

# Optimized energy storage system and related method.

## KEYWORDS

- ❑ STORAGE ENERGY
- ❑ ENERGY SYSTEM
- ❑ HEAT EXCHANGERS
- ❑ HEAT OUTPUT
- ❑ ELECTRICITY OUTPUT

## AREA

- ❑ ENERGY & ENVIRONMENT

## CONTACTS

- PHONE NUMBERS  
+39.06.49910888  
+39.06.49910855
- EMAIL  
u\_brevetti@uniroma1.it

## Priority Number

n. 102019000023262 \_06.12.2019.

## Patent Type

Patent for invention.

## Ownership

Sapienza Università di Roma 100%.

## Inventors

Andrea Vallati.

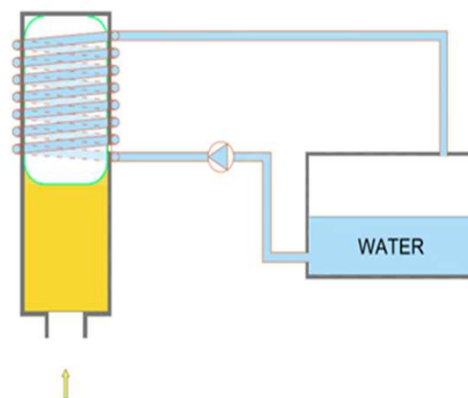
## Industrial & Commercial Reference

The field of this study is to optimize the energy from renewable sources e to use this energy in the combined HVAC and electric systems.

## Time to Market

Actually the patent idea we can assigned TRL level equal to 4. A model has in fact been built in the laboratory and the first experimental measurements and calibration of the mathematical model have been made.

**LICENSED**



**Fig. 1** Diagram of the heat exchanger and its circuit.

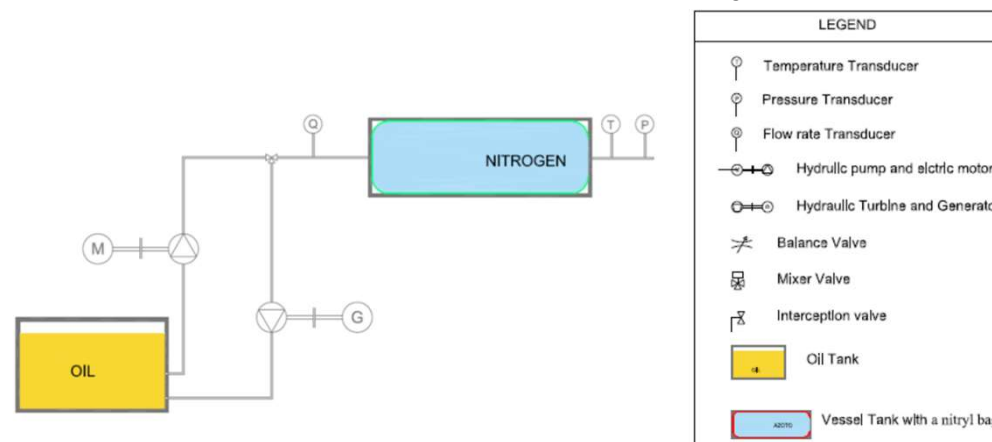
**Fig. 2** The layout of the GLES system.

## Abstract

The idea is that of a system in which a gas is compressed by introducing liquid into a pressure tank using a high-efficiency hydraulic pump. During this phase, a heat exchanger placed all around the storage tank, will take the heat produced during compression, to use it outside of the system. This exchanger will also have the purpose of improving the compression efficiency.

After compression there will be a pause period, and subsequently, when the demand for electricity appears, the high pressure water is released into a Pelton turbine coupled to a high efficiency electric generator, thus producing electricity.

## Functional scheme of the system



**SAPIENZA**  
UNIVERSITÀ DI ROMA

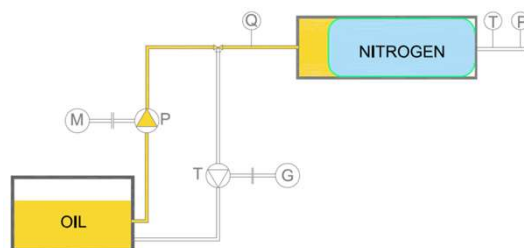
ASuRTT \_ UFFICIO VALORIZZAZIONE E TRASFERIMENTO TECNOLOGICO  
SETTORE BREVETTI E TRASFERIMENTO TECNOLOGICO

➤ <http://uniroma1.it/ricerca/brevetti>

# Optimized energy storage system and related method.

## Technical Description

The optimized storage system is designed to simultaneously accumulate and supply electrical and thermal energy if necessary and is equipped with a tank designed to contain liquid and gas separated from each other either by a piston or a membrane bag. Outside the tank, a heat exchanger, which is designed to recover a quantity of heat that develops during the storage of electrical energy inside the storage medium. A hydraulic pump designed to allow the passage of liquid from an external tank into the storage tank. A Pelton turbine and an electric generator, designed for the production of electricity and finally a hot water collection tank connected to the exchanger.

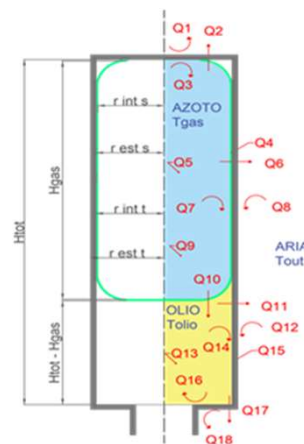


**Fig. 3.** The layout of the GLES system, during the compression phase

## Technologies & Advantages

The proposed storage system is a system that has great strengths compared to a traditional system. Surely the mechanical parts that compose it have a high number of operating hours, low maintenance but above all they are eco-compatible. Furthermore, it is important to highlight the great flexibility and scalability of the system which can therefore be used for a very wide range of powers and therefore a wide range of applications. As far as the production of thermal energy is concerned, it is a very important advantage because not only does it bring the system to very high efficiencies (70%) but it is therefore possible to insert it in a plant system for the production of electrical and thermal energy such as that of a residential or tertiary building.

**Fig. 4,** Heat fluxes in the physics model formulation



## Applications

The applications for this system can be different: it can be used as an energy system to level the peak of electricity demand in a building or in a smart grid where there are renewable sources, it can be used to ensure energy self-sufficiency in a system stand-alone with the combination of photovoltaic or wind power, it can be used for recharging electric vehicles in a building, it can be inserted in an air conditioning system of a full electric building and to support electricity management and finally it can be used to favor the penetration of renewable sources into the national electricity system.



**Fig. 6** G.L.E.S. prototype (oleo dynamic system and oil pump).

## CONTACTS

➤ PHONE NUMBERS  
+39.06.49910888  
+39.06.49910855

➤ EMAIL  
u\_brevetti@uniroma1.it



**SAPIENZA**  
UNIVERSITÀ DI ROMA

ASuRTT \_ UFFICIO VALORIZZAZIONE E TRASFERIMENTO TECNOLOGICO  
SETTORE BREVETTI E TRASFERIMENTO TECNOLOGICO

➤ <http://uniroma1.it/ricerca/brevetti>