

Excavator energy storage and energy saving

Does hydraulic excavator save energy?

Compared with the current hybrid system and conventional system, the energy saving efficiencies are 4% and 48% respectively with different cylinder velocities. The fuel consumption and emission of hydraulic excavator can be reduced effectively with the proposed powertrain and energy management strategy.

What is a hydraulic excavator energy saving system?

In order to address these issues, a hydraulic excavator energy saving system based on a three-chamber accumulator is proposed. Firstly, the conventional piston-type hydraulic accumulator is integrated with the hydraulic cylinder to form a three-chamber accumulator, which has a pressurizing function during energy storage.

How regenerated energy is stored in a hydraulic excavator?

For the HERS, the regenerated energy can be stored in the hydraulic accumulator through hydraulic valves [12,13]. To reduce the energy consumption of the hydraulic excavator, the stored energy can be reused to drive the actuator independently, or assist the engine to drive the hydraulic system.

How efficient is hydraulic excavator?

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How many energy storage devices do excavators need?

The regeneration system always requires at least one energy storage device. However, using a single storage device is difficult to meet the need for energy recuperation as well as performance satisfaction of excavators. Some researches combine two independent energy storage devices to form a combined energy storage system.

What are hydraulic energy recovery methods for excavators?

Currently, the mainstream hydraulic energy recovery methods for excavators mainly include the electric energy regeneration system (EERS) and the hydraulic energy regeneration system (HERS).

Saving energy is important and necessary for hydraulic excavators. This paper proposed a novel energy regeneration boom system. ... improved efficiency, and reduced costs. Shen et al. [19] analyzed an energy storage system in which a super capacitor and battery were used for energy storage in an electric vehicle. Super capacitors provide high ...

In this article, taking the hydraulic system of mining hydraulic excavator boom and stick as the plant, an adaptive robust impedance controller based on an extended state observer and backstepping method is

designed. The energy-saving operation and position tracking performance are considered in system modeling and control law design. The system effects ...

Different ESEs are adopted in different energy storing systems for energy demand. For example, flywheel is widely used in hydro systems, while accumulator is widely used in hydraulic systems [8], and battery or SC (Super Capacitor) is usually used in hybrid vehicles and construction machineries. Now people are exploring the combination of applications with a ...

the endurance and output power of electric energy storage units and motors. Hybrid systems have wider applicability and reliability. Fuel-electric hybrid and ... novel fuel-hydraulic excavator swing energy-saving system with a variable motor and a valve-controlled accumulator (Yu et al., 2016; Yu and Ahn, 2020).

The potential energy or kinetic energy of an actuator can be converted to electric energy by using a generator and saved in energy storage unit. A hydraulic hybrid excavator uses a hydraulic accumulator as the energy storage unit, in ...

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The simulation and the experimental results show that the proposed control method has a much faster response for the energy-saving operating points, which reduces the energy consumption by 9.28% and 5.56% without adding any energy storage devices to the hydraulic excavator.

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