC increases (Hakkila, 1962).

Monthly moisture content of fresh pine and birch stemwood in Finland

Routa et al. (2015) compiled information on the average MC of fresh pine and birch stemwood by harvesting month in Finland, based on data from several sources.



The moisture content of fresh pine and birch stemwood in Finland by month (Routa et al., 2015).

Birch has the highest variation in MC. The average MC is higher in pine and spruce than in birch. The MC of fresh pine and spruce is higher in winter than in summer. The MC of birch is at its highest in spring in May, just before leafing. This is due to the root system becoming active before the leaves bud, i.e.

before the start of leaf transpiration. After budbreak, the transpiration rate is so fast that the water consumption of the tree is larger than the water intake, and as a result, the MC drops. After leafing, the MC drops below the average during summer before rising back to the average level again in autumn. When the quantity of water supplied by the roots exceeds the transpiration rate, the MC of birch starts to rise. This occurs at the latest in autumn when the leaves fall. The MC keeps rising as long as the roots can remain active when the weather gets colder (Hakkila, 1962).

Read more:

- Hakkila, P., 1962. Polttohakepuun kuivuminen metsässä. Communicationes Instituti Forestalis Fenniae (1963) 54. 54, 1–82.
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- Lehtonen, I., Venäläinen, A., Kämäräinen, M., Asikainen, A., Laitila, J., Anttila, P., Peltola, H., 2019. Projected decrease in wintertime bearing capacity on different forest and soil types in Finland under a warming climate. Hydrology and Earth System Sciences 23, 1611–1631.
- Lindblad, J., Routa, J., Ruotsalainen, J., Kolström, M., Isokangas, A., Sikanen, L., 2018. Weather based moisture content modelling of harvesting residues in the stand. Silva Fennica 52, 7830.
- Routa, J., Kolström, M., Ruotsalainen, J., Sikanen, L., 2015. Validation of prediction models for estimating the moisture content of small diameter stem wood. Croatian Journal of Forest Engineering: Journal for Theory and Application of Forestry Engineering 36, 283–291.

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SECURE-BIO-SUPPLY- Development of Long-Term Storage of Solid Biofuels to Enable a Sustainable Energy Transition

Contact us:

abo.fi/secure-bio-supply



Project information:

Time period: 1.3.2024–28.2.2026

Project Owner: Åbo Akademi University

Project partners: Novia University of Applied Sciences, Finnish Forest Centre

Financier: EU-FRO Just Transition Fund (Ostrobothnia's FRO (JTF) call 2/2023.) The Regional Council of Ostrobothnia.

The goal of the **SECURE-BIO-SUPPLY** project is to analyse the challenges and opportunities that changes in long-term fuel storage can create in Ostrobothnia.



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