



Biomass hybrid dryer

Using solar heat and cheap electricity can be an economic way to dry biomass, and it is also a possible way to store energy in solid fuels. Increasing the heat value and improving the quality of solid fuels by drying helps fuel management, particularly in winter when large fuel storages and fuel of better quality are needed during high energy demand. Lower moisture content of biomass prevents from dry matter losses on one hand, and less material is needed for energy production on the other hand. If biomass is dried close to the harvesting site, significant cost reduction on road transportation can be attained.

Storage of solid biomass fuel plays an important role in all bioenergy supply chains. Usually, storage is needed to even out unequal demand during the year on one hand and to decrease the moisture content of fresh biomass by seasoning on the other. In practice, the most feasible way to apply solar or hybrid drying and to store dried biomass is to do it in small units, for example at farms, where biomass sources are closer and all logistical solutions are easier than in urban areas.

VTT has studied biomass drying for many years. As a direct continuation to lab-scale equipment, VTT has built a pilot hybrid dryer for solid biomass drying. In this dryer, solar collectors (24 m²) and a heat pump (25 kW), integrated into an air supply unit, are placed in a freight container. A parallel container serves as a drying chamber for biomass. The pump is primarily used to remove moisture from the drying air and to provide initial heat if necessary. The dryer can be run on a solar or pump mode or on both of them. Algorithms follow the electricity price and determine which is the most economical mode to operate. If the electricity price fluctuates during the day, drying can be halted and continued when economical again. Cheap energy, whether solar or power, can be stored in dried biomass. The whole system is movable and scalable in modules.

The concept suits best in rural areas such as farms and small enterprises, close to dispersed biomass sources. It should also be noted that fossil fuel is most often used for drying grain at farms. Grain and other crops can also be dried with this kind of hybrid dryer and thus decrease the need for fossil fuels. With this concept all that fuel can be substituted with renewable alternatives.

VTT has piloted the dryer (TRL 6) already in various conditions and tested it in a production environment.



Photo: Jyrki Raitila, VTT

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ADDITIONAL INFORMATION

This dryer effectively utilizes fluctuations in power prices and enables storage of intermittent solar energy in biomass. Flexible use of different operating modes allows choosing the most economical way to run the dryer, depending on the electricity price and availability of irradiation. Energy of renewable electricity can be stored in biomass through this process as well. Storage is particularly important in countries like Finland where high demand for heating takes place in winter and alternative energy sources are expensive.

Scaling up is also possible, for example in biomass terminals where handling, storage and logistics are more efficient. On the whole, hybrid drying adds value to the energy carrier or agricultural product, and it is cost-effective compared to most fossil fuels. Investment subsidies, often available in rural areas, and benefits of scale would greatly improve the system economy.



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ABOUT BRANCHES

BRANCHES is a H2020 “Coordination Support Action” project, that brings together 12 partners from 5 different countries. The overall objective of **BRANCHES** is to foster knowledge transfer and innovation in rural areas (agriculture and forestry), enhancing the viability and competitiveness of biomass supply chains and promoting innovative technologies, rural bioeconomy solutions and sustainable agricultural and forest management.



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THE PARTNERSHIP

