NOAA Ship

Significant Spill Report

EXECUTIVE SUMMARY

A NOAA Ship was alongside on the day of the incident. The deck crew was pressure washing the hull in preparation for painting.

At 0755, the Boatswain Group Leader noticed a sheen on the water on the starboard side below three overboard discharges where he was pressure washing. The cause appeared to be a slow leak of diesel fuel from the A/C plant overboard discharge. All pressure washing operations ceased, the Commanding Officer notified, and a crew response team mustered to deploy containment boom and sorbent pads below the discharge. At 0802 the A/C plant overboard discharge was secured by the 2AE, but fuel continued to leak. After some initial confusion about the source of the leak, the response team determined that the discharge pipe passes through the #1 starboard fuel oil tank, and that fuel was leaking from around the pipe, at the interface with the hull, instead of out of the pipe. The CME immediately transferred fuel from the #1 starboard tank to the #2 starboard tank. As soon as the fuel level in the #1 tank fell below the level of the A/C discharge pipe, the leak stopped. It was estimated that a total of approximately five gallons of diesel fuel was discharged over a period of 20 minutes.

Clean up was conducted by a local response contractor. They boomed the vessel from a small boat and pumped fuel oil from the water surface into a vacuum truck using a skimmer. Full cleanup operations were completed 4.5 hours after they arrived.

It was determined that the failure was ultimately caused by a failed pipe/hull weld, in conjunction with a shortcoming of the ship's original construction, namely an unsealed "weep" hole inside the fuel tank. To prevent further incidents, it was suggested that more stringent requirements be added to fuel tank inspections to include welds on seawater discharge pipes. In addition, it was recommended that a formal fleet Standard Operating Procedure (SOP) be developed for emergency fuel transfer; this could include requiring fuel tanks to be well below capacity during alongside repair periods (allowing internal fuel transfer in the event of an emergency), and/or agreements with other vessels or response contractors to provide emergency fuel transferring capacity. Other recommendations included installation of oil spill boom reels along the pier and the investigation of an alternative patching material for minor fuel leaks.

INTRODUCTION

A NOAA Ship was involved in a small diesel fuel spill (~ 5 gallons) on the morning of the incident while alongside during her winter repair period. The oil spilled into the water because of a small leak in a 5500 gallon fuel tank. The root cause of the incident was failure of a hull weld on an overboard discharge pipe that transited through the fuel tank, as well as an original construction oversight. This report includes details of the response, root cause of the incident, and possible corrective actions to prevent such incidents in the future.

TIMELINE

0755 – Oil sheen discovered by BGL, who notified CB
0756 – CO notified
0758 – Crew mustered on pier to begin response
0801 – Crew begins deploying sorbent booms, then pads at spill source
0802 – A/C plant overboard discharge secured
0805 – Diesel fuel leak determined to be from weld around discharge pipe; this pipe penetrates #1S fuel oil (FO) tank
0807 – Commence transferring FO from #1S tank to #2S tank
0814 – FO leak from hull stops
0819 – Facilities Manager
0820 – Local response company contacted for containment boom and cleanup
0850 – MOC-A/P notified
0910 – Local response company arrives on-scene in small boat, begins deploying containment boom
0915 – Spill reported to National Response Center
1000 – Local response company crew arrives on scene
1015 – CO meets with reps from USCG Sector, who estimate spill slightly more than 5 gallons. Based on ship's response and contractor presence, no concerns are communicated by USCG.
1115 – Small skimmer and vacuum truck on scene, commence skimming ops
1330 – Cleanup contractors depart

DESCRIPTION OF EVENTS

Background information

On the morning of the incident, the ship had been alongside for approximately three months for its winter repair period. The Deck Department was pressure washing the hull to remove algae and rust in order to prepare the surface for painting. The BGL was pressure washing an area on the starboard side with three overboard discharges, located roughly midships, focusing especially on the A/C overboard discharge which had considerable buildup. As he was pressure washing, the BGL noticed a sheen on the water, then a pinkish substance running down the hull. He immediately notified Chief Boatswain, who notified the Commanding Officer.

Location of Vessel
Alongside at pier.

Description of Containment and Response

Further investigation by sight and smell revealed what appeared to be diesel fuel coming out of the A/C plant overboard discharge, which is a through-hull pipe that discharges cooling seawater above the waterline and into the water. The CO went to the Bridge and made an announcement over the 1MC for all hands to muster on the pier for an oil spill. A crew response team was mustered soon after, with responders breaking out the ship's three spill response kits. A portable man lift was moved from the bow to midships to assist in the response. The spill area below the discharge was contained with sausage boom, and then sorbent pads were placed in the water to recover the oil. A second sausage boom was placed aft, between the ship and the pier, to prevent the sheen from moving toward an adjacent vessel and into the main channel.

There was initial confusion and disbelief as to why fuel oil would be coming out of the A/C discharge as this pipe has no connection to the fuel system. The A/C plant was secured by 2AE and the seawater

discharge stopped, but the fuel oil leak continued. The CME requested a sample of the leaking substance to confirm it was indeed fuel oil. Given the urgency, the CO proposed that the discharge pipe might penetrate the Starboard Day Tank and that oil was coming from around the pipe and not out of it. The CME agreed to the concept and reasoned that the discharge pipe did not pass through the Day Tank, but through another, larger fuel storage tank (#1 starboard, 5560 gallon capacity). The CME immediately went below to start transferring fuel out of the #1S tank into the #2S tank. Once the fuel level in tank #1S fell below the level of the A/C discharge pipe, the leak stopped. Overall, the leak was slow and occurred for a total of about 20 minutes.

The Chief Mate contacted a local spill response contractor to request booming of the ship and possible cleanup. A small boat towing a boom arrived roughly 50 minutes after the initial request (and roughly 75 minutes after the spill began) and began booming the vessel. The contractor arrived on the pier with a cleanup team around 1000. The team surveyed the scene and suggested that a small skimmer be utilized to recover the oil on the water. Representatives of USCG Sector arrived soon after to inspect the scene, indicating no concerns based on the ship's response and the presence of the contractors. At approximately 1115, the skimmer began operations along the starboard side of the ship, with oily water being pumped to a vacuum truck. The skimmer operated for about two hours. When the contractor departed, there was little if any evidence that a spill had occurred.

Description of Spill

All fuel oil was spilled over the starboard side, running down the hull, at frame 58 (approximately).

After the response, a number of key crewmembers were informally polled about their estimate of the total spill. The consensus was roughly 2-5 gallons. The spill was reported to the NRC as less than 5 gallons, but USCG personnel on scene estimated the spill amount to be "a little more than 5 gallons."

At its greatest extent, the sheen extended ~10 feet to the starboard side of the ship (and possibly beneath the pier) and about 20 feet aft of the ship, prior to being boomed by the contractor. There was a fairly heavy concentration of oil directly beneath the tank leak and a substantial sheen with a ~5-10 foot radius. The remainder of the sheen near the ship was light and broken. At no time did the sheen reach the small boat dock facility or hardened shoreline forward of the ship's port bow. The sheen also did not reach the vessel moored about 50 feet aft of the NOAA Ship.

The weather was clear, with a temperature of ~65F and wind of 5-10 knots.

NOTIFICATIONS

Facilities Manager at 0819.
Local spill response company at ~0820.
Initial email report to MOC at 0850.
Report to the National Response Center at ~0915.
NRC forwarded the report to USCG Sector.

CAUSES OF DISCHARGE: PROXIMATE AND ROOT CAUSES

After emptying and inspecting fuel oil tank, it was determined that the failure was ultimately caused by a failed weld, in conjunction with a shortcoming of the ship's original construction, namely an unsealed "weep" hole inside the fuel tank.

The A/C cooling water discharge pipe is constructed of copper and nickel (Cuni) and passes through the #1S fuel tank before discharging over the starboard side. Inside the tank, at the interface of the discharge pipe with the hull, there is a sleeve that surrounds the discharge pipe. The pipe and sleeve are welded together, and the sleeve is welded to the hull.

The oil spill occurred at the site of a failed weld between the discharge pipe and sleeve. Note that the A/C plant runs continuously, creating a constant discharge of seawater through this pipe and over the side. This weld has been continuously inundated with seawater since vessel construction, which weakened it over time.

The enabling factor was an unsealed "weep" hole in the sleeve. Typically when a pipe is welded inside a sleeve such as this, it is normal procedure to drill a hole in the sleeve before making welds at each end. This allows the escape of any gases or moisture trapped between the pipe and the sleeve, as the two ends are being sealed by welds. After the welds are completed, this “weep” hole is sealed. However, in this instance, the "weep" hole on the sleeve was not sealed during construction of the vessel.

Because the "weep" hole had not been sealed, and because the weld between the pipe and the sleeve failed, this allowed fuel oil to pass first through the weep hole, then through the failed weld, and over the side.

Note also that, based on original design standards, there should have been a doubler plate (i.e. reinforcement ring) on the hull exterior, around the end of the discharge pipe, to strengthen the weld interface.

CORRECTIVE ACTIONS PLANNED AND EXECUTED

The #1S fuel tank was emptied and gas-freed before any repairs were initiated.

Repairs consisted of sealing the "weep" hole, repairing the weld, and adding the doubler plate. The repairs were tested using dye penetrant and air pressure.

A similar overboard discharge that is constantly inundated with running seawater (e.g. main engine overboard discharge) was also inspected visually.

LESSONS LEARNED

1) Shipboard fuel tanks hold a large amount of fuel, and a leaking tank can present a substantial risk. Ship personnel were able to stop the tank leak quickly, but only because engineers were able to transfer fuel from the leaking tank to another shipboard storage tank without hesitation. The ship’s total fuel on board during the incident was about 50% of total capacity. If the ship had full tanks, some other method of transferring fuel, involving another ship or a land-based contractor, would have been required. The resulting delay would have caused more oil to be spilled into the environment and substantially complicated and lengthened the response. ***Recommend that a SOP be formalized to direct vessels to enter alongside repair periods with a TBD maximum amount of fuel aboard. SOP should provide that any single fuel tank can be quickly emptied via internal transfer to an alternative shipboard fuel***

tank(s), or to a ballast tank in an emergency. If this is not possible, recommend a SOP for emergency transfer of fuel between moored ships, and/or a standing contractual agreement for a spill response contractor to arrive on-scene within xx minutes with sufficient tanker capacity to transfer fuel out of the leaking tank.

2) The sausage sorbents deployed by crew from the ship and pier were of limited effectiveness in terms of booming the spill. Also, the time between contacting the spill response contractor, and the contractor completing the booming of the ship, was more than one hour. The contractor also mentioned that they were "in the area" when called, so a future response time could be even longer. In the event of a more substantial leak, this potential delay in booming the vessel would make the response less effective and the outcome less positive. ***Recommend that oil spill boom reels be permanently installed along each NOAA port facilities. These booms can be used during fueling, as well as during a spill response.***

3) The #1S fuel tank had been emptied and visually inspected by ABS in February 2011. The discharge pipe had ultrasonic non-destructive testing conducted on it at that time, but the subject weld was not required to be similarly tested. Port Engineer noted that air pressure leak testing used to be part of ABS inspections, but these tests are no longer required. It seems inconsistent to require fuel tanks and through-pipes to be inspected, but not welds that are also a part of these tanks. ***Recommend that ABS and/or other periodic fuel tank inspection requirements be reviewed, and if necessary, modified to include weld inspection and/or air pressure testing. Recommend OMAO immediately adopt a policy of periodically inspecting all welds on discharge pipes (esp seawater) that penetrate fuel tanks.***

4) It was frustrating to stand by and watch fuel leak from the hull as we had no way to get close enough (even with a man lift on scene) to apply pressure to slow the leak. Even if we had, the only thing in our toolkit would have been sorbent pads, given the nature of the leak from the weld. In the event of similar leaks in the future (including hairline tank cracks, etc), material to stop the flow of oil would be useful. Putty material, or something similar to Emergency Water Activated Repair Patch (EWARP) that is activated by fuel instead of water, would be good to use in this case, if available. ***Request STEM investigate material to temporarily patch small fuel leaks where standard DC gear will not suffice.***