

For Public Release

Investigation into June 22, 2012, Oil Spill Pacific Operators Offshore, LLC Platform Houchin

Lease OCS-P 0166, Area 6B, Block 5163

Pacific OCS Region



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Introduction

An incident that resulted in a pollution event occurred on Pacific Operators Offshore, LLC's Platform Houchin on Lease OCS-P 0166, Area 6B, Block 5163, in the Santa Barbara Channel, offshore the State of California, on June 22, 2012, commencing between the hours of 0100 and 0300.

Pursuant to 43 U.S.C. 1348 (d) (1) and (f) [Outer Continental Shelf Lands Act (OCSLA), as amended] and U.S. Department of the Interior regulations at 30 CFR 250, the Bureau of Safety and Environmental Enforcement (BSEE) formed a team to investigate and prepare a public report of the June 22, 2012, incident. By memorandum dated July 17, 2012, from the Regional Director, Pacific Outer Continental Shelf (OCS) Region, and pursuant to the BSEE Manual, Part 640, Chapter 3, Incident Investigation and Information Management, personnel were named to investigate the incident at Platform Houchin.

The following BSEE personnel were named to the Incident Investigation Team:

Marco DeLeon, Lake Jackson District, District Field Operations, GOM OCS Region
Michael Else, Offshore Regulatory Programs, Headquarters
Bob Fuller, California District, Office of Field Operations, Pacific OCS Region
Michael Idziorek, Investigations & Review Unit, Office of the Director
Michael Mitchell¹, California District, Office of Field Operations, Pacific OCS Region
Kenneth Seeley, Environmental Enforcement Division, Pacific OCS Region
Glenn Shackell, Regional Operations Section, Office of Field Operations, Pacific OCS Region

By letter dated August 1, 2012, the following United States Coast Guard personnel were invited and added to the Incident Investigation Team:

Lt. Jeff Fry, Marine Safety Detachment Santa Barbara, United States Coast Guard
CWO4 William Decamp, Marine Safety Detachment Santa Barbara, United States Coast Guard

¹ Designated as Team Chairman

Executive Summary

Early on the morning of June 22, 2012, crude oil totaling 35.62 barrels² was spilled into the Pacific Ocean from Platform Houchin, operated by Pacific Operators Offshore, LLC (POOLLC).

Platform Houchin is a fixed production platform located approximately four miles off the California coast, in the Santa Barbara Channel. Platform Houchin is actively being used for the recovery of hydrocarbons on the Outer Continental Shelf.

At the time of the spill, Platform Houchin was manned by only one operator, assigned to the night shift. The night shift operator discovered the discharge and after securing the platform began making notifications at approximately 0330 hours that Platform Houchin had shut in operations, and had discharged oil into the surrounding waters. This notification initiated a response and clean-up effort. No oil reached the nearby shoreline and there were no reported impacts to wildlife.

The BSEE appointed an Incident Investigation Team to determine the facts and circumstances that led to the spill. The Team conducted on-site inspections of Platform Houchin, interviewed employees of POOLLC, and reviewed documents requested from POOLLC. The Team also arranged for forensic testing of a Pressure Safety Element (PSE) from surge tank number one. The PSE was identified as the device that failed and caused the initial release of hydrocarbons into the flare header that resulted in oil being inadvertently released into the ocean via the disposal tube and the flare stack.

The team also concluded that the settling tank which acts as a flare scrubber had been taken out of service during an earlier annual inspection because of corrosion issues. The Team further concluded that a major contributor to the cause of the spill was the manner in which the production flow had been diverted, bypassing the settling tank. The settling tank or properly routed substitute may have prevented the oil from migrating to the disposal tube and consequently the flare stack. The operator was found to have been routing the pressure relief flow of gas and liquids to the flare header in an unapproved manner during the settling tank repairs. The team also concluded other factors contributed to the volume spilled, including the automated platform shut-down which initiated the shut-down of the shipping pumps and activation of the deluge system. Additionally, the sump and surge tank pumps continued to run, circulating the influx of deluge water and existing production fluids that eventually exceeded the capacity of the system.

² Recovered volume.

Background and Lease Information

Lease OCS-P 0166 covers approximately 1,995 acres and is located in Area 6B, Block 5163, Santa Barbara Channel, off the Coast of California. The lease was originally issued effective January 1, 1967, to Phillips Petroleum Company and partners with Phillips Petroleum Company designated as the Lease Operator on January 25, 1967. There are 2 platforms installed on the lease. Platform Hogan was installed in 1967 and Platform Houchin in 1968 in approximately 154 ft. and 163 ft. water depth, respectively. Signal Hill Service, Inc. (Signal), a subsidiary of Carone Petroleum, effective February 5, 1991, became 100% title owner of the lease. Pacific Operators Offshore, Inc. was approved as the Designated Operator effective February 19, 1991. On January 22, 2003, Pacific Operators Offshore, Inc. changed its name to Pacific Operators Offshore, LLC.

Platform Houchin is an 8-leg, 60-slot steel structure. The platform is located approximately 4.5 miles offshore Carpinteria, California. This production and drilling platform started producing in 1969 and is currently producing approximately 500 barrels of oil per day and 500 thousand cubic feet of gas per day. Oil/water and gas production from Platform Houchin is transported by subsea pipelines to Platform Hogan where it is combined with Platform Hogan's production and sent to the La Conchita facility for onshore processing. Platform Houchin has a Production Deck (+38' MLLW), Mezzanine Deck (+47' MLLW), Drill Deck (+60' MLLW), Pipe Rack Deck (+78' MLLW), and Heliport (+90' MLLW). The Minerals Management Service (now BSEE) approved the seismic re-assessment and requalification of Platform Houchin by letter dated February 13, 2009.



Figure 1 – Platform Houchin (BSEE Photo)

Description of Production Process Flow

The reservoir that Platform Houchin produces from is approved as a No Flow Reservoir in that oil is incapable of natural flow to the surface. Oil and water from the reservoir is brought to the surface utilizing progressive cavity pumps, rod hydraulic pumps and electric submersible pumps. Oil, gas and water from the well heads flow via a production flow line to a production header and then to the production separators. These two-phase separation vessels allow for the gas to be separated from the oil and water and directed to the gas pipeline to shore. The production separators operate at a pressure of approximately 80 pounds per square inch gage (psig).

From the production separators, the oil and water are directed to the surge vessels which operate at a pressure of 25-35 psig. From the surge tanks the oil and water emulsion is pumped to the oil pipeline via a shipping pump.

The free gas from the wells is routed from the casing annulus to a gas gathering flow line and to the gas gathering header which is routed to the gas pipeline and to the La Conchita processing facility onshore. The gas pipeline operates at 25-35 psig.

The Settling, Clean-up and Test Separator (CTS), and Surge Tanks



Figure 2 – Surge and CTS (right) Tanks on board Platform Houchin. (BSEE photo)

On board the platform, there are both pressurized (vessels) and atmospheric (tanks) containers that are used for the storage of oil. There are three containers that are referred to in this report, the settling tank, CTS vessel, and surge or shipping vessels.

The settling tank is a single tank that at atmospheric pressure is used to hold hydrocarbons in the event of an upset or other abnormal occurrence. The tank also serves as a flare scrubber, allowing retained gas to separate from liquids, and vent to the flare.

The settling tank was rated to hold approximately 225 barrels³ (bbl) of fluid. Fluid would normally enter the settling tank from either the sump pump, or the flare header.

The Clean-up & Test Separator or CTS is primarily used for testing wells. Normally, produced oil and water flowing from the wells are routed to the production vessels. The CTS allows for isolation of individual wells for testing purposes. The CTS was estimated to be able to hold approximately 75 bbl of fluid and is a pressurized vessel.

The surge or shipping tanks are holding vessels that fluids accumulate in until an adequate volume had been collected to run the shipping pumps. The fluid would then be pumped to the onshore processing facility via pipeline. Platform Houchin has two such pressurized vessels.

Pressure Safety Devices

Pressurized tanks or vessels are required⁴ to be equipped with safety devices that allow for discharging pressure in the event of abnormal conditions thereby preventing over pressuring the vessel. Of particular focus during the investigation were the Pressure Safety Element (PSE) or burst disc and the Pressure Safety Valve (PSV) located on surge tank number one.

The PSE is a thin metal disc that is installed between joints within a pipe leading from the tank. Its purpose is that, if the tank pressure were to increase to the rated pressure of the PSE, the disc would rupture, and relieve the pressure to prevent damage to the vessel.

Once ruptured, the PSE allows free movement of the gas or fluids from within the tank. In contrast, the PSV can open and close automatically. As pressure increases, the PSV would open at a set pressure. As pressure within the tank is bled off below the PSV's set pressure, the PSV would then close. Both of these components are in place to prevent damage to the tank. Both are designed to function at set pressures below the maximum allowable working pressure (MAWP) of the tank. Since the PSE is destroyed and cannot close once pressure ruptures the disc, it should always be rated for a greater pressure than the PSV set pressure.

³ 1 Barrel (bbl) = 42 US Gallons

⁴ American Petroleum Institute Recommended Practice 14J, Design and Hazards Analysis for Offshore Production Facilities, which is a document incorporated by reference at 30 CFR 250.198.



Figure 3 – A Rupture Disc, shown for reference only. (BSEE photo)

Inspection & Incidents of Noncompliance prior to the Incident (May 31, 2011)

On May 31, 2011, BSEE inspectors and engineers were conducting the annual inspection of Platform Houchin. POOLLC was issued an Incident of Noncompliance (INC) when the settling tank was found to have a leak due to corrosion.

The settling tank is significant to the overall safe operation of the production system as it allows for collection of continuous or intermittent releases of oil and gas⁵. In order to continue operating, POOLLC was required by the California District Manager to find a method of rerouting the flow of the flare header to a suitable replacement for the settling tank while it was being repaired.

Proposed Use of CTS: The Approved Plan

Following issuance of the INC for a leak on the settling tank, the POOLLC Offshore Superintendent proposed and received verbal authorization from BSEE California District Engineers to reroute the sump pump and flare header from the settling tank to the CTS vessel. Despite the CTS having less capacity than the settling tank, this would still provide temporary relief and containment in the event of an upset or abnormal condition. This authorization was followed up by an e-mail dated May 31, 2011, from the POOLLC Offshore Superintendent to the BSEE California District Manager.

POOLLC returned signed confirmation to the California District that the conditions cited on the Incident of Noncompliance referenced above were corrected on June 5, 2011.

⁵ API RP 14J

On the date of the spill, the platform was manned by a lone POOLLC operator, whose duty on the night shift was primarily to monitor operations on the platform. The operator would conduct periodic rounds of the platform, but spent most of the time in the production office. The office is a standalone structure and, although on the same deck, is located on the opposite side of the platform from the well bay. There is also a dividing fire wall separating the deck. The operator later told BSEE Inspectors that he had left the production office at 0110 hours to make a round and use the restroom located two decks above. Nothing out of the ordinary was observed and the flame from the gas pilot on the flare was burning normally.

At 0300 hours upon leaving the production office, at the start of another round of checks, the operator saw water dripping from the decking above. The operator, in going to investigate the source of the water, found that the fire water system (deluge system) in the well bay was discharging and that water was filling the deck in the well bay.

Not seeing any fire, the operator began to manually shut down the deluge system.

Based on activation of the deluge system and seeing that the pumps on the wells were not running, the operator realized that the facility had shut in. The operator also found that the platform flare pilot was no longer burning, and there was oil on the flare boom and on the side of the platform.

The operator then went to the electrical room where the alarm panel was located. The electrical room, adjacent to the production office, is also a standalone structure. Upon entering the electrical room, the operator saw that many of the warning and shut-in indicator lights were illuminated on the panel; however, no audible alarm was sounding as designed. The operator then went up one deck to inspect the production vessels in an effort to determine why the platform had shut-in.

The operator found that the pressure was low and fluid levels were high on the surge vessels. The operator then started the shipping pumps in order to lower the level of these vessels. However, the operator was unable to stop fluid from continuing to enter the well bay via the disposal tube, whose top was in the well bay.

While attempting to control fluid levels on the deck and in the vessels, the operator called the Offshore Superintendent by cell phone. After being apprised of the situation the Offshore Superintendent began to arrange for other POOLLC employees to respond to the platform.

Additional POOLLC employees began to arrive on the platform at approximately 0500 hours. One of the employees found that the settling tank pump and sump pumps were running. Upon shutting those pumps down, water stopped flowing out of the disposal tube. The night shift operator on duty was unaware that the settling tank pump and sump pumps needed to be shut down manually.

The operator also stated he notified Clean Seas⁶ at 0420 hours. The operator had stated during his interview that initially he was not certain if oil had gone into the ocean, but made the notification based on seeing oil on the platform and on the flare boom. The operator's suspicions were confirmed, however; when daylight began to break, oil could be seen on the water around the platform.

Clean Seas dispatched two oil spill response vessels, which arrived in the area at 0740 hours and deployed containment booms and skimming systems to recover the oil. Their initial on water response was completed the day of the spill by 1900 hours. Clean Seas response vessels did continue additional skimming operations the next day, working with a spotter helicopter to collect oil from a reported slick. Over the next few days, responses to the area were made for other reported slicks but no further recoverable oil was found. Based on quantifications made at the conclusion of recovery efforts, the total volume of crude oil recovered was 35.62 bbl, with no shoreline impact noted as a result of the spill. Harm to sensitive species and habitats as well as commercial and sport fisheries was avoided by what was evaluated as a rapid and effective response to the spill by Clean Seas.



Fig. 4 – Oil Containment Following Response by Clean Seas, LLC. (BSEE Photo)

The BSEE Investigation: Initial Findings

The BSEE investigation into the incident began immediately after notifications were received at 0600 hours by Dan Knowlson on the morning of the spill. Inspectors from the BSEE California District arrived at the platform at approximately 0820 hours.

The initial response and preliminary investigation determined how oil had been released from the platform and into the ocean.

⁶ Clean Seas, LLC is a not for profit Oil Spill Response Cooperative made up of member offshore operators in the Santa Barbara Channel. Membership in the Co-Op meets the Oil Pollution Act of 1990 requirement to have under contract spill response resources. Pacific Operators Offshore, LLC is a member of the Clean Seas Co-Op.

Inspectors found that oil and gas had initially flowed out of surge tank number one and into the flare header. Flow from the flare header, which normally is routed to the settling tank, had been diverted to the disposal tube, and ultimately up and out the flare boom.

Inspectors also identified that as a result of the shut-in process, pneumatic lines that control most of the safety systems on the platform had bled off, as the shut-in would have stopped the on board air compressors. The drop in air pressure ultimately led to the fire water (deluge) system discharging. This is a safety mechanism where in the event of a fire or explosion that affected the controls, the automatic fire suppression system (deluge) would still activate.

The sump and the settling tank pumps were not designed to automatically shut down (the pumps prevent overflow of the sump). These pumps continued to run and continually cycled water from the well bay (which drains to the sump), to the surge tanks and to the disposal tube. The results of this were observed by the operator and other employees as water continued to flow out the top of the disposal tube after the fire water system was turned off.

The cause of the initial shut-in could not be accurately determined. The platform was not equipped with any means to record abnormal occurrences. By the operator's account, once he was aware that the facility was shut-in and he inspected the alarm panel, several indicator lights were illuminated signifying various conditions, any of which could have initiated a shut-in.

The operator also reported that he had left the production office at 0110 hours and had observed nothing unusual. The operator did not report becoming aware of the shut-in until 0300 hours when he left the production office and found that the deluge system was on. However, in later review of documents provided by POOLLC following a request by BSEE, production oil measurement readings from La Conchita had shown that it had stopped recording flow from Platform Houchin at 0030 hours.

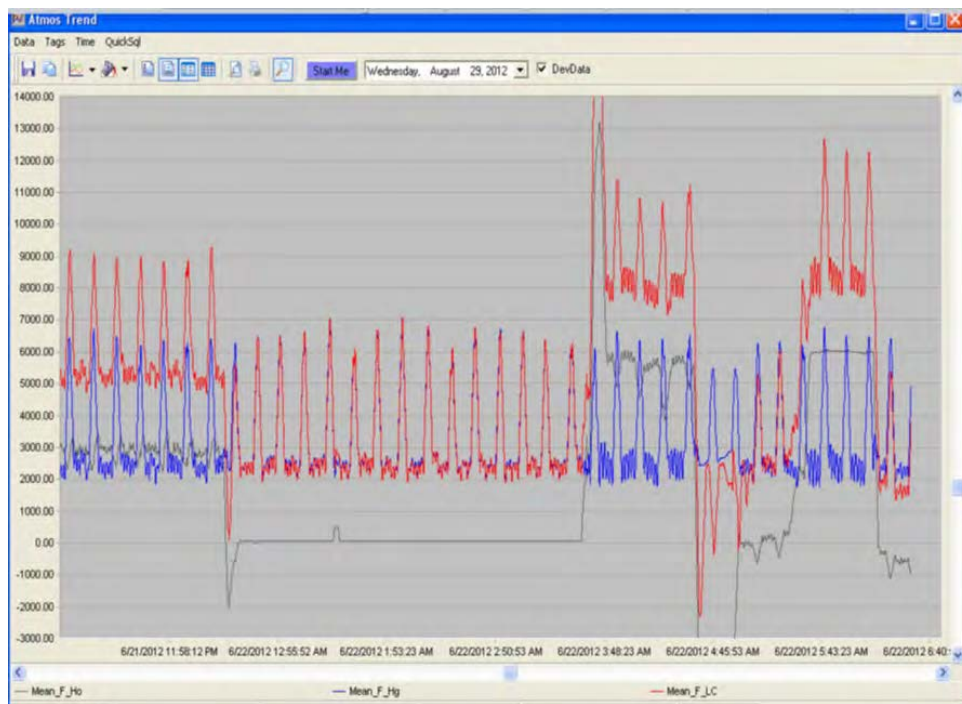


Fig. 5 – Flow from Houchin Platform (Black Line) as recorded at the La Conchita Processing Facility. (POOLLC Document Production)

BSEE Inspectors that responded to Platform Houchin the morning of the spill observed POOLLC personnel testing the safety devices on surge vessel number one. During a test of the level safety high (LSH), the indicator lights for both warning and LSH shut-down illuminated on the alarm panel but no audible horn sounded. The horn did sound once the reset button on the alarm panel had been pressed. As a result POOLLC workers believed that the mechanical relay switch for the horn had malfunctioned, and prevented the horn from sounding, both during the test and the actual event.

The BSEE Investigation – Oil & Gas Leaving the Surge Vessel

With the exception of discharge for normal shipment, oil, gas and water can leave the surge vessel via two other outlets. Both are safety devices and any flow from these outlets is routed to the flare header.

The first is via a pressure safety valve (PSV). As previously noted, this is a safety mechanism to prevent overpressure from damaging the vessel. The PSV on the surge vessel had been tested prior to the spill by POOLLC and witnessed by BSEE Inspectors during the annual inspection of the platform earlier in the month, and was found to have an opening or release pressure of 132 psig.

The second method that oil, gas and water could leave the surge vessel is via a pipe which has an in-line pressure safety element (PSE), or rupture disc. During the investigation of the incident, POOLLC employees disconnected the pipe and found that the PSE for surge vessel number one had burst.

Normally, rupture discs of the type used on the surge vessel have an attached metal tag that is visible outside of the pipe when installed. This tag would have information such as burst pressure rating and manufacturer. The tag on the PSE recovered from surge vessel number one was missing, and appeared to have corroded away.

POOLLC representatives could not provide any documents that showed when the disc had been installed, or when if ever the rupture disc had been replaced. POOLLC employees that had worked on Platform Houchin for several years also could not recall ever servicing the PSE.

The rupture disc from surge vessel number one was removed by POOLLC employees and delivered to the BSEE Investigation Team. BSEE then sent the disc to Argonne National Laboratory (ANL) for testing. Their findings are discussed further in a separate section of this report.

The BSEE Investigation – Failure to Follow Approved Plan

The issuance of an Incident of Noncompliance to POOLLC in May 2011 for the settling tank was not an order to stop production. POOLLC had received instructions that to continue production, an acceptable alternative had to be found for the settling tank while it was to be repaired. The proposed plan to use the CTS vessel during repair of the settling tank would have met the requirements set forth in regulations and conformed to accepted practices.

During an interview conducted by the Investigation Team, the POOLLC Production Superintendent acknowledged that it was not advisable to flow without the settling tank since it was the final liquid trap in the vent system. The Production Superintendent also stated in the same interview, “I wish we would have routed the system to the CTS back when BSEE wrote us the INC (for the) settling tank leaking. This would have probably prevented the flow from going out the vent (flare) boom.”

Also interviewed was the Offshore Superintendent who received the verbal approval and had sent the e-mail to the California District Manager. Both of those communications with BSEE had specified the use of the CTS vessel. However, the Offshore Superintendent in his interview stated that he had meant to say the surge tank and not the CTS vessel since that is how he instructed his workers to re-route the flow when the settling tank was removed from service. In addition, both verbally at the time the INC was written, and in the e-mail, the Offshore Superintendent had indicated that a safe plan would also be submitted to the District. A subsequent check of District records showed that no such submission was ever received.

It is required under 30 CFR 250.802 that, “*All production facilities, including separators, treaters, compressors, headers, and flow lines be designed, installed, and maintained in a manner which provides for efficiency, safety of operation, and protections of the environment.*”

API RP 14C states, “*If gas is discharged from a pressure vessel during normal operations (flare, vent), a scrubbing vessel should be provided to remove liquid hydrocarbons.*”

As evaluated by engineers from the BSEE California District and members of the Investigation Team, the operating conditions presented by not having an adequate flare scrubber did not meet the requirements of the regulations.

The BSEE Investigation – Testing of Rupture Disc

The night operator had made a statement to the first BSEE Inspectors to arrive on the platform that he believed that the PSE had ruptured on one of the surge tanks. This information helped the Investigation Team develop the hypothesis that gas and oil did vent from surge tank number one. Based also on the production volumes and normal operating pressure⁷ it is believed that the PSE prematurely ruptured below its nominal burst pressure.

The ruptured disc, along with an undamaged disc⁸ also obtained from POOLLC, was sent to the Argonne National Laboratory (ANL), in Lemont, IL. A separate report⁹ of the test results was prepared by ANL scientists and provided to the BSEE Investigation Team.

⁷ 25-35 psig

⁸ This disc was from storage on board Platform Houchin. Based on the design of the undamaged disc it was not believed to have been of the same manufacturer as the disc that ruptured. It was sent to ANL only as a reference.

⁹ See Attachment 1, “Technical Report on Laboratory Analysis of Rupture Disc Sample Obtained from Platform Houchin, Pacific OCS,” Argonne National Laboratory

The ANL analysis included the use of a Scanning Electron Microscope, and Energy Dispersive X-ray Spectroscopy. Since the rupture disc was missing its identification tag, ANL performed a series of tests that concluded that the PSE had been made of Type 321 Stainless Steel and, based on the thickness of the material, would have had an estimated burst pressure of 210 psig. Analysis also revealed that corrosion pits were located on the high-pressure side of the disc, along with cracking that was present before the burst occurred. These microscopic cracks and surface corrosion compromised the disc's integrity and led to rupture below its nominal burst pressure.



Fig. 6 – Rupture Disc (PSE) Recovered from Houchin Surge Tank One (BSEE Photo)

Conclusions

The Investigation Team concluded that the failure of the PSE on surge tank number one initiated the release of hydrocarbons into the flare header that resulted in oil being inadvertently released into the ocean via the disposal tube and the flare stack.

The Investigation Team identified that a major contributing cause of the spill was the manner in which the production flow had been diverted following the May 2011 annual inspection. This diverted flow was in contrast to the plan approved by email, and not in accordance with recommended safe practices.

It is required under 30 CFR 250.802 that, *“All production facilities, including separators, treaters, compressors, headers, and flow lines be designed, installed, and maintained in a manner which provides for efficiency, safety of operation, and protections of the environment.”*

API RP 14C states, *“If gas is discharged from a pressure vessel during normal operations (flare, vent), a scrubbing vessel should be provided to remove liquid hydrocarbons.”*

As evaluated by engineers from the BSEE California District and other members of the Investigation Team, the operating conditions presented by not having an adequate flare scrubber did not meet the requirements of the regulations.

POOLLC had been operating in this unapproved manner from June 1, 2011, until the date of the spill, June 22, 2012. POOLLC's operation was in violation of 30 CFR 250.802(e), which reads in part:

“Prior to installation, the lessee shall submit, in duplicate for approval to the District Manager a production safety system application containing information relative to design and installation features.”

POOLLC also failed to submit an updated Piping and Instrumentation Diagram (P&ID) and Safety Analysis Function Evaluation (SAFE) chart of the diverted flow plan as required by 30 CFR 250.802(e)(2).

It was concluded that by whichever uncontrolled means that fluids and gas first left the surge vessel, without the settling tank or proper substitute there was not adequate volume in the piping system to control the effects of a buildup in pressure or fluid volumes. Additionally, pumps that normally serve important functions for moving drain fluids were not linked to the automatic shut-down functions associated with a facility shut in, further tasking the piping and containment system.

The Investigation Team did not have the information required to be able to identify the initial cause of the upset to the process system that resulted in the spill; however, the investigation team determined there were two scenarios which would result in oil being spilled into the ocean once the upset occurred.

The first scenario is, following the unknown trigger, a shut-in occurred. Pipeline pumps shut down, as well as the air compressor. Pneumatic lines that control the actuation of the fire deluge system would have begun to lose pressure. An audible alarm that normally would sound immediately in the event of a process upset did not function. As a result the lone operator aboard who was inside the production office was unaware of the situation.

As a result of the loss of pressure in the air line, the deluge valve opened, and began to spray water into the well bay. The water drained into the sump tank, which began to fill. The sump pump which operates automatically by a level controller began to pump fluid out of the tank. Fluid was then pumped into the surge vessels. The shipping pumps that normally move oil and water out of the surge vessel had been stopped as a result of the shut-in, causing the fluid level in the surge vessel to rise. As the fluid level rose, the pressure in the vessel increased. Ultimately, the PSE for surge vessel number one whose integrity was found to have been compromised by microscopic cracks and corrosion, ruptured below its nominal burst pressure. Gas and fluids (oil and water emulsion) were then forced out of the vessel and into the flare header and disposal tube. The volume of gas and oil was greater than the space available in this portion of the piping and was forced out the flare tip with the oil going into the ocean.

The second scenario has oil and gas levels increasing within the surge vessel as part of normal production. The increase in fluid volume proportionally increased the pressure in the vessel which had the same effect on the PSE as in the first scenario. A rupture of the PSE would drop the

pressure in the vessel, and a shut-in would have occurred due to low pressure. Following the surge vessel shutting in, the loss of instrument air would have a cascading effect on shutting in the entire platform.

In both cases, the water from the deluge would continue to cycle through the system until the sump and settling tank pumps were manually shut down.

A conclusion was also made that the failure of the audible alarm to sound and alert the operator only prevented a quicker response to the upset condition. The failure of the rupture disk in combination of operating without an adequate flare scrubber resulted in the release of hydrocarbons reaching the Pacific Ocean much more rapidly than if the operator would have been able to respond to an audible alarm. Based on its condition as determined by testing, the PSE rupturing below its set or nominal pressure was inevitable.

Recommendations

The results of the investigation into the June 22, 2012, incident lead to the following recommendations for POOLLC and BSEE from the Investigation Team to prevent a similar event from occurring aboard Platform Houchin or other POCSR facilities.

POOLLC Actions

- Immediately repair and properly maintain the settling tank. (The settling tank has been repaired and was inspected by BSEE prior to startup.)
- Repair or replace the alarm monitoring panel. (The panel has been replaced by POOLLC and inspected by BSEE personnel.)
- Install supplemental visual warnings in other areas of the platform to alert operators of process upsets if they are not at the alarm panel. (A flashing light has been installed in the production office.)
- Develop separate start-up/shut down control logic for the sump and settling tank pumps. (Completed.)
- Consider additional audible alarms on the platform for redundancy and better coverage. (POOLLC has verbally committed to adding an alarm on the drill deck area; the work is in progress.)

BSEE Actions

- Issue a Safety Alert warning of potential Pollution from Production Operations Due to Rupture Disk Failure. (A draft has been circulated through the POCSR and to Headquarters.)
- Issue additional INC's for operating without an adequate flare scrubber and failing to submit an application to modify the production facility. (Two additional INC's were issued on March 6, 2013.)
- Determine the presence of Pressure Safety Elements on Platform Houchin and other facilities, evaluate their usage and verify identification tags are present and legible. (The PSE's on Platforms Houchin and Hogan were removed and replaced with blind flanges. PSE's were found to be in use on other POCSR platforms. BSEE inspectors verified that the identification tags were in place and legible as

required. The BSEE production engineer verified that the usage of the PSE's was in compliance with applicable regulations and standards.)

- Have an independent third party complete an audit and evaluation of the Safety and Environmental Management System program for Platform Houchin. This audit will address training needs of POOLLC's employees related to platform operations. (The directed audit will be in addition to the POOLLC – submitted self-audit to satisfy the requirements in 30 CFR 250 subpart S.)

List of Attachments

Attachment 1 – Argonne National Laboratory, Technical Report on Laboratory Analysis of Rupture Disc Sample Obtained from Platform Houchin, Pacific OCS