

Use Case Engine Starting



Eaton supercapacitors provide reliable start-up for engine design

Designing a reliable engine start system is a necessity for automotive electrical and mechanical engineers. But even the best lead-acid battery can result in a stalled engine due to a cold climate or premature degradation. Conventional batteries can cause issues for commuters, commercial vehicle operators, generator owners and those in locations with varying weather conditions.

Eaton supercapacitors are designed for ultra-long lifespans – eliminating battery woes for every engine design. They charge rapidly while the vehicle is at rest and instantaneously transmit pulse power to kick-start the engine every time, even from a cold start.

A discharged or defective battery is one of the most ubiquitous causes of engine start failure. When a car battery is low, it cannot start an engine or may cause the engine to stall. At this point in the battery life, frantically turning the ignition multiple times only depletes the charge level further.

Lithium-ion batteries are plagued with several problems including poor cold-start power, and a limited number of charge/discharge cycles. When everything else fails, the final resort to remedy a defective battery will be to jumpstart it – which is both expensive and unsustainable.

Conventional lead-acid, starting batteries also degrade quickly when experiencing wide variations in ambient temperature. Low-temperature conditions can freeze the electrolytes, preventing the chemical reactions that produce an electric current. Hot temperatures accelerate chemical reactions which rapidly degrade the internal components, sapping the battery of its starting power.

Unlike batteries, Eaton supercapacitors charge in less than 60 seconds. They can be charged millions of times with reliable operation over a wide range of temperatures (-40 °C to +85 °C). As soon as the ignition is started, supercapacitors provide instantaneous high-density power and low-end torque for failsafe engine starting, even in cold weather.

The average lifespan of a lead-acid battery is just around 2 to 4 years, while Eaton supercapacitors can last up to 10 years or more – possibly outliving the vehicle itself.

Unlike 12 V lithium-ion batteries which store charge with an electrochemical reaction, a supercapacitor will store energy via a static charge. The Electric Double-Layer Capacitor construction (EDLC) of supercapacitors significantly increases charge density, ensuring an extended operating life at reasonable costs.

The XT supercapacitors feature technology with a maximum operating voltage of 3 V at 275, 370, and 555 farad (F), while the XV model offers 2.7 V at 300 F, 400 F, and 600 F. Both products have a high tolerance for temperature variance (-40 °C to +85 °C). The XL60 supercapacitor provides an ultra-high capacitance of 3000 F and 3400 F and ultra-low resistance at 3 V with operating temperatures from -40 °C to +65 °C for larger engines.

Eaton offers a range of supercapacitors for a wide

variety of engines and conditions. Typical engine-start applications require 6 or 12 XT, XV, or XL60 supercapacitors. They can be arranged for 12 V or 24 V starters.

The lightweight and small-footprint XT, XV, and XL60 supercapacitors help manufacturers meet size constraints in even the most streamlined engine systems. Eaton supercapacitors start a wide range of engines, including:

- Marine vehicles
- Commercial trucks & vans
- Buses
- Passenger vehicles
- Locomotives
- Generators

Eaton supercapacitors utilize Electric Double-Layer Capacitor construction (EDLC) for ultra-high capacitance, low Equivalent Series Resistance (ESR), and high-power density. Each cell comprises durable and eco-friendly materials. All products are RoHS-compliant and UL recognized.

Experience better engine start lifespan, efficiency, and reliability without sacrificing weight or safety with Eaton supercapacitors.

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