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# **ACID BATTERY AND JUMP STARTING**

**Leader's Guide, Fact Sheet  
& Quiz**

**Item Number: 3270**  
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***This easy-to-use Leader's Guide is provided to assist in conducting a successful presentation.***

## **PREPARING FOR THE MEETING**

Here are a few suggestions for using this program:

- a) Review the contents of the Fact Sheet that immediately follows this page to familiarize yourself with the program topic and the training points discussed in the program. The Fact Sheet also includes a list of Program Objectives that details the information that participants should learn from watching the program.
- b) If required by your organization, make an attendance record to be signed by each participant to document the training to be conducted.
- c) Prepare the area and equipment to be used for the training. Make sure the watching environment is comfortable and free from outside distractions. Also, ensure that participants can see and hear the TV screen or computer monitor without obstructions.
- d) Make copies of the Review Quiz included at the end of this Leader's Guide to be completed by participants at the conclusion of the presentation. Be aware that the page containing the answers to the quiz comes before the quiz itself, which is on the final page.

## **CONDUCTING THE PRESENTATION**

- a) Begin the meeting by welcoming the participants. Introduce yourself and give each person an opportunity to become acquainted if there are new people joining the training session.
- b) Introduce the program by its title and explain to participants what they are expected to learn as stated in the Program Objectives of the Fact Sheet.
- c) Play the program without interruption. Upon completion, lead discussions about your organization's specific policies regarding the subject matter. Make sure to note any unique hazards associated with the program's topic that participants may encounter while performing their job duties at your facility.
- d) Hand out copies of the review quiz to all of the participants and make sure each one completes it before concluding the training session.

# 3270 ACID BATTERY AND JUMP STARTING FACT SHEET

**LENGTH: 12 MINUTES**

## **PROGRAM SYNOPSIS:**

Automotive technicians can take pride in their skill and quality service and the professionalism in their industry. It's not complicated, but it takes a professional to handle and charge batteries safely, to have the knowledge to answer questions and to wear personal protection to prevent injuries. This program reviews how the battery works, different types of batteries, power ratings, inspection and charging procedures and how to safely handle and use batteries.

Topics include battery construction, testing a battery, types of batteries, cold crank rating, charging batteries properly and jump starting a battery.

**PROGRAM OBJECTIVES:** After watching the program, the participant will be able to explain the following:

- How a lead acid battery maintains its charge;
- Why a battery should be tested with a hydrometer before charging;
- How conventional and maintenance-free batteries differ;
- Why a battery's cold cranking rating is important;
- How to properly charge a battery;
- What the steps are in jump starting another vehicle.

## **INSTRUCTIONAL CONTENT:**

### **BATTERY SAFETY**

- All lead acid batteries emit hydrogen gas, which is highly flammable. A spark can ignite the gas and cause a battery to explode.
- Exploding batteries can cause physical damage and the sulfuric acid inside the battery can easily damage skin, clothing and permanently damage your eyes. That's why it's mandatory to wear eye and skin protection and prevent sparks around batteries.
- One method of reducing, but not eliminating, the explosive hazard is to place a damp rag over the vent caps when handling or working around batteries. The damp rag reduces the hydrogen gas escaping from the vent caps.
- This short program can't list all the safety rules or procedures relating the batteries, so be sure to read and follow the battery manufacturer's recommendations and your company's safety procedures.

### **BATTERY CONSTRUCTION**

- Electrical energy is produced in a lead acid battery by immersing two unlike lead plates in a sulfuric acid solution which is called electrolyte.
- One plate is made of lead peroxide which is negatively charged. The other plate is made of lead sponge and is positively charged.
- When a battery is sufficiently charged, you have sufficient acid or electrolyte solution around the positive and negative plates to cause a chemical action that produces electrical energy.
- A discharged battery results from the absorption of the acid and the electrolyte into the plates; therefore, the chemical action can't produce electrical energy.
- You already know a battery can be full of water but still discharged. The acid has been absorbed and only water remains.
- You need a method of getting the acid back out of the plates to mix with the water. We call it "charging the battery".
- When a battery can't be recharged, it can mean the plates are worn out and won't release the acid or perhaps the plates have been shorted together; therefore, no chemical action can take place.

### **TESTING A BATTERY**

- When you test a battery with a hydrometer, you're checking the amount of acid in the battery compared to the amount of water. That's the main reason you shouldn't add water to a battery before you take the hydrometer reading.

- Water is assigned a 1.000 unit of measure. Electrolyte or the acid water solution that has a 1.265 reading means the electrolyte is 1.265 times heavier than water.
- Hydrometer readings vary with temperature, so be sure to check the battery manufacturer's recommendations when testing batteries for specific gravity readings.
- There are other methods of testing batteries, such as a load test. Each method depends upon the type of equipment you have in your organization.

### **TYPES OF BATTERIES**

- Many inexperienced sales and service technicians are frequently asked the difference between the types of batteries, such as conventional and maintenance-free batteries. The usual answer is "one requires water and the other doesn't". That's not the correct answer because the customer already knew that.
- A conventional battery is manufactured with 2.5 percent antimony, a chemical to strengthen the lead. The lead plates are separated by thin pieces of glass mat.
- As the battery gets older, the lead plates flake off and settle to the bottom of the case. The flaking can cause chemical loss or shorting of the battery by touching both positive and negative plates.
- Antimony increases gassing therefore more water loss through evaporation.
- The maintenance-free battery is constructed with calcium lead which reduces gassing. The plates are enclosed in envelope type separators. Lead flakes are retained inside the envelopes, reducing the shorting out potential.
- The plates rest directly on the bottom of the battery, allowing more electrolyte to cover the plates.
- Less gassing, higher level of electrolyte, less evaporation means you don't normally have to add water, but many maintenance-free batteries have removable vent caps in the event water is needed.

### **COLD CRANKING RATING**

- The next question the customer may ask is, "Why do I need such an expensive battery? I'm going to sell the car next week. I want the least expensive battery." As a professional, you should explain cold cranking rating to the customer.
- Cold cranking rating is determined by the manufacturer and measures the ability of the battery to crank the engine under cold weather conditions. It's the number of cranking amps the battery delivers at 0 degrees for 30 seconds and maintains a minimum of 7.2 volts.
- Every vehicle has certain requirements based upon engine size and electrical systems. Installing an undersized battery that won't perform properly is doing the customer a disservice.
- Explaining how batteries are rated will help the customer make a better judgement in selecting the proper size battery. Your parts catalog provides the cold cranking ratings and group sizing of batteries for most types of vehicles.

### **CHARGING BATTERIES PROPERLY**

- Everyone knows how to charge batteries, but let's just mention a few basic procedures.
- First, follow the instructions on your charging equipment. There are a variety of chargers and methods of charging batteries, but some common rules apply to most situations.
- No sparks, open flames or smoking near the battery your battery charging operations.
- Leave the vent caps on the battery while charging. This reduces escaping hydrogen gasses and many vent caps are designed with flame arrestors or barriers which reduce the explosive hazard.
- Turn the charge rate switch and timer off before connecting leads to the battery.
- Never touch the cable leads when the charger is on. This could break the connection at the battery terminal, creating a spark.
- Shut the equipment off before handling cable connections.
- Wear protective equipment and use extra care when handling or charging batteries.

### **JUMP STARTING**

- How about jump starting a vehicle with another vehicle? Bring the two vehicles close together, but don't allow them to touch.
- Turn off all electrical loads on both vehicles and set the parking brakes. Place automatic transmissions in park and manual transmissions in neutral.
- Determine whether the discharged battery has a negative or positive terminal connected to ground. The ground lead is connected to the engine block, car frame or other good metallic ground.

- All cars manufactured in the United States in the past 20 years are negative ground. European and Asian passenger vehicles have been negative ground since 1971.
- The vent caps on both vehicles should be on tight and a damp rag should be placed across the vent caps to reduce hydrogen gasses. Make sure the rag is clear of the fan blades, belts or other moving parts.
- On a negative ground system, connect both ends of one cable to the positive terminals of each battery. Connect one end of the other cable to the booster battery negative terminal.
- The last connection is connected to the engine block or metal frame, away from the battery, carburetor and moving parts.
- Next, start the engine of the booster vehicle, wait a few minutes, then attempt to start the engine with the discharged battery. If the vehicle doesn't start after 30 seconds, something else may be wrong with the vehicle. Remove the cables in reverse order and remove the damp cloth.

## **REVIEW/CONCLUSION**

- A lead acid battery is an automotive part that produces electrical energy through chemical action. A battery consists of two unlike metals called plates.
- One is positively charged, the other negative. Both are immersed in sulfuric acid and water, which is called electrolyte.
- The battery recharges itself by the vehicle's charging system or a battery charger.
- It's not complicated, but it takes a professional to handle and charge batteries safely, to have the knowledge to answer questions and to wear personal protection to prevent injuries.
- Automotive technicians can take pride in their skill and quality service and the professionalism in their industry. Automotive technicians keep this country on the move!

## **ACID BATTERY AND JUMP STARTING**

### **ANSWERS TO THE REVIEW QUIZ**

1. b

2. a

3. a

4. c

5. c

6. b

7. a

8. c

**ACID BATTERY AND JUMP STARTING**  
**REVIEW QUIZ**

*The following questions are provided to determine how well you understand the information presented in this program.*

Name \_\_\_\_\_ Date \_\_\_\_\_

1. The plate in a lead acid battery that is positively charged is made of \_\_\_\_\_.
  - a. Lead peroxide
  - b. Lead sponge
  - c. Lead nitrate
  
2. You should NOT add water to a battery before taking a hydrometer reading.
  - a. True
  - b. False
  
3. A conventional battery is manufactured with \_\_\_\_\_ antimony.
  - a. 2.5 percent
  - b. 5.5 percent
  - c. 7.5 percent
  
4. A maintenance-free battery is constructed with \_\_\_\_\_ that reduces gassing.
  - a. Magnesium lead
  - b. Copper lead
  - c. Calcium lead
  
5. The cold cranking rating is the number of cranking amps the battery delivers at 0 degrees for 30 seconds and maintains a minimum of \_\_\_\_\_.
  - a. 3.2 volts
  - b. 5.2 volts
  - c. 7.2 volts
  
6. You should remove the vent caps on a battery while charging.
  - a. True
  - b. False
  
7. All cars manufactured in the United States in the past 20 years are negative ground.
  - a. True
  - b. False
  
8. Electrolyte solution in a lead acid battery is composed of \_\_\_\_\_ and water.
  - a. Nitric acid
  - b. Hydrochloric acid
  - c. Sulfuric acid