

MaxFire® Electronic Firing System Continues to Perform as Designed After Lightning Strikes Derrick

LIGHTNING STRIKES DISABLE OPERATION, BUT MAXFIRE SYSTEM STILL DELIVERS, SAVING APPROXIMATELY USD 2.2 MILLION IN RIG TIME

GULF OF MEXICO

CHALLENGES

- » Perforate a deepwater well at an extreme depth where standard perforating solutions could not be utilized
- » Provide an a rugged EFS firing system that could withstand natural threats, such as lightning strikes

SOLUTION

MaxFire® EFS, which is designed to perforate a well without exceeding the pressure limitations of other downhole tools and equipment, and to also withstand lightning strikes and electromagnetic interference

RESULTS

- » Perforated the zone of interest at 27,814 feet (8478 meters) TVD, with a temperature of +/-300°F (150°C), pressure of 21,405 psi (1478 bar), and 460-psi (32-bar) overbalance
- » Proved reliability of MaxFire EFS technology following a lightning strike, with the tool surviving the electrical discharge from the lightning strike and still performing to its designed parameters
- » Saved operator approximately USD 2.2 million by eliminating the costs associated with having to trip out of the well to check the affected BHA for possible necessary repairs, and then to trip back in

OVERVIEW

During a challenging shoot-and-pull operation on a deepwater well in the Gulf of Mexico, lightning struck the derrick, disabling the top drive, drawworks, roughneck, and compensator. This occurred while the perforating string, including the Halliburton MaxFire® electronic firing system (EFS), was at a depth of 3,500 feet (1067 meters) above the proposed perforating target of 27,814 feet (8478 meters). This lightning strike shut down operations for almost 24 hours. However, using the Halliburton MaxFire EFS enabled the operator to avoid having to trip out in order to check the affected bottomhole assembly (BHA) for any necessary repairs or changes, and then to trip back in – thus saving the operator approximately USD 2.2 million.



Lightning strikes are no match for the MaxFire® EFS, which is designed and tested to withstand lightning strikes and electromagnetic interference.

CHALLENGES

The lightning strike occurred while the perforating string, including the MaxFire EFS, was at a depth of 3,500 feet (1067 meters) above the proposed perforating target of 27,814 feet (8478 meters), which had a temperature of +/-300°F (150°C) and pressure of 21,405 psi (1476 bar). This lightning strike shut down operations for almost 24 hours, costing an estimated USD 950,000 to repair the rig, inclusive of lost rig time.

In the Gulf of Mexico, unexpected events caused by nature can slow or shut down operations for days or weeks, costing operators millions of dollars. To increase reliability and ensure success under any condition, operators depend on new and existing technologies to complete and produce wells in a manner that is safe to personnel, equipment, and the environment. When developing new technology, the unexpected must be taken into account, and these tools must address operational safety, flexibility, and reliability, and be rigorously tested in extreme conditions – including weather, lightning, and high-pressure/high-temperature (HP/HT) environments.

SOLUTION

The Halliburton MaxFire memory-based EFS can meet these extreme-condition challenges, as this system is designed and tested to aircraft certification standards to withstand lightning strikes and electromagnetic interference. This safe, precise, and adaptable EFS can initiate a gun system through a predetermined sequence of pressure cycles. Firing can be aborted with reset pressure at any time, and the tool can last up to 30 days in extreme downhole conditions. It can either be run on the top or bottom of the gun.

RESULTS

The MaxFire EFS initiated the perforating gun with a low activation pressure of 460-psi (32-bar) overbalance. The overbalance was achieved with heavy and corrosive calcium bromide wellbore fluid. The MaxFire EFS withstood the electrical discharge from the lightning strike (thus providing assurance that the operation could continue as normal without having to trip out of the well to check the tools and then trip back in) and also had the flexibility to operate after the time delay related to the rig repair.

Even with the damage sustained to the rig from the lightning strike, the MaxFire EFS performed as designed to successfully initiate the perforating string, saving the operator approximately USD 2.2 million by eliminating the costs associated with having to trip out of the well to check the affected BHA for any necessary repairs and then to trip back in.

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