Marine Safety Investigation Unit

Transport Malta

SAFETY INVESTIGATION REPORT

201807/031 REPORT NO.: 14/2019 July 2019

MT *SANAR-8*

Equipment failure leading to the serious injuries to two crew members and subsequent loss of life of a crew member in position 40° 50.35' N 29° 16.17' E 31 July 2018

SUMMARY

On 31 July 2018, at about 1100, the second engineer observed a condensate / steam leak from the sight glass, fitted right above the atmospheric condenser return line. He approached one of the engineers and asked him to rectify the leak together with another crew member.

Soon after his safety round, the second engineer noticed the engineer was using a hammer to tighten the sight glass. At this stage, the sight glass failed, spilling hot condensate and steam into the engine-room.

The two injured crew members were helped to remove their wet clothes. Cold water was also applied to the burns. Eventually, they were assisted out of the control room and transferred ashore. Nine days after the accident, one of the crew members succumbed to his injuries.

Taking into consideration the safety actions taken by the Company, no safety recommendations have been made.

MV *Sanar-8*

FACTUAL INFORMATION

Vessel

Sanar-8, a 62,569 gt double-hulled, crude oil tanker was built in 2000 and was registered in Malta. She was owned by Sunor Ltd., managed by PI Complex Cargo Ltd., Cyprus and classed by the Russian Maritime Register of Ships (RMRS).

Sanar-8 had 12 cargo oil tanks, arranged as seven pairs on port and starboard. The vessel was also fitted with two slop tanks. *Sanar-8* had a length overall of 249.0 m, a moulded breadth of 44.0 m and a moulded depth of 21.2 m. She had a summer draught of 14.6 m, corresponding to a summer deadweight of 113,424.

Propulsive power was provided by a 6-cylinder B&W 6S60MC-C, two stroke, single acting, slow speed, direct drive diesel engine, producing 13,549 kW at 105 rpm. This drove a single fixed pitch propeller to reach a service speed of 14.0 knots.

Crew

Sanar-8's Minimum Safe Manning Certificate required a crew of 17. At the time of the accident, there were 23 crew members on board. All the crew members were Russian nationals. The injured crew members were the fourth engineer and one of the motormen.

The fourth engineer was 40 years old and had been at sea for nine years, serving as fourth engineer for the previous 24 months. He had been serving on board Company ships for 12 months. He had been on board for just over five months when the accident happened.

The motorman was 29 years old at the time of the accident and had been at sea for five years, serving in his current rank for the previous 24 months, on board Company ships. He had joined the vessel just over three months prior to the accident. The motorman succumbed to his injuries about nine days after the accident.

The official language on board was English but the working language was Russian.

Weather conditions

At the time of the accident, the weather was reported to be clear with good visibility (10 nautical miles). The sea state was calm with a 0.2 m swell from the Northeast. A light breeze was also from the Northeast. Air temperature was recorded to be 30 °C and sea water temperature was 25 °C.

Narrative[1]

On 08 July 2018, *Sanar-8* departed the outer port limits of Kavkaz, Russia and sailed to Tuzla, Turkey. The vessel proceeded to the shipyard for her scheduled repairs and surveys. Her stay in Tuzla had been uneventful until the day of the accident.

On 31 July 2018, at about 1100, the second engineer was in the engine-room, carrying out a safety round. Walking past the sight glass fitted right above the atmospheric condenser return line, he observed leaking water / steam.

The second engineer took note of the situation and approached the fourth engineer to inform him about the leak. After discussing the issue, the second engineer asked the fourth engineer to look into the leak and fix it. The second engineer recalled that he cautioned the fourth engineer to tighten the sight glass but without using a hammer.

The second engineer confirmed that he did not remain in the vicinity of the sight glass and left the fourth engineer to rectify the situation, together with another crew member.

[1] Unless otherwise stated, all times are Local (LT).

Upon completion of the safety rounds in the engine-room, the second engineer made his way to the engine control room deck. From there, he could observe the area of the sight glass. From this position, he noticed the fourth engineer using a hammer to tighten the sight glass (Figures 1 and 2).

Figure 1: Hammer and tool used by the crew members

Figure 2: Simulation to show how the sight glass was being tightened

It was at this time that the second engineer observed the sight glass failing (Figure 3) without any warning. He also noticed hot water and steam leaking in the direction of both the fourth engineer and the motorman, who was standing close to the fourth engineer.

Figure 3: Damaged sight glass after the accident

Actions following the accident

The third engineer, who was working on diesel generator no. 1, recalled that at about 11:00, he heard screams from behind him. Turning round, he noticed steam leaking in the engine-room and noticed the two crew members running towards the engine control room. It was evident that they were injured and in pain.

The two injured crew members were helped to remove their wet clothes and cold water was also applied to the burns. Eventually, the two crew members were assisted out of the engine control room by their colleagues and shore workers. They were eventually landed ashore and transferred to a local hospital at about 11:50.

Both crew members were treated for the burn injuries which they had sustained when the sight glass broke. Notwithstanding the treatment received, the AB succumbed to his injuries nine days after the accident.

ANALYSIS

Aim

The purpose of a marine safety investigation is to determine the circumstances and safety factors of the accident as a basis for making recommendations, and to prevent further marine casualties or incidents from occurring in the future.

Sight glass and condensate system

The sight glass was of the conventional type, fitted on the condensate line of the system. Condensate from the fuel oil settling and service tanks flowed through the sight glass and eventually directed by two valves, either to an atmospheric dump condenser or the system's hotwell (Figure 4).

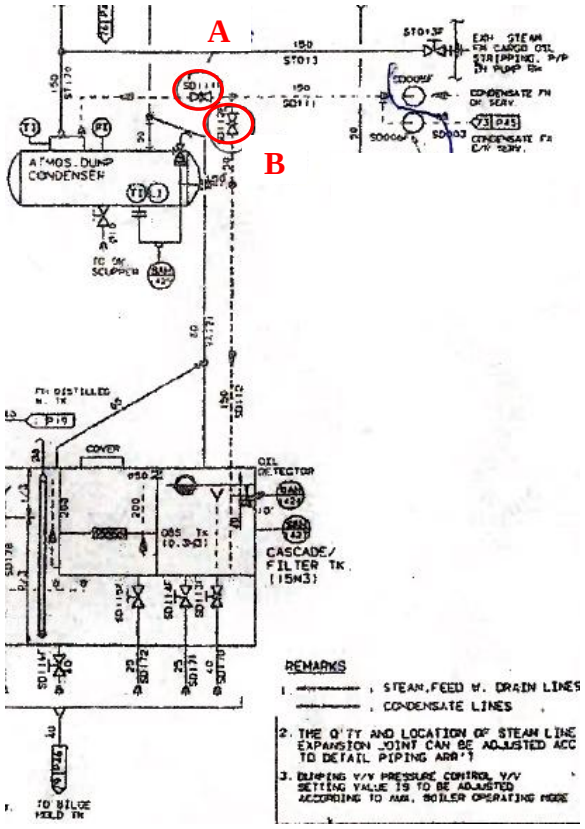

Figure 4: Part of the condensate system showing the sight glass and the two valves (A and B)

Figure 5 is a simplified schematic drawing of the part of the condensate system which incorporates the sight glass.

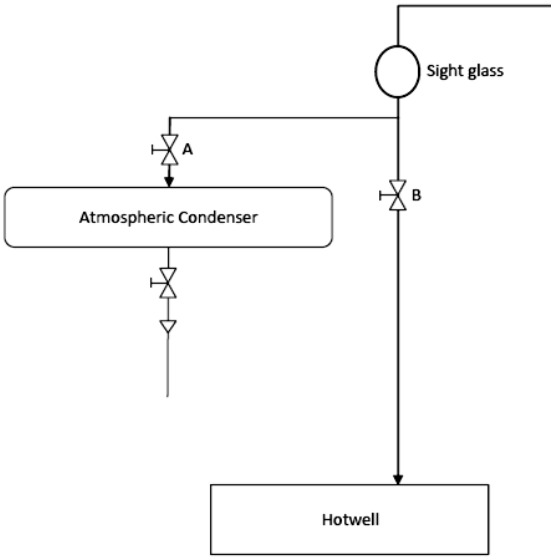

Figure 5: Simplified schematic drawing

It was reported to the MSIU that following the accident, both valves 'A' and 'B' were found closed. The status of both valves was not normal and it was therefore hypothesised that these were closed prior to the tightening of the sight glass (Figure 6).

Figure 6: Location of the valves and sight glass

The closing of both valves, however, meant that a part of the system, which included the leaking sight glass was under pressure. Whilst this may have not necessarily contributed to the failure of the glass, however, it was considered possible that this would have exacerbated the effects of leaking water and steam into the engine-room as soon as the sight glass failed.

The safety investigation was of the view that the two crew members actually had two options which could have been adopted. The first option was to leave both valves 'A' and 'B' open. The flow of water and steam would have been unhindered, although it would still have been possible that the mixture could have leaked out into the engine-room in the eventuality of a sight glass failure.

The second option would have necessitated a complete shutdown of the boiler, closure of the main steam stop valve and draining the lines from steam and condensate. None of the above two options had been selected by the crew members. This matter is addressed further down.

Crew familiarisation

As part of the safety management system implemented on board, both crew members had completed their 'Familiarisation with the Engine-room Equipment' checklist. The fourth engineer signed his checklist on 08 February 2017, whereas the oiler had signed his document on 28 April 2017.

Item 7 on the checklist referred to Boilers: machinery and systems related. The MSIU was unable to determine how detailed the familiarisation process would have been, however, it has to be submitted that one would expect that this would be limited given that:

1. crew members would be new to the vessel and therefore it would be pointless to overwhelm them with detailed information;
2. item 7 on the checklist is but one of 28 other items and therefore it would be expected that the familiarisation remains exactly that – a familiarisation run through the numerous engine-room systems; and
3. the steam, feed water and condensate system is a very complex system and it would not be possible to cover the entire system during a familiarisation process.

Notwithstanding the above, considering that the accident happened at the end of July 2017, both crew members would have been familiar with the system by then; more so for the fourth engineer who was responsible for the boiler's maintenance.

Acceptance of risk

The maintenance task being carried out by the two crew members was executed in the following context:

1. the boiler system had not been deactivated; and
2. the use of a tool which contributed to the sight glass failure.

As much as the better option would have been to shut down the boiler system, and drain the pipes, one needs to see this option in a wider perspective. The task *per se* was almost trivial and non-demanding, both cognitively and physically. Shutting down an entire boiler system to tighten a leaking sight glass may have been perceived as an excessive action which could not be justified.

The information available to the safety investigation indicated that before the task was initiated, the second engineer had cautioned against the use of a hammer to tighten the sight glass. Moreover, evidence suggested that a hammer had actually been used to tighten the sight glass.

The safety investigation is of the view that the crew member was unable to stop the leak and resorted to the use of a hammer to further tighten the flange. It was therefore clear that the potential failure of the sight glass had not been anticipated by the crew members (even if cautioned against the use of the hammer) and possibly, the crew members did not analyse what other options could have been available.

The safety investigation acknowledged the fact that the task had been assigned to two crew members. Both crew members had been on board for a number of months and given that they were tasked to work together was a clear indication that there were no issues between themselves. As much as two is the minimum number of people to engage in a team, there was no indication that they had interacted together to discuss the nature of the work which had to be carried out.

However, the safety investigation is of the view that the task must have not been considered complex and technically challenging to necessitate the conventional processes and dynamics which one would expect to find in a typical team performance.

It was a fact that a hammer had been used, even if the second engineer had specifically cautioned against its use[2]. The performance of the two crew members in a team depended on, *inter alia*, the team members' personal traits and how they managed the perceived risks.

The use of a hammer was a risk that had been accepted by the crew members. In the absence of a toolbox meeting or a similar risk assessment exercise, this may be taken to be a situation where the crew members involved may have considered the use of a hammer as a necessary risk which had to be accepted, especially if the sight glass still leaked following the hand tightening of the sight glass.

Use of personal protective equipment

Both crew members were wearing conventional safety protective clothes which are normally worn in the engine-room. The protective clothes worn by the crew members did not offer any protection against scalding by hot water.

[2] It was not possible to determine whether the oiler was aware of the second engineer's instructions against the use of a hammer.

CONCLUSIONS

1. Two valves on the condensate line after the sight glass were found closed.
2. A hammer had actually been used to tighten the sight glass.
3. The closing of both valves meant that a part of the system, which included the leaking sight glass, was under pressure.
4. The status of the valves may have exacerbated the effects of leaking water and steam into the engine-room as soon as the sight glass failed.
5. Although the better option would have been the shutdown of the boiler before the commencement of the maintenance work on the sight glass, this option may have been perceived as an excessive action which could not be justified.
6. The potential failure of the sight glass had not been anticipated by the crew members (even if cautioned against the use of the hammer) and possibly, the crew members did not analyse what other options could have been available.
7. The task must have not been considered complex and technically challenging to necessitate the conventional processes and dynamics which one would expect to find in a typical team performance.
8. The crew members involved may have considered the use of a hammer as a necessary risk which had to be accepted, especially if the sight glass still leaked following the hand tightening of the sight glass.
9. The protective clothes worn by the crew members did not offer any protection against scalding by hot water.

SAFETY ACTIONS TAKEN DURING THE COURSE OF THE SAFETY INVESTIGATION[3]

The Company carried out an internal investigation in accordance with the requirements of the ISM Code. The aim of the internal investigation was to identify long term safety corrective actions.

As a result of the internal investigation, the Company has:

1. Included a specific cautionary note in the engine-room training programme on the hazards related to potential residual pressure release from pipes and joints;

2. Additional warning signs have been posted in the engine-room to caution about pressurised systems and pressure relief before repairs and maintenance are carried out.

[3] **Safety actions shall not create a presumption of blame and / or liability.**

SHIP PARTICULARS

Vessel Name:	*Sanar-8*
Flag:	Malta
Classification Society:	Russian Maritime Register of Shipping
IMO Number:	9212008
Type:	Oil Tanker
Registered Owner:	Sunor Ltd.
Managers:	PI Complex Cargo Ltd.
Construction:	Steel
Length Overall:	249.0 m
Registered Length:	240.14 m
Gross Tonnage:	62,569
Minimum Safe Manning:	17
Authorised Cargo:	Liquid bulk

VOYAGE PARTICULARS

Port of Departure:	Kavkaz, Russian Federation
Port of Arrival:	Tuzla, Turkey
Type of Voyage:	Short International
Cargo Information:	In ballast
Manning:	5

MARINE OCCURRENCE INFORMATION

Date and Time:	31 July 2018 at 11:00
Classification of Occurrence:	Very Serious Marine Casualty
Location of Occurrence:	Repair yard
Place on Board	Engine-room
Injuries / Fatalities:	One fatality and one serious injury
Damage / Environmental Impact:	None
Ship Operation:	Repairs
Voyage Segment:	Arrival / Alongside moored
External & Internal Environment:	Clear weather with good visibility (10 nautical miles). The sea state was calm with a 0.2 m swell from the Northeast. A light breeze was also from the Northeast.
Persons on board:	Unknown