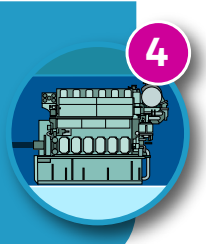
Waste Heat Recovery

FACTSHEET



Vessel Technology Advice & Support

VTAS

for Fuel Efficient Shipping

This is one of a series of Energy Saving Technologies (EST) factsheets that provide a brief description of emerging technologies which are available to ship owners and other stakeholders who are aiming to reduce fuel consumption and/or Greenhouse Gas (GHG) emissions.

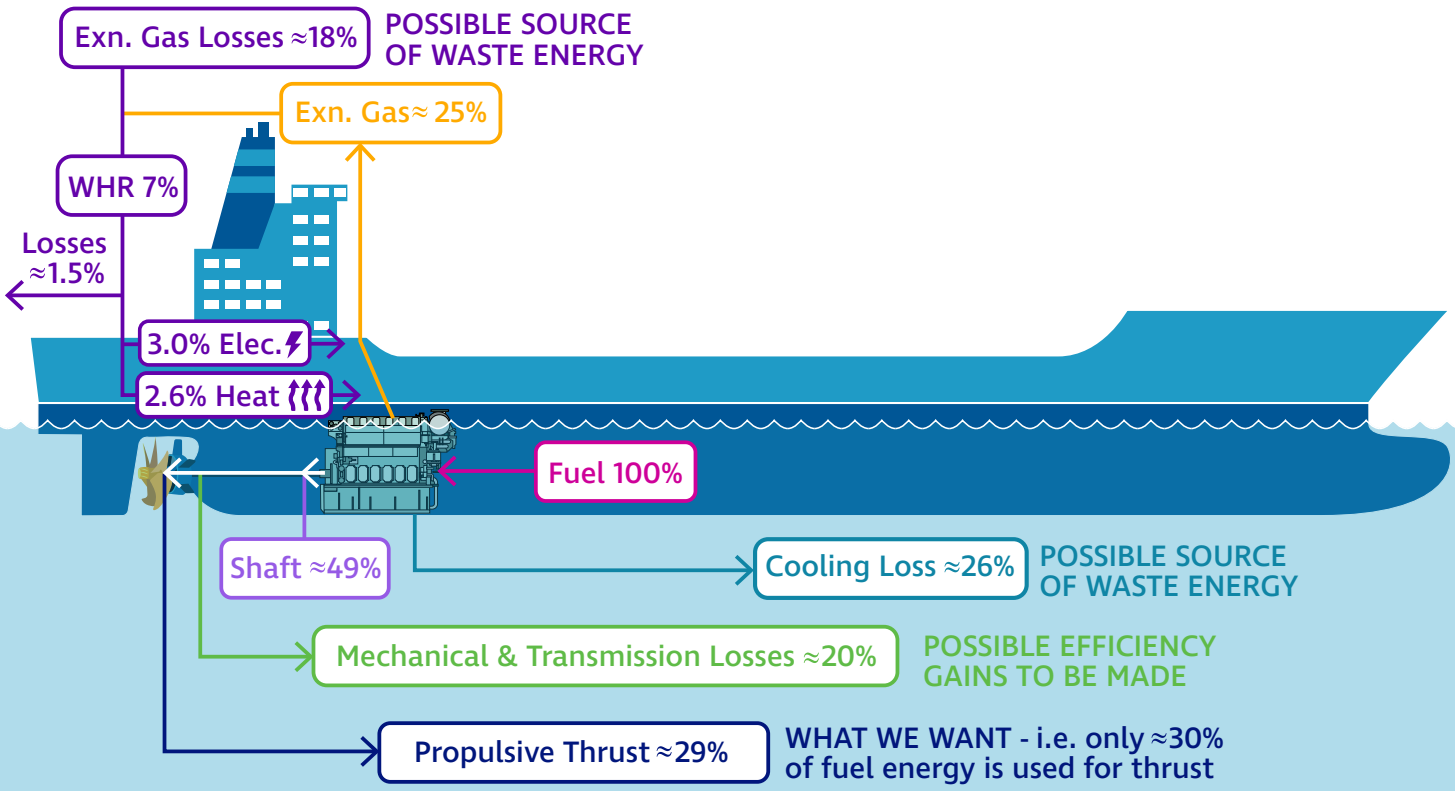
HISTORY

Waste heat recovery (WHR) is already utilised in the majority of ships in some form. Since the first engines were invented, engineers have been looking to find ways to capture waste heat. The two most common examples are economisers, whereby exhaust heat is used to generate steam for domestic services and cargo heating, and flash evaporators which utilise the lower grade heat of engine jacket water to distil fresh water. When at sea, the remainder of the exhaust and jacket water heat not used for these purposes is dissipated to the environment as a loss.

With modern developments in a broad range of energy conversion technologies, there is scope to recover more of this energy and convert it to electricity, which can then mitigate the load on the generators, contribute useful propulsive power, or potentially be stored for later use via batteries or other energy storage mediums.

HOW DO THEY WORK?

In simple terms, waste heat recovery is the practice of utilising the waste energy generated from on-board machinery to perform useful work, which would otherwise have been lost to sea or atmosphere. This heat can be used directly for heating tasks, or converted to electricity to augment propulsion or on-board services.



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HOW DO THEY WORK?

There are a number of technologies that aim to recover this heat for generating useful power and products, including:

CHILLED WATER GENERATION

In an absorption chiller plant (ACP), waste heat from cooling water or direct from hot exhaust gas is used to produce chilled water.

STEAM TURBINE GENERATOR

Once the ship has used the heat it requires from the service steam system, excess steam is dumped into storage called a dumping condenser; prior to entering the condenser, this excess steam can be used to generate electrical power via a turbine generator.

ORGANIC RANKINE CYCLE (ORC)

ORC uses an organic fluid with a boiling temperature less than water. This working fluid is utilised in the same manner as steam in a typical Rankine cycle, whereby the evaporated fluid is expanded through a turbine to generate electricity before being re-condensed.

ELECTRO TURBO COMPOUNDING

Used in shore based installations as a compact and efficient way of harnessing energy direct from exhaust gas into a gas turbine driven alternator.

SELECTING THIS TECHNOLOGY

The best application of WHR is dependent on the type of vessel and its operation. To integrate alternative and new methods of heat recovery, a detailed understanding of the energy profile of the vessel is required.

Technology maturity is generally high with multiple products available on the market and currently in-service.

Many of these technologies can be retrofitted and have increased merit with older, less efficient, engines. There is scope for installing waste heat recovery technologies as an energy source for other EST to improve overall efficiency of the vessel, e.g. utilising the electricity from an ORC to offset the power consumption of Flettner rotors.

KEY INTEGRATION FACTORS

- Footprint/space requirements of the system installation.
- Consideration of the safety, toxicity & storage of any of the fluids & substances used in some heat recovery processes.
- Crew experience & training is required to ensure the technology is maintained, operated & utilised to best effect across all ship operating states.
- Careful consideration of the expected operating conditions & the expected waste heat demands from the vessel.

TYPICAL APPLICATIONS

- Virtually all commercial vessels generate waste heat that has the potential to be utilised for energy saving purposes.
- The selection of technologies is strongly dependant on the energy profile of a vessel, ships with high auxiliary power requirements are particularly good candidates.

BENEFITS SUMMARY

- Fuel savings & greenhouse gas emission reductions.
- Equipment & space cooling.
- Improve redundancy of other vessel services (e.g. cooling water, fresh water, steam, chilled water).
- Reduced pressure on auxiliary power generation.

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HOW WE CAN HELP?

Selecting the right EST for the trades a vessel will undertake is critical to the investment decision. iTEM, at the heart of the VTAS independent assessment process, will consider the technical features of the vessels, the voyage profile all in combination with candidate EST. This is integrated with the risk and financial evaluation using your parameters or those investors are likely to recognise. Collectively this provides an informed view of how selecting appropriate EST contributes to reducing fuel consumption, lowering your operating costs and reducing your greenhouse gas emissions.

To embed this core offering VTAS is able to support you with independent consulting, analysis, feasibility and design integration advice, vessel performance and whole life cost evaluation.

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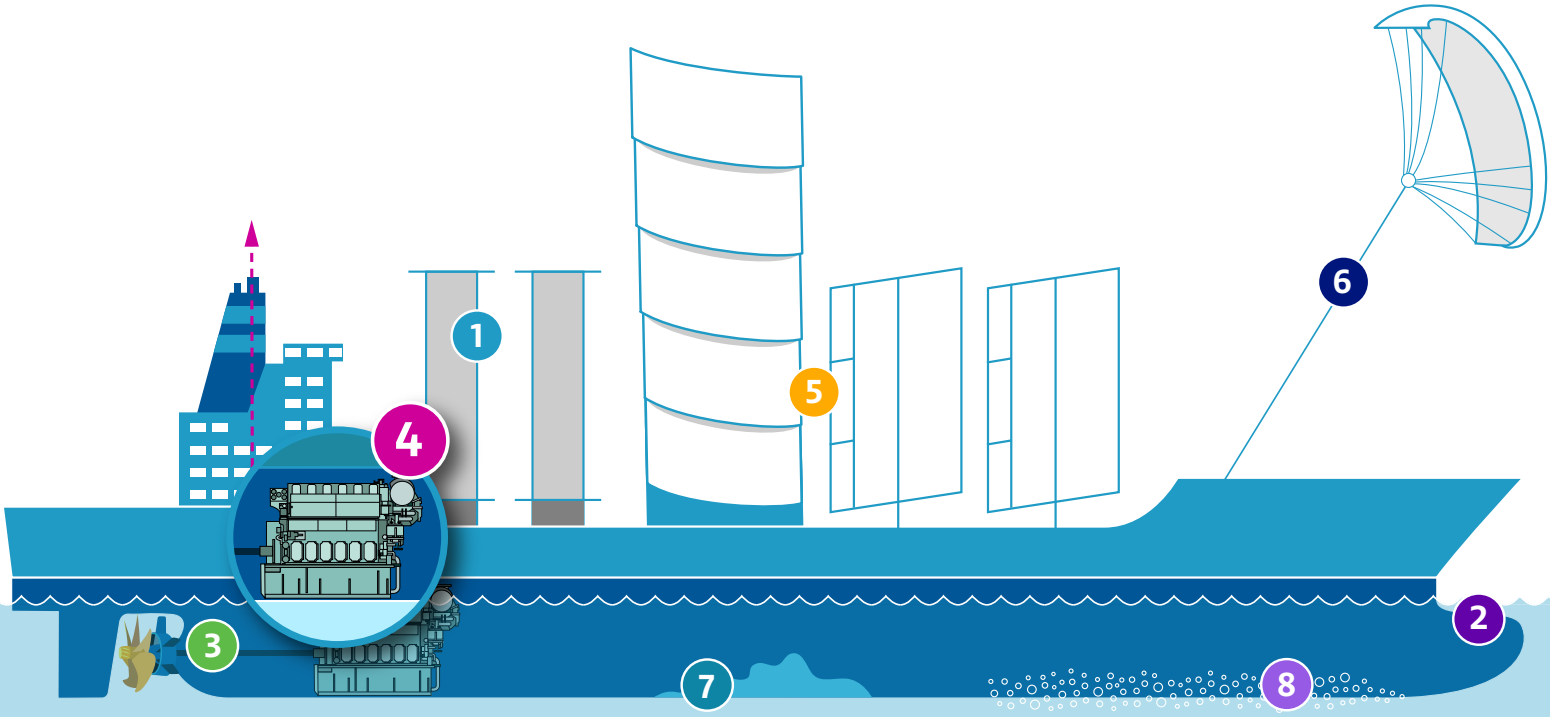
Further information can be found by visiting
www.VTAS-fes.com

or contacting us via
info@VTAS-fes.com



1. Flettner Rotors
2. Hull Form Optimisation
3. Propulsion Efficiency
4. Waste Heat Recovery
5. High Efficiency Sails
6. Kites
7. Low Friction Hull Coatings
8. Microbubbles