BSP Lateral learning Bulletin

Lead Acid Batteries could be Dangerous (Incidents NOT BSP related)

Case # 1: Battery shorts out, top is blown off and IP suffers acid burns

Findings:

Prior to a rig move, two rig crewmembers were **charging the batteries** on the backup generator unit in preparation for needed auxiliary power during rig down operations. #

After **charging** the batteries for a short time, one crewmember attempted to start the generator engine, and one of the 24 Volt **batteries exploded**. Battery acid contacted the crewmember's forearms and face.

Case # 2: Battery shorts out, top is blown off and IP suffers acid burns

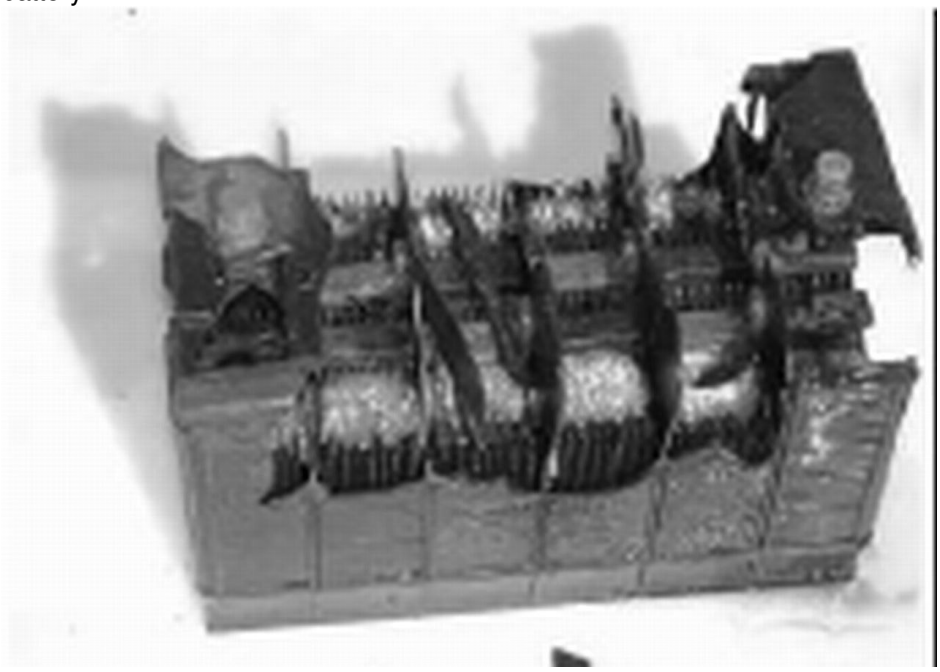
Findings:

Location > Rig's Emergency Generator House.

Rig suffered an unplanned main Engine shutdown due to fuel supply problem. The Emergency Generator received signal to start, would but failed to fire up. Rig Team (Eng/Mech/Elect) attended Emergency Generator & found batteries were now depleted. Spare batteries were bought from Locker & connected to **"Jumpstart"** the Engine. On final connection, one of the original batteries split. Two men (full PPE) were splashed with battery acid on exposed skin (wrists).

Case # 3: Battery shorts out, top is blown off and IP suffers acid burns
Findings:

A crane was being started when one of the batteries in a bank of four exploded.
In attempting to start the crane a spark was developed **internally** in the battery igniting a build up of gasses.
This caused an explosion and destroyed the battery. A similar event occurred on West Tuna in 2002 when a battery exploded during crane starting.
In both cases the batteries were from the same manufacturer and were a sealed lead acid "maintenance free" type battery.



Case # 4: A bank of UPS Batteries were unattended while being charged and exploded.

Findings:
Location > Abandoned Former Computer data Centre
UPS Batteries were unattended while being charged, Hydrogen alarm triggered for three days and building eventually exploded. No ventilation took place during charging.

The Result

What do all these incidents have in common?

Remember, battery charging or jump starting, produces excess hydrogen

1. **Batteries were, or had recently, been charged.**
2. **Poor or no ventilation took place when charging.**
3. **In 3 cases batteries were used for power off take immediately after charging.**

Do's and Don'ts - Why do Batteries Blow Up and Split?

Connecting Batteries (Jump Start)

Incorrect Polarity of "slave" batteries when connected to existing batteries.

- This will cause the acid to rapidly expand (boil), thus splitting the case.
    - If this is the case evidence can be expected in the form of damaged battery terminals or posts and signs of excessive heat before the split occurs (Not usually an instantaneous failure).

Low acid level in one of the batteries allows a spark to jump between plates.

The spark potentially ignites excessive H_2 (Hydrogen) in the battery, causing the case to split.

This is difficult to confirm failed batteries are destroyed.

The fact that the battery case has comprehensively split supports the theory that the initiation came from within.

The spark created when the final connection is made ignites excessive H_2 in the atmosphere surrounding the batteries.

The Hydrogen will be generated in and around the battery during the significant failed attempts to start the engine and, in case of none or poor ventilation will ignite and explode.

Hydrogen (H_2) is produced when batteries are worked hard as well as when they are charged.

Thus - a recently, heavily depleted battery (due to cranking a big 'non-starting' engine rather than a long term flat battery) could contain 'boiling acid' and be emitting Hydrogen (inside and out) thus have the potential to "pop". Remove it from the circuit and into a "Safe" area to recover before attempting to charge.

It is good practice when a circuit is being established to leave a connection off to allow a final check to be done with a "touch" – The size of the spark can be used to confirm the Polarity is correct and there is no 'heavy draw' items left running which will drain the battery before the generator is started.
If it was hard wired with a open switch as a barrier and the switch closed – the high current could weld it closed thus prevent the circuit from being broken until a major failure occurs.
Establish the positive lead first ensuring it cannot touch an earthed component; connect the negative to the fresh battery. The other end should ideally be secured to a major component (ie bumper) well away from the drained battery so the spark does not ignite H_2.

It is good practice to secure batteries using a non-conducting method –Not metallic clamps secured to the chassis of the vehicle.

Key Learnings:

Always stand clear of batteries when any type of motor is being started from battery(s). At these times currents in the order of many 100s of amps are being supplied from the battery.
No battery should be considered maintenance free.
All batteries have maintenance requirements, which include regular inspection and timely change out.
Consider the age of the battery, they do not last forever.
A battery change out program should be implemented to address this causal factor.
For larger set-ups, with multiple batteries like UPS systems, **hydrogen monitoring warning** systems should be installed.
These mishap can also happen in "sealed" lead acid batteries, so do not feel "comfortable with these types.

Batteries should only be charged in a well-ventilated, safe area with the caps unscrewed.

Never store batteries in a sealed, acoustic enclosure or in the stagnant corner of a garage owned by a DIY welder…..