OCS Report
MMS 2002-080

Investigation of Blowout
High Island Block A-368
OCS-G 2433
May 9, 2001

Gulf of Mexico
Off the Texas Coast

U.S. Department of the Interior
Minerals Management Service
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Stephen Martinez
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Freddie Mosley

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Investigation and Report of Blowout

Authority

A well blowout occurred during the period between May 9 and May 18, 2001, resulting from drilling operations by Devon Energy Production Company, L.P. (Devon) on Well A-5 ST01 BP00, Lease OCS-G 2433, High Island Block A368, in the Gulf of Mexico (GOM), offshore the State of Texas.

Pursuant to Section 208, Subsection 22 (d), (e), and (f), of the Outer Continental Shelf Land 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 blowout. By memorandum dated May 15, 2001, the following MMS personnel were named to the investigative panel:

Ronald Lee Fowler, Lake Jackson District, Clute, Texas (Chairman)

Stephen Martinez, Lake Jackson District, Clute, Texas

James Hail, Lake Jackson District, Clute, Texas

Freddie Mosely, Houma District, Houma, Louisiana

Procedures

The site was visited and inspected by James Hail and Ronald Lee Fowler on May 10 and 12, 2001. Numerous digital photographs of the scene were taken by representatives of MMS and Devon.

A meeting was held on June 7, 2001, with representatives of Devon in the Lake Jackson District offices to discuss all aspects of the incident.

Interviews with key operating personnel were conducted on the rig on June 14 and 26, 2001. Incident summaries and descriptions were taken from personnel during these

interviews. Teleconferences were held on August 16, September 6, and October 3, 2001. Additional teleconferences were held on January 15 and 24, 2002, to discuss report contents, formulation, and formats. Stephen P. Martinez contacted the U. S. Coast Guard in Galveston, Texas, and learned that there would be no Coast Guard investigation of this incident. The panel members met at various times throughout the investigative effort and, after having considered all of the information available, produced this report.

Introduction

Background Lease OCS-G 2433 covers Block A-368 of the High Island Area, East Addition, South Extension, Gulf of Mexico, approximately 105 miles from the Texas coast in 314 ft of water. (*For lease location, see Attachment 1.)* The lease was initially issued effective August 1, 1973, covering 5,760 acres. Effective August 29, 2000, Coastal Oil & Gas USA, L.P.; Pennzoil Energy Exploration and Production, L.L.C.; and TBP Offshore Co. designated Devon Energy Production Company, L.P. as operator. Devon Energy had contracted Global Marine Drilling Company to conduct the drilling operations on Platform A using the MODU *Glomar Baltic I.*

Description of Incident A blowout occurred on Well A-5 ST01 BP 00 during the period from May 9 to May 18, 2001, after the 13⅜–inch surface casing was cemented. The mobile offshore drilling unit (MODU) *Glomar Baltic I* was cantilevered over "Platform A." The rig is owned by Global Marine Drilling Company. The plan called for the A-5 ST to be directionally drilled with a drift angle of approximately 55 degrees.

On May 8, 2001, after the 13⅜-inch surface casing was cemented, a slight flow was noted coming from the annulus between the surface casing and the 18⅝-inch conductor casing. The diverter was closed and pressure started increasing on the annulus. Valves and piping were rigged up to the 18⅝-inch A section to permit monitoring of pressure and transport of fluids to and from the annulus. Throughout the night of May 8 and through 0730 hrs on May 10, unsuccessful attempts were made to bleed off the annular pressure.

On May 10, 2001, gas belched from the 22-inch drive pipe of Well A-10 ST01, located one slot south of Well A-5 ST01. There were no gas bubbles coming from the A-5 ST01 drive pipe at this time. However, in the ensuing 15 minutes, gas bubbles were observed around other wells at the water line. Within an hour, all 57 personnel on the rig and platform were safely evacuated.

The flow eventually ceased, and the rig was re-manned on May 12, 2001. Attempts to salvage the well failed, the well was successfully plugged, and the rig was released on June 16, 2001.

Findings

Descriptions of Platform and Rig

The blowout occurred after setting surface casing on Well A-5, ST01, Lease OCS-G 2433, at High Island Block A-368, "Platform A." The self-elevating MODU *Glomar Baltic I* was situated alongside the platform. This arrangement is typical of such installations in the Gulf of Mexico.

Platform A is a four-leg, eight-pile, self-contained production platform located 500 ft south and 5,500 ft east of the northwest corner of the block. Platform A has 12 well slots. The decks of the platform are 75 ft by 86 ft. The approximate levels of the platform main, cellar, and sub-cellar decks above mean sea level are 80, 57, and 46 ft, respectfully. The MODU *Glomar Baltic I* is a self-elevating drilling unit-cantilever Marathon LeTourno Super 300-class. Maximum rated drilling depth is 25,000 ft with a maximum water depth capability of 375 ft.

Sequence of Events

Well Plan

The A-5 ST was to be the last of the seven-well program to be drilled by the *Glomar Baltic I* from Platform A. In all, 23 wells, including sidetracks, have been drilled from this platform. The bottomhole location for Well A-5 ST was planned to be located in High Island Block A-351, Lease OCS-G 2429. However, because of the blowout, the well was terminated with the final bottomhole location in High Island Block A368, Lease OCS-G 2433.

The A-5 ST well plan, including the plan for setting and cementing the surface casing, was based on the drilling programs of Wells A-7 ST and A-10 ST. Because of the high angle of this hole, there were no plans to reciprocate the surface casing while circulating and pumping the cement job.

A TIMCO fill-up and circulation tool was employed to keep the casing full of mud and to circulate while the casing was being run. After circulating one casing volume, the TIMCO tool would then be laid down. The cement head would then be nippled up on the casing and the cement job would be pumped.

The fracture gradient at planned surface casing depth was too weak to support a full column of tail slurry that would extend above a shallow gas sand. Only the lead slurry would cover the sand and extend to the surface.

Activities Preceding the Blowout

The original well, A-5 ST00 BP00, was plugged, and a mudline sidetrack, Well A-5 ST01 BP00, was initiated. Drive pipe was driven and the conductor casing was set and cemented after four attempts because of tight spots. The 12¼-inch surface hole was drilled and opened to 17½ inches without any significant incidents. A shallow gas sand was penetrated in this well.

The same sand was the source of a blowout that occurred during drilling of Well A-3 in March of 1980.

The surface casing was run to depth on Tuesday, May 8, 2001. A TIMCO tool was used to keep the casing full of mud while running and to circulate bottoms up immediately after the casing was run. The top of the last joint of casing was several feet above the rig floor.

The top drive became inoperative because of the failure of an electrical relay in the top drive control panel. The relay was bypassed, but the top drive still would not function. Approximately five hours were spent troubleshooting this problem, during which time mud was circulated. The TIMCO tool could not be removed without use of the top drive because of the elevation of the last joint of casing.

After the top drive was back in service, the TIMCO tool was removed from the casing and the cementing head was installed. On Tuesday, May 8, 2001, at 0614 hrs, cement lines were rigged up and pumping of the cement began. During the cement job, returns were lost for approximately 10 minutes when the cement reached the casing shoe. Cement returned to the surface 72 barrels earlier than anticipated. The cement job was completed at 0930 hrs on Tuesday, May 8, 2001.

Blowout

Five hours after pumping, at approximately 1430 hrs on Tuesday, May 8, 2001, cement was washed out to 130 ft from the annulus between the surface casing and the conductor casing. At that time, a slight flow began and the diverter was shut in. The motor vessel *Dakota* was called to the rig when this problem was first noted and arrived on location at 0230 hrs on Wednesday, May 9, 2001. Pressure built up to 250 pounds per square inch

(psi) within an hour and later to 470 psi and then to 560 psi. Shortly, bubbles were noticed between the rig and the platform.

Lines were rigged up to bleed the casing pressure through the choke manifold, and gas was bled from the annulus six times at 5-minute intervals. These efforts failed to bleed off the casing pressure. Beginning at 1800 hrs on Wednesday, May 9, 2001, 11-ppg mud was lubricated into the casing. The plan was to pump mud into the annulus until pressure reached 750 psi, wait, and then bleed gas until the pressure decreased to 560 psi. After 12 hours, 23.5 barrels (bbls) of mud had been lubricated.

Over a 45-minute period, beginning at 0645 hrs on Wednesday, May 10, 2001, 13 bbls were bled from the annulus. The pressure decreased to 20 psi. At 0730 hrs, gas belched from the annulus between the drive pipe and conductor casing of Well A-10. No activity was noted on the A-5 ST drive pipe. All production operations were shut in. The bubbling increased to a boil between the rig and the platform, and the rig was fully evacuated by 0900 hrs on Thursday May 10, 2001, some 45 hours after the cement job. The Lake Jackson District Office was notified at this time. The uncontrolled gas flow also caused a boil around the entire platform. *For photographs of the platform and rig during the flow of gas to the sea floor, see Attachment 2.*

The platform was monitored, and flow had greatly diminished by 1700 hrs, Friday, May 11, 2001. The M/V *Seawolf* arrived on location with a remotely operated vehicle (ROV). At 1900 hrs the ROV performed an underwater survey around the rig and found no signs of gas. The rig was re-boarded by Boots and Coots and essential personnel at 0900 hrs on Saturday, May 12, 2001. A pressure of 240 psi was noted on the 13⅜-inch

by 18⅝-inch annulus of the Well A005 ST01. A noise and temperature log was run, indicating that flow was coming from the previously mentioned shallow gas sand.

On Sunday, May 13, 2001, a second noise and temperature log indicated that flow from the sand had subsided. A sector bond log was run and confirmed that no cement bond existed behind pipe above the sand. On Wednesday, May 16, the surface casing was cut with a saw, slips were installed, the diverter was removed, and blowout preventers (BOPS) were nippled up. On Friday, May 18, 2001, the surface casing was perforated above the sand. The first cement squeeze was performed and all bubbles around the platform ceased. The ROV indicated that there were no gas bubbles at the mudline. During the period from Saturday, May 19, through Saturday, May 26, 2001, the casing was successfully squeeze-cemented through even shallower perforations to ensure isolation of the annulus.

Operations were begun to salvage the well by drilling out of the surface casing. A hole was found in the casing above the sand. Six unsuccessful attempts were made to squeeze cement into the hole. During washing out below the hole with a watermelon mill, the drill pipe became stuck and was backed off. The well was permanently plugged with casing removal delayed pending platform removal. The rig was released on June 16, 2001.

Damages

There were no fires, explosions, fatalities, injuries, significant pollution events, and no reported significant equipment damage as a result of this incident. There was an

undetermined loss of hydrocarbons (natural gas) as a result of the uncontrolled flow. The blowout began on Tuesday, May 8, 2001, with plugging operations being completed on June 14, 2001. Total rig time lost because of the blowout of Well A-5 ST01 was 37 days.

Conclusions

It is concluded that the source of the gas that flowed through the ST A-5 surface/conductor annular region and the gas that flowed to the seafloor is the previously mentioned shallow gas sand. Although the squeeze cementing of the annular region coincided with the cessation of the sea boil, the definite mechanism(s) by which the gas flowed to the seafloor is not known.

1. Normal operating practices were followed during drilling of the surface hole, and the hole was drilled with adequate mud weight. The density and pressure regression properties of the cement led slurry are considered to have been a contributory factor.

2. Probable causes of the well control situation are
    a) regression of cement from the mixed weight of 11.4 ppg to a seawater gradient of 8.65 ppg and/or
    b) formation of a channel while the cement was pumped.

3. Contributing causes of the well control situation may include the following:
    a) The delay in pumping cement into the surface casing of Well A-5 may have contributed to the formation of the channel. A loss of well control did not occur on Wells A-7 and A-10, where cement was pumped much sooner after landing the surface casings.
    b) The loss of returns when the cement reached the casing shoe indicates a fracture of the formation. This may have contributed to formation of the channel.

c) Well A-5 may have penetrated formations more susceptible to washout and lost returns than Wells A-7 and A-10, since Well A-5 was closer to Well A-3 than Wells A-7 and A-10 at the aforementioned shallow gas sand.

d) The delay in cementing the surface casing may have resulted in a channel. This delay was caused by the difficulty in removing the TIMCO fill-up circulation tool from the casing.

e) The explosion prevention timing system de-activated the top drive. This problem required an extended period of time for troubleshooting.

4. The loss of head resulting from washing 130 ft of cement from the 13⅜-inch by 18⅝-inch annulus would not have caused the incident.

5. The decision to lubricate mud into the annulus to stop the gas flow prevented any gas from actually reaching the rig floor. Not lubricating mud into the annulus could have resulted in potentially catastrophic consequences such as occurred on Well A-3.

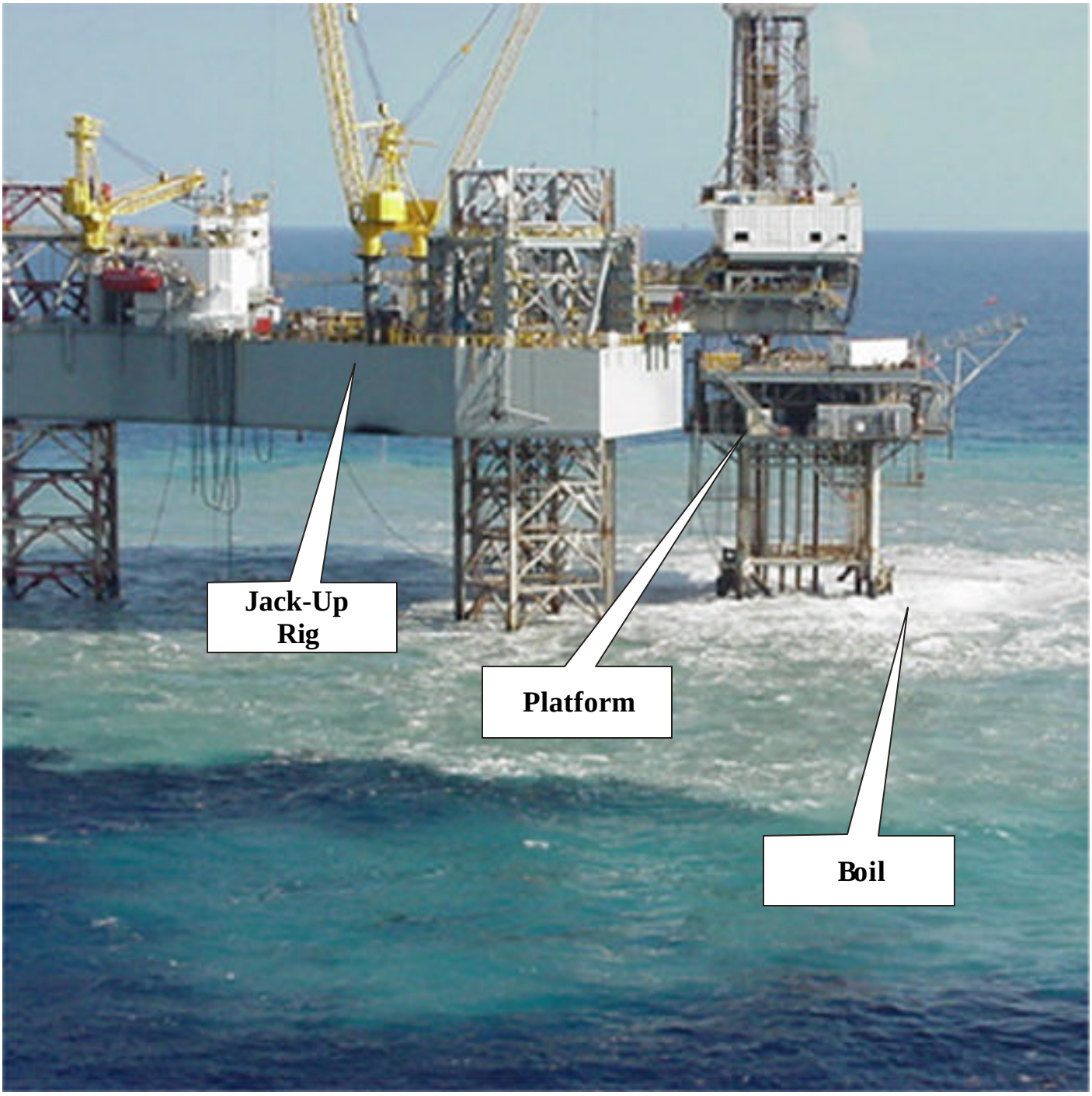
6. The evacuation of personnel from the rig was conducted safely and efficiently. Summoning of the work boat when the problem was first noted eliminated or at least greatly reduced the risks associated with transferring personnel to and from the capsules.

Recommendations

The MMS should issue a Safety Alert that recommends the following: That cement should be pumped as soon as possible after landing the surface casing and circulating at least one casing volume.

Location of Lease OCS-G2433,HighIslandBlockA368

Attachment 1



Photograph of platform and rig during gas flow to seafloor