FROM OUR DESIGN PORTFOLIO

ICE MARINE DESIGN

SCRUBBER & BALLAST WATER TREATMENT SYSTEMS

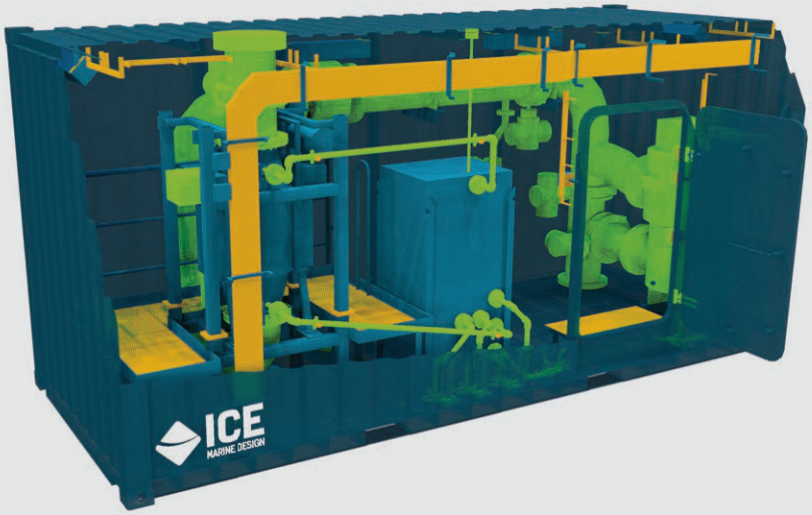
Having experience from design for new construction and conversion of a large number of ships of different types, ICE offers an independent engineering assessment of the most appropriate system to meet IMO regulations for exhaust gas cleaning (EGC) and Ballast Water Treatment (BWT) for a specific vessel.

ICE covers all engineering disciplines involved in retrofit projects (naval architecture, structural, piping, electrical, instrumentation).

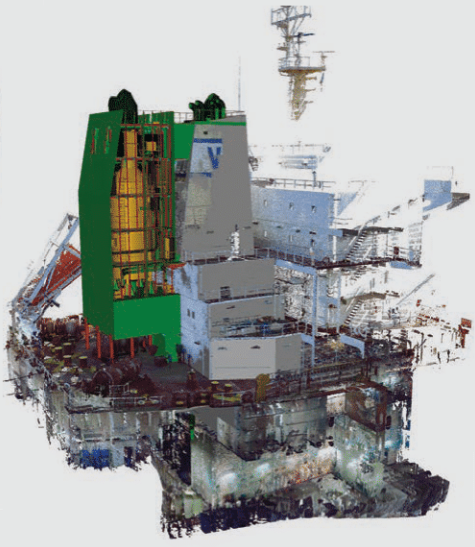
Services:

- Assessment of suitable technology and availability
- Ship Survey / Appraisal / Pre-planning / 3-D laser scanning
- System selection and space allocation
- Feasibility study providing 3-D modelling of pre-selected systems' equipment integrated into 3-D model
- Design engineering (Class package, detail design, prod. info. and as-built documentation, incl. preparation and submission of all documentation required for Class approval)
- Technical assistance throughout fabrication and installation
- Project management

BWTS Retrofit for a 37,000 dwt Oil / Chemical Tanker



Scrubber Retrofit Engineering
(open loop "U" type solution)



Why Choose ICE?

Technical competence

ICE will advise the client on the most appropriate equipment and the best way to install it, based on a holistic understanding of the ship's technical systems and operating conditions.

Independence

ICE will select the best technical and economical solution with no bias towards supplier or installer.

Flexibility

ICE provides services around the world, we can undertake all or part of the technical aspects of the retrofit job from concept and basic design to detail design and supervision.

Size

As Europe's largest independent ship design company ICE can handle several projects – large or small – simultaneously and covering all design disciplines. We have an annual capacity of 700,000 man-hours of naval architecture and marine engineering.

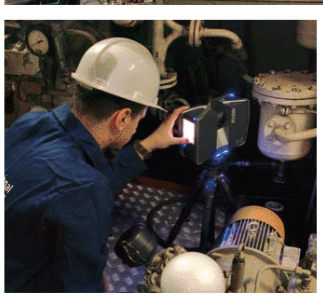
Trustworthiness

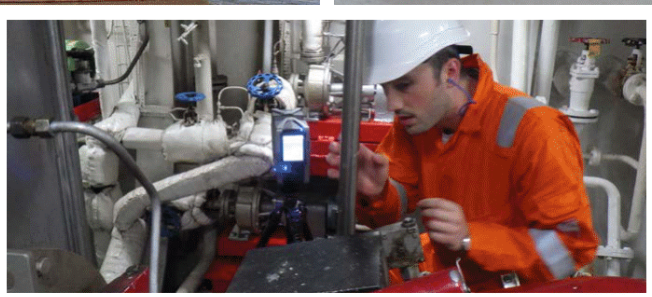
In business 50 years, corporate member of the Royal Institution of Naval Architects (RINA), ISO 9000 certified, track record of previous retrofits.

Value-for-money

With most naval architects and engineers based in Romania, ICE offers high quality design at very competitive rates.

Examples of 3D Laser Scanning Projects Performed by ICE - Experience Based on 5,000+ 3D Laser Scans

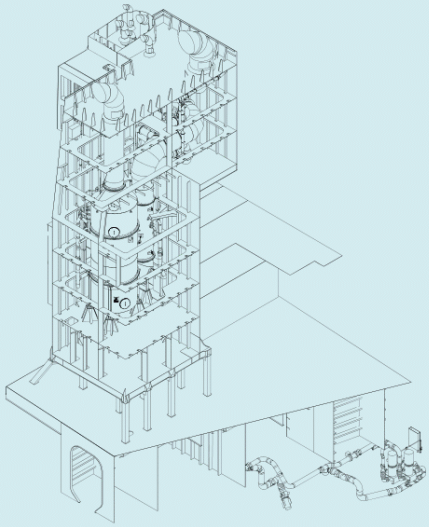




Example of BWT Retrofit Projects Performed by ICE

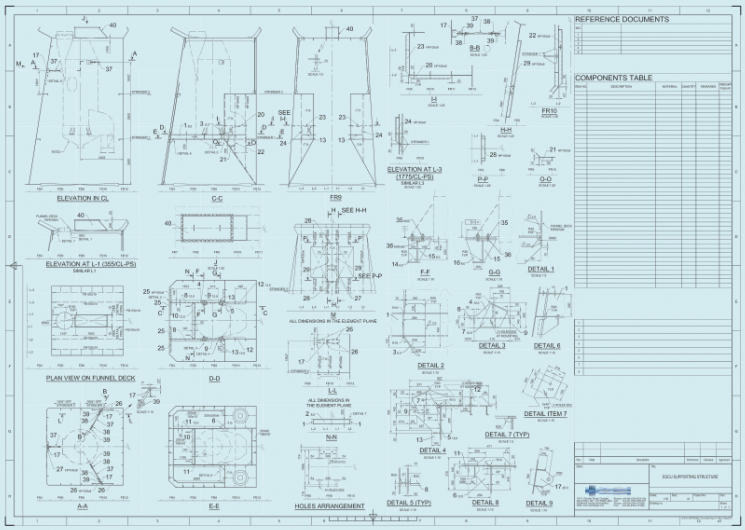
147,000 cu m LNG Tanker

Design developed from concept to detail engineering

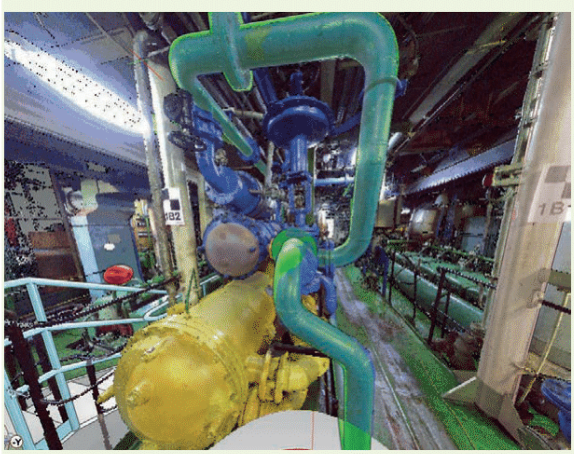


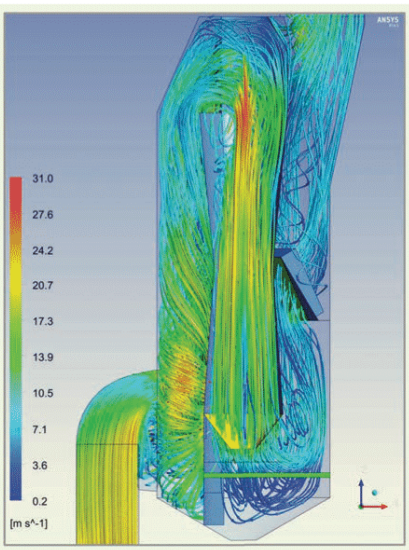
Arrangement of New Piping & Mechanical Equipment

Exhaust Gas Cleaning Unit
Example of Supporting Structure - Structural Modification Plan



AVEVA E3D Model – Bubble view

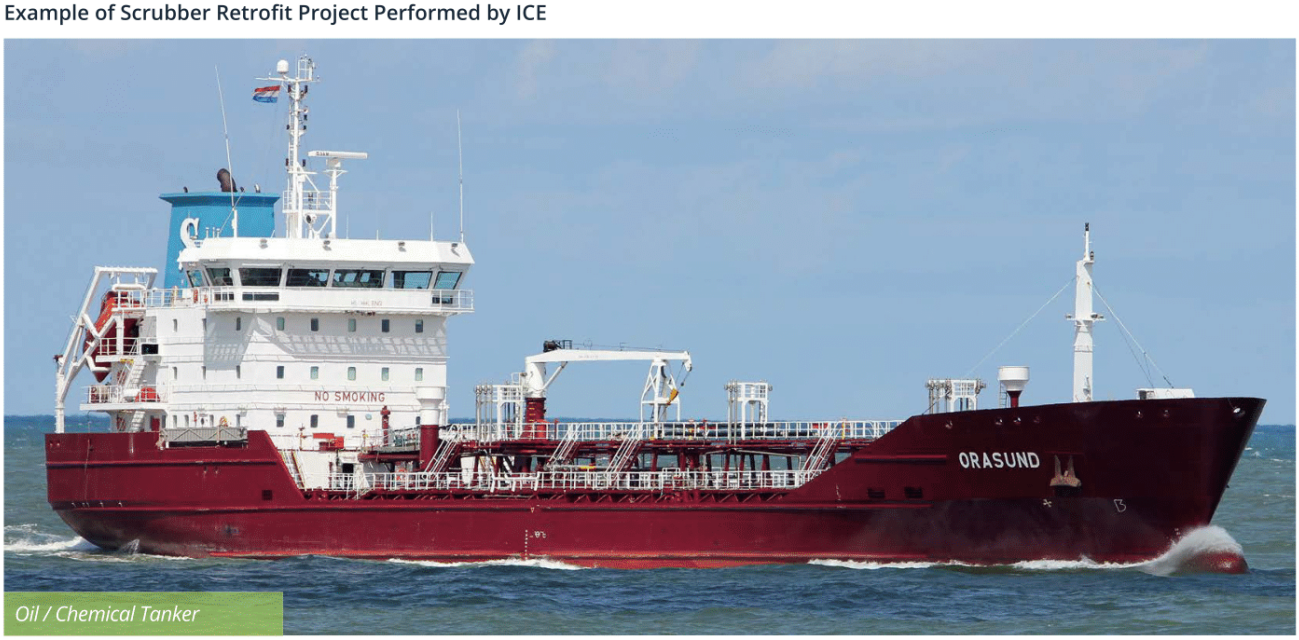




CFD Analysis of Marine SOx Scrubbing System

The picture shows volumetric streamlines colour coded by local velocity measured in m/s, as resulted from a CFD Analysis of a Marine SOx Scrubbing System. The shown picture corresponds to the dry running case, when the water supply to the spray nozzles is stopped. The CFD study treats also a number of wet running cases (not shown here).

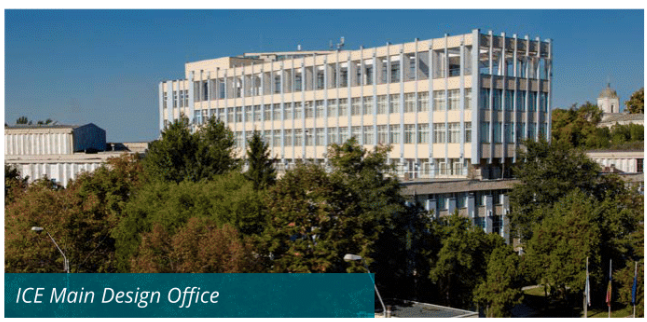
Example of Scrubber Retrofit Project Performed by ICE



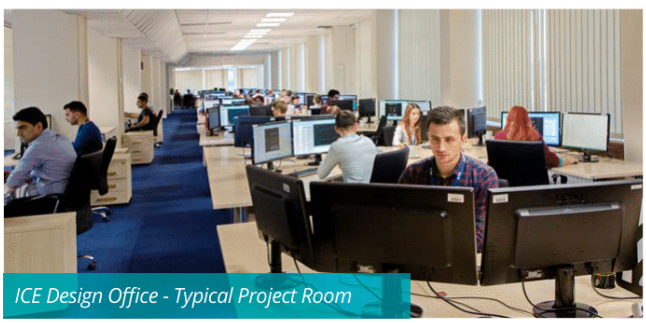
Oil / Chemical Tanker

ICE GROUP CAPABILITIES AND RESOURCES

As a leading European ship design company, during its 50-year history ICE has been involved in design of about one thousand ships and offshore platforms. ICE covers all marine engineering disciplines and we can thus in-house calculate and design all necessary modifications associated with a BWT retrofit, including submissions to Class. We have clients world-wide, and can quickly dispatch engineers for surveys and supervision. Sample retrofit engineering projects are shown below.



ICE Main Design Office



ICE Design Office - Typical Project Room

Bulk Carrier 75,000 dwt

Oil Chemical / Asphalt Tanker 15,000 dwt

Bulk Carrier 82,000 dwt

Scrubber Retrofit Engineering (Bulk Carrier 82,000 dwt) and Ballast Water Treatment (BWT) Retrofit (Handymax Bulk Carrier)

Image Courtesy: www.shipspotting.com

ICE MARINE DESIGN

ENGINEERING CERTAINTY

International Contract Engineering Limited, 19-21 Circular Road, Douglas, Isle of Man, IM1 1AF British Isles
Tel: +44 (0)1624 623 190 | **Fax:** +44 (0)1624 628 297 | www.icedesign.info

With a 50-year track record and an annual capacity of 700,000 professional engineering man-hours, the International Contract Engineering (ICE) Group is Europe's largest independent ship design consultancy. We provide high-calibre multi-discipline design services to yards and owners in the commercial shipping, defence and offshore energy industries, ranging from conceptual studies and Class drawings to detail design and production information. We cover a full range of naval architecture and marine engineering disciplines such as hydrodynamics, structural, mechanical, piping, electrical, instrumentation, outfit and HVAC. Our experience includes gas carriers, passenger vessels, navy and coast guard ships, chemical tankers, drill ships, FSO/FPSOs and a range of other vessels. We also have available proprietary designs that can be adapted to clients' requirements.

With our head office in the Isle of Man and our engineering facilities in Romania and Croatia, we provide high quality design and engineering at very competitive prices.