# Case study for onboard safety meeting - Scrubber fire

This case study is relevant for vessels equipped with Scrubbers. Please read the below description of an incident and evaluate the events while keeping your Company Standards and Safety Management System (SMS) procedures in mind. Discuss the factors which led to the incident and how it could be avoided from happening on your vessel.

A crude oil tanker, equipped with an open-loop Exhaust Gas Cleaning System (EGCS), was en-route from Suez to Singapore. Upon approaching Singapore, where the discharge of open-loop scrubber washwater is prohibited, the engine crew initiated the fuel changeover from Heavy Fuel Oil (HFO) to Low Sulphur Marine Gas Oil (LSMGO).

The changeover process required the isolation of the scrubber tower to prevent damage from the hot exhaust gasses. To achieve this, the engine crew simultaneously closed the scrubber inlet valve and opened the bypass valve, effectively diverting hot exhaust gases directly through the funnel. With the gas flow diverted, the seawater pumps supplying cooling washwater to the scrubber tower were also stopped, and the scrubber was set to standby mode.

Soon thereafter a fire broke out in the scrubber tower. Black smoke and flames coming from the stack were the first signs of fire noticed by the crew. Crew members quickly responded by switching the scrubber to active mode to start the seawater pumps, which successfully extinguished the fire. The repair costs exceeded USD 200,000.

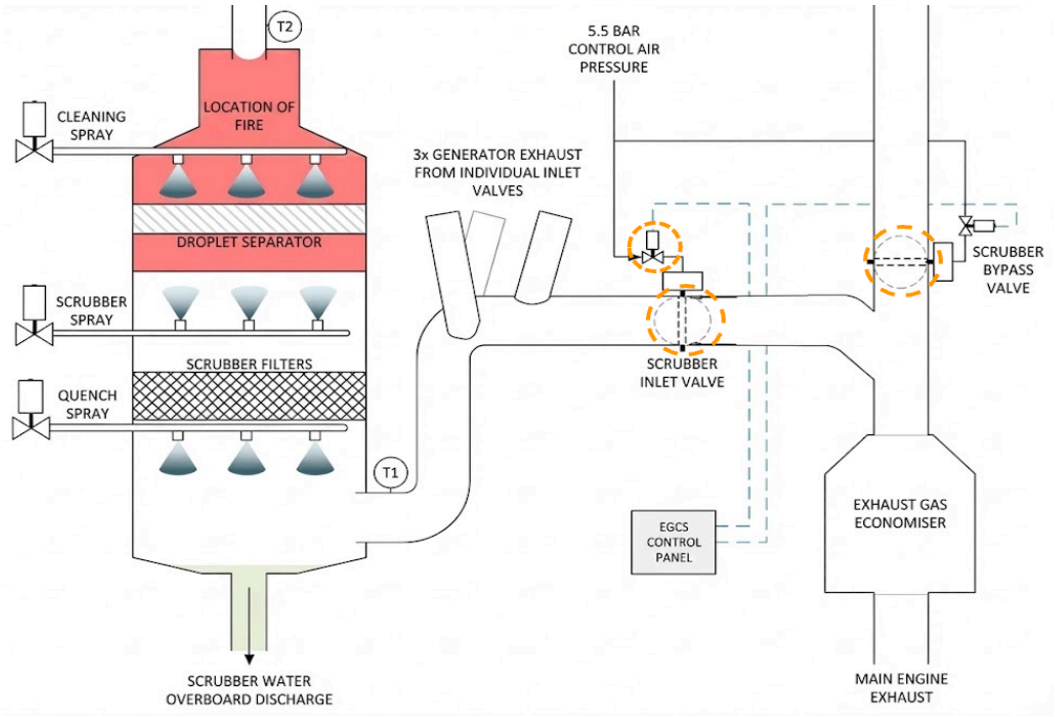


*Diagram for illustrative purposes only. To prevent the ingress of high-temperature exhaust gases into the scrubber tower during standby mode, it is critical that the scrubber inlet valve is fully closed and the bypass valve is fully open.*

### Investigation findings – Cause of fire

- The main engine exhaust gas inlet valve was not fully closed (possibly due to a malfunction of the pneumatic actuator or a drop in control air pressure), allowing hot exhaust gases to enter the scrubber tower.
- In the absence of cooling seawater, the temperature inside the scrubber tower increased rapidly, igniting plastic components such as spray nozzles and droplet separators.
- EGCS temperature sensors were inactive in standby mode, preventing detection of rise in temperature.
- Design limitations, such as plastic materials used inside the scrubber were not sufficiently heat-resistant.
- No process was in place to verify the position of the bypass and scrubber inlet valves.

### Failure of bypass arrangement

- The report indicated a possible malfunction of the pneumatic actuator controlling the inlet valve or a drop in control air pressure, which resulted in the inlet valve remaining partially open.
- There was no process to verify the position of the bypass and the inlet valves after scrubber system was shutdown.

## Discussion points for onboard safety meeting

*Use these points to facilitate a safety discussion with the crew regarding the mitigation strategies on your vessel to prevent an incident similar to the one outlined above. Keep in mind your vessel's procedures and onboard risk assessment practices. Encourage the crew to identify specific safeguards currently in place and any additional measures that may be needed to ensure operational safety.*

### Monitoring position of valves in bypass arrangement

- Verification of isolation: What technical and procedural methods are employed by the engine crew to verify that exhaust gas inlet valves are 100% seated and gas-tight when the scrubber is in standby or bypass mode?
- Position indication: Does the automation system provide positive feedback (limit switches) on the bypass arrangement, and is there a manual physical verification required by the watchkeeper?

### Material selection and maintenance

- Thermal limits: What are the design temperature limits for the internal components of the scrubber tower (including linings, nozzles, and spray bars)?
- Inspection regimes: What is the established frequency for internal inspections and cleaning of the scrubber tower to remove flammable soot or particulate buildup?
- Internal condition: During the last inspection, what was the observed condition of the protective coatings and internal hardware regarding heat and corrosion resistance?

### Hazard detection and response

- Standby monitoring: Which specific sensors in the scrubber tower remain fully active while the EGCS is in standby mode?
- Thermal anomalies: Are there dedicated high-temperature alarms or rate-of-rise indicators to detect hot gas ingress into the scrubber tower while the cooling water pumps are stopped?
- Emergency protocols: What is the crew's standardized response protocol for a fire in the scrubber tower?

1 Contributing factors: What factors contributed to the incident?

2 Risk assessment: Could some of the factors identified be present on board your ship? What is the likelihood and severity of those risk factors?

3 In the risk transfer zone (yellow and red), what would you suggest as measures to control the risk? Any additional barriers that could be introduced?