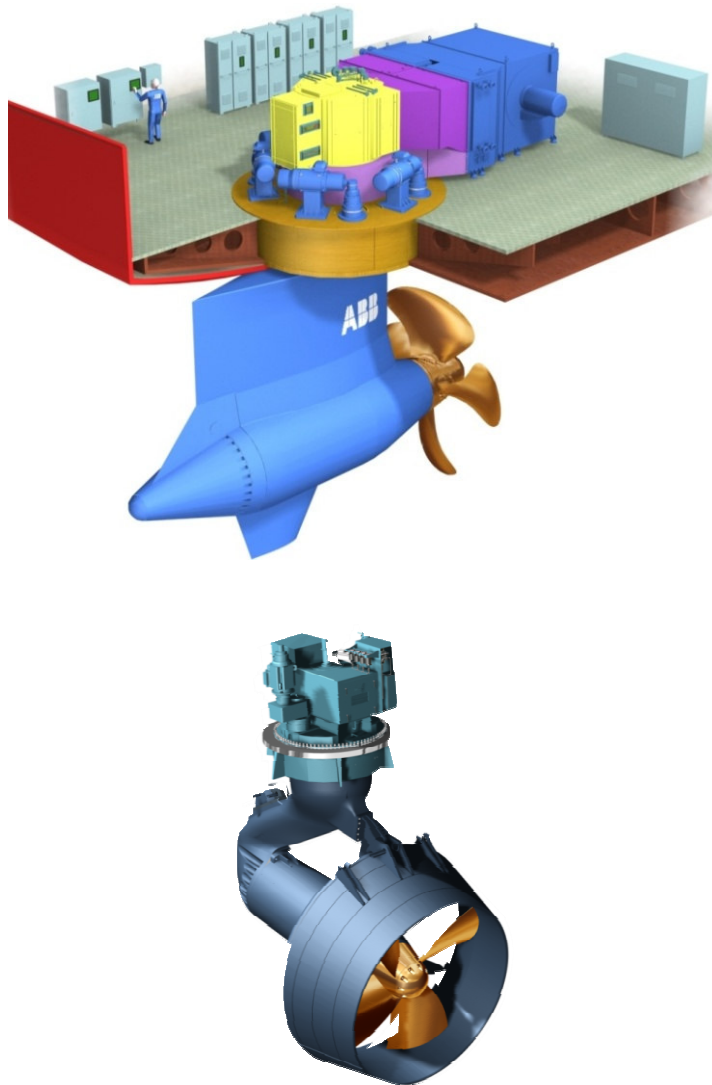


June, 2012

ABB Propulsion Products for Main Propulsion and Thrusters

Azipod® - The most environmental friendly propulsion system



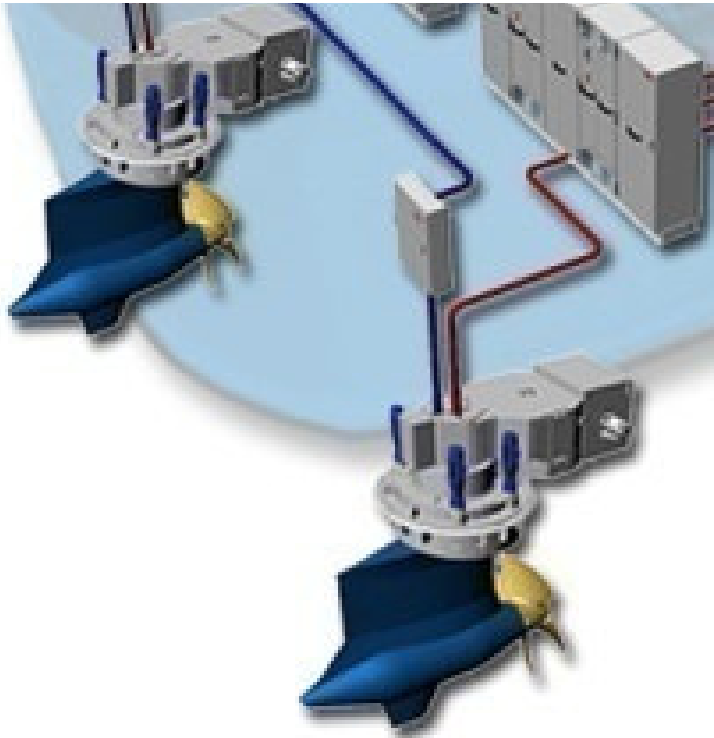
- Azimuthing electric propulsion and thruster system
- Electric motor is inside a submerged pod
- Speed controlled fixed pitch propeller
- Propulsion module can be rotated 360 degrees around its vertical axis
- Azipod® is a registered trade mark of ABB

Electric Propulsion System



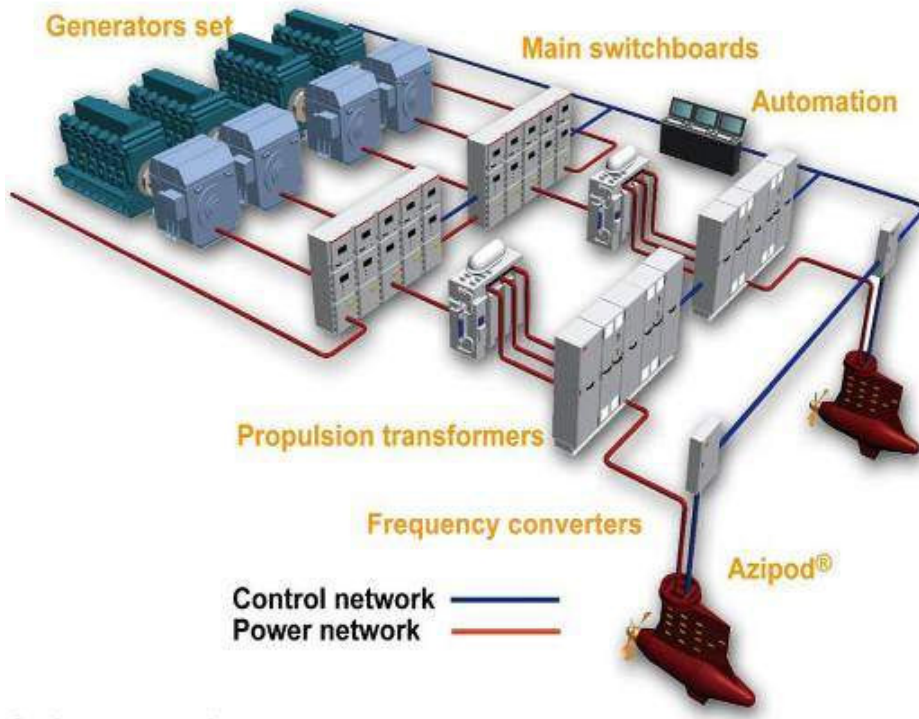
- Power plant principle
- Optimum loading of prime movers
- Free location for engines
- Speed controlled fixed pitch propellers
- Redundant systems
- Excellent controllability of the electric motor

Azipod[®] System



- Improved hydrodynamic efficiency
- Excellent manoeuvrability
- No need for separate rudders, long shaftlines and stern thrusters
- Space savings
- Improved environmental friendliness
- Reduced noise and vibrations

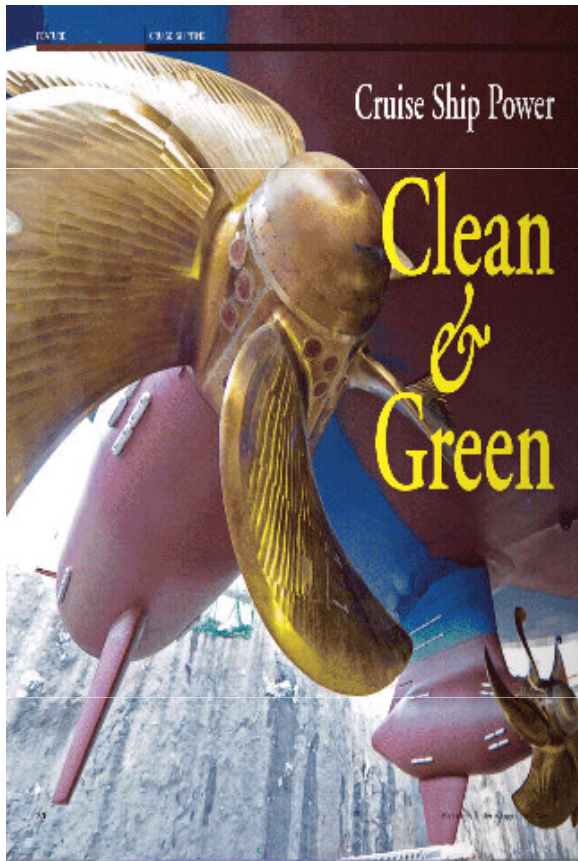
Benefits of Azipod® System



Compared to shaftline systems Azipod propulsion provides:

- Improved safety and redundancy
- Improved fuel efficiency and reduced life cycle cost
- Most environmental friendly propulsion system
- Remarkably improved comfort onboard
- Excellent characteristics in ice operation
- Easier general arrangement and more payload
- Straightforward and fast installation
- Shipbuilding process and investment advantages

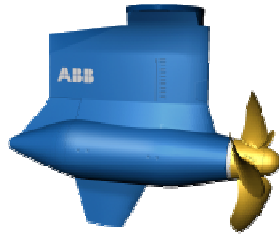
Most Environmental Friendly Propulsion Systems



Maritime Reporter , Feb 2011

- Minimum environmental footprint in production and use of propulsion unit
- Makes the design and building of environmentally friendly ships easier
- Saves fuel due to high internal and hydrodynamic efficiency as well as by using less auxiliary ships
- Reduced environmental risk
- Adaptable to future green energy sources

Development History of ABB Propulsion Products



2011 New Azipod C factory in Shanghai

2010 Order for n:o 100 Azipod vessel,

2008 Azipod XO introduction

2007 New Azipod factory in Helsinki

2004 Azipod CZ deliveries for drilling rig

2001 CRP Azipod introduction

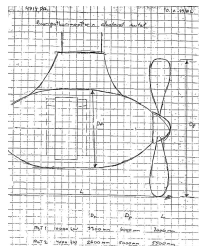
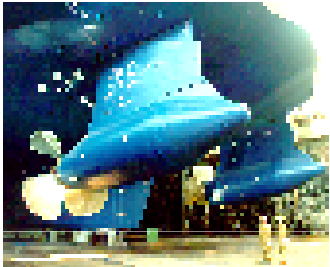
2000 Azipod C introduction

1995 1st Cruise Vessel application, "*Elation*"

1994 1st Icebreaker application "*Röthelstein*"

1989 Prototype installation

1987 Original Azipod Idea



Propulsion Units

Open water applications



- Azipod[®]VO
- Azipod[®]XO
- Open water applications up to 20 + MW



- Azipod[®]CO
- Open water applications 1,3 - 4,5 MW

Propulsion Units

Icegoing applications



- Azipod®VI
- Ice applications for different ice classes
- Delivered power range 0,5 – 16 MW

Propulsion Units

High efficiency applications



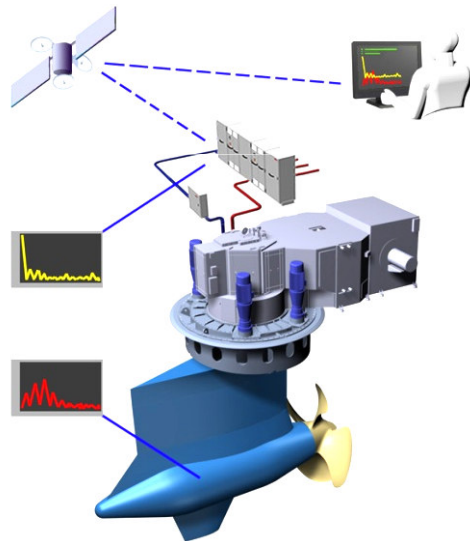
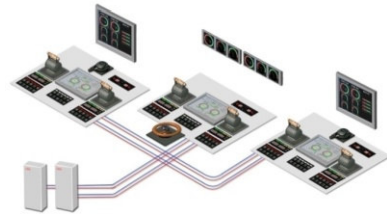
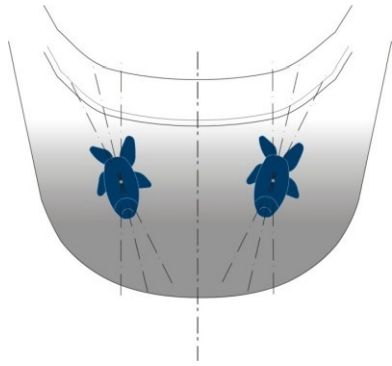
- Azipod[®]XC
- Contra rotating application for high speed vessels
- Up to 100 MW total propulsion power

Thruster Units



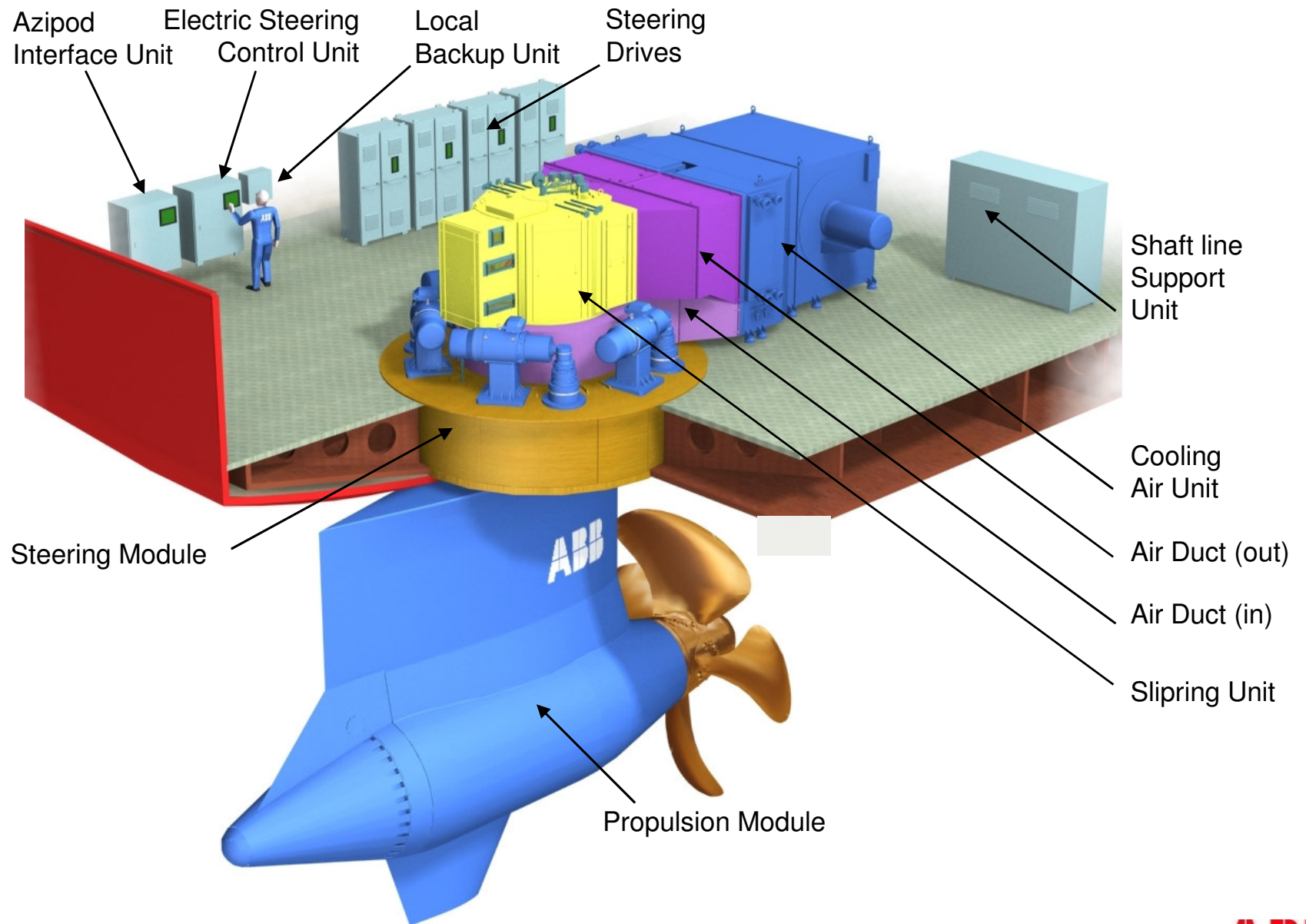
- Azipod®CZ thruster
- Open water applications for thrust up to 60 – 84 tons/unit
- Power range 3,3 – 4,5 MW
- Pushing propeller with a nozzle
- High kN/kW ratio

Azipod XO - System with Inherent Intelligence

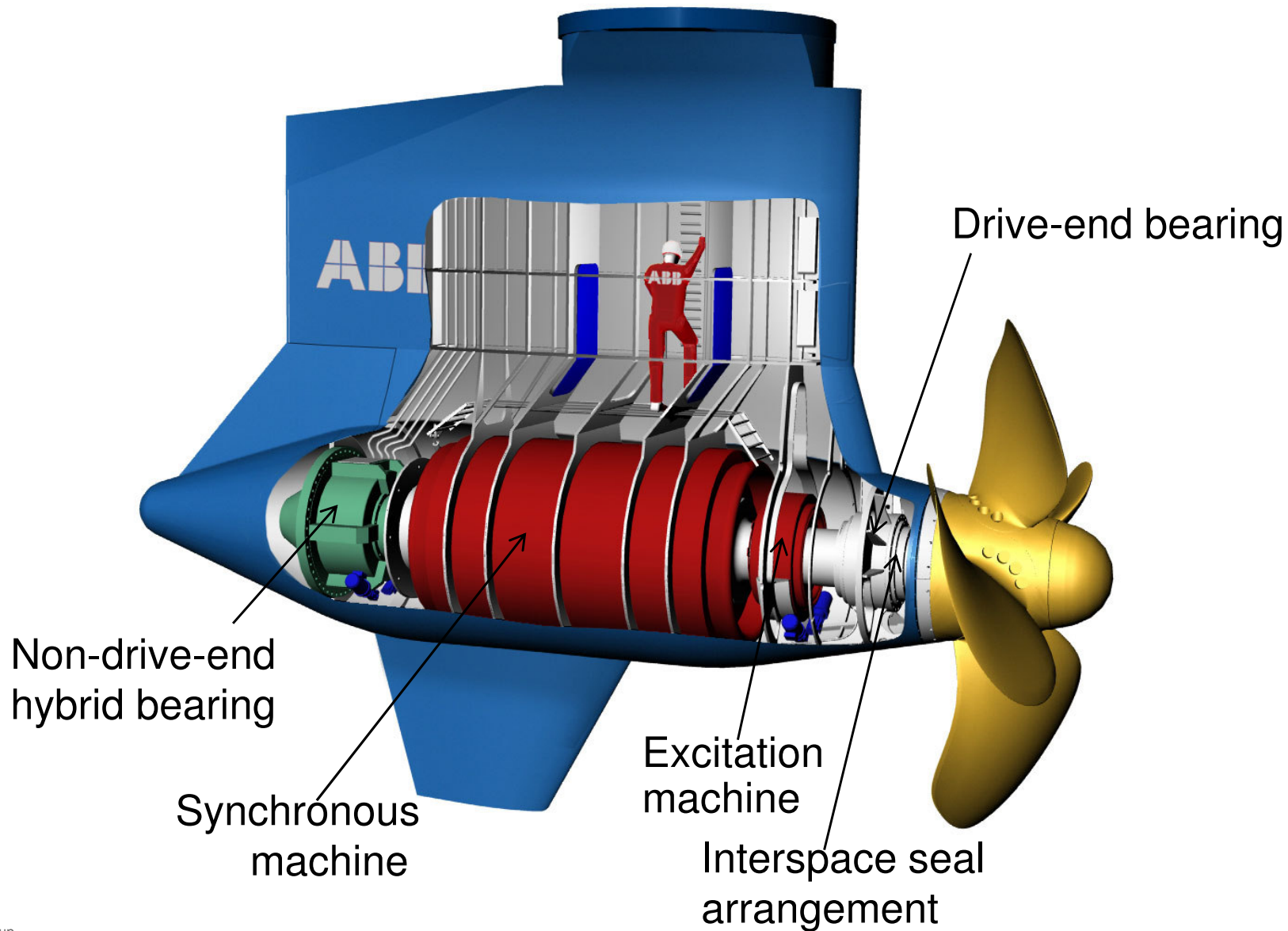


- Azipod Dynamic Optimizer
 - Collects data and optimizes Azipod toe-angle to improve efficiency
- Intelligent Bridge Control Interface
 - Real time information for optimized operating practices
- Propulsion Condition Monitoring System
 - Monitoring of key components for optimized maintenance
 - Enables remote monitoring

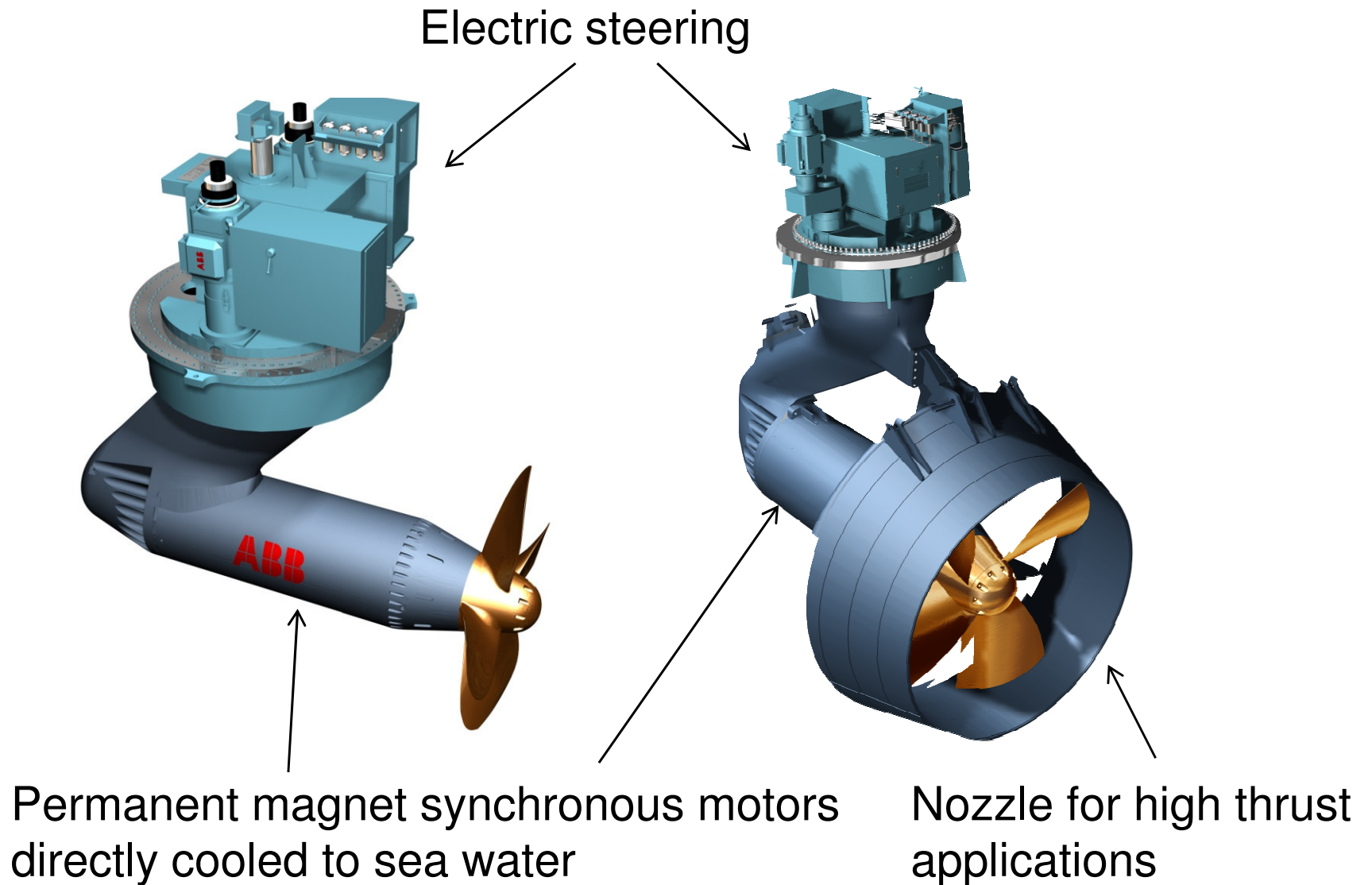
Azipod® XO



Azipod® XO



Azipod[®] CO and Azipod[®] CZ



High Standard Production Facilities

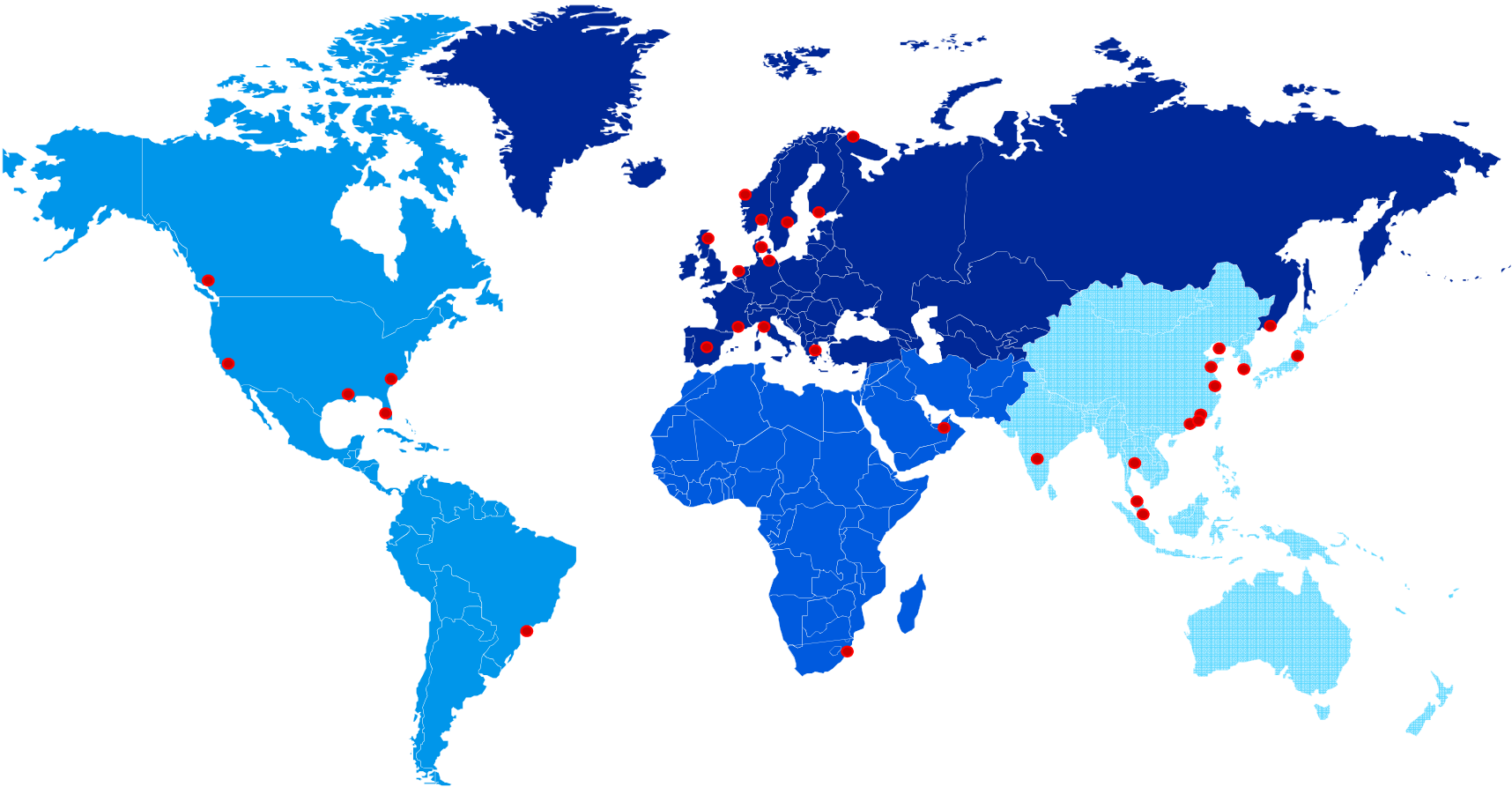


- Production line in Helsinki, Finland
 - Operations started 2007
 - Azipod[®] V , X products



- Production line to in Shanghai China
 - Azipod[®]C products
 - Operations started 2011

Global ABB Marine service network



- 20 Marine Services Centers (MSC)
- 15 Crane Service Centers (CSC)
- ABB Marine and Crane Services

Azipod® Service



- Dedicated Azipod Regional Service Centers to support world wide Marine Service network
- Regional Service Centers
 - Customer contacts
 - Dedicated and specialized Azipod service personnel
 - Capability to technically lead large Azipod service projects
 - Necessary workshops and tooling
 - Azipod service support for other Azipod service locations
 - Service and spare parts sales
- Local Service Centers
 - Customer contacts
 - Service and spare part sales

Azipod[®] Service



Customer event at Azipod service workshop in Houston

- Azipod Regional Service Centers
 - Helsinki, Finland
 - Houston, USA
 - Murmansk, Russia
 - Shanghai, China

Summary of Azipod® References, June 2012

Vessel type	Number
Cruise vessels	52
Ice going vessels Ice breakers, Arctic cargo vessels	27
Ferries	8
Yachts	7
Research vessels	5
Offshore support vessels	5
Other special vessels Pipe layer, Crane vessel, Heavy lift, Patrol vessel, WTI	8
Drilling rigs	2

Total delivered or on order:

- Over 250 Azipod® units
- 114 vessels

Total Propulsion Power: 2 600 MW

Installation at more than 30 different shipyards

About 7 500.000 operating hours



Azipod XO

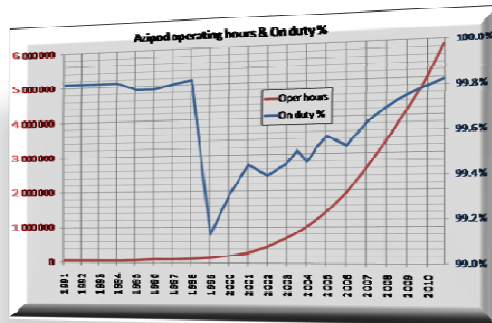


Azipod XC
(CRP)



Azipod CO

Experiences After 7 500 000 Operating Hours



- Deep cooperation with many operators and shipyards have complemented the understanding of Azipod concept
- For most customers Azipod concept exceeds the expectations
- We have identified certain components that are critical for undisturbed operation and they receive meticulous attention
- The technical challenges have been approached by systematic analysis and solved
- Correct operation of the vessel and maintenance according to instructions are essential
- Due to being a new concept the pod propulsion challenges have received much attention in media. However, the reliability of the system is at the same level as with other propulsion concepts
- Essential to have the product responsibility and know-how in one organization, from R&D to service including mechanical, electrical, control and hydrodynamical competence

Power and productivity
for a better world™

