**LNG FUEL SYSTEM TECHNOLOGY**

**LNG FUEL SYSTEM DESIGN**
Definition of system hardware and related arrangement with vessel boundaries.
- Tank type and position
- Gas processing arrangement
- Hazardous zone plan
- Gas safety & gas control system
- Interfaces to engines and vessel automation

**HARDWARE SUPPLY**
LNG Hybrid supplies a full package of the specified LNG fuel system including gas safety and gas control system to your project.

**FUNDING SUPPORT**
Becker Marine Systems has extensive experience in applying for and receiving funding for innovative marine technologies. We will work out the necessary requirements to qualify for current funding programmes related to hybrid propulsion and LNG fuel system technology.

**SYSTEM SPECIFICATION**
Preparation of a tender and/or detailed specification of the LNG fuel system.

**RISK ASSESSMENT / CLASS CONFORMANCE**
Preparation and execution of project / vessel related HAZID / HAZOP workshop.
- Analyses of the design of LNG fuel system in terms of potential hazards occurring in operation, bunkering etc.
- Assessment of the identified hazards
- Draft of required measures to reduce single risks as recommendations
- Implementation of workshop recommendations and update of the LNG fuel system design.

**SYSTEM CONFIGURATION & DEFINITION**
Based on the results gained from the simulation, and taking technical feasibility and economic viability into account, LNG Hybrid defines the most suitable system configuration and options.

**DECISION BASIS**
Based on the results gained from the simulation, and taking technical feasibility and economic viability into account, LNG Hybrid defines the most suitable system configuration and options.

**HYBRID PROPULSION TECHNOLOGY**

**IDENTIFICATION OF TECHNICAL AND OPERATIONAL REQUIREMENTS**
- Collection of relevant technical data related to your specific vessel/project
- Identification of the scheduled operational profile

**SIMULATION OF OPERATIONAL PROFILE**
Based on the specific customer information describing:
- Requested power / sailing under different conditions / operational modes / practical requirements / given schedule and time limits,
- LNG hybrid simulation, all relevant parameters in a given period of time to get a realistic picture of the selected propulsion concept to define the most suitable engine types and potential battery capacities.

**RISK ASSESSMENT / CLASS CONFORMANCE**
Preparation and execution of project / vessel related HAZID / HAZOP workshop.
- Analyses of the design of LNG fuel system in terms of potential hazards occurring in operation, bunkering etc.
- Assessment of the identified hazards
- Draft of required measures to reduce single risks as recommendations
- Implementation of workshop recommendations and update of the LNG fuel system design.

**SYSTEM SPECIFICATION**
Preparation of a tender and/or detailed specification of the hybrid propulsion system.

**HARDWARE SUPPLY**
The full hardware package for the specified propulsion system is delivered. To reveal out our services, LNG Hybrid also provides supervision of the installation process.

**DETAILED SPECIFICATION**
LNG Hybrid provides a detailed specification of the propulsion system.

**LNG HYBRID CONCEPTS**
The international maritime industry faces huge challenges. Higher efficiency, greater sustainability and increased safety are important worldwide. As an innovative ship supplier, Becker Marine Systems contributes towards meeting these goals with anticipatory products and services technologies. As a first step in this direction Becker Marine Systems is committed to the establishment of environmentally friendly, fuelled natural gas (LNG) in the maritime industry. With LNG as a low emission fuel Becker develops clean shore power technologies and marine fuel systems.

LNG Hybrid, a division of Becker Marine Systems, was founded in 2012 with the focus on LNG fuel system technology and hybrid propulsion systems for inland, coastal and seagoing vessels. As an innovative ship supplier Becker Marine Systems contributes towards meeting these goals with anticipatory products and services technologies. As a first step in this direction Becker Marine Systems is committed to the establishment of environmentally friendly, fuelled natural gas (LNG) in the maritime industry. With LNG as a low emission fuel Becker develops clean shore power technologies and marine fuel systems.

LNG Hybrid, a division of Becker Marine Systems, was founded in 2012 with the focus on LNG fuel system technology and hybrid propulsion systems for inland, coastal and seagoing vessels. The product portfolio ranges from technical and economic studies and planning to the development and specification of technology and the full supply of hardware. A focus lies on the customer support in terms funding processes and tendering documents.

Hybrid Port Energy (HPE) is a wholly owned subsidiary of Becker Marine Systems. HPE develops and operates shore power technology such as the LNG Range Hummel which supplies 13 MW of shore power in the Port of Hamburg and the Port of Hamburg. Future HPE barges will be able to supply up to 15 MW to the German ports from its shore power plants. As a next step, Becker Marine Systems is planning to introduce a new hybrid power plant which is equipped with a battery and a low emission shore power to container ships as well as a plug at the port of Hamburg. A total of 120 MV LNG PowerPac units will be put into operation starting in 2017.
Becker Marine Systems developed the advanced LNG Hybrid Barge, an innovative solution for improving air quality at harbour cities by reducing emissions from cruise ships at port. The LNG Hybrid Barge produces significantly lower emissions than the diesel engines used to generate power on board cruise ships.

The LNG Hybrid Barge has been shown to reduce CO₂ emissions by 20% and NOₓ by 80% with no particulates or sulfur emissions whatsoever. Designed as a flexible and mobile solution, the barge supplies power to cruise ships during the summer season and is able to operate as a floating power and heat plant in the winter.

Classified as a seagoing vessel, the world’s first LNG Hybrid Barge in operation at the port of Hamburg is 76.0 m long, 11.4 m wide with a draught of 2.5 m. It is equipped with modular, silently operating 7.5 MW LNG GenSet power plants fuelled by two 17 t LNG containers.

ADVANTAGES OF THE LNG HYBRID BARGE:
• Cold ironing customised for cruise ships
• Significant reduction of harmful emissions
• Silent operation
• Guaranteed independent power supply
• 100% maritime solutions
• In line with energy laws – no state taxes, grid fees etc.
• Mobility and flexibility – multi-customer concept

LNG HYBRID BARGE
CLEAN ENERGY FOR CRUISE SHIPS AT PORT

ADVANTAGES OF THE LNG POWERPAC®:
• Cold ironing customised for container ships
• A flexible, independent on-board power supply
• Significant reduction of harmful emissions
• Quick implementation – usable at any port
• 100% maritime solution
• In line with energy laws – no state taxes, grid fees etc.
• Suitable for all kinds of container terminal operations

COMPARISON WITH OTHER SUPPLY TECHNIQUES

LNG POWERPAC® HANDLING CHAIN

LNG POWERPAC® CLEAN ENERGY FOR CONTAINER VESSELS AT PORT