

# PROJECT REPORT

PR2918/97

## HiTRAN<sup>®</sup> Thermal Systems Technology

IMPROVES LNG VAPORISER PERFORMANCE FOR KVÆRNER SHIPS A.S.

### PLANT

LNG Vessel built by Kværner Masa-Yards, Finland for ADNOC.

### SERVICE

LNG Forcing Vaporiser

### EXCHANGER

TEMA type BXU exchanger  
2 tube passes  
182 tubes: 25.0 x 2.0 x 2400mm



### PROBLEM

The exchanger was required to vaporise LNG (91% Methane, 9% Ethane) from storage at -163°C (180 kPa) and superheat the vapour to -40°C using saturated steam at 170°C. Upon testing, the exchanger was found to be unable to meet the design requirements with liquid droplet carryover occurring on the vapour side.

### SOLUTION

Analysis by Cal Gavin confirmed Kværner Ships expectations that the unit's performance was limited by film boiling due to the high heat flux and temperature difference. A hydraulic analysis also indicated that maldistribution of flow was likely due to the low frictional pressure drop across the bundle.

Installation of HiTRAN<sup>®</sup> Matrix Elements in the outlet pass of the exchanger would suppress the film boiling, substantially enhancing the boiling coefficient. The increased frictional losses across the bundle would improve the fluid distribution. To ensure the HiTRAN<sup>®</sup> Matrix Elements would be securely located in the U-tubes, a special retention system was proposed which also allowed easy removal for any routine maintenance requirement.

### BENEFIT

Testing of the exchanger after installation proved successful, demonstrating the design flow and vapour superheat temperature could be achieved. This led to the installation of HiTRAN<sup>®</sup> Matrix Elements in the remaining vaporisers on the vessel.

### INSTALLATION

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