



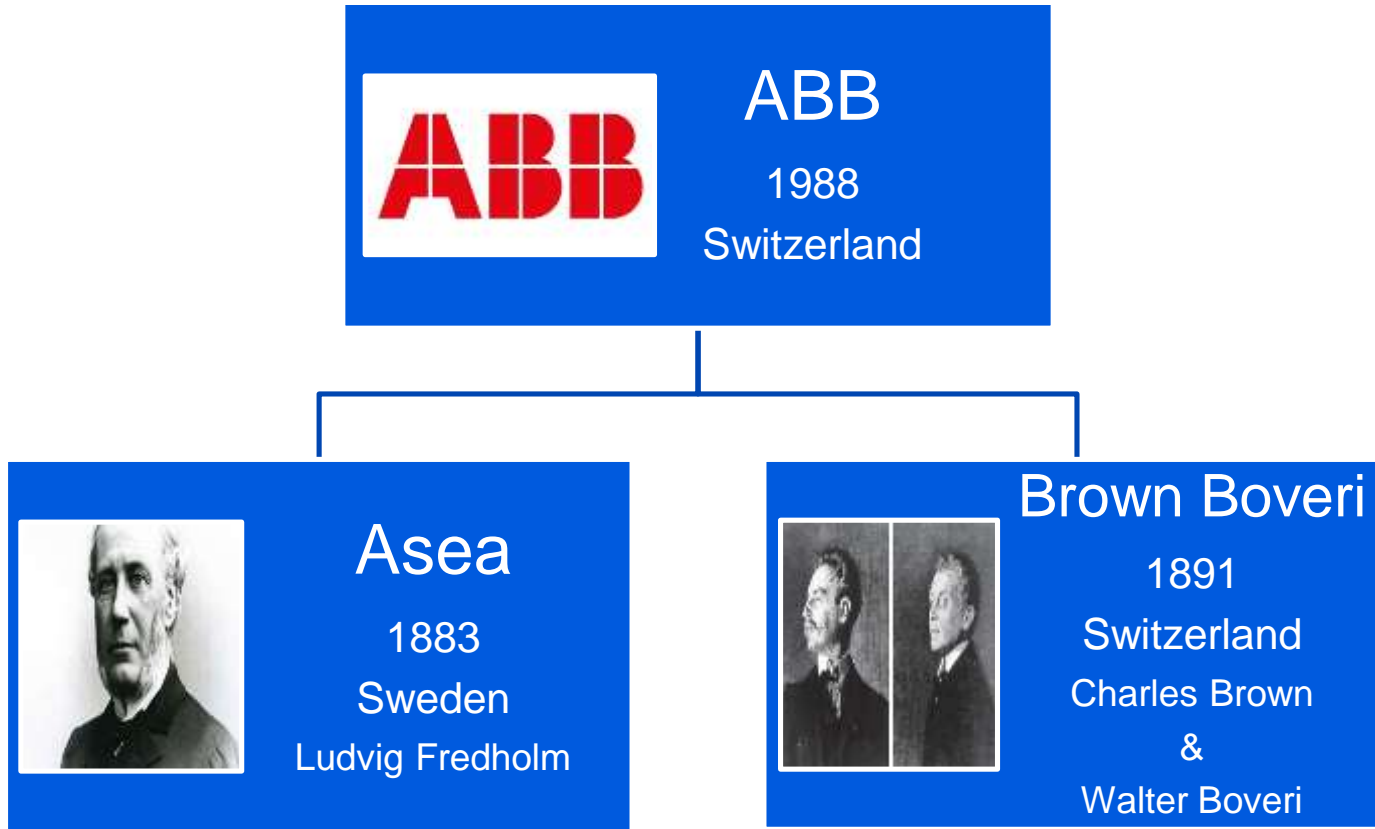
Antonis Asimakopoulos, Marine Energy Solutions, ABB Marine Services

Improving vessel energy performance

Simple steps to reduce fuel consumption

Tanker Operator, Athens Conference – Making money in a tough market, April 3rd, 2013

Our roots



Our businesses

ABB Group: \$38 billion – active in over 100 countries - about 145,000 people.



Power Products

\$10.9 billion
36,000 employees



Power Systems

\$8.1 billion
20,000 employees



**Discrete Automation
and Motion**

\$8.8 billion
29,000 employees



**Low Voltage
Products**

\$7.7 billion
31,000 employees



**Process
Automation**

\$8.3 billion
28,000 employees

ABB Marine Services a member of Process Automation

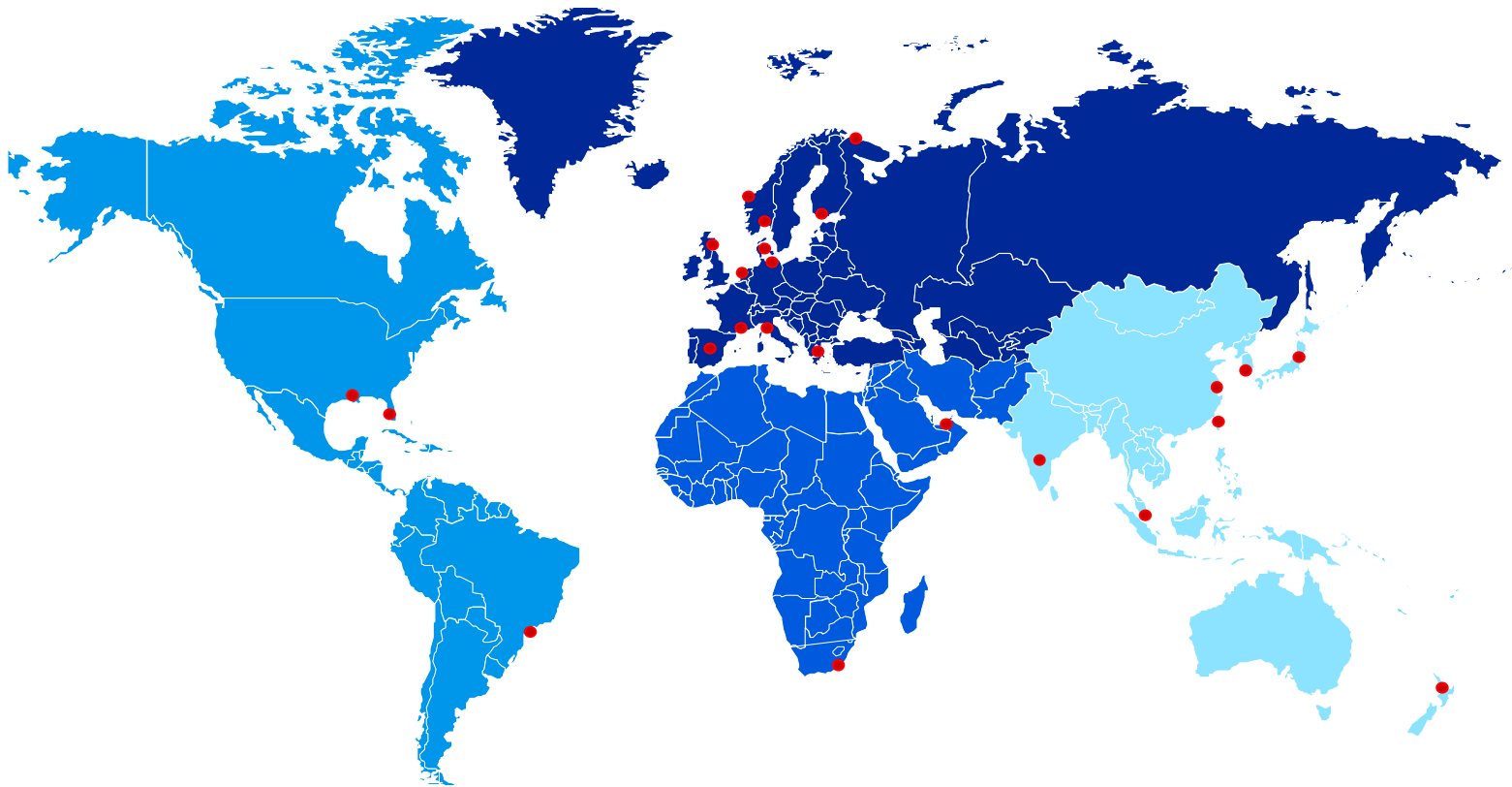
ABB Marine today - Worldwide operation with strong local presence

ABB Marine's operations are organised and coordinated by two centers of excellence, CoE Cruise & Ferries and CoE Oil & Gas. The main sales locations are in Finland, Norway, China and Singapore.

All in all, ABB Marine employs some 1000 people. After-sales services, support and training are integral parts of ABB Marine's total delivery. ABB has service operations in more than 100 countries with Marine Service Centers located in the world's main shipping and shipbuilding areas.



ABB Marine network



22 Marine Services Centers (MSC)
More than 1000 employees

Shipping Efficiency Matters



Abstract:

Energy efficiency plays the most important role in CO₂ emission reductions, accounting for up to 53% of total CO₂ emission reductions. In pump and fan applications onboard vessels, using VFD can cut the energy consumption for these applications by as much as 60%.

Energy Efficiency – The Other Alternative Fuel

Shipping Efficiency Matters



Abstract:

Energy efficiency plays the most important role in CO₂ emission reductions, accounting for up to 53% of total CO₂ emission reductions. In pump and fan applications onboard vessels, using VFD can cut the energy consumption for these applications by as much as 60%.

Objective:

Improve our customer's processes to increase energy efficiency through turnkey ABB solutions

Shipping Efficiency Matters



Abstract:

Energy efficiency plays the most important role in CO₂ emission reductions, accounting for up to 53% of total CO₂ emission reductions. In pump and fan applications onboard vessels, using VFD can cut the energy consumption for these applications by as much as 60%.

Objective:

Improve our customer's processes to increase energy efficiency through turnkey ABB solutions

Relations:

$$\text{Flow } Q_1/Q_2 = n_1/n_2$$
$$\text{Head } H_1/H_2 = (n_1/n_2)^2$$
$$\text{Power } P_1/P_2 = (n_1/n_2)^3$$

Shipping Efficiency Matters



Abstract:

Energy efficiency plays the most important role in CO₂ emission reductions, accounting for up to 53% of total CO₂ emission reductions. In pump and fan applications onboard vessels, using VFD can cut the energy consumption for these applications by as much as 60%.

Objective:

Improve our customer's processes to increase energy efficiency through turnkey ABB solutions

Affinity law:

10% speed reduction → 27% power reduction

50 kW power reduction → 100 mt annual fuel savings

ABB - Your partner in energy efficiency

Complete retrofit packages

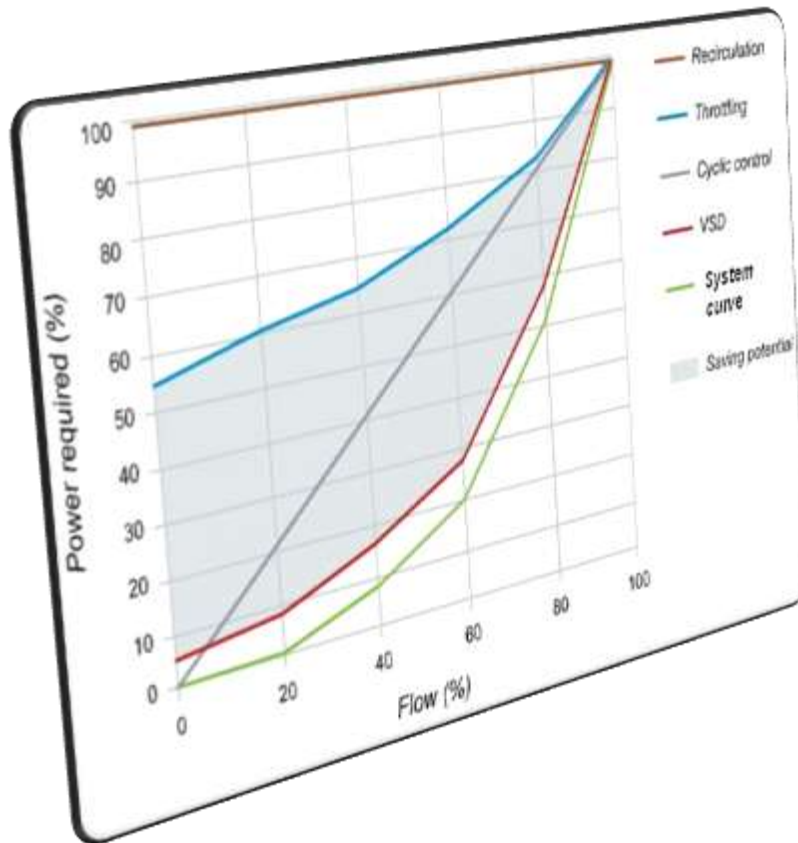


ABB provides specialized solutions and services for energy efficiency projects onboard vessels with an average of 40 % energy savings

A fast track to savings with an average lead time of three months from initial on-board surveys to start of savings

We take full responsibility for complete energy efficiency retrofit projects

High return on investment with an average of nine months pay-back time

Installing Variable Frequency Drives

A simple way to get started with green shipping



10% speed reduction = 27% power reduction

Instant energy savings when the pump or fan always run at the correct speed to meet flow and pressure demands

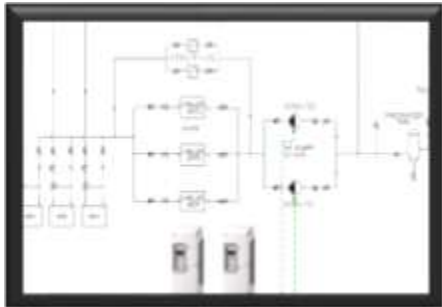
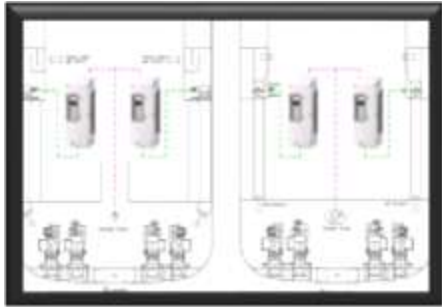
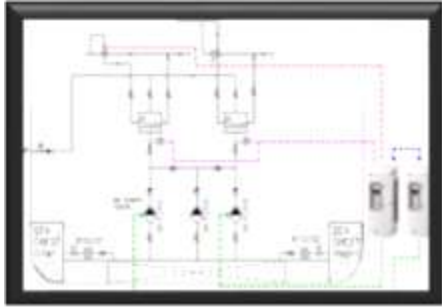
The fuel emissions and savings generated by VFD may surprise you.

50kW power reduction equals to 80 000 USD savings / year



Vessel auxiliary system

Cooling systems



SW Cooling systems

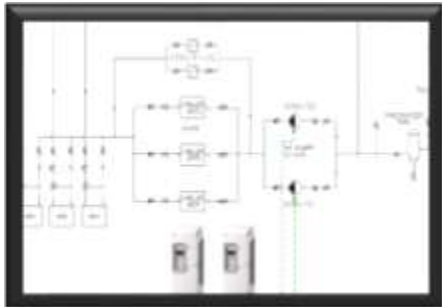
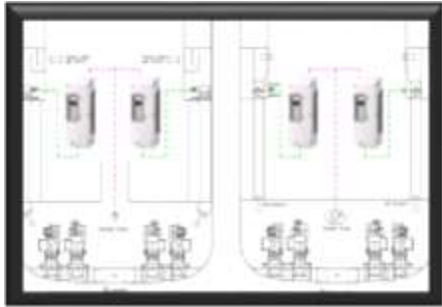
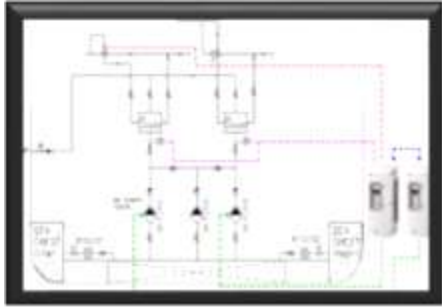
Pump applications very often over-dimensioned to the need.

Design criteria set to meet the extreme conditions the vessel may operate in. Every day operation rarely come close to such conditions.

Throttling and by-pass loops reduce the flow, but they do not reduce the power consumption of the motor.

Up to 40% energy savings may be achieved by applying VFD together with ABB's patented Intelligent Pump Control to the existing SW Cooling process

Vessel auxiliary system Intelligent Pump Control



Intelligent Pump Control

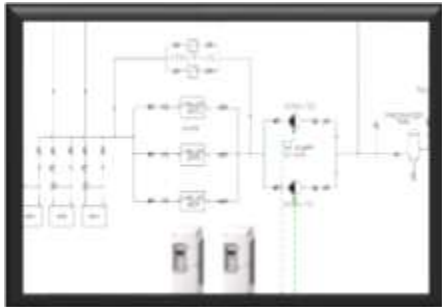
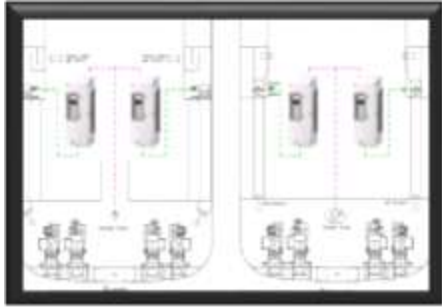
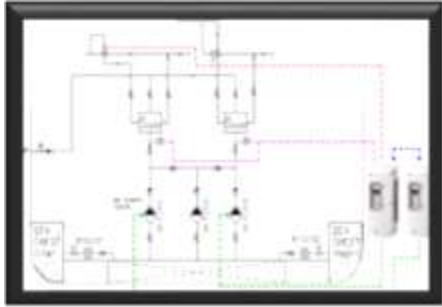
Intelligent Pump Control (IPC) is a Software package for ACS800 drives. Incorporating all the most common functions required by pump or fan users, it eliminates the need of an external PLC and other additional components.

A pump system with fewer electrical components is always more reliable, especially in the harsh environment typical in marine applications. IPC can help save energy, reduce downtime and prevent pump jamming and pipeline blocking.

Dimensioning a cooling system with parallel pumps enables the creation of a redundant system. With the cooling demand control of the IPC, the redundancy of the system is 100%.

Vessel auxiliary system

Cooling systems



Engine Room Ventilation

Supply and exhaust fan applications very often over-dimensioned to the need.

Design criteria set to meet the extreme conditions the vessel may operate in. Every day operation rarely come close to such conditions.

Use actual temperature and pressure information to apply VFD together with ABB's patented Intelligent Fan Control to the existing ventilation system and achieve at least 20% energy savings.

Vessel auxiliary system

Other systems that benefit from VFD upgrade

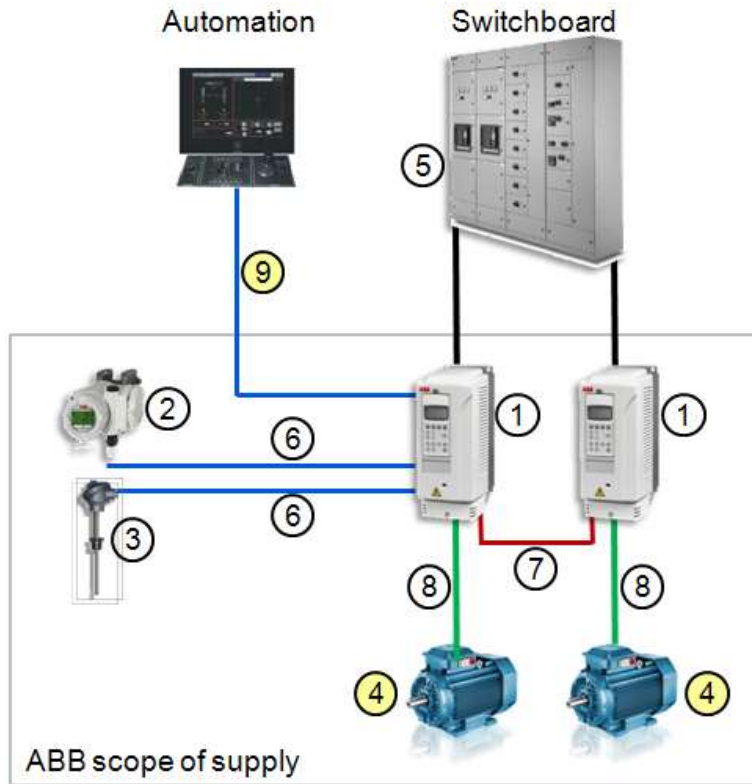
Example of other processes suitable for VFD upgrade

- Boiler feed pumps
- Bilge water pumps
- Cargo area fans
- Air conditioning systems
- Cargo tank cleaning pumps
- Cargo pumps
- Lubrication pumps
- Mooring- and Anchor Handling Winches

In practice it is useful to install a VFD on any process equipped with a motor and a throttling valve with the purpose to reduce the flow or change the pressure.



Content of a turn-key supply project



▪ Equipment

- Variable Frequency Drives
- High Efficiency motors as an option
- Sensors
- PLC as an option
- Installation material

▪ Services

- Onboard Survey
- Project management
- Engineering
- Delivery and logistics
- Installation
- Start-up
- Saving verification

Reference cases

Energy efficiency @ Stolt Tankers

Stolt Breland, Product / Chemical Tanker

- The Vessel
 - DWT 43,475 ; LOA182 m
- Annual savings:
 - 60% Energy saving on EV & SWC
 - Fuel savings of 255.4 ton * 650 USD/ton = \$ 166,000
 - 2.8 % Fuel saving on total fuel consumption
 - CO2 reduction of 644 ton
- Payback time less than half a year
- Scope:
 - Turn-key variable frequency drive retrofit
 - two sea water cooling pumps, 65 kW each
 - four engine room ventilation fans, 32 kW each
 - controlled by ABB PLC
 - one tank cleaning pump, 160 kW



Energy efficiency @ Pullmantur

Pullmantur Sovereign, Cruise vessel

- The Vessel:
 - 73 529 GT ; LOA 268 m
- Annual savings:
 - 30% of contract linked to saving verification
 - More than 40% savings verified and proved
 - Payback time one year
- Scope:
Turn-key variable frequency drive retrofit
 - Two sea water cooling pumps, controlled by ABB PLC, including high efficiency motors
- Verification:
 - For saving verification an energy meter was installed on the supply cables from the switchboard

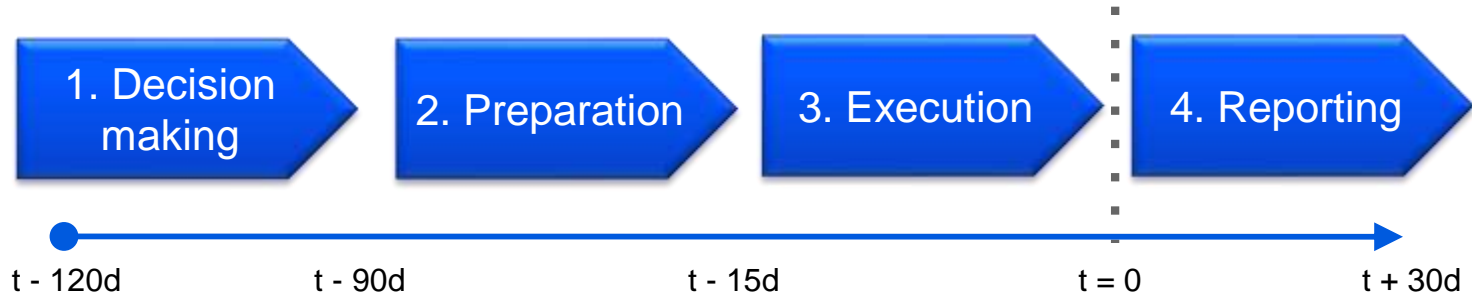


Energy efficiency project plan

Flexibility in payment models

- Fixed fee
- Rental agreement
- Performance based

Main steps and phases in VFD Energy Efficiency projects:



Key Activities:

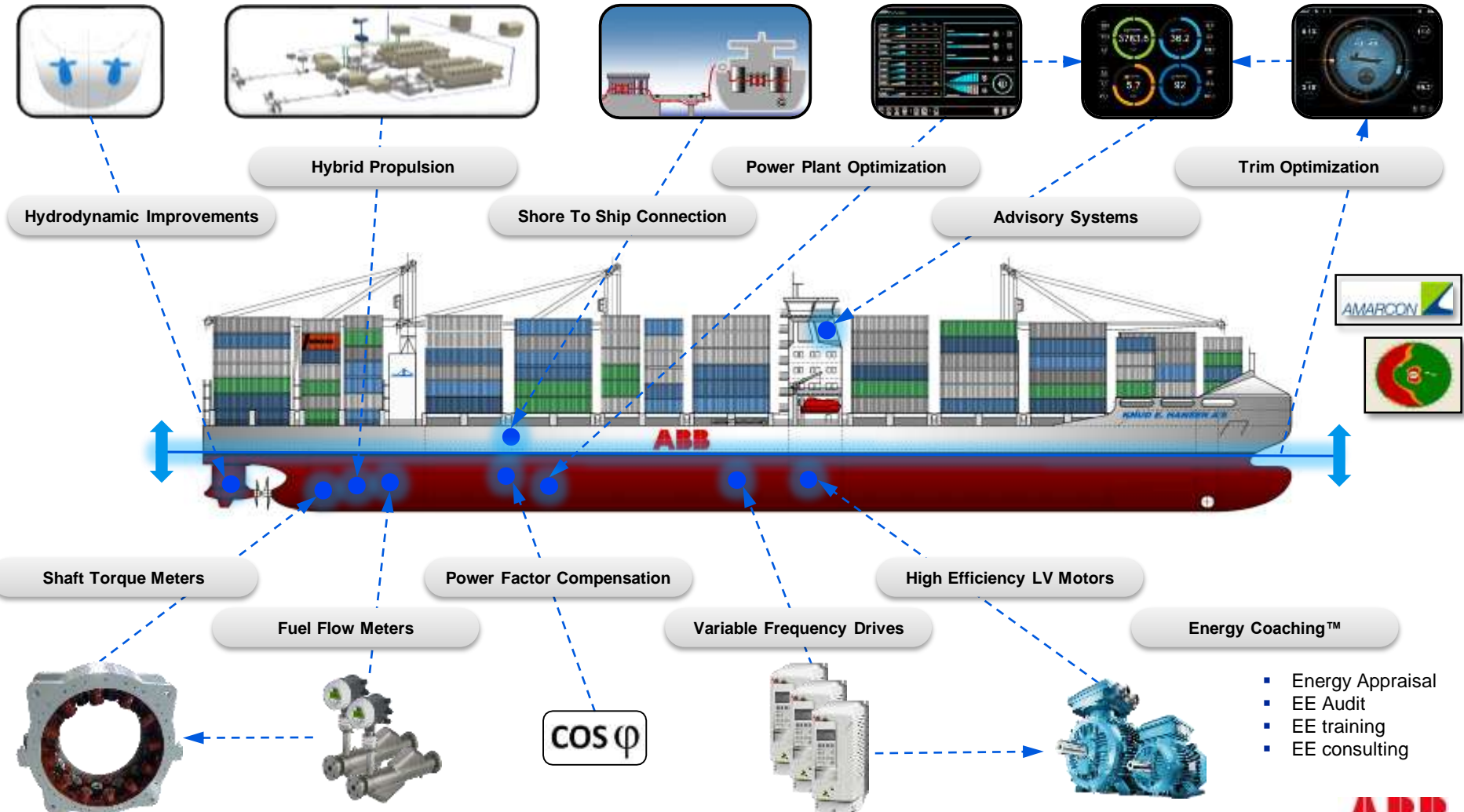
- | | | | |
|---|-------------------------|------------------------------|--|
| • Onboard survey | • Scheduling | • Project mgmt | • Saving verification |
| • Economical feasibility study with ROI calculation | • Engineering | • Delivery | • Invoicing |
| • Budget estimate | • Project mgmt | • Installation | • Project evaluation (customer feedback) |
| • Communication between ABB and customer | • Procurement | • Commissioning and start-up | • Project close-out |
| • Contract | • Manufacturing | • Duration appr 10 days | |
| • Duration appr 30 days | • Logistics | | |
| | • Duration appr 75 days | | |

Day 0
Start saving

Summary and energy efficiency product portfolio

Marine Energy Solutions

Summary - Find the savings onboard



Contact information

Antonis Asimakopoulos
Marine Service Manager
Phone: +2104212637
Mobile: +306937075236

E-mails:

antonis.asimakopoulos@gr.abb.com

services.marine@gr.abb.com

Power and productivity
for a better world™

