

## **ecoETHN<sup>®</sup> Superior ethane reliquefaction**

Babcock's LGE business is a world-leading provider of cargo handling and fuel gas supply systems for the liquefied gas markets. Our environmentally-focused technologies improve efficiency and enhance performance; delivering value to customers throughout the vessel's lifetime.

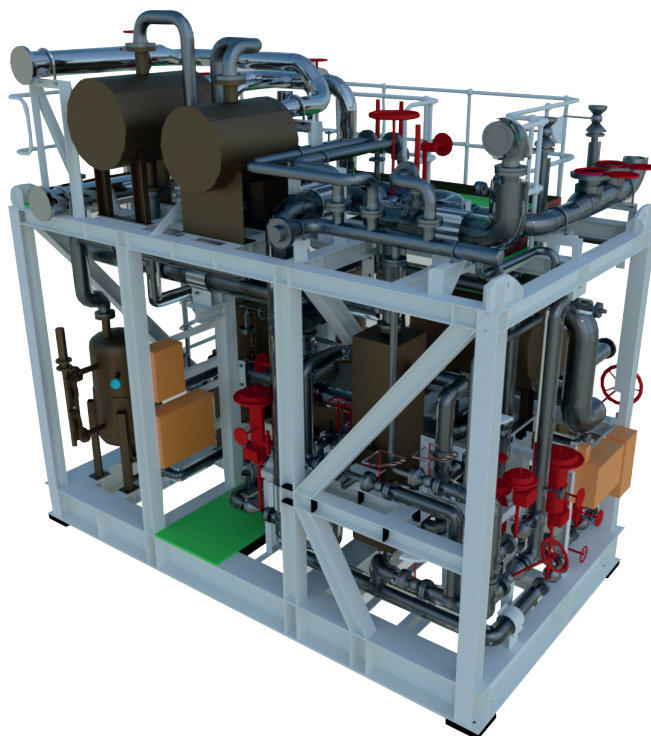
**ecoETHN<sup>®</sup> is Babcock LGE's patent-pending technology, designed for the growing Very Large Ethane Carrier (VLEC) and Ultra Large Ethane Carrier (ULEC) markets.**

The ecoETHN<sup>®</sup> solution enables the carriage of higher methane content commercial ethane cargoes by integrating the vessel's reliquefaction system with the fuel gas supply system. ecoETHN<sup>®</sup> provides condensation of ethane/methane boil off gas (BOG) from the reliquefaction system to the fuel gas supply system, with up to 2.0 mol% methane in the liquid phase. By harnessing the methane component cargo specifically as an energy/fuel source, the methane content of the cargo is reduced during the voyage. Ethane cargoes can then be delivered at a higher purity with reduced

methane content than the cargo originally loaded, reducing the volatile methane component by up to 1.0 mol%.

This not only decreases time spent processing the cargo on-shore at both the loading and unloading terminals but also increases the tradable cargoes available to the market, paving the way for producers to sell more volatile ethane cargoes. ecoETHN<sup>®</sup> thereby provides through-life benefits and OPEX savings to the entire ethane value chain.

In addition, on a typical voyage - carrying a single grade ethane cargo between the United States and China - ecoETHN<sup>®</sup> can reduce the reliquefaction requirements, allowing only a single reliquefaction unit to operate for significant portions of the voyage, a further OPEX saving.



**ecoETHN® consists of three key components, each adding to the increased performance of the full system:**

ecoETHN® Component	Features	Benefits
<b>Fuel Gas Economiser</b>	Transfers energy as heat from the cargo BOG to the fuel gas	<ul style="list-style-type: none"> <li>› Improves efficiency</li> <li>› Reduces external heating load</li> </ul>
<b>Liquid Fuel Injection</b>	A portion of the re-condensed BOG can be injected into the ethane liquid fuel	<ul style="list-style-type: none"> <li>› Reduces methane build-up in the cargo tank vapour space</li> <li>› Reduces the methane content of the cargo</li> <li>› Minimal compromise to quality of ethane fuel to engines</li> </ul>
<b>Auxiliary Generators Fuel Gas</b>	A side-stream can be extracted from the reliquefaction system to provide fuel to auxiliary engines	<ul style="list-style-type: none"> <li>› Even less methane rich BOG is returned to the cargo tanks, further reducing methane content and methane accumulation</li> <li>› Fuel savings realised from operating the auxiliaries on BOG, rather than Low Sulphur Marine Gas Oil (LSMGO) or Low Sulphur Intermediate Fuel Oil (LSIFO)</li> </ul>

ecoETHN® is a disruptive technology in the ethane trading market, providing tangible benefits across the full value chain.

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