



### A heat storage device

Generation of energy from periodically available renewable sources, such as wind and solar energy, has a major disadvantage: the unpredictable availability of energy from these sources. A solution for this can be to utilize energy storage systems that can store the generated energy to be released when needed, i.e., when the renewable energy source (wind, solar) is unavailable and cannot supply energy. In practice, there are electrical, thermal and mechanical energy storage systems.

At the University of Warmia and Mazury in Olsztyn, a laboratory device was designed for storing heat obtained from various sources in the active medium made of paraffin packets and its subsequent release in the form of thermal energy.

After being adapted to the needs of the target installation, this type of energy storage, can work both in the heating systems of small installations, such as households, farms and small companies, and in large installations for thermal stabilization.

A thermal energy storage system achieves higher efficiency because its active medium is characterized by a higher capacity due to the phase change. As a result of this, much more thermal energy is possible to be stored than generated from conventional heating. Another functional aspect relates to the possibility of supplying heat from the outside of the storage system by connecting the device to an external heat and/or electricity source circuit.

The designed device can work with any source of thermal or electric energy, which is converted into heat by means of electric heaters placed in the tank. The energy needed to power the device can therefore be from a power grid, a photovoltaic installation, a power generator driven by a wind turbine, a water turbine, an element of a cogeneration system, etc.

Energy storage using phase change agents (here paraffin) which change the physical state according to the operating temperature, requires adjusting the temperature to the melting and solidification temperatures of the agent. For example, the melting point of paraffin ranges from 45°C to 65°C, which will be used in tap water installations. The heat capacity of such an energy storage using water is about 4.5 MJ with a temperature increase of 1°C.



Tank filled with paraffin packs.  
Photo: W. Miąskowski.

### KEY WORDS

Heat, systems for storing energy, electric current generator, heat capacity

### COUNTRY

Poland

### AUTHORS

Wojciech Miąskowski  
[wojciech.miaskowski@uwm.edu.pl](mailto:wojciech.miaskowski@uwm.edu.pl)

### DISCLAIMER

This Practice Abstract reflects only the author's view and the BRANCHES project is not responsible for any use that may be made of the information it contains.

### DOWNLOAD

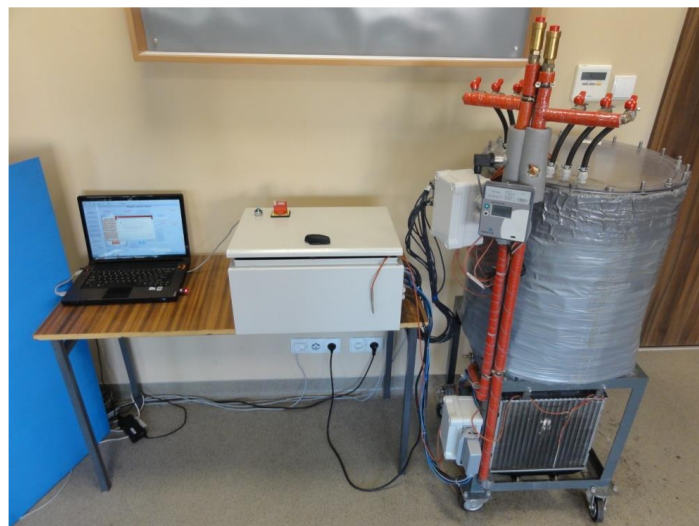
[www.branchesproject.eu](http://www.branchesproject.eu)

## ADDITIONAL INFORMATION

Parameters such as the capacity of a storage tank, range of temperature and the number of elements serving to receive and to transmit the energy into the storage tank are selected based on the intended use of the installation and available energy resources.

Technical parameters of the laboratory device are:

- Range of operating temperatures: +10-95°C
- Power of the heaters: 0.5 + 0.85 + 1.0 kW<sub>e</sub> (maximum total power 2.35 kW<sub>e</sub>)
- Capacity of the tank: 1.1 m<sup>3</sup>



Lab-scale illustration of the process of charging and discharging the storage tank. The tank is monitored and controlled remotely on the operator's desktop (also accessible online), where the current operating parameters are displayed. Photo: W. Miąskowski

**Coordinator:** Johanna Routa - (Luke) [johanna.routa@luke.fi](mailto:johanna.routa@luke.fi)

**Dissemination:** [itabia@mclink.it](mailto:itabia@mclink.it)

[www.branchesproject.eu](http://www.branchesproject.eu)

## 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.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101000375

## THE PARTNERSHIP

