Flywheel storage cost per kwh

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A French start-up has developed a concrete flywheel to store solar energy in an innovative way. Currently being tested in France, the storage solution will be initially offered in France’s overseas territories and Africa.

A flywheel system is able to store electricity by converting it into kinetic energy using a motor to spin a rotor. The flywheel rotates at such a high speed that the electrical power is transformed into mechanical power.

The proposed solution consists of a hollow or solid cylinder that is rotated around an axis and connected to an electric motor and generator. “When you have the energy to store, the engine drives the flywheel, which accelerates,” said the company"s co-founder and general director, Andr? Gennesseaux. “In the other direction, the motor can act as a brake to discharge the electricity.”

To date, according to the manufacturer, most of the flywheels used for this kind of storage were made of steel. "But steel flywheels have a limit: their price, while stationary storage users are looking, above all, for the best costs,” Gennesseaux explained. “Some companies are also developing carbon cylinders, which are much lighter but, again, very expensive while our approach is not to work primarily on the weight because in this type of applications, it does not matter.”

According to the general director, carbon flywheels currently cost around EUR250/kWh, steel flywheels EUR200/kWh and concrete ones around a few euros. "The particularity of our patented technology is that the concrete cylinder is pre-stressed by a winding of fiberglass and is held in a vacuum to avoid friction,” Gennesseaux stated. Thanks to this, maintenance operations are reduced because the mechanical part is sealed and the lubricating oil is also in a vacuum environment, without risk of oxidation.

The flywheel is guaranteed for 30 years and a change of its inverter is expected after 15 years. "At the beginning, we chose concrete for price reasons, but we quickly found that its life cycle analysis was also positive," Gennesseaux went on to say. “We are around 10 grams of CO2 per kWh, while lithium-ion batteries are around 40g CO2/kWh, at the same level as steel flywheels."

The system capacity should be increased, initially, to 20 kWh, and then 50 kWh, to eventually reach 24 hours of storage. “The size limit will be given by logistics as we have to find cranes capable of burying the flywheels in the ground, which is why we are limiting ourselves to 50 kWh in our current business plan,” Gennesseaux added, noting that the solution will be initially offered in France"s overseas territories and Africa.

The French company received funding from the European Union"s Horizon 2020 research and innovation program. "As a beta-test, we have a demonstration project with Voltalia in Guyana," Gennesseaux said.

“In this context, we will install a 10 kWh flywheel which will manage fluctuations on the network for one hour if a cloud passes.”

According to him, in hot and humid regions, the flywheels are much more robust and reliable than lithium-ion batteries. The company is also working in partnership with Engie on the Th?mis solar power plant project in the Pyr?n?es-Orientales (3.4 MWp) where several 10 kWh flywheels will be installed with the objective of verifying the effect of this technology in frequency regulation, compared to lithium-ion batteries.

*The article was updated to amend a translation error. The proposed solution consists of a hollow or solid cylinder and not a hollow, solid cylinder as we previously reported.

If the basic unit’s flywheel (not steering wheel) has a mass of 3 tons, then that would indeed correspond to a concrete volume of about one cubic metre. Reinforcing the concrete with one or more windings of fibreglass would not change this much

This is one of those technologies that never quite catches on, but never quite goes away.One issue with the material in one these is "creep". The flywheel will slowly destroy itself over time. That is pretty much a given. Some sort of containment system will be needed for a steel or concrete flywheel. A carbon fiber wheel simply turns into a large pot scrubber upon its failure. Worth its cost because of this built in safety factor.