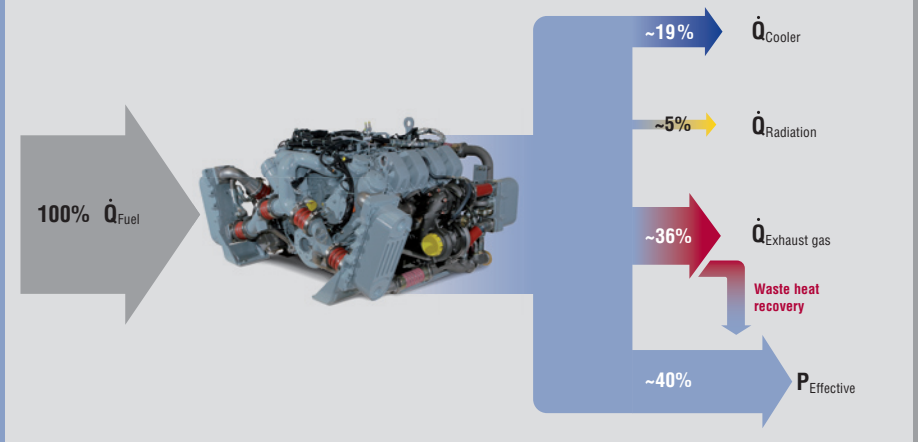
Voith Turbo

SteamTrac System – Waste Heat Recovery System Using a Steam Cycle

Voith piston expander R2/800



Energy flow of a combustion engine

At present stage, over 60% of the energy stored in fossil fuel remains unused during the combustion of liquid or gaseous fuels. This unused energy disappears in the form of exhaust heat and cooling water. By utilizing the exhaust heat, the fuel consumption and the CO_2 emissions of ship's propulsion and auxiliary combustion engines can be significantly reduced.

Voith Turbo has developed a unique waste heat recovery system; Voith SteamTrac. A main component of this system is a completely new reciprocating piston expander.

The Voith Steam Trac system converts a significant amount of waste energy into effective mechanical energy which is delivered back to the crankshaft of a combustion engine. As a result, the fuel consumption and the emissions footprint are considerably reduced, i.e. the engine output is kept at the same level, with less fuel injected.

The Voith Steam Trac system offers a significant opportunity for fossil fuel consumption reduction of all kind of ships as well as a direct related ratio of a lower pollutant emission of toxic and hazardous gases (CO_2) from the exhaust of combustion engines in the range of 4% to 12%.

Voith Turbo has developed a technology, based on a thermodynamic cycle which can be used for all drives with combustion engines. The major difference between the SteamTrac and other thermodynamic systems is that the SteamTrac has been developed especially for cyclical operation in marine applications. It therefore meets the weight and installation space requirements of small and medium sized marine applications such as:

- Inland waterway vessels
- Short Sea Shipping
- Fishery
- Coastal Patrol
- Passenger vessels and ferries

Such an intelligent heat management and exhaust heat recovery system is an important milestone on the way to meet future environmental requirements using as little fuel as possible.

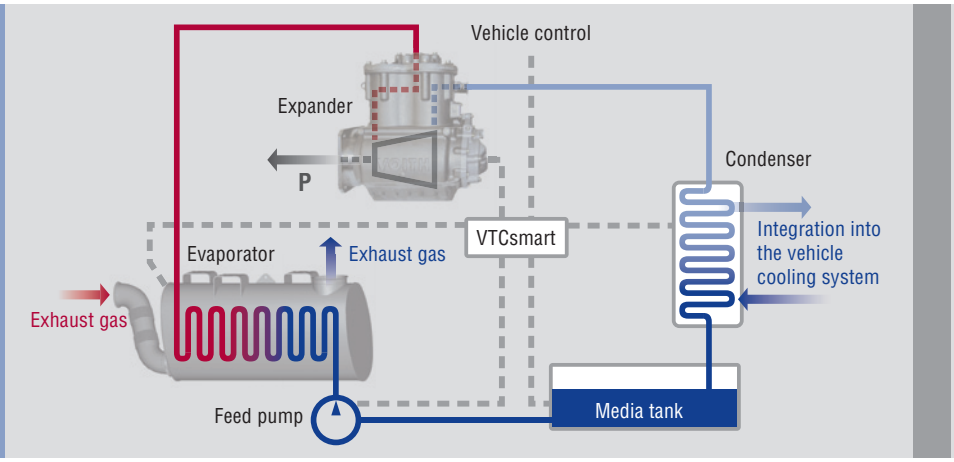
Apart from its ecological advantages and thanks to lower fuel consumption the SteamTrac system also significantly enhances the economy of the drives.

Operating principle

The operating medium is pressurized by a feed pump and pumped to an evaporator (heat exchanger). This evaporator is integrated in the exhaust gas funnel or as a part of the silencer. The operating medium is heated up by the exhaust gasses from the combustion engine until it evaporates to steam and finally by superheating, to superheated steam. The superheated steam is expanded into the piston expansion machine.

The energy present into the steam is converted into mechanical energy which is fed back into the combustion engine's crankshaft. The operating medium is liquefied downstream the piston expander in a condenser followed by storage into an operating medium tank.

The entire process and the integration into the drive system is controlled and monitored by the Voith SteamTrac Systemcontroler. This includes the complete integration into the thermal management of the drive system.



Operating principle of the SteamTrac system

Technical data R2/800

Nominal output	40 kW*
Max. speed at full load	2700 min^{-1}
Max. speed at part load	3500 min^{-1}
Max. operating pressure	60 bar
Min. operating pressure	10 bar
Max. inlet temperature of steam	400 °C
Min. inlet temperature of steam	300 °C

** Thanks to the modular expander concept, expander nominal outputs of 15 kW to 160 kW can be achieved with other expander sizes.*

Special Features

- robust, low-maintenance system
- closed circuit
- self-regulating control system
- adaptable to a wide range of engines

VOITH

Engineered reliability.

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