



Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation
Federal Higher Authority subordinate to the Federal Ministry
of Transport and Digital Infrastructure

Interim Investigation Report

Serious Marine Casualty 236/20

**Fire in the main engine scavenge air receiver
on board the EBBA MAERSK
on 29 July 2020**

6 July 2021

Pursuant to the first sentence of Article 28(1) of the Law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Law – SUG) of 16 June 2002, as amended and promulgated on 1 March 2012 (BGBl. [Federal Law Gazette] I p. 390), amended most recently by Article 5 of the Regulation of 8 March 2012 (BGBl. I p. 483), in conjunction with Article 14(2) of Directive 2009/18/EC of the European Parliament and of the Council of 23 April 2009 establishing the fundamental principles governing the investigation of accidents in the maritime transport sector, the Federal Bureau of Maritime Casualty Investigation publishes an interim report within a period of 12 months of a very serious or serious marine casualty if it is not possible to complete the corresponding investigation report within that period.

Issued by:
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1 Factual information

1.1 Photo



Figure 1: MV EBBA MAERSK approaching Hamburg¹

1.2 Ship particulars

Name of ship:	EBBA MAERSK
Type of ship:	Full container ship
Nationality/Flag:	Denmark
Port of registry:	Copenhagen
IMO number:	9321524
Call sign:	OXHW2
Owner:	MAERSK A/S
Shipping Company:	MAERSK A/S
Year built:	2007
Shipyard:	Odense Staalskibs-Lindo
Classification society:	American Bureau of Shipping
Length overall:	398,90 ² m
Breadth overall:	56,40 m
Draught (max.):	17,00 m
Gross tonnage:	171.542

¹ source: Hasenpusch Photo Productions (2018).

² after extension; source: THB (2018).

Deadweight:	174.239
Engine rating:	80.080 kW @ 102 min, restricted to 54.000 kW
Main engine:	Doosan/Wärtsilä 14RT-flex96C
(Service) Speed:	24 kts
Hull material:	Steel
Hull construction:	Conventional (closed hatches, cell guides, double bottom etc.)
Minimum safe manning:	13

1.3 Voyage particulars

Port of departure:	Southampton (UK)
Port of call:	Hamburg (DE)
Type of voyage:	Merchant Shipping, international
Cargo information:	Container
Manning:	25
Draught at time of accident:	T _r = 11,5 m, T _a = 11,8 m
Pilot on board:	Yes
Passengers:	None

1.4 Marine casualty information

Type of marine casualty:	Serious marine casualty (SM) Fire in main engine scavenge air receiver
Date, time ³ :	29/7/2020, 0707
Location:	Elbe approach Traffic Separation Scheme „Elbe Approach“
Latitude/Longitude:	$\varphi = 53^{\circ} 59,3' N$ $\lambda = 008^{\circ} 09,6' E$
Ship operation and voyage segment:	Pilotage waters
Place on board:	Main engine, scavenge air receiver
Human factor	No
Consequences (for people, ship, cargo, environment, other):	- Approx. 10 hours repair at emergency anchoring position, east of Traffic Separation Scheme “Elbe Approach” - no harm to persons, no environmental pollution - no permanent damage to the main engine

³ All times in the report are UTC + 2 hours, corresponding to local time at the scene of the accident.

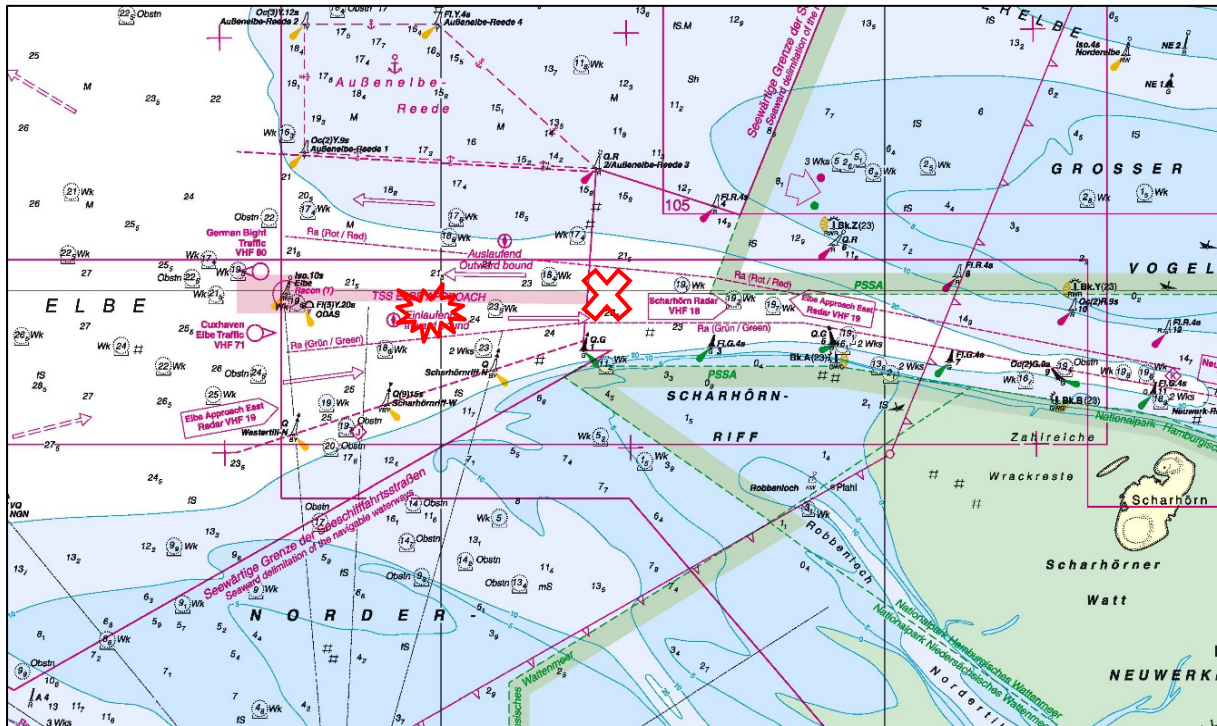


Figure 2: Scene of the accident – emergency anchoring position (cross)⁴

1.5 Shore authority involvement and emergency response

Involved parties:

Radar pilot for Traffic safety

- VTS⁵ Cuxhaven

- No external intervention required

Resources used:

Multipurpose vessel NEUWERK on stand-by

Actions taken:

- Emergency anchoring in Elbe fairway

- Fire extinguished with built-in engine fire extinguishing system

- Maintenance work on two ICUs⁶

- Trial run in German Bight

- Further maintenance work during approach to Hamburg on river Elbe

⁴ source: Federal Maritime and Hydrographic Agency (BSH).

⁵ vessel traffic service.

⁶ so-called „injection control unit“.

2 Summary

On 29 July 2020, the EBBA MAERSK was en route from Felixstowe/UK to Hamburg/Germany. After changing over to a low-sulphur, light fuel, a fire broke out in the main engine scavenge air receiver.

The main engine of the EBBA MAERSK is a common rail engine⁷. An electronically regulated injection control unit (ICU) controls the injection for each cylinder. Fuel pressure inside the ICUs is injection pressure (approx. 700 bar).

The vessel sails with an open-loop scrubber⁸ on high seas and has to change over to a low-sulphur fuel for voyages in ECAs⁹. The amount of heavy, low-sulphur fuel on board that day was insufficient for the trip up the river Elbe to the berth in Hamburg. Therefore, contrary to usual practice, the main engine was changed over to a light, low-sulphur fuel, which was on board in sufficient quantity.

On the day of the accident, the fuel was changed over according to procedure using the so-called "chiller", which automatically regulates the mixing and cooling rate of the fuel. Shortly after the changeover, during the vessel's approach of the river mouth, two cylinders showed increased exhaust gas temperatures. Cylinder 10 was consequently "cut out"¹⁰.

After initially dropping as expected, the exhaust gas temperature in the "cut out" cylinder rose again after a while, even though the ICU was not in the injection control loop. It should not have been possible for fuel to be injected.

At the same time, alarms sounded for "fire in scavenge air receiver" for the forward six of the 14 cylinders, which was quickly verified by the engine crew. They informed the bridge that the engine needed to be shut down without delay. The ship anchored immediately, just east of the Traffic Separation Scheme "Elbe Approach", level to the separation zone between the traffic lanes.

The fire in the scavenge air receiver was extinguished by means of the built-in system provided for this purpose. After sufficient cooling of the engine, a detailed inspection of the scavenge air receiver was carried out. No damage to the cylinder units was detected. However, the ICUs of cylinders 10 and 5 were clogged with a tar-like

⁷ Instead of injection pumps in front of each individual cylinder, the injection pressure (approx. 700 bar) in a common-rail engine is applied in a common line that runs along the entire length of the engine.

⁸ A scrubber removes sulphurous components (sulphur oxides, SO_x), which are produced by the combustion of sulphurous fuel, from ship exhaust gases. An open-loop scrubber uses (relatively alkaline) seawater as a washing medium to neutralize the SO_x (which is acidic in aqueous solutions). The sulphurous, acidic water is discharged back into the sea after the neutralization process. This is prohibited in many territorial waters, so an open-loop scrubber cannot be operated there and low-sulphur fuels are used.

⁹ so-called "emission control areas" according to MARPOL Annex VI: shipping zones in which special environmental guidelines apply to emissions, especially from exhaust gases.

¹⁰ "Cutting out" cylinders in this modern engine means that the ICU is switched off at the computer in the engine control room and is no longer a part of the injection control loop. Contrary to the original meaning of "cutting out" a cylinder, the piston continues to move up and down, i.e. it continues to compress up to ignition pressure, but without injection.

substance and were both “stuck” in fully open position. Both ICUs were overhauled and then reassembled.

Before entering the river Elbe, the pilot demanded a trial run in the German Bight in order to demonstrate that there was no danger of a repeated similar incident. This trial run was uneventful. However, later on the river, the same phenomenon occurred. The exhaust gas temperatures of cylinder 4 rose. The ICU in question was successfully cut out mechanically with a sealing screw, in addition to cutting it out electronically. The voyage to Hamburg did not need to be interrupted and was otherwise unremarkable.

The BSU received accident notifications of the fire from VTS Cuxhaven, the Hamburg Waterways Police and later also from the shipping company. Investigations were begun immediately. Two ship visits took place, data and fuel samples were collected.

In this investigation, the BSU is primarily interested in the question as to whether the special characteristics of the relatively „young“, heavy low-sulphur fuels could have played a role in the development of the fire. However, it is also possible that the well-known phenomenon of changeover problems from a heavy to a light fuel were part of the problem. In such a case washouts, in combination with the cooling of the fuel and injection systems, may reveal hairline cracks and/or cause cloggings. The special characteristics of a common rail engine and the ICUs may also have played a part.

The comprehensive appraisal of all sources of knowledge is a time-consuming process. Therefore, the BSU cannot meet the one-year deadline set by the European Union and transposed into national law by the Federal Republic of Germany for the publication of an investigation report after a very serious or serious maritime accident without compromising the quality of the conclusions and safety recommendations that define the report.

Therefore, after careful consideration of all relevant factors, and with the understanding that the quality of an investigation report must take priority over the time aspect of publication, the BSU has decided to postpone the publication date of the final report and to publish the above interim investigation report, which is to be prepared in such a case. The investigation is ongoing.