Action code: AT FIRST OPPORTUNITY

Prevention of crankcase explosions

The latest safety components standard

SL2022-730/PRP
September 2022

Concerns

Owners and operators of MAN B&W two-stroke marine combustion engines. Type: All two-stroke engines older than 2004.

Summary

To ensure the highest safety standard, MAN Energy Solutions strongly recommends all owners and operators of MAN B&W two-stroke engines to inspect the mentioned systems and components for all engine plants under their responsibility.

This service letter targets ships with engines older than 2004.

Dear Sir or Madam

Safe design and operation of two-stroke MAN B&W combustion engines are key to MAN Energy Solutions. Over the years, we have come across examples of non-MAN Energy Solutions safety systems that failed to meet the required standard and human behaviour that potentially could result in crankcase explosions. Crankcase explosions pose a serious threat to both property and persons, and may even result in bodily injuries and/or fatal casualties.

In the past year, MAN Energy Solutions has received reports of destructive crankcase explosions on a number of older MAN B&W engine designs. The safety equipment decribed in this service letter and proper response to alarms from such equipment, with slow down or engine stop and subsequent fault identification, could have prevented these explosions. This service letter draws attention to the latest relevant safety components developed by MAN Energy Solutions and includes a specification of the recommended and proper execution of maintenance routines.

During the years, also the other safety components mentioned in this service letter have developed to a higher degree of safety and reliability.

MAN Energy Solutions has established a task force of specialists to support the crew and shipowners with any questions related to updating of the safety components, thereby ensuring the safe operation of the engine.

For questions regarding this service letter, please write to: primeserv-cph@man-es.com

Yours faithfully

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Content

Rules of reference

IACS UR M9 Crankcase explosion relief valves for crankcases of internal combustion engines.
IACS UR M10 Protection of internal combustion engines against crankcase explosions.
IACS UR M66 Type testing procedure for crankcase explosion relief valves.
MAN B&W Quality Control Ident No.: 0742839-2 Crankcase explosion relief valve, first-time production approval.
MAN B&W Quality Specification Ident No.: 0742838-0 Crankcase explosion relief valve.

Crankcase explosion relief valves

In the period 1998 to 2020, crankcase relief valves have undergone a safety-improving design development.
The latest generation of crankcase explosion relief valves improves the protection of the crew and limits the damage if a crankcase explosion occurs, see also service letter SL09-512/CAA.

Between 2006 to 2020, four types of crankcase explosion relief valves have been type approved and meet the specifications in IACS UR M66, *Type testing procedure for crankcase explosion relief valves*. The makers and types of the approved relief valves are the following:

- Hoerbiger Ventilwerke, type EVX
- Mt. Halla Control Valves, type CR52
- Ziincheol Co. Ltd, type HWG (former name Hyunwoo SMT)
- Prosave, Type ERV (former name Unitech)

MAN Energy Solutions strongly recommends to use only the above type-approved relief valves.

Fig. 1 shows a disassembled old-type crankcase explosion relief valve. The wire mesh in the picture will not function as a flame arrestor (keeping the flames from an explosion inside the engine). The picture on the left is from a situation where a crankcase explosion resulted in flame propagation into the engine room and a full-scale engine room fire.

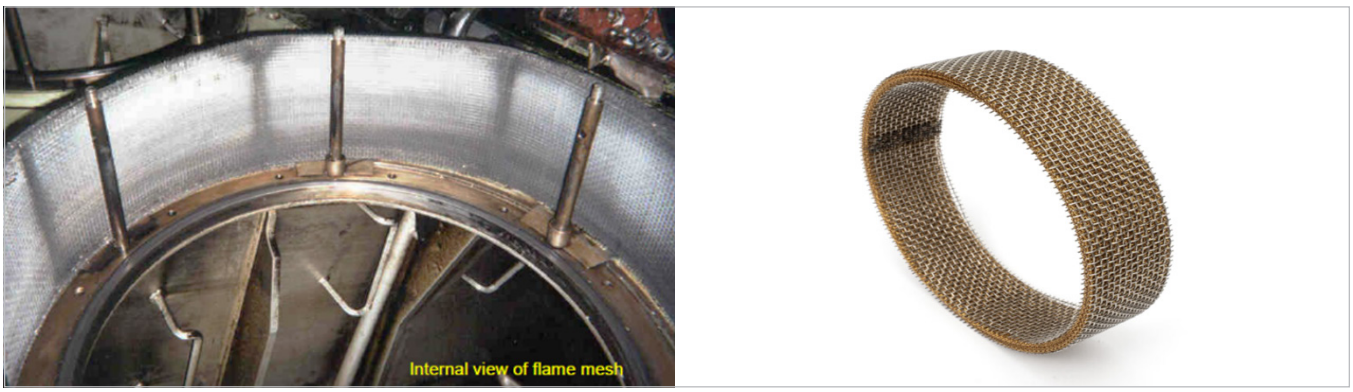

Fig. 1: Old-type crankcase explosion relief valve

Fig. 2 shows two different modern crankcase explosion relief valves designed to withstand two explosions. Both types have been type-approved by IACS and MAN Energy Solutions.

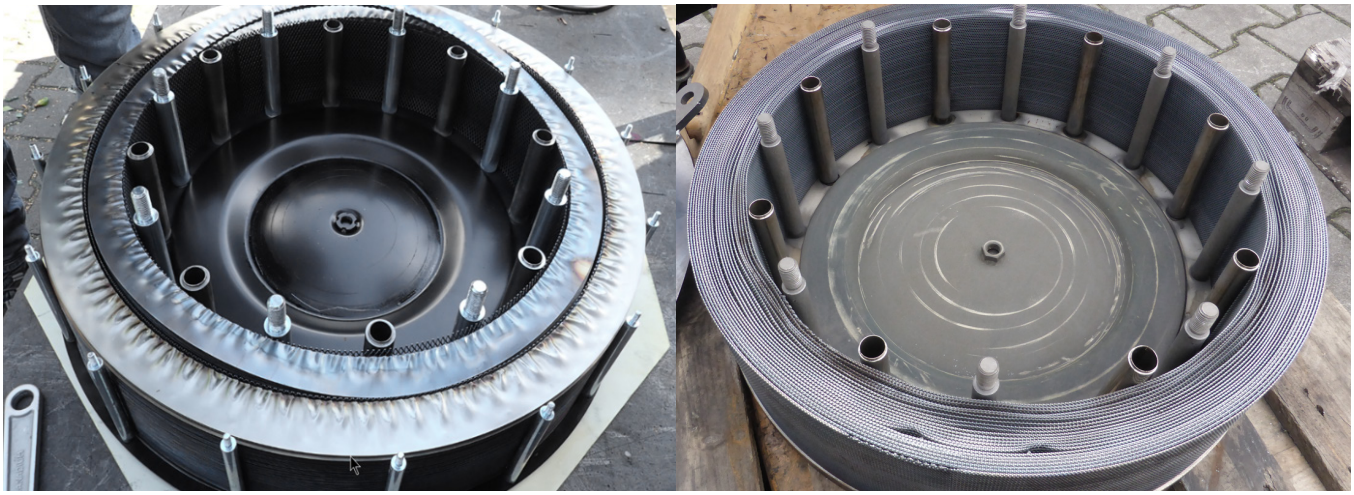

Fig. 2: Left: Hoerbiger EVX type. Right: Prosave ERV Type

These types of valves will relieve the explosion pressure from the crankcase while keeping the flames inside the engine, thereby preventing engine room fires.

Figs. 3a/b/c show pictures taken in an engine room after a fire caused by a crankcase explosion. Actually, there were two explosions because the crankcase explosion relief valve did not close properly after the first explosion, causing fresh air to rush into the crankcase and creating a second explosion powerful enough to blow the crankcase doors off the engine.

IACS UR M66 type approved crankcase explosion relief valves will prevent this from happening.

Fig. 3a: View from aft to fwd side

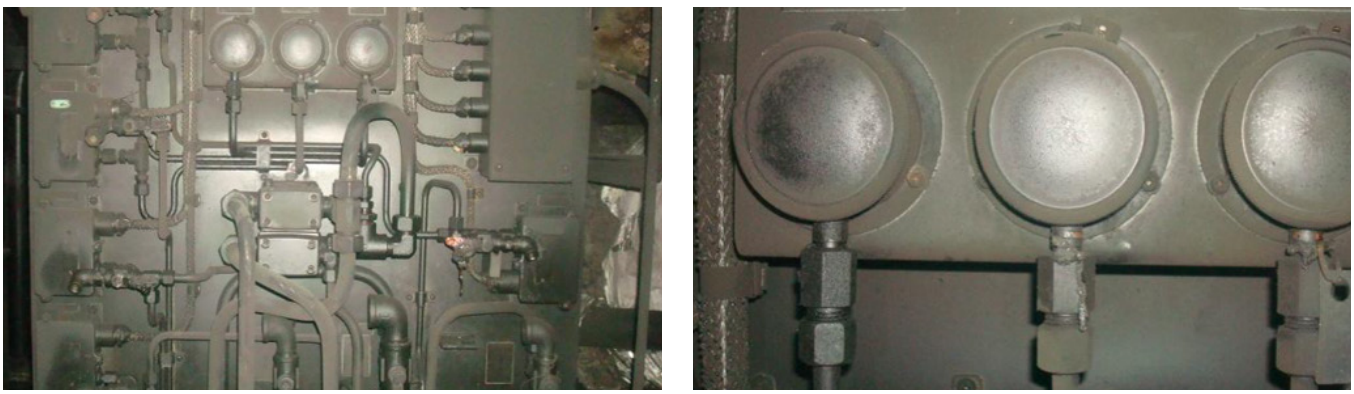

Fig. 3b: Left: control/safety air panel. Right: Close-up of control/safety air panel


Fig. 3c: Left: crankcase unit #2. Right: above crankcase unit #2

Oil mist detector

MAN Energy Solutions recommends the oil mist detector (OMD) display and control module to be installed in the engine control room. The OMD must be connected to the alarm management system (AMS) and to its automatic alarm and slowdown/loaddown function. This enables the OMD to issue a slowdown/loaddown request if the oil mist concentration in the crankcase becomes too high.

Additionally, checking the oil mist detector and the oil mist alarm should be included in the regular maintenance routine as specified in the manuals and in service letter SL09-512/CAA.

Fig. 4: Left: oil mist detector on engine. Right: oil mist detector before mounting

Bearing wear monitoring system

Since 2008, it has been mandatory for all engines designed by MAN Energy Solutions with bore size 45 or above to have a bearing wear monitoring (BWM) system installed. The BWM system can assist the crew in detecting problems at an early stage. MAN Energy Solutions also strongly recommends installation of a BWM system on older engines as described in our service letter SL2013-569/HWC. The latest BWM specification issued by MAN Energy Solutions enables an early detection of sudden and rapidly developing bearing damage by lowering the response time of the BWM system. In addition, we strongly recommend connecting the BWM system to the AMS and its automatic alarm and slowdown/loaddown function.

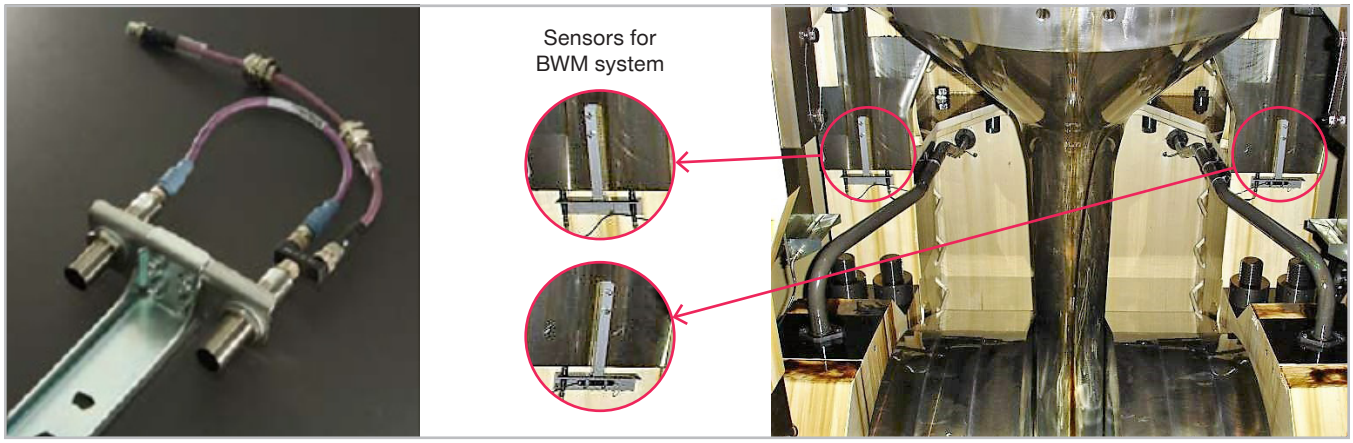

Fig. 5: Bearing wear monitoring system

Shaftline earthing device

To avoid spark erosion and increased main bearing wear rates, which may potentially damage the cranktrain bearings, we recommend installing a shaftline earthing device and a monitoring system. Service letter SL08-498/AAB gives recommendations on how to install and maintain a shaftline earthing device and how to deal with signs of spark erosion and early detection.

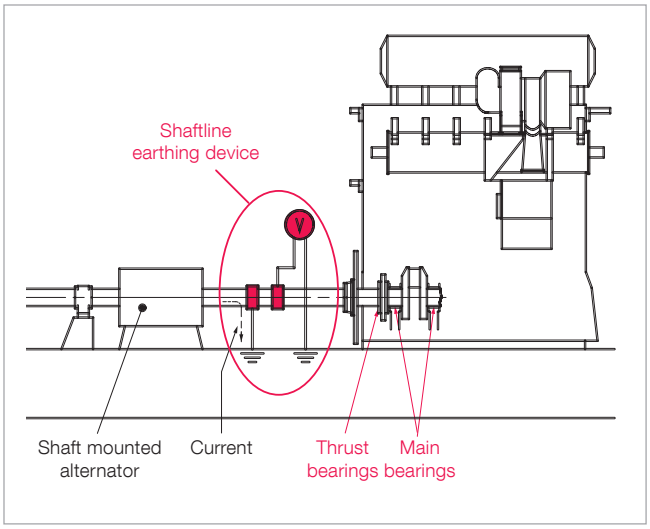

Fig. 6: Shaftline earthing device and a monitoring system

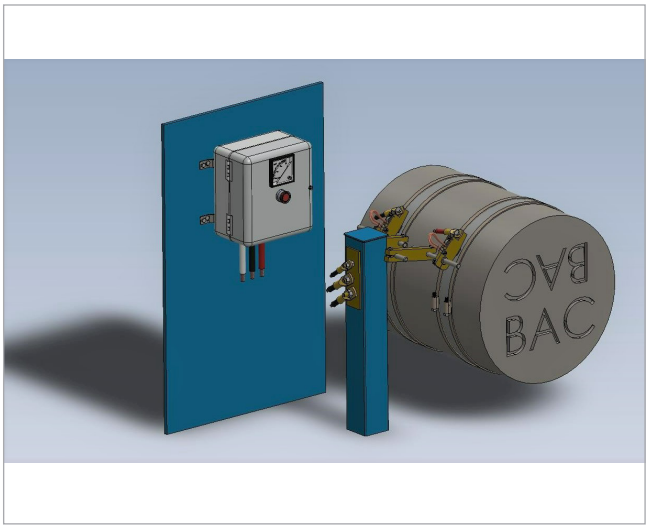

Fig. 7: Shaftline earthing device parts

Water-in-oil monitoring system

Water or moisture is the second largest source of contamination (after particles) in oil systems. Water has a damaging effect on the lifetime of oil and system components. The presence of water in lubricating oil can have far-reaching effects on system components, and surface wear and reduced lubrication performance – probably the most obvious effect – is directly linked to the presence of free water. In bearings, accelerated metal surface damage can be promoted even if all the water present in the lubricating oil is dissolved. This is particularly valid for crosshead bearings featuring a lead overlay as running layer. In short, the excessive water content will cause the lead overlay to corrode away rapidly.

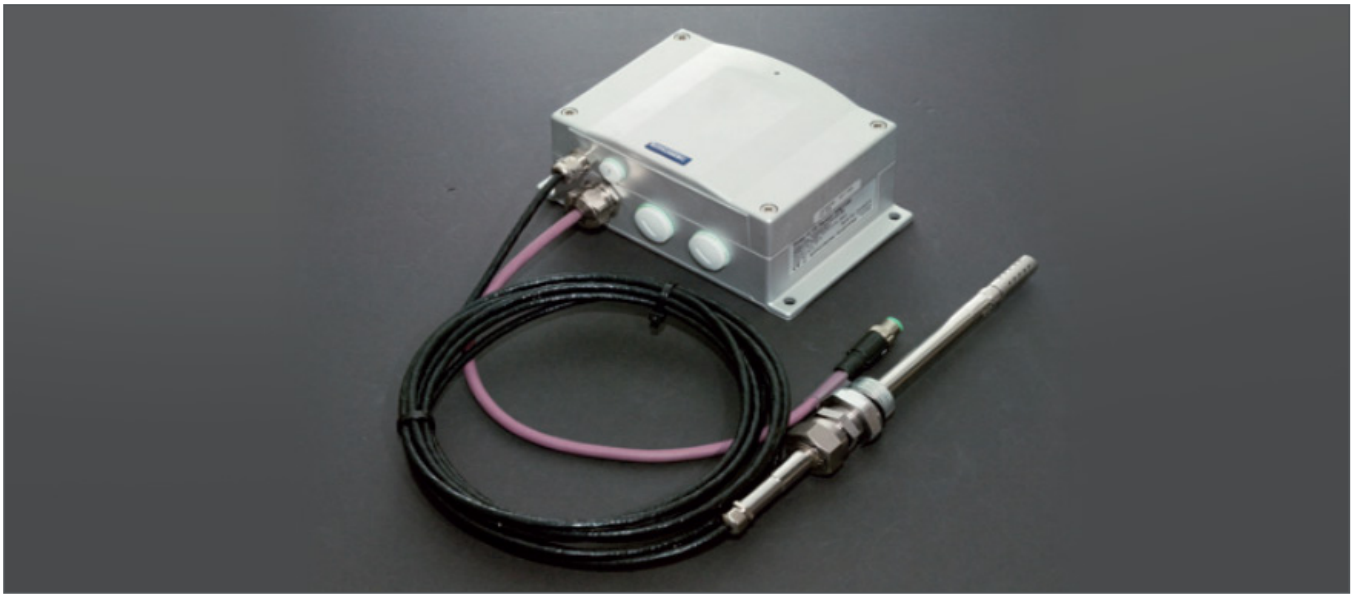

Fig. 8: Water-in-oil monitoring system

Maintenance routines

Regular inspections are required to ensure that the cause of potential problems is detected as early as possible and solved promptly. It is vital that daily routines and maintenance are performed in accordance with the instruction books, operation manuals, and service letters issued by MAN Energy Solutions.

Over the years, MAN Energy Solutions has come across examples of behaviour that potentially could result in crankcase explosions. We emphasise that disabling any part of the engine safety system, such as the OMD, and ignoring alarms or maintenance procedures have previously resulted in both casualties and engine damage resulting in off-hire. The improper use of unauthorised spare parts may also lead to casualty or engine damage.

Key findings from crankcase explosions reported to MAN Energy Solutions show that the main system lube oil filter may burst if it is not properly maintained. As a consequence, particles and material retained in the filter may be released into the main bearings, where hot running and subsequent collapse of the main bearings may be the result.

>> As part of the maintenance routines, use the checklist on the following page. >>

Checklist

MAN Energy Solutions has created a list of precautions against crankcase explosions. We recommend using the list as a checklist to learn how well-protected your engines are against crankcase explosions and the consequential damage:

1. Crankcase explosion relief valves have been approved according to IACS UR M66 *Type Testing Procedure for Crankcase Explosion Relief Valves* or MAN Diesel 1999 specifications.

2. Oil mist detectors are well maintained and tested according to the manufacturer's maintenance and test manual.

3. Oil mist detectors are connected to the AMS and the slowdown function. The OMD system issues a slowdown request if the oil mist concentration in the crankcase gets too high.

4. The bearing wear monitoring system (if installed) is connected to the AMS and the automatic slowdown/load reduction function.

5. The water-in-oil monitoring system (if installed) is connected to AMS and correct alarm limits are defined.

6. The shaftline earthing device (if installed) is connected to the AMS, and brushes and bands are in good working order.

7. Main system lube oil filter; important to follow the cleaning routines and check the pressure differences over the filter.

8. To avoid fuel oil contamination of the lube oil system, monitor for leakages from the fuel oil pumps into the lube oil in the camshaft box.

9. Crankcase pipe connections are made of steel or other explosion-proof material. No "garden hose type" solutions!

10. Venting pipes are made of steel and are at least 20 metres long.

11. Crankcase covers are gas-proof and must be closed tightly before the engine is started.

12. Crankcase explosion relief valves and flame arresters must be undamaged and uncovered. Never cover a flame arrester with plastic, paper, or paint!

13. Spare parts must be original MAN Energy Solutions spare parts, and maintenance must be performed according to the instructions enclosed and/or the instruction manuals of MAN Energy Solutions.

Contact information

MAN Energy Solutions has established a task force of specialists to assist crews and shipowners with any questions on updating of safety components related to the safe running of engines.

The task force has also made it possible to order the latest type-approved crankcase explosion relief valves directly from our international group company (IGC) hubs located worldwide. The new relief valves can be delivered directly to the vessel or in combination with other spare parts at the next yard call.

Contact info for quotes and ordering: primeserv-cph@man-es.com