Info-sheet

SECURE-BIO-SUPPLY

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Covering of wood chip piles

Covering of chip piles and moisture management

There is an imbalance between the supply of biofuels and demand due to the seasonal nature of demand. There is thus a need for storage of wood in the form of chips to ensure a continuous supply to the heating or power plant. When stored outside, chip piles are exposed to rain and snowfall. Covering piles is a method of protecting the chip piles and managing the **moisture content (MC)**, which is one of the most important properties of biofuels. The MC of wood chips is directly related to the energy content, and a high MC during storage may facilitate fuel degradation and further reduce the energy content. The activity of microbes depends on the MC; an MC of 30–50% is ideal for fungal growth (Krigstin and Wetzel, 2016). Furthermore, moist wood chips are heavier and thus costlier to transport.

Properties of the cover

While a cover can protect wood chip piles from rewetting, there are differences between the types of covers used. If a compact cover is used, the average MC in the pile does not decrease; it is just redistributed (Anerud et al., 2018). The water heated by biological and chemical reactions condensates at the surface of the covered pile, increasing the moisture content at the surface. A pile covered with a compact plastic cover was even observed to have a higher **dry matter loss (DML)** compared to an uncovered pile (Nurmi, 1990). Rather than being fully compact, the cover should be breathable, preventing precipitation from reaching the chips while simultaneously allowing for the release of water vapor from the pile. Ventilating tarps, such as TopTex® (made of polyethene, specific weight of 200 g/m^2), have in studies been found to be effective in reducing DML and improving the drying of wood chip piles (Anerud et al., 2021, 2018; Anerud and Eriksson, 2021; Wästerlund et al., 2017).

Study results of dry matter losses in uncovered and covered wood chip piles

Being aware of typical DML during the storage of fuels is important for optimizing resources and logistics in the supply chain. **Figure 1** shows rough trendline estimates of how monthly DMLs vary with storage time based on different studies conducted in Finland and Sweden comparing DMLs in covered and uncovered wood chip piles. The tree species in the studies are pine, spruce, birch or a mixture of these. The chips were made from logging residues, stem wood or whole trees. Some studies used freshly made chips, while others used chips that had been

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pre-stored for different amounts of time. The type of covers used in the studies differed; permeable and non-permeable plastics as well as waterproof paper were used.

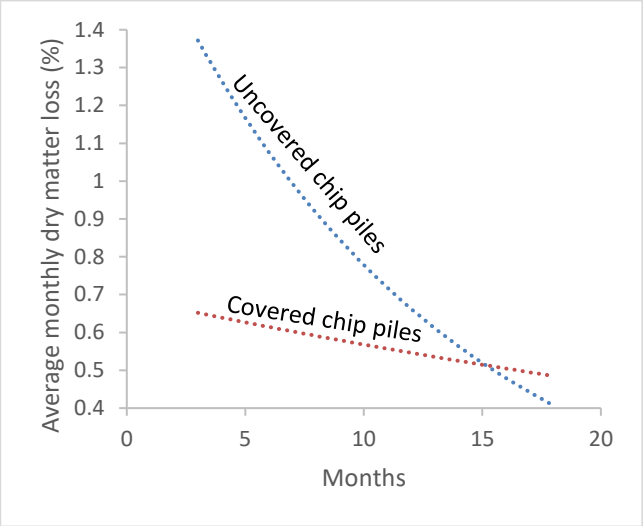

Figure 1. Rough trendline estimates of monthly dry matter losses in covered and uncovered wood chip piles based on measurements in different studies (Anerud et al., 2021, 2018; Anerud and Eriksson, 2021; Jylhä et al., 2022; Nurmi, 1990; Prinz et al., 2022; Wästerlund et al., 2017).

The monthly DML ranged from **0.1–2.7%**. The studies indicate that DMLs are the highest at the beginning of a storage period. The average monthly DML in **uncovered and covered piles were 1.1% and 0.7%, respectively**. This would imply that, **on average, covered piles lost about 40% less dry matter**. This figure should be treated with caution because there is great variation between the studies regarding storage circumstances and the properties of the chips. Nevertheless, the results of the studies seem to indicate that covering wood chip piles can contribute to quite significant reductions in DML.

Read more:

Anerud, E., Bergström, D., Routa, J., Eliasson, L., 2021. Fuel quality and dry matter losses of stored wood chips - Influence of cover material. Biomass and Bioenergy 150, 106109.

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Anerud, E., Jirjis, R., Larsson, G., Eliasson, L., 2018. Fuel quality of stored wood chips – Influence of semi-permeable covering material. Applied Energy 231, 628–634.

Jylhä, P., Ahmadinia, S., Hyvönen, J., Laurén, A., Prinz, R., Sikanen, L., Routa, J., 2022. Self-Heating, Drying, and Dry Matter Losses of Stockpiled Stemwood Chips: The Effect of Ventilation. Energies 15, 7094.

Krigstin, S., Wetzel, S., 2016. A review of mechanisms responsible for changes to stored woody biomass fuels. Fuel 175, 75–86.

Nurmi, J., 1990. Polttohakkeen varastointi suurissa aumoissa. Metsäntutkimuslaitos.

Prinz, R., Routa, J., Anerud, E., Bergström, D., Sikanen, L., 2022. Performance of an Innovative Bio-Based Wood Chip Storage Pile Cover—Can It Replace Plastic Tarps? Energies 15, 1680.

Wästerlund, I., Nilsson, P., Gref, R., 2017. Influence of storage on properties of wood chip material. J. For. Sci. 63, 182–191.

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

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Project information:

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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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