GS YUASA ACADEMY
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Basic Battery Operation

Introduction

This mandatory training course deals with how a battery works.

The object of this training course is to instruct you on the basic fundamentals of battery operation.

Additional training material specific to the operation of lead acid batteries is available in the lead acid battery operation course.

This course will include additional information on the electrochemical reaction, ionisation, battery discharge and recharge processes and health and safety.

This training course consists of the following modules:

What is a battery?
The lead acid battery
Voltage and current
Labelling terminology
Specifications
Service terminology

Each module has its own training video, downloadable resources and some will be followed by a short multiple-choice test.

Once you have completed all modules there will be a final test to check your understanding and knowledge.

Once passed you will earn a certificate for the completion of this course.

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Module 1 - What is a Battery?

A battery is a device that can store electrical energy in chemical form and release it in a controlled way.

Two electrodes made of different materials submerged in an electrolyte will generate a voltage.

In its simplest form, a battery can be made by inserting a zinc and a copper rod into a lemon.

When connected the zinc rod chemically reacts with the acidic lemon juice and begins to dissolve.

This reaction results in the release of electrical energy in the form of electrons into the Zinc rod.

These electrons travel through the circuit and can illuminate an LED light.

When the electrons arrive at the Copper rod they combine with Hydrogen ions contained in the lemon juice to form Hydrogen gas bubbles.

This is known as a primary voltaic cell because it uses a chemical reaction to produce electrical energy but cannot be recharged.

Module 2 - The Lead Acid Battery

All GS Yuasa batteries are made up of lead acid voltaic cells arranged side by side that can produce a little over 2 volts.

Thus a 12-volt battery will feature 6 of these cells.

Positive and negative plates made from two different lead compounds suspended in an electrolyte solution of sulphuric acid and de-ionised water.

Unlike the lemon the chemical reaction that produces electrical energy in a lead acid battery is reversible.

This means that the battery can be recharged after use.

This is known as a secondary type battery as it can repeatedly be recharged.

Typically, GS Yuasa batteries are used in either standby or cyclic applications.

A cyclic application is where the battery is repeatedly discharged and recharged.

Examples include vehicle batteries used to start a car and industrial batteries used to power a golf trolley.

Standby also known as float standby is where the battery is continually on charge ready to be used as back-up power when needed.

Examples of this include, Uninterruptable Power Supply or security system batteries.

Module 3 - Battery Terminology

To understand the basic principles of a battery it is essential that we first look at the units and symbols used to measure its operating states.

The electrical energy in a circuit is measured using both voltage and amps.

Voltage is the measurement of electrical pressure measured in volts.

Current is a measurement of electrical flow.and is measured in amps.

Voltage forces current to flow through a complete conductive circuit.

The bigger the voltage, the higher the pressure resulting in more current flow.

Module 4 - Labelling Terminology

Amp hour is the measurement of a battery's capacity performance rating.

For vehicle batteries it is the amount of electricity it will deliver for 20 hours before its voltage falls to 10.50V.

Industrial batteries are generally rated in the same way but in some instances, will be rated at 10 hours before its voltage falls to 10.80V.

Cold cranking amps or CCA is the measurement of starting performance.

It is the maximum current a fully charged battery can deliver at -18°C and is represented by A on the label.

It is used to determine its ability to supply high cranking currents for engine starting and maintain sufficient voltage to power ignition requirements.

Like CCA, Marine Cranking Amps is used to measure the current a battery can deliver at a specified temperature.

However, the MCA test is conducted at 0°C rather than -18°C.

MCA ratings are 20 to 25% higher than A ratings and are commonly used for marine cranking applications.

Reserve capacity is an indication of the time that a vehicle with a typical electrical load will run for if the alternator fails.

It is the length of time in minutes taken for the voltage to fall to 10.5 when a constant load of 25 amps is applied at 25°C.

Module 5 - Specifications

Power is the rate at which energy is generated or consumed.

Some GS Yuasa leisure and marine batteries feature a Watt/Hour rating which indicates the power it can deliver.

For example, a with a 500-watt hour rating can deliver 1 watt of power for 500 hours, 50 watts for 10 hours or 500 watts for 1 hour.

Industrial batteries will have published performance figures that specify Watts per cell data for different discharge times, also known as autonomy.

As an example, a single 12-volt industrial battery will deliver six times the Watts per cell data.

Cycles are a measure of the number of times that a battery can be fully discharged and then recharged.

The higher the cycle specification the longer the service life.

Only leisure, marine and deep cycle industrial batteries are designed to withstand repeated deep discharge cycling.

Although a battery may feature an Ah rating this does not imply suitability for cyclic use.

Repeated deep discharge of a standard starter battery will damage the internal components and lead to premature failure.

Module 6 - Service Terminology

Industrial batteries have a recommended float and boost charging voltage.

Float charge is the constant voltage needed to keep the battery in a fully charged state without overcharging it.

Boost charge is generally used for cyclic applications.

It is the maximum recommended charging voltage and only be used for short time periods.

Industrial batteries feature a terminal torque figure.

Terminal bolts MUST be tightened in accordance with this figure.

Over tightened or loose bolts can cause serious battery damage and failure.

GS Yuasa industrial batteries carry the UL logo. This means that the manufacturing facility has been registered by the United Laboratory and products classified with varying degrees of flame retardancy.

GS Yuasa industrial batteries with the highest degree of flame retardancy will have a FR part number suffix.