TerranearPMC Safety Share

Week of June 20, 2011 – Battery Charging

A few days ago, I was listening to a person present a safety topic to begin a meeting. This person explained how he witnessed a friend get seriously hurt while jump starting a car battery. All of us at the meeting were intrigued by his story. It was so informative; I thought it would be a great idea to reiterate some of the highlights of what was discussed.

I confess – I am not a car mechanic, nor am I one of those guys that can open the hood of a car engine, and start fidgeting with whatever car experts fidget with and miraculously make the engine start humming like a low sustaining tone on an electric guitar (like Jimi Hendrix right before the down beat in *Foxy Lady*). But I have, on numerous occasions, changed batteries as well as jump-start automobiles for friends, strangers and myself.

One of the hazards of working with car batteries is that they contain sulfuric acid – a highly corrosive material that can cause serious damage to the eye and skin as well as being an upper respiratory irritant. And while physical contact with sulfuric acid is a concern, sulfuric acid generates hydrogen, especially during battery charging operations. Hydrogen gas is VERY explosive having an explosive range in air from 4 – 74 %. One of the most devastating examples in history of hydrogen's explosive nature is the destruction of the Hindenburg dirigible (aka lighter-than-air aircraft) that occurred in New Jersey in the 1930's. It is unfortunate, but many people today have rediscovered the explosive hazards of hydrogen while jump starting a vehicle. Usually this occurs when someone is either smoking or creating a spark during the process. If jump-starting is not performed in a safe manner, whether it's during the initial hook-up, energizing or disconnection - we are inviting ourselves to a terrible event. Such is the possibility when a spark is produced. So, it is important to understand how sparking can occur during jump starting a battery and how to perform this task safely.

The following steps are provided as a safe-work practice for reducing the risk of a hydrogen explosion during battery jump starting.

1. Connect one end of the RED jumper cable to the positive (+) terminal on the dead battery.
2. Connect the other end of the RED cable jumper cable to the positive (+) post on the good battery.
3. Connect one end of the **BLACK** jumper cable to the negative (-) post on the good battery (note: this process is the reverse of what was done for the red jumper cable connection).Connect the other end of the **BLACK** jumper cable to a heavy metal ground on the engine or car frame of the vehicle that has the dead battery. Find an unpainted bolt or bracket that is as far from the dead battery as possible. This will provide a solid ground while further reducing the possibility of igniting any hydrogen gas. DO NOT make a final connection to the negative post on the (dead) battery itself because it will typically cause a spark.
4. Make sure bystanders move to a safe distance, and then start the car with the working battery.
5. Once it's idling strongly, start the stalled car.

6. With both engines idling, carefully remove the cables in reverse order: engine-block clip first; negative (- / black) working-battery clip second; positive (+ / red) clip on the *working* battery terminal third; and positive (+ / red) clip on the *dead* battery last.

If the battery is cracked and liquid is leaking out, **DO NOT** proceed any further! Bite the bullet and go buy another battery and swap it out. If you try to jump start a battery with a crack in it, it will explode, leaving you susceptible to a severe exposure to sulfuric acid. It makes no sense to jump a cracked battery; it will die in a few minutes anyway.

Car batteries produce 12 volts, so the danger of shock is actually minimal (nevertheless, please don't intentional try to shock yourself just to prove or disprove this theory). However, batteries can produce hundreds of amps; so never touch a metal object such as a wench between the positive and negative battery posts to see if the battery will spark….IT WILL!...as well as producing a current similar to a welding arc. Besides damage to the tool (small consequence) this can cause the battery to explode (potentially BIG consequence).

Also, in this day and age of hybrid electrical vehicles (most notably, the Prius), the hybrid battery pack in the back of the vehicle is a high voltage battery (300+ volts). This is enough to cause a serious electrical shock with the potential to be fatal. So never work on the hybrid electrical system of these vehicles without first disabling or disconnecting the high voltage battery per the manufacturer's instructions. In addition, this type of work needs to be conducted with double insulated tools and proper working/leather gloves.

Within recent years, manufacturers have designed safety jumper cables. A simple set has a middle connection/disconnect point, so when the initial connections to both batteries are made, no voltage potential is created as the middle connection point still needs to be made. This protects the persons making the connection as he/she is making the final electrical connection away from both vehicles. A more sophisticated type of safety cable has a small electronic brain (located at the mid-point of the cable) that monitors the state of the connections and only lets power flow when everything is hooked up just right. So, if you accidentally connect your cable backward on either end, the system will display a red warning light and the power stays off. If you accidentally touch the loose ends of a live cable, the red light glows and there are no sparks. If there's a short of any kind, even within the dead battery, the red light glows and everyone remains safe. Once both ends are properly connected and both indicator lights glow green, the system uses a soft start circuit to gradually ramp up the power flow, eliminating power spikes and protecting delicate vehicle electronics.

In addition to following safe work practices (a general administrative control) or using safety cables (an engineering control), personnel protective equipment should be considered when working with car batteries. Safety glasses, gloves and an apron that is acid resistant will help protect you in the event that the other controls fail. For the right PPE, contact your safety and health professional.

At present, few scientists foresee any serious or practical use for atomic energy. They regard the atom-splitting experiments as useful steps in the attempt to describe the atom more accurately, not as a key to the unlocking of any new power – Fortune magazine, 1938