

## Economize - and optimize your waste heat recovery

*Efficient heat recovery of waste heat from the diesel engine contributes considerably to the good operating economy of a ship and saves fuel for the benefit of our environment.*

### Efficient exhaust gas economizers save money

Utilizing your fuel consumption to its full potential is not only about low(ering) fuel consumption for your diesel engine or installing an advanced oil/gas burner on your boiler, but equally so about ensuring maximum waste heat recovery by installing or upgrading to the most efficient exhaust gas economizer after your diesel engines. A quite substantial amount of thermal energy (heat) is often wasted as exhaust/flue gas.

In some cases, it will be advisable to replace a less efficient economizer with a more efficient one; especially so as the pay-back time can be as short as 4-5 years. Such optimization may be relevant

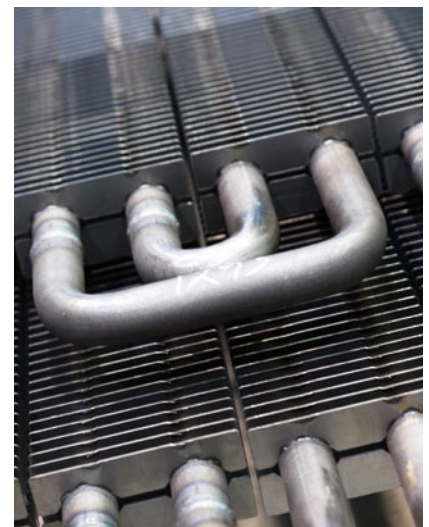
*Heat recovery from diesel engine exhaust gas by means of an exhaust gas economizer*

when a ship is transferred to different purposes than those for which it was originally built and where more steam or power is required. The thermal energy can also be used for preheating of combustion air, for cargo heating or water heating.

### MISSION™ XW economizer

The most efficient exhaust gas economizer currently in the product range of Aalborg Industries is the MISSION™ XW (ex-name AV-6N) which is designed with double gilled tubes.

The double gilled tube design is especially suited to the ever increasing power versus weight requirements of today's ocean-going vessels as it provides a very compact unit while maintaining the large extended surface area for a high degree of heat recovery.



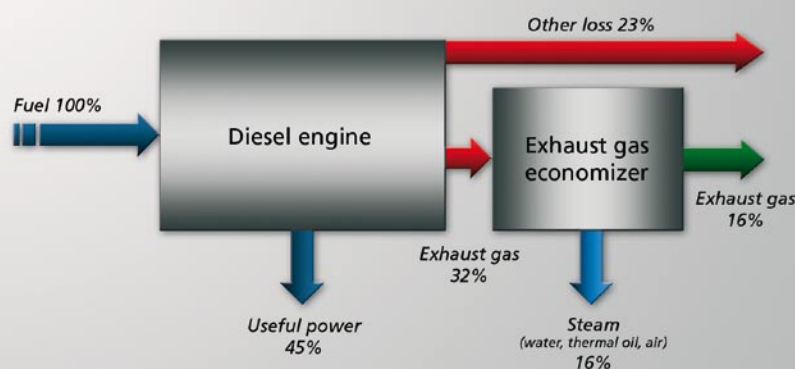
*The efficient double gilled tubes used in the MISSION™ XW exhaust gas economizer*

### Waste heat recovery from auxiliary engines

As the auxiliary engines are increasing in size, especially on container and passenger vessels, it could be an added advantage to install waste heat recovery after these auxiliary engines, thus producing steam from waste heat during port stay and thereby reducing the environmental impact of the vessel operation.

Further, we have over the past years experienced a growth in MR-tankers (MR = medium range) with a boiler configuration of one large oil-fired boiler and one exhaust gas economizer after the main

**Total efficiency (example values only): 45 + 16 = 61%**

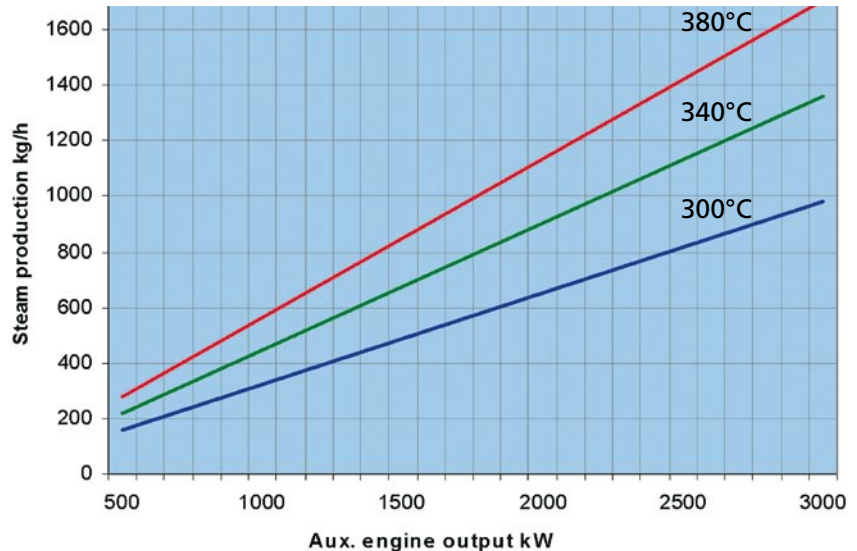
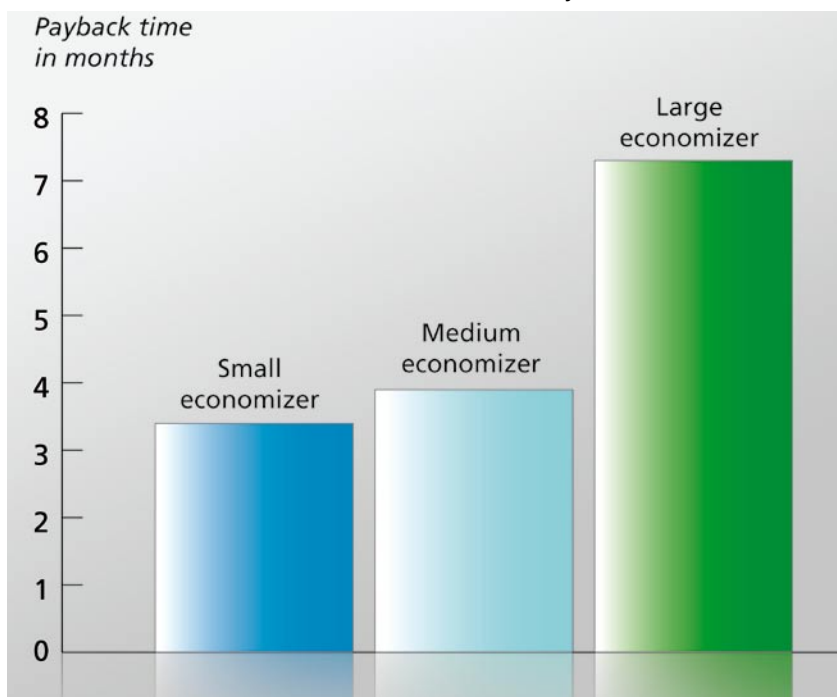


engine. During port stay, it may be required to operate the large oil-fired boiler to meet a fairly modest steam requirement, thus increasing maintenance and operating costs (FD fan approx 50-80 kW). In some instances it could be ideal to install an exhaust gas economizer after the auxiliary engine to produce the necessary steam during port stay, which could be boosted by an electric heater if required.

### Optimize through maintenance or replacement?

Regular maintenance and monitoring of your exhaust gas economizer maximises its life cycle and ensures the best possible thermal efficiency (heat transfer) and optimal performance. A variety of maintenance procedures is de-

*Our payback calculation (repair investment/payback time) when repairing an exhaust gas economizer is based on:*  
 Fuel price, HFO, 380 cSt ..... 350 USD/ton  
 Auxiliary boiler efficiency,  
 kg steam/kg oil ratio: ..... 13  
 Operating days annually ..... 280 days



scribed in the economizer's instruction manual ranging from soot blowing to water washing.

As described in Aalborg Solutions No. 1 of October 2001, an unmonitored accumulation of soot in the economizer can lead to sudden and devastating soot fires that may totally melt down the economizer. In view of the often quite poor quality of heavy fuel oil (HFO) combusted onboard, the economizer is usually contaminated rather

Examples of waste heat recovery capacity of various exhaust gas economizers (depending of the size of the auxiliary engine). Output should be calculated from case to case.

Steam pressure ..... 7 bar(g)  
 Feedwater temperature ..... 50°C  
 Pinch point ..... 25°C  
 Spec. gas quantity ..... 7.5 kg/kWh

rapidly so the importance of regular if not daily monitoring cannot be emphasized enough.

As regards "Soot deposits and fires in exhaust gas boilers", we refer to leading diesel engine manufacturer MAN B&W's technical paper at [www.manbw.com/article\\_004063.html](http://www.manbw.com/article_004063.html).

Many shipowners fail to realize the poor economy in not restoring their exhaust gas economizers to their original standard. In the event of an economizer failure, Aalborg Industries can offer tube replacement during sea voyage by means of a by-pass duct for the exhaust/flue gas that allows for easy renewal of tubes without disruption of the vessel's operation. The procedure will restore the economizer to its maximum efficiency.