



## **MARINE SAFETY ALERT**

### **Inspections and Compliance Directorate**

December 16, 2016  
Washington, DC

Safety Alert 17-16

#### **MAN B&W Cooling Jacket Failures** **Using the correct bolts is essential!**

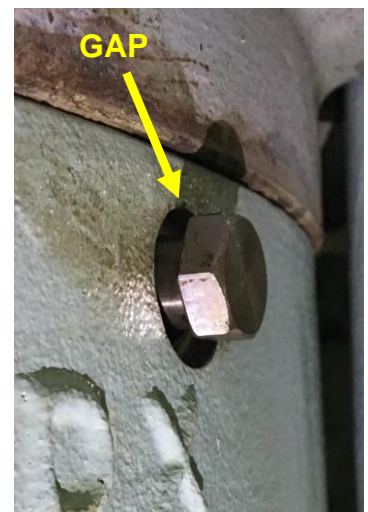
Recently, a 738-foot bulk carrier ran aground while outbound on the Columbia River. The grounding resulted in limited damage to the vessel and no pollution or loss of cargo. This casualty occurred primarily because of cracks on the cooling jacket of a two-stroke crosshead design Mitsui MAN B&W MC-C engine. The cracks caused a loss of engine cooling water that eventually resulted in the overheating of the cylinder cover. This then triggered an automated slow-down of the engine and an unintended loss or reduction in the vessel's propulsion and maneuverability. Although the investigation is ongoing, identical failures of the same engine type have occurred with similar results although the engines were of different piston diameters and cylinder arrangements: about two years ago a similar equipment failure contributed to a grounding on the Columbia River, and in 2012, a vessel approaching Corpus Christi, TX lost power due to the same cause and struck a jack up oil rig causing extensive damage to the rig.

On these engines, the outer surface of the lower areas of the engine's cylinder covers, a.k.a. heads, forms the internal area of the cooling water circuit when the cooling jacket is installed. Water flow from the cylinder liner is directed through four connections into the cooling jacket and then flows upward into other areas of the cylinder cover before exiting. The cooling jacket slips over the bottom of the cylinder cover's outer surface which has several o-rings that seal the coolant passages. The cooling jacket is held in place by the use of four shoulder type bolts that go through the cooling jacket and into the sides of the cylinder cover. Please watch the following YouTube videos for more information: [Video A](#) and [Video B](#).

By design, the shoulders of these bolts are longer than the cooling jacket wall thickness. New replacement bolts will often have even longer shoulders. When the bolts are properly tightened there will likely be a gap between the bottom of the bolt head and the outside of the jacket cover. (Image A) The extra shoulder length allows the cooling jacket to position itself concentrically on the bottom of the cylinder cover and facilitate any movement or slight expansion of the o-rings. It also allows for some expansion of the cast iron cooling jacket. If the cooling jacket is slightly positioned non-concentrically on the cylinder cover, some of the bolt head's bottom surface areas may appear as if the bolt is fully tightened against the outside of the jacket cover.

In the past, cooling jackets have fractured vertically through the bolt holes that secure the jackets to the cylinder cover. (Photographs - next page.) These fractures have caused a loss and reduction in cooling water that eventually resulted in the overheating of the cylinder cover. That then caused an automated slow-down of the engine and reduced the ship's maneuverability. These fractures can be caused by the following:

- Stress corrosion cracking
- Inadequate coolant water treatment
- Excessive rust and scale development
- Use of wrong bolts to secure cooling jacket
- Blockages of coolant flow throughout jacket space and cylinder cover passages
- Overheating / thermal expansion of cylinder cover causing excessive stress on jacket cover



*Image A: Properly secured cooling jacket bolt.*

Photographic examples of fractures:



MAN B&W has developed a Service Letter related to this issue and it is available [here](#).

As a result of these casualties the Coast Guard **strongly recommends**, *regardless of engine manufacturer*, that vessel:

- Owners, managers and operators ensure that their vessel engineering staffs have access to all available manufacturer service letters for propulsion, electrical generation, steering and other critical equipment; and
- Senior engineering personnel on vessels with MAN B&W MC-C and other similarly constructed engines using the same cooling jacket cover securing method *review* the applicable maintenance procedures and ensure that persons assembling these components know that the shoulder bolts may not butt up against the cooling jacket cover, as breakage may occur if forced, and that regular bolts with no shoulders should never be used.

This safety alert is provided for informational purpose only and does not relieve any domestic or international safety, operational, or material requirements. Developed by the Investigations Division of Marine Safety Unit Portland, Oregon and the Coast Guard Headquarters Office of Investigations and Casualty Analysis. Questions or comments may be sent to [HQS-PF-fldr-CG-INV@uscg.mil](mailto:HQS-PF-fldr-CG-INV@uscg.mil).

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