Flywheel energy storage prague

Flywheel energy storage prague

Charging infrastructure has to keep pace with the growing number of electric cars. If we wanted to charge ten cars at once in ten minutes, say, we would need the equipment capable of supplying a skyscraper with electricity. Expanding and upgrading the existing infrastructure is a difficult and expensive project that will take time.

An Israeli start-up called Chakratec -- a firm which ?KODA concluded a strategic partnership with last year via ?KODA AUTO DigiLab Israel Ltd -- is taking a different approach. It"s a really interesting idea. Kinetic Power Booster is a flywheel-based energy storage system without the need for chemical battery cells. This technology makes it possible to charge electric cars with double the charging power the electricity grid could provide. What"s more, it can be used in places where the grid"s capacity falls far short of what"s required for fast charging. Or it can charge two electric cars at "full" speed, whereas under different circumstances they would have to share the available capacity.

Last year ?KODA AUTO DigiLab, in collaboration with Pra?sk? Energetika (PRE), began pilot operation of the innovative flywheel-based kinetic storage system hooked up to a fast-charging station. You can find it at the PVA EXPO complex in Prague"s Let?any district. It is the first facility of its type in Czech Republic and the third in the world.

The kinetic storage facility enables fast charging even in places where the local grid would not be powerful enough. The storage system absorbs peak loads in the grid to spin flywheels to high rotation speeds, which stores electricity in kinetic energy form. As soon as an electric car is connected to the storage facility, the Kinetic Power Booster slows down the flywheels again and releases the energy as electricity.

In this way it can double the charging power for a given time compared to what the grid can provide. This solution is ideal for car showrooms or shopping centres, where increasing the power supply for installing a fast-charging station would involve an unaffordable investment.

One disadvantage of earlier fast-charging stations using chemical accumulators is their fluctuating capacity. Chakratec"s system does away with this - the capacity remains constant. That"s because the technology is entirely mechanical, not chemical. And it lasts for ages: it enables roughly 200,000 charging and discharging cycles. The manufacturer puts its lifespan at twenty years.

The current version of the Israeli firm"s energy storage system consists of ten flywheels, each weighing 150 kilograms. These are housed in special steel cases in a container, where they rotate in a vacuum. When current from the grid is fed into them, their spinning gradually accelerates - conversely, when an electric car is charging its battery, they generate electricity and, logically, their rotation speed gradually falls.

To give you an idea: this energy storage technology would make it possible to charge the accumulators of two ?KODA CITIGO? iV cars to 80% capacity simultaneously - which is double the power the grid could provide on its own. After they are discharged, the flywheels need a certain amount of time to get back to the required rotation speed - when hooked up to the 50 kW grid connection at the PVA EXPO this takes roughly 45 minutes.

To ensure the flywheels encounter as little air resistance as possible, they are housed in special steel cases allowing them to rotate in a vacuum. The Israeli engineers devised a sealing system that is as close to perfect as possible. The vacuum is maintained by pumps, but to save energy the pumps switch on only when the vacuum state falls below a certain threshold. This keeps the system at a constant level of 10 millitorrs, or 1.33 pascals.

When the Kinetic Power Booster is at "full charge", the flywheels spin at 18,000 revolutions per minute. When a car is being charged, the speed gradually falls to 7,000 rpm - at that point the charging is halted because the storage facility is fully discharged. The time it takes to recharge - i.e. get the flywheels back up to maximum speed - depends on the capacity of the grid the facility is hooked up to. With a 50 kW grid it takes around 45 minutes.

If the electricity supply was switched off when the flywheels were spinning at top speed, it would take four days for them to stop completely. Could they charge an electric car even after being disconnected? Of course they could, but this is not done in practice.

The storage facility itself, including the connected charging station, consumes roughly 3 kWh of energy. That means that all the other energy flowing in from the grid is used to charge electric cars" batteries. The rest is used to power the flywheels, the vacuum pump, the air-conditioning unit, the operation of the charging station itself and so on.