Operating Experience Summary

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1 Fatal Accident at White Bluffs Substation — The Investigation Results

On March 1, 2010, at the White Bluffs Substation, near Richland, Washington, a Bonneville Power Administration (BPA) contractor heavy equipment operator loading a Bobcat® skid-steer loader (Bobcat) onto a transport trailer became trapped between a backhoe attachment and the Bobcat. The operator was injured and later died at a local hospital. Figure 1-1 shows an aerial view of the accident scene. An Accident Investigation Board began investigating the accident on March 2, 2010, to determine the cause of the accident and recommend corrective actions. (ORPS Report EM-RL--GORL-DDSC-2010-0002; final report issued March 3, 2010)

The accident occurred when the operator moved into a position between the Rollover Protection Structure (ROPS) cage and the backhoe attachment, lowered the seat bar, bypassing the Bobcat Interlock Control System (BICS™), and engaged the hydraulic systems. This caused the Bobcat lift arms to raise the backhoe attachment, pinning the operator between the seat and the ROPS. Figure 1-2 shows the ROPS and lift arm; Figure 1-3 shows the pinch point.

The Board learned that while a co-worker hooked the pickup to the trailer, the operator retrieved the backhoe attachment and attached it, but did not hook up the hydraulic hoses for the attachment. As he drove the backhoe to the trailer loading ramp, the backhoe attachment came into contact with the trailer, so the operator backed up about a foot and stopped. He got out of the Bobcat, connected the hydraulic hoses, and re-entered the loader. He then exited a second time to check the hydraulic connections to ensure they were properly connected and, again, re-entered the Bobcat.

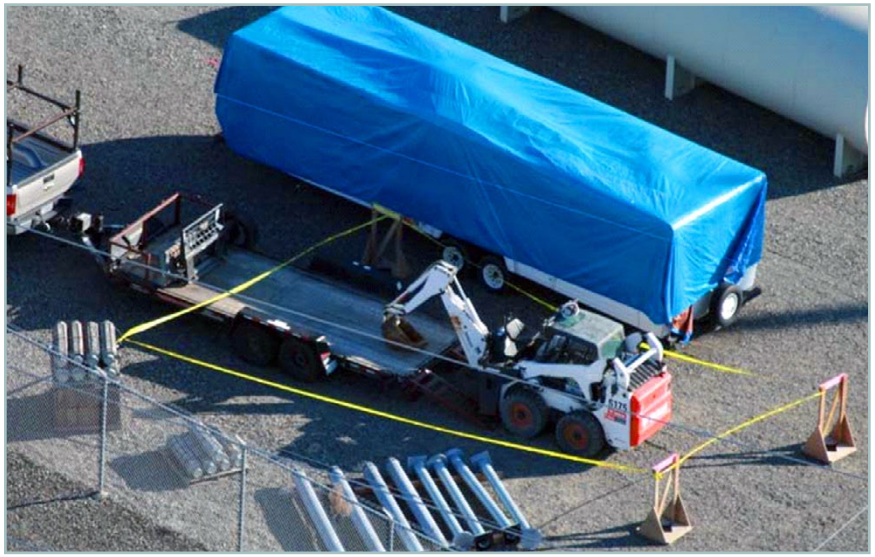

Figure 1-1. The accident scene surrounded by yellow tape

Figure 1-2. ROPS and lift arm

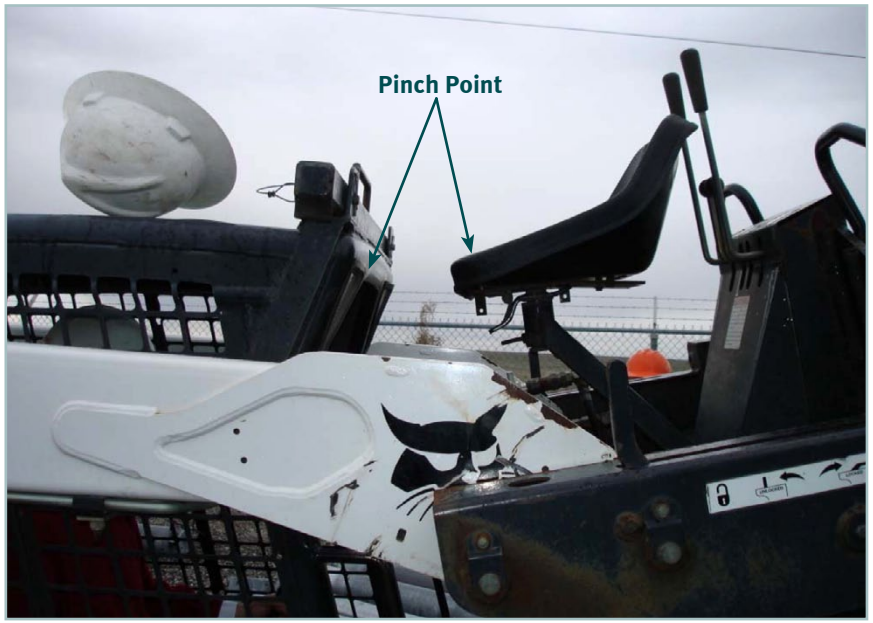

Figure 1-3. Pinch point

The Accident Investigation Board determined that the second time the operator entered the Bobcat he either remained standing, put the seat bar down, and activated the BICS™ system or he put the seat bar down, sat on the bar, and activated the BICS™. They also determined that he reached for the backhoe attachment seat to either pull himself up from a seated position or held onto it for support. In either case, the operator apparently depressed the left foot hydraulic pedal, which raised the Bobcat lift arms, pinning him between the backhoe attachment seat and the ROPS of the Bobcat. The Board concluded that the direct cause of this accident was that the operator activated the hydraulic controls while standing in the pinch point.

The BICS™ seat bar restraint system helps keep the operator in the seat when the seat bar is in the down position. The spool interlocks require the operator to lower the seat bar to operate the foot pedal controls. When the seat bar is down, the "press to operate loader" button is activated, the engine is running, and the lift, tilt, and traction drive functions are operable. Once the operator had activated the BICS™, all of the hydraulic controls were active, so stepping on the foot pedal raised the lift arms. The Accident Investigation Board determined that the root cause of the accident was that the operator bypassed the BICS™ when he lowered the seat bar. They concluded that he failed to follow the instructions in the operation and maintenance manual for the Bobcat, which state: "always sit in the operator's seat when activating the controls."

The Board concluded that an insufficient pre-job briefing contributed to this event. The briefing for the entire crew on the day of the accident indicated that the work to be performed was unchanged from previous days (e.g., setting forms and pouring concrete), and it did not reflect the actual work that was planned for that day (loading materials, tools, and equipment to move to the next job site). The Board also learned that the operator was briefed separately, and his briefing addressed only the assignment of job tasks associated with moving tools and equipment to a new job site. The briefing did not include a discussion about work planning or a job hazards analysis and hazard controls.

Although the Board requested the operator's training records, they were not provided. The Board could not determine whether the operator had been trained on all aspects of the Bobcat and its attachments.

Accident Investigation Board Recommendations

As a result of their findings, the Board made the following recommendations to BPA.

- Require contract personnel to follow instructions in the operation and maintenance manuals of mobile fleet equipment.
- Ensure that all members of a crew assigned to perform work receive an adequate job briefing.

- Develop and implement skid-steer training requirements, and require all BPA employees who operate mobile fleet equipment to receive proper training in the safe use of this equipment.

The Accident Investigation Board's final report is available at http://www.hss.energy.gov/csa/csp/aip/accidents/typea/BPA_Level_I_Bobcat_Fatality.pdf.

Proper planning and preparation for work play a major role in preventing accidents. A thorough pre-job briefing should always be performed to describe the specific job tasks and address all potential hazards, error-likely situations, and possible consequences. Chances for error also increase when an unfamiliar situation is encountered or when something unanticipated occurs (e.g., when the backhoe attachment came in contact with the trailer). Workers must be adequately trained to ensure that they immediately stop work, place the equipment in a safe condition, and get help from a knowledgeable person when such situations are encountered.

In addition, site management requirements should ensure that all workers review and follow manufacturer's operating manuals for mobile equipment, so that they are aware of any hazards and take the necessary precautions. It is also important that contracts for operating mobile equipment include a requirement that contractor employees who will operate mobile equipment have received proper training in the safe use of the equipment.

KEYWORDS: Fatality, Bobcat®, BICS™, backhoe attachment, loader, ROPS, interlock controls, pinch point

ISM CORE FUNCTIONS: Define the Scope of Work, Analyze the Hazards, Develop and Implement Hazard Controls, Perform Work within Controls

Department of the Interior Identifies Safety Measures in the Wake of the Deepwater Oil Spill 2

On April 20, 2010, an explosion and fire erupted on an offshore drilling rig called the Deepwater Horizon, located in the Gulf of Mexico (Figure 2-1), where an exploratory well had just been completed 52 miles from shore in 4,992 feet of water. Eleven crew members were killed in the explosion; the remaining crew members abandoned the rig and were rescued by a nearby supply vessel. The fire destroyed the rig (Figure 2-2), which sank on April 22, 2010.

Figure 2-1. Deepwater Horizon prior to explosion

For nearly 3 months, crude oil continued to flow from a broken pipe on the sea floor, spreading across thousands of square miles and damaging local economies, sensitive coastlines, and marine and wildlife throughout the Gulf region. Figure 2-3 shows the oil spreading along the Louisiana coastline, and Figure 2-4 shows one of the many pelicans in the region that are covered in oil as a result of the spill.

On July 15, 2010, 86 days after the Deepwater Horizon explosion, British Petroleum (BP), operators of the drilling operation, announced that they had capped the well and halted the leak. However, seepage of oil and gas continued in several areas. As of July 20, 2010, some seepage was still occurring within several hundred yards of the well.

A failed blowout preventer (BOP) on the Deepwater Horizon drilling platform appeared to be the primary cause of the spill, which is one of the worst disasters in the history of oil production.

Figure 2-2. Deepwater Horizon just after explosion

A BOP is a large valve or series of valves that can seal off an oil or natural gas well being drilled or worked on. If underground pressure forces oil or gas into the wellbore, operators can close the valve remotely (usually with hydraulic actuators) to forestall a blowout and can regain control of the wellbore. After the Deepwater Horizon drilling rig explosion, the BOP should have activated automatically, but it did not. Underwater remotely operated vehicles (ROV) were used in attempts to manually activate the switch for the BOP, but were unable to do so.

Representatives from BP suggested that the preventer could have suffered a hydraulic leak; x-rays of the BOP shortly after the explosion and spill showed that its internal valves were partially closed and were restricting the flow of oil. Whether the valves closed automatically during the explosion or were shut manually by an ROV is not known.

On April 30, 2010, President Obama directed the Secretary of the Interior to conduct a thorough review of the Deepwater event to identify additional precautions and technologies that would improve the safety of oil and gas exploration and production operations on the outer continental shelf. In response to the President's directive, the Secretary conducted a review and recommended a series of steps that could be taken immediately to improve the safety of offshore oil and gas drilling operations in Federal waters. The Secretary also called for a moratorium on certain permitting and drilling activities until safety measures can be implemented and further analyses can be completed.

Figure 2-3. Oil from spill along the coastline of Louisiana

In May 2010, the U. S. Department of the Interior (DOI) published a report, *Increased Safety Measures for Energy Development on the Outer Continental Shelf*, which details the DOI review. The report includes recommendations that address well control and well abandonment operations, specific requirements for BOPs and their testing, and industry practices (see Table 2-1).

Figure 2-4. Brown pelican covered in oil from the spill

Actions recommended by DOI included both prescriptive near-term requirements and longer-term requirements that take into account the risks and challenges of drilling activities in a deep-water environment. They addressed BOP equipment and emergency systems, including establishing formal equipment certification requirements.

Proposed actions also included developing new BOP and ROV testing requirements, inspection procedures, and reporting requirements, as well as requirements for secondary control systems. New requirements for deep-water well-control procedures will also be established, as will new requirements for well design construction (e.g., new casing installation procedures).

Importantly, DOI will increase enforcement efforts for existing safety regulations and procedures, including Order compliance verification, and will move toward adoption of a final rule requiring operators to adopt a robust safety and environmental management system for offshore drilling operations.

The Deepwater Horizon oil spill underscores the fact that as drilling activity moves increasingly into very deep water environments, it is important to re-evaluate whether best practices for safe drilling operations developed over the years need to be bolstered to account for the unique challenges of drilling in deep water. The entire DOI report can be accessed at http://www.doi.gov/deepwaterhorizon/loader.cfm?csModule=security/getfile&PageID=33598.

We believe it is important for the Department of Energy (DOE) community to monitor the Deepwater Horizon catastrophe because of its effects on our country and to reflect on lessons that the accident might offer for safety in DOE operations. Although investigation of the causes of the accident will take many months, we will publish additional information on the event as investigations proceed.

Table 2-1. Recommendations for Increased Safety Measures

Recommendations	Key Components (with implementation plan)
Blowout Preventer (BOP) Equipment and Emergency Systems	• Order re-certification of subsea BOP stacks (immediately) • Order BOP equipment compatibility verification (immediately) • Establish formal equipment certification requirements (rulemaking)
New Safety Equipment Requirements and Operating Procedures	• Develop new BOP and remote operated vehicle (ROV) testing requirements (immediately) • Develop new inspection procedures and reporting requirements (immediately) • Develop secondary control system requirements (emergency rulemaking) • Establish new blind shear ram redundancy requirements (emergency rulemaking) • Develop new ROV operating capabilities (rulemaking)
Well-Control Guidelines and Fluid Displacement Procedures	• Establish new fluid displacement procedures (immediately) • Establish new deepwater well-control procedure requirements (emergency rulemaking)
Well Design and Construction – Casing and Cementing	• Establish new casing and cementing design requirements – two independent tested barriers (immediately) • Establish new casing installation procedures (immediately) • Develop formal personnel training requirements for casing and cementing operations (rulemaking) • Develop additional requirements for casing installation (rulemaking) • Enforce tighter primary cementing practices (rulemaking) • Develop additional requirements for evaluation of cement integrity (immediately) • Study Wild-Well intervention techniques and capabilities (immediately)
Increased Enforcement of Existing Safety Regulations and Procedures	• Order compliance verification for existing regulations and April 30, 2010, National Safety Alert (immediately) • Adopt safety case requirements for floating drilling operations on the Outer Continental Shelf (emergency rulemaking) • Adopt final rule to require operators to adopt a robust safety and environmental management system for offshore drilling operations (rulemaking) • Study additional safety training and certification requirements (rulemaking)

Information about the Deepwater Horizon spill, including photographs, videos, and links to additional information, can also be accessed from the DOE Operating Experience Wiki at http://operatingexperience.doe-hss.wikispaces.net/Deepwater+Horizon+Accident.

KEYWORDS: Department of the Interior, DOI, Deepwater, Horizon, oil spill, explosion, drilling rig, blowout preventer, remotely operated vehicle, BOP, ROV, British Petroleum, BP, fatalities

ISM CORE FUNCTIONS: Analyze the Hazards, Develop and Implement Hazard Controls, Perform Work within Controls

The Office of Health, Safety and Security (HSS), Office of Corporate Safety Analysis publishes the *Operating Experience Summary* to promote safety throughout the Department of Energy (DOE) Complex by encouraging the exchange of lessons-learned information among DOE facilities.

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