

Running out of

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Steadfast and regular preventive maintenance is the key to making your boiler plant last as long as your ship and saving considerably on costly and inconvenient repairs or – worse – accidents.

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■ ■ Though Aalborg Industries is not quite as old as The Swedish Club and only began manufacturing marine steam boilers in 1919, the globally sprawled company is still one of the oldest boiler manufacturers and specialist boiler service companies in the world. Today, the company's market share for sales of new boilers is close to 50 per cent with a full range of steam and hot-water boilers, exhaust gas economizers, thermal fluid heating systems and heat exchangers. For several years now, Aalborg Industries no longer allows licence production of its boilers, which are manufactured under strict quality control in China, Denmark, Brazil, Indonesia and, as of next year, also in Vietnam.

Aalborg Industries delivers comprehensive instruction manuals with recommendations for regular maintenance and sound operating procedures, and also commissions most of the Aalborg Industries boiler plants. However, the risk of "running out of steam" exists because of faulty operation or insufficient preventive maintenance of the boiler plant resulting from the fact that crews on board are often renewed, and in some cases boiler operators are inexperienced and lack professional training and language skills, or are simply too few to accomplish proper preventive maintenance of all machinery on board.

A primary or secondary concern?

From dealing with shipowners worldwide, we find it apparent that there is a gulf between the focus on the boiler as a primary or secondary component in a ship. When considered a primary component in the ship – like for instance in tank ships where huge steam quantities are

required and large boilers installed – the boiler plant is quite often well maintained, whereas the boiler is clearly considered a secondary component by operators of containerships and bulk carriers and thus risks neglect with regard to preventive maintenance.

Frequent causes of boiler problems

- Most boiler problems hinge on boiler water treatment, the options being practically non-existent boiler water treatment, too infrequent boiler water treatment or faulty treatment where for instance the oxygen level in the feedwater or the chemical composition of the boiler water is wrong. Cracks in the boiler can occur due to inadequate water treatment.
- The most serious and costly boiler damage can often be ascribed to oil contamination on the water side.
- In the case of exhaust gas economizers, the problem is often related to soot build-up due to lack of sootblowing or water washing to remove excessive soot which may result in lower efficiency and ultimately cause soot fires.

Boiler feedwater treatment

Untreated water is never pure. It contains a cocktail of salts and gases. If not removed or altered by chemicals and water softening treatments, salts cause scaling on the boiler heat transfer surfaces. Carbon dioxide gas will combine with water to form carbonic acid which attacks the boiler and the condensation system. Oxygen in the feedwater and make-up water is a major cause of corrosion in boilers, but the oxygen can be removed from the feedwater by keeping the feedwater temperature above 85°C. Thermal deaeration will remove up to 75 per cent of the unwanted oxygen from the feedwater. Chemical oxygen scavengers can absorb the remaining oxygen. To avoid the damaging effects of carbon dioxide in the feedwater, the water must be kept at a temperature of 85-90°C. Alkaline boiler

water and chemical treatment can help neutralise the effects of the gas as well as handle the salt problem.

It is equally important that the chemical composition of the boiler water is monitored and measured to ensure that the procedure does not damage the boiler to the extent of causing corrosion and cracks. It is recommended to use multi-chemical boiler water treatment incorporating an oxygen-binding component.

Oil contamination in marine boilers

Condensed steam is returned to the oil-fired steam boilers to replace the boiled off water. When steam from the boiler and condensed steam circulate through heaters and the ship's other systems, it is almost inevitable that foreign substances like heavy fuel oil, lubricating oil or seawater is picked up due to leakages. With seawater it is well known that chlorides will form a very hard layer of lime deposits if the contaminated feedwater is not treated sufficiently. Also, make-up water bunkered ashore might contain humus particles and silica, forming heating surface deposits when heated.

The most dangerous water contamination is heavy fuel oil entering the steam or condensate from leaking tank coils or heat exchangers. This leakage often occurs in coil flanges or broken gaskets in plate heat exchangers. If the problem is not observed and dealt with in time, the boiler could be completely destroyed due to overheating of the furnace because of reduced water flow and minimised heat transfer/cooling of the boiler tubes.

It is recommended to install oil monitoring equipment and issuing the feedwater/hotwell/cascade tanks with filters in the form of lofa sponges, coconut fibres or similar material to absorb the oil.

Oil contamination inside the boiler tubes or the furnace walls promotes heat transfer resistance on the water side of the boiler causing the steel structure facing the flame and the flue gas to be heated beyond their design point.

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Corroded boiler furnace dome and convection tubes.



Soot fire raging from the stack.



Tube burst due to short-term overheating.



Creep cracks in a boiler end plate due to long-term overheating.

This may lead to structural damage or rupture and a leaking boiler.

The provision of salinity alarms/shut-downs and oil detecting systems in the feed-water arrangement is recommended.

Soot build-up in economizers

The underlying causes of the increase in soot fires in economizers are linked to a growing reliance on cheap, low-grade fuel oils for the main engines, resulting in more soot in the exhaust gases. Another problem is the growing number of long-stroke diesel engines, which calls for larger quantities of lubrication oil, also adding to the soot build-up.

Regular maintenance of exhaust gas economizers calls for the use of sootblowers or water washing procedures.

To improve sootblowing, the economizer can be monitored with an Ecomon system which measures pressure and temperature differences across the economizer, indicating the best time for cleaning. The Ecomon system is a precision device that eliminates excessive use of steam for sootblowing, thus slashing operating costs while increasing security on board.

Water washing can be further enhanced by installing a so called Ecoclean system which is used after the engine has been stopped while the circulation keeps the economizer hot. The Ecoclean system involves installation of spray nozzles at the economizer top to flush away soot deposits, thus cleaning the heating surfaces. Due to the temperature, the soot will practically crack away from the tube elements.

"If everything else fails, read the instruction manual"

Aalborg Industries strives to provide good and useful instruction manuals for its boiler plants. Instructions must, however, be carefully examined and observed – or the boiler plant and control system unrealistically easy to operate – to ensure safe and correct boiler operation and maintenance.

Boilers and economizers can unfortunately be quite hazardous machinery when not properly maintained and, though the advice of reading the instruction manual may sound impertinent, it really is in the shipowner's and manager's own best interest to make sure manuals are actually used on a continual basis.

A little help goes a long way

Addressing specific and common problems with boiler maintenance, Aalborg Industries has made a newsletter series entitled "Aalborg Solutions" that can be accessed on the marine after sales page of our website www.aalborg-industries.com.

We issue, on a regular basis, informed and timely warnings and explanations, recommending short- or long-term repairs and offering practical advice on preventive maintenance to keep up the steam supply. Questions to an Aalborg Industries company nearby are always most welcome.

New Members (since May 2005)

Arion Shipping Limited, Greece	H&M
Densan Shipping Co., Turkey	H&M
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Jiangxi Ocean Shipping Company, PRChina	H&M
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