

**Investigation of
Casing Blowdown Accident and Fatality
West Cameron Block 331
Gulf of Mexico
Off the Louisiana Coast
December 24, 1997**



Investigation and Report

Authority

An accident that resulted in one fatality occurred on Sonat Exploration Company's Platform A, West Cameron Block 331, Lease OCS-G 3275 in the Gulf of Mexico, offshore the State of Louisiana, on December 24, 1997, at approximately 1045 hours. Pursuant to Section 208, Subsections 22 (d), (e), and (f), of the Outer Continental Shelf Lands Act, as amended in 1978, and the Department of the Interior Regulations 30 CFR Part 250, the Minerals Management Service (MMS) is required to investigate and prepare a public report of this accident. By memorandum dated January 15, 1998, the following MMS personnel were named to the investigative panel:

Frank Pausina, New Orleans, Louisiana (Chairman)
Milford Cole, Lake Charles, Louisiana
Marty Rinaudo, Lafayette, Louisiana

Procedures

On the afternoon of December 24, 1997, Lt. Paul Dittman of the United States Coast Guard (USCG) investigated the scene of the accident, thereby initiating a joint investigative effort by the MMS and USCG. Also, on that afternoon Frank Pausina gathered preliminary information through telephone conversations with various Sonat field personnel.

On December 26, 1997, Milford Cole interviewed the acting platform supervisor and a production operator at Sonat's shore base at Intracoastal City, Louisiana.

On December 29, 1997, Milford Cole met with various Sonat personnel at Sonat's offices in Houston, Texas, for the purpose of discussing the details of the accident and examining the equipment that was directly involved in the accident.

On January 23, 1998, all MMS panel members and Lt. Dittman met with Sonat representatives at Sonat's offices in Houston, Texas, again for the purpose of discussing the details of the accident and examining the equipment that was directly involved in the accident.

On February 23, 1998, Frank Pausina and Milford Cole interviewed the Sonat employee who was present on the platform at the time of the accident. The interview was held at Sonat's legal representative's office in Lafayette, Louisiana.

Through Sonat's legal representative, the investigative panel was forwarded on June 10, 1998, a copy of a report prepared by an engineering consulting firm that was contracted by Sonat to investigate the cause of the accident.

The panel members met and communicated with the USCG at various times throughout the investigative effort and, after having considered all of the information available, produced this report.

Introduction

Background

Lease OCS-G 3275 covers approximately 5,000 acres and is located in West Cameron Block 331, Gulf of Mexico, off the Louisiana coast. *For lease location, see Attachment 1.* The lease was issued effective September 1, 1975, to TransOcean Oil, Incorporated. Sonat Exploration Company became the designated operator of the lease in October 1993 and the sole lessee in January 1994. At the time of the accident only one well was flowing on Platform A.

Description of

On the morning of December 24, 1997, two Sonat employees arrived on Platform A to

Accident

perform various duties, one of which was to blow down the casing pressure on Well A-1. While one of the employees was attempting to blow down the pressure, a tubing extension on the blowdown valve assembly rotated rapidly and fatally struck the employee. Subsequent to the rotation and fatal blow, the entire assembly broke free from a fitting downstream of an open gate valve, thereby opening casing gas flow to the atmosphere. The well was secured by the other employee shortly thereafter by closing the gate valve.

Findings

Recent Well A-1 From August 1996 to November 1997, the status of Well A-1 was a nonproducing gas

History

completion. Recompletion activities commenced on October 31, 1997, and were completed on November 9, 1997. The recompletion activities consisted of operations to plug off the perforations of a lower sand, produce the perforations of an upper sand, and correct pressure communication between the production tubing and production casing.

On the first day of recompletion activities, tubing and casing pressures were recorded at 1,780 psi and operations began to squeeze off the lower perforations. On November 6, 1997, the lower perforations were successfully squeezed off by installing a through-tubing plug. The plug was tested to a pressure of 1,000 psi and operations to isolate the tubing hole commenced. The final day of recompletion operations involved setting a lower and upper pack-off assembly to isolate the tubing hole. After setting the pack-off assembly, pressure on the production casing was 1,140 psi. The casing pressure was bled to zero and monitored for one hour with no build up, indicating a successful pack off. The highest tubing and casing pressure recorded during recompletion operations was 1,910 psi. The well was flowed to unload water and shut in with a tubing pressure of 1,760 psi. A Surface Controlled Subsurface Safety Valve (SCSSV) was then installed and tested. The final recorded recompletion pressures were a flowing tubing pressure of 1,900 psi, a shut-in tubing pressure of 2,130 psi, and a casing pressure of zero.

Prior to the recompletion, the production casing pressure was recorded as 900 psi. Subsequent to the recompletion and prior to the accident, the production casing pressure ranged approximately from 1,150 to 1,650 psi. A diagnostic test was performed on Well A-1's production casing pressure on four occasions prior to the accident. At the time of the accident, the casing pressure was 1,410 psi.

**Blowdown Valve
Assembly**

A blowdown valve assembly is a mechanical assembly of valves and a pressure gauge

that is used to blow down (release) pressure from the annulus between casing strings or between a casing string and production tubing and to diagnostically test those pressures with respect to a blowdown and subsequent buildup rate. The assembly is connected to a well's casing head and appears in varying configurations throughout the oil field.

The assembly in question at the time of the accident was connected to the well's gate valve at a bull plug fitting. Extending from the fitting was a ½-inch nipple to which was connected a pressure gauge. Extending from the pressure gauge was another ½-inch nipple that was connected to a ½-inch ball valve, henceforth referred to as Ball Valve A. Sequentially connected to Ball Valve A by short ½-inch nipple sections were a tee and a ½-inch needle valve. Extending horizontally from the tee and away from the face of the pressure gauge was a short, ½-inch nipple to which was connected an elbow. The other end of the elbow was facing downward. Connected to the downward end of the elbow by a short, ½-inch nipple was a ½-inch ball valve, henceforth referred to as Ball Valve B. Connected by a short, ½-inch

nipple to Ball Valve B prior to the accident was a ½-inch tubing extension which, during the meetings and an interview, was described as being straight prior to the accident. The extension was approximately 24-inches in length. *For schematics of the front and back of the blowdown assembly prior to the accident, see Attachments 2 and 3, respectively.*

It was stated to the panel in the course of the investigation that the primary device on the assembly that was used to blow down the casing pressure was the needle valve. With the needle valve nozzle directed horizontally and in close proximity to the edge of the platform, any liquids vented would have been released into the sea. *For a photograph of the horizontal portion of the blowdown assembly being held in its approximate position prior to the accident, see Attachment 4. For a schematic showing the position of the blowdown assembly relative to the platform prior to the accident, see Attachment 5.* To prevent this from happening in the event that liquids begin to be vented in a casing pressure blowdown, the needle valve would have been closed and the liquids would have been directed downward through the tubing extension into a container through the opening of Ball Valve B. The ball valve would also be used in the event that the needle valve iced closed.

Accident

On the morning of the accident at approximately 0730 hours, two Sonat operators, henceforth referred to as Operators 1 and 2, departed the Sonat facilities at West Cameron Block 352 with a third Sonat employee. The third employee was brought to Sonat facilities at West Cameron Block 369 prior

to Operators 1 and 2 continuing to their destination of Platform A in West Cameron Block 331. Operators 1 and 2 planned to pick up the third operator at 1130 hours. Operators 1 and 2 arrived at Platform A at approximately 0900 hours. The plan of the day was to work on a reboiler, remove the chart recorder from Well A-1 for use on another facility, and blow down the casing pressure on Well A-1. It was decided that Operator 1 would work on Well A-1. After removing the chart recorder, Operator 1 brought the recorder downstairs to the foot of the stairwell, Operator 1 told Operator 2 that he was going to blow down the casing pressure, that the pressure was 1,400 psi, and that they will shut down at 1130 hours. After Operator 1 returned to the well bay area, Operator 2 heard “ten seconds of normal hissing” for a blowdown operation and then a loud, quick noise. Operator 2 walked to the well Bay area where he saw that Operator 1 had received a fatal head injury. Operator 2 noted the time of the accident as 1045 hours. Operator 2 shut in the casing pressure and notified his supervisor by radio of the incident.

Personnel from MMS and USCG were notified shortly thereafter. Sonat personnel and Lt. Dittman investigated the accident scene prior to the removal of the body of Operator 1, which occurred at approximately at 1600 hours. The cause of death was officially listed by the coroner’s office as a severe head injury.

On-Scene Findings

Sonat supervisory personnel and Lt. Dittman found that the blowdown assembly had broken off at the bull plug and that the tubing extension component with the elbow attached had separated from the tee. *For a*

schematic showing the relative positions of the blowdown assembly, tubing extension, Operator 1, and the well, as based upon on-scene observations, see Attachment 6.

It was observed the needle valve handle was in the closed position.

It was also observed from examining the wound that the fatal blow to Operator 1 was delivered from above.

Examination and Analysis of Blowdown Assembly The ½-inch nipple had fractured at the last made-up thread at the bull plug. The fracture of the thread and the deformation of the end of the nipple indicate that the deforming and failure-causing force was applied to the assembly from the side of the assembly from which the elbow and tubing extension extended. *For photographs of the assembly showing the failure and deformation of the nipple at the bull plug, see Attachments 7 and 8.*

An examination and attempted reconstruction of the tubing extension indicate that, while some of the deformation resulted from the accident, the tubing was not straight immediately prior to the accident. It appears that the deformation of the extension prior to the accident was intentionally imposed on the extension for unknown reasons. It is probable that the extension was intentionally bent in order to utilize it for some other application and then returned for use on the blowdown assembly. *Refer to Attachment 7 for the*

location of the bend in the tubing extension prior to the accident. It is estimated that the downward pointing tubing extension was bent to the left (in the direction of the needle valve) of a vertical line passing through the elbow. The opening of Ball Valve B under pressure with a bend in the tubing to the left would produce a moment that would tend to produce a counterclockwise rotation of the tubing extension. Such a moment or torque would also tend to unscrew the elbow from the tee. The magnitude of the moment is a function of the pressure released and the amount and direction of the bend.

It was observed from the Teflon on the nipple extending from the tee that the elbow was made up tight to the nipple.

Previous Blowdowns and Usage of Tubing Extension	According to interviews with Operator 2, he and Operator 1 blew down casing pressures alone and together prior to the recompletion of the well. Operator 2 stated that he had never used the tubing extension but that Operator 1 had. Records and statements by Operator 2 indicate that after the recompletion, Operator 1 blew down the casing pressure on a least two occasions and that one of those blowdowns was the last done prior to the blowdown attempt that resulted in the accident. Operator 2 stated that he recalled the tubing extension always being straight.
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Operator 2 stated that, in addition to using the Ball Valve B for those

situations when liquids were encountered or the needle valve froze up, it was also used to speed up the blowdown operation only after the casing pressure had been reduced to approximately 200 psi.

Operator 2 stated that, two days prior to the accident, he hadn't seen the tubing extension on the blowdown assembly, and during the following two days the weather did not allow for travel to Platform A. He therefore concluded that Operator 1 installed the extension on the morning of the accident.

Safety Issues

Sonat representatives stated that Sonat does not have a prescribed procedure for blowing down casing pressures in its procedure/safety manuals. In the previously referenced January 23 meeting with the panel members, Sonat representatives stated that Sonat considers the MMS Letter to Lessees and Operators dated January 13, 1994, which prescribes the use of a ½-inch needle valve for well diagnostic purposes, as constituting an adequate procedural guideline for the use of such blowdown assemblies. It should be emphasized that the MMS letter was never intended as a safety/procedural guideline with respect to the use of blowdown assemblies but rather a document that, in part, simply references a ½-inch needle valve as the device through which diagnostic tests will be conducted. Given the varying configurations of blowdown assemblies in the Gulf; MMS's letter's reference to the ½-inch needle valve as a prescribed diagnostic tool only, with no other blowdown assembly device being referenced; and, which will be seen later in this report, that a blowdown assembly ball valve that was

not referenced in the MMS letter contributed to the accident; it is obvious that the use of the MMS letter as a safety/procedural guideline is an erroneous expansion of the intent of the letter. It should be noted that in the Gulf of Mexico the use of blowdown assemblies for various pressure-releasing operations is extremely common and thus considered fairly routine. It would therefore not be considered uncommon for safety/procedural guidelines to omit such procedures.

Conclusions

Cause

It is concluded from the preceding findings that on the morning of the accident, Operator 1, after having removed a chart recorder from the blowdown assembly and after having attached the bent tubing extension to the tee portion of the tubing assembly, was fatally struck on the head from above by the counterclockwise rotating tubing extension as he stood on the back side of the assembly, i.e., the side facing the back of the pressure gauge and the side from which the elbow, Ball Valve B, and the tubing extend. The tubing extension rotated as a result of Ball Valve B being suddenly opened under approximately 1,400 psi and the tubing extension being bent in such a manner so as to produce a counterclockwise moment that overcame the tee nipple/elbow thread connection resistive force. The reactive force on the blowdown assembly caused by the blow of the tubing to Operator 1 caused the assembly nipple to fail at the bull plug.

It is also concluded that, in previous uses of the tubing extension by Operator 1, the extension was straight. The manner and circumstances under which the extension became bent prior to the accident are not known.

Possible Causes

The exact conditions under which Ball Valve B was opened are not known, nor are the intentions of Operator 1 with respect to his actions in influencing the opening of the valve. Therefore, the following possibilities are listed:

1. Operator 1 had no intention of using the needle valve to blow down the casing pressure but rather intended to use Ball Valve B and the tubing

extension to blow down the pressure. He then:

- A. Fully opened Ball Valve B to blow down the pressure not realizing that the bend in the tubing extension would cause the rotation of the tubing,
- B. Began to throttle the ball valve but accidentally opened it fully through some inadvertent action, or
- C. Began to throttle the ball valve, which suddenly opened due to the pressure behind the valve and possibly, but not necessarily, because of the removal of his hand from the valve.

For cases B. and C. Operator 1 may or may not have been aware of the moment that would have resulted from the bend in the extension. He may have intended to throttle the pressure down to a level that he considered incapable of producing a moment of sufficient magnitude to result in the rotation of the tubing. It should be noted that ball valves are considered fully opened/fully closed valves and are not intended as throttling valves.

- 2. Operator 1 intended to use the needle valve to blow down the casing pressure but accidentally struck the handle of the ball valve with his hand or arm causing the valve to fully open.

Contributing Causes Despite the routine nature of the operation, the failure of Sonat to have

a reference to casing pressure blowdown procedures in a procedural or safety manual must be considered a contributing cause of the accident.

A thorough job safety analysis of the blowdown operation could reasonably be expected to have identified the possible dangers regarding the use of a bent tubing extension. The incorporation of the results of that analysis into a safety/procedural guideline document would have thus alerted the operators to such dangers.

Recommendations

The MMS should issue a Safety Alert to all lessees and operators containing the following:

1. A brief description of the accident appearing in this report,
2. A recommendation that operators analyze all of their manual blowdown operations from a Job Safety Analysis perspective and that such analyses be incorporated as a requirement in their Safety Program, and
3. A recommendation that procedures be formulated for those manual blowdown operations that have been identified as containing elements of danger by the above analysis, and that those procedures be referenced in the operators' safety/procedural guideline handbook.
4. A reminder that ball valves are fully opened/fully closed valves and are not intended as throttling valves.