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ABB Marine Academy
Linking people and technology
2013

Welcome to ABB Marine Academy

During my 19 years at ABB I have seen how important training and competence management is for our customers. I have spent most of my time on cruise vessels, oil rigs and ice breakers performing troubleshooting, maintenance and commissioning. We all know what can go wrong if the right competence is missing, but also how well things work when the crew is well trained.

The crew I have worked with over these years all have something in common – they are motivated professionals who need to do their job safely and efficiently, and they need to keep up with changing work requirements and operational technologies. At the same time, our customers' corporate management needs to ensure safe and reliable operations through competence management programs – while managing the company's cost structure and growth strategy.

With that in mind, ABB Marine Academy has set itself two targets: first, we want to provide our customers' crew with the right kind of training that enables them to do their job safely and better; and second, we need to support our

customers' corporate management in reaching their safety and reliability KPIs, and their targets for cost and growth.

In practice, this means we have improved our training portfolio. We offer more product and system courses, and better options for on-site training and coaching. We have also improved our training material to support trainees after the completion of their course, and we have linked our courses to a clear training path. I hope you will recognize these improvements when using our services.

I look forward to hearing from you either by direct contact or via our customer satisfaction surveys, which we follow closely.

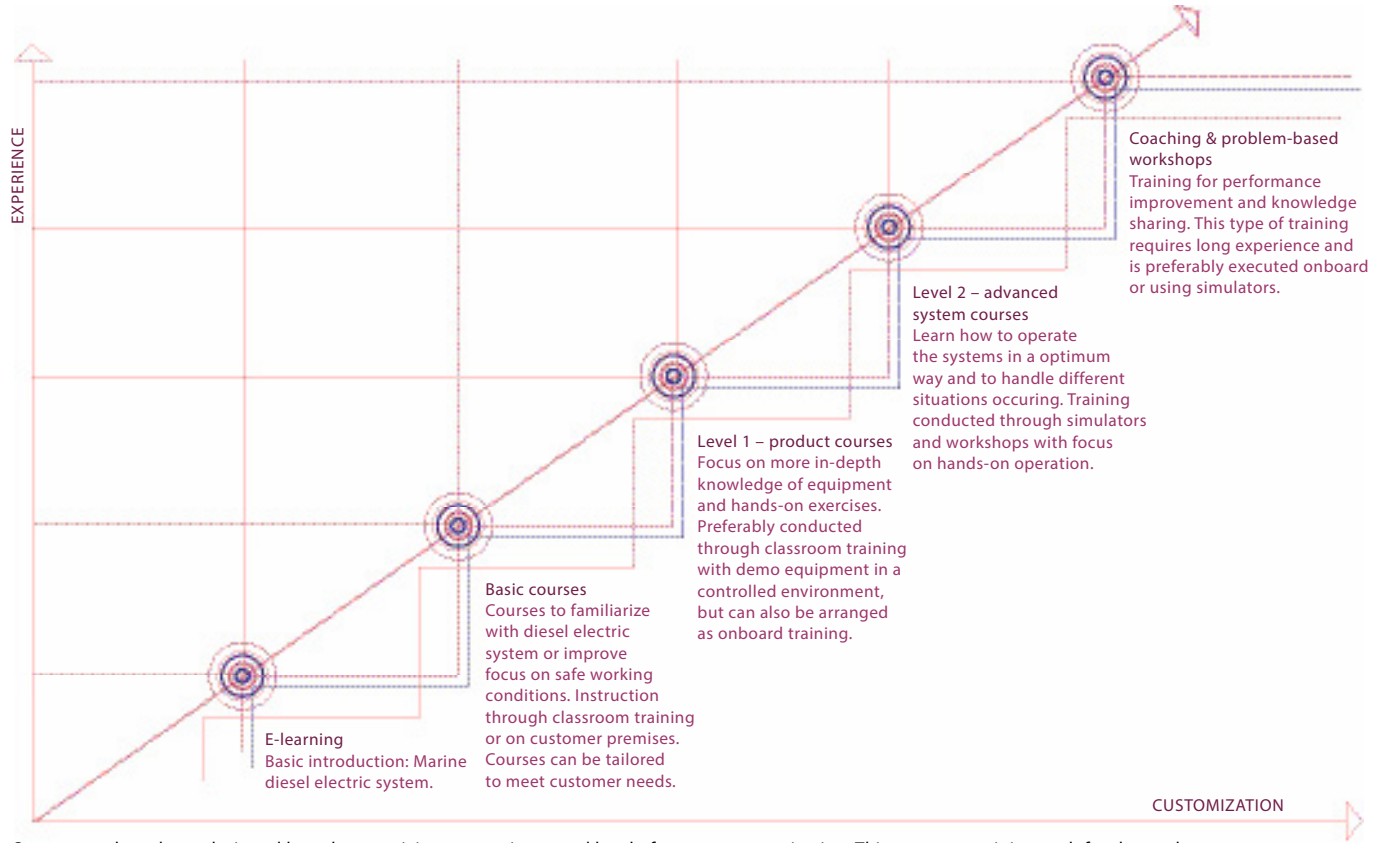


Yours sincerely

A handwritten signature in black ink, appearing to read 'J. Hellgren', written over a horizontal line.

Jukka-Pekka Hellgren
Global Training & Competence Manager
ABB Marine

Training paths



Our courses have been designed based on participant experience and level of content customization. This creates a training path for the students.



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1. Electrical systems

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Marine power plant basics for technical staff



Level: Basic

Duration: 4 days (+½ day for Azipod® if required)

Student profile: Marine engineers and electro-technical personnel at the support and operational level

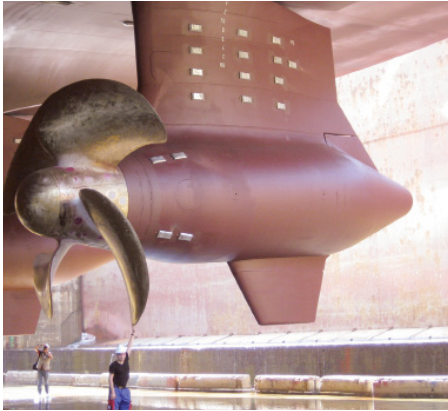
Prerequisites and recommendations: None

Course objectives: Upon completion of this course the participants will have an understanding of a marine power plant's design and function and an understanding of the ABB propulsion system.

Main topics:

- Marine power plant overview
- Regulation principles
- Frequency converters
- Motors & generators
- Basic electrical occupational safety and risk assessment
- Azipod® system overview (if required)

General course for deck staff



Level: Basic

Duration: 4 days

Student profile: Deck personnel at the support, operational and management level

Prerequisites and recommendations: None

Course objectives: The goal of the course is to familiarize the participants with ABB diesel electric Azipod® propulsion basic features including remote control system, power plant and distribution to Azipod® units.

Main topics:

- Diesel electric Azipod® propulsion system main components and their functions
- Power generation, distribution and consumers
- Azipod® propulsion system terminology
- Frequency converter propulsion with power plant overview
- Azipod® units technical overview
- Alarm conditions
- Remote control units and operation
- Bridge backup/emergency operation
- Azipod® occupational safety basics

Propulsion system



Level: 2 - Advanced

Duration: 4 days

Student profile: Marine engineers and electro-technical personnel at the operational and management level

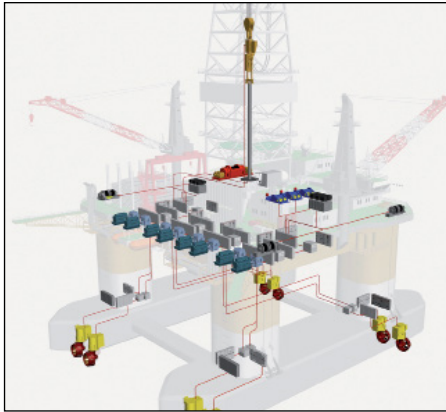
Prerequisites and recommendations: The participant should have fundamental knowledge of vessel operation, and have basic knowledge of Windows XP. Completion of ACS6000 SD/AD marine drive course or similar knowledge is advisable.

Course objectives: Upon completion of this course, students will be able to understand the function of electrical propulsion control systems and operate the maintenance station.

Main topics:

- Electrical propulsion system overview
- Operation of maintenance station
- Software introduction
- Fault tracing and troubleshooting

Drilling system



Level: 2 - Advanced

Duration: 4 days

Student profile: Marine engineers and electro-technical personnel at the operational and management level

Prerequisites and recommendations: Drilling drive system course from ABB or similar knowledge is advisable.

Course objectives: Upon completion of this course the participants will be able to explain the ABB drilling system project configuration and functions of different components. The participants will be able to trace alarms from the process panel down to drives and control components. System backup and recovery will also be discussed.

Main topics:

- System structure and project configuration of ABB drilling drive system
- Project download and signal tracing
- Download DSU/BRU/LCU configuration
- Perform DW/MP/TD start/stop simulation and fault tracing
- System backup and recovery



2. Electrical products courses

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ACS6000c NTY cycloconverter



Level: 1 - Product

Duration: 5 days

Student profile: Marine engineers and electro-technical personnel at the operational and management level

Prerequisites and recommendations: Marine power plant basic course for technical staff in ABB propulsion and marine high voltage safety course or similar knowledge is advisable.

Course objectives: Upon completion of this course, students will be able to understand the drive topology and operation. Students will be able to locate the hardware components, test, measure, troubleshoot and replace the drive's parts when needed, and understand the function of propulsion and drive control.

Main topics:

- Overview of cycloconverter operation principle
- Control system and power system hardware
- Operation and different drive modes
- Propulsion control software
- Cooling principle
- Software tools
- Hands-on training
- Preventive maintenance, troubleshooting and repair
- Life cycle information

ACS6000 SD/AD marine drive



Level: 1 - Product

Duration: 4 days (1 extra day propulsion for LNG customers)

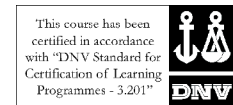
Student profile: Marine engineers and electro-technical personnel at the operational and management level

Prerequisites and recommendations: Marine power plant basic course for technical staff in ABB propulsion and marine high voltage safety course or similar knowledge is advisable.

Course objectives: Students will be able to understand the drive topology, be able to locate hardware components, to verify and replace the drive's parts, and to perform preventive maintenance. They will understand the function of propulsion and drive control (5 day course).

Main topics:

- Function and operation of ACS6000 AD/SD drive
- Function of DriveWindow software
- Preventive maintenance
- Functional description of the propulsion system (5 day course)



SAMI Megastar marine drive



Level: 1 - Product

Duration: 4 days

Student profile: Marine engineers and electro-technical personnel at the operational and management level

Prerequisites and recommendations: Marine power plant basic course for technical staff in ABB propulsion and marine high voltage safety course or similar knowledge is advisable.

Course objectives: The goal of this course is to teach students to operate, maintain and trouble-shoot Megastar W in marine applications. Students will learn how the Megastar is connected to the vessel automation system. The training covers the following types and constructions:

- SAMI Megastar W – single/parallel drive
- Drives with APC-controller

Main topics:

- Hardware and software overview
- Component and board functions
- Reading and interpreting circuit diagrams and part lists
- Control panel functions
- Preventive maintenance
- Fault tracing
- Replacing HV – components
- Using the PC-tools for the Megastar

Operation and maintenance of STADT x-AC-y-z



Level: 1 - Product

Duration: 4 days

Student profile: Marine engineers and electro-technical personnel at the support and operational level.

Prerequisites and recommendations: Marine power plant basic course for technical staff in ABB propulsion or similar knowledge is advisable.

Course objectives: Upon completion of this course, students will be able to locate the hardware components, to verify and replace the drive's parts and to perform preventive maintenance.

Main topics:

- In-depth theory of the Stadt x-AC-y-z drive principles
- Hardware description
- Software introduction
- Water cooling system
- Operation
- Fault-tracing and troubleshooting

PSR-cycloconverter marine drive



Level: 1 - Product

Duration: 4 days

Student profile: Marine engineers and electro-technical personnel at the operational and management level

Prerequisites and recommendations: Marine power plant basic course for technical staff in ABB propulsion and marine high voltage safety course or similar knowledge is advisable.

Course objectives: Students will be able to understand the drive topology and operation. Students will be able to locate the hardware components, test, measure, troubleshoot and replace the drive's parts when needed. They will understand the function of propulsion and drive control.

Main topics:

- Overview of cycloconverter operation principle
- Control and power system hardware
- High speed circuit breakers (operation and maintenance)
- Excitation system (brush/brushless)
- Operation and different drive modes
- Propulsion control software
- Cooling principles
- Software tools
- Hands-on training
- Preventive maintenance, troubleshooting and repair

Drilling drive system course



Level: 1 - Product

Duration: 5 days

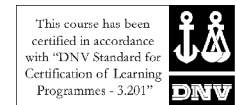
Student profile: Marine engineers and electro-technical personnel at the operational and management level

Prerequisites and recommendations: Basic knowledge of electronics, AC drive, process control system and experience with Microsoft Windows is advisable.

Course objectives: Upon completion of this course the participants will be able to locate hardware components, verify and replace ACS800 liquid-cooled supply, inverter and cooling units. The participants will also be able to perform basic trouble-shooting of the AC800M drilling drive control system.

Main topics:

- Construction and function of ACS800LC marine drive
- Function of DriveWindow software
- System function of ABB drilling drive system
- AC800M control system and software
- Preventive maintenance
- System recovery



HV power distribution system – general



Level: 1 - Product

Duration: 5 days

Student profile: Marine engineers and electro-technical personnel at operational and management level

Prerequisites and recommendations: Marine power plant basic course for technical staff in ABB propulsion and marine high voltage safety course or similar knowledge is advisable.

Course objectives: Upon completion of this course students will be able to understand the structure and operation of marine power plant and safely operate and maintain diverse marine high voltage switchgears.

Main topics:

- Switchboards
- Functional characteristics and performance of protection system
- Safe operation, maintenance and testing of switchgear (circuit breaker, contactor)
- Basic trouble shooting
- Power plant regulation principle
- Power distribution system overview (transformers, generators and motors)

HV power distribution system – ZS1 Unigear



Level: 1 - Product

Duration: 4 days

Student profile: Marine engineers and electro-technical personnel at the operational and management level

Prerequisites and recommendations: Marine power plant basic course for technical staff in ABB propulsion and marine high voltage safety course or similar knowledge is advisable.

Course objectives: Participants will be able to understand the basic functioning of marine power distribution as well as safely operate and maintain UniGear switchgear, gas & vacuum circuit breaker, vacuum contactor and protection relay.

Main topics:

- Marine HV distribution system
- Power plant regulation principles
- Functional characteristics and safety features of the UniGear switchboard
- Structure and working principles of gas and vacuum circuit breakers
- Operation of circuit breakers and vacuum contactors
- Operation of protective relays and interfacing to computer software (optional)

This course has been certified in accordance with "DNV Standard for Certification of Learning Programmes - 3.201"



LV power distribution system



Level: 1 - Product

Duration: 4 days

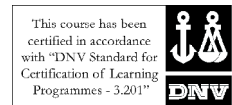
Student profile: Marine engineers and electro-technical personnel at the support, operational and management level

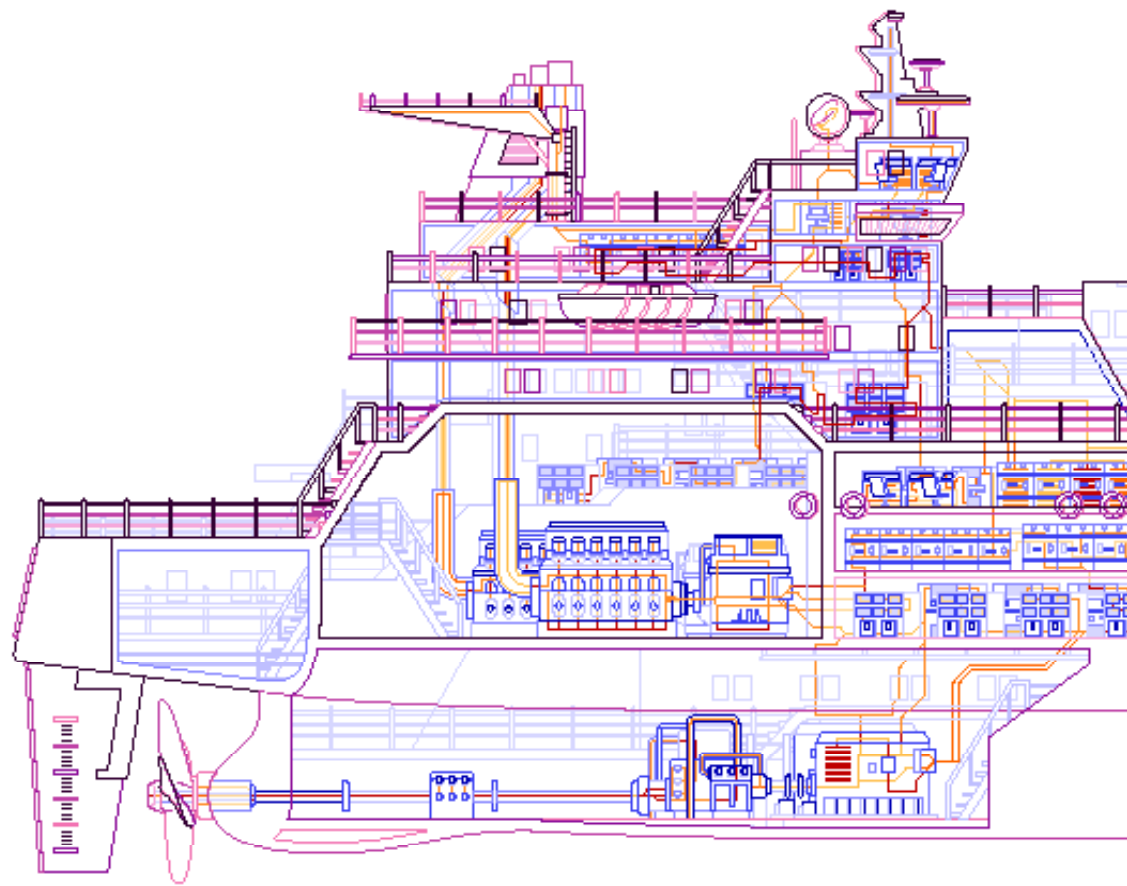
Prerequisites and recommendations: None

Course objectives: Participants will be able to understand the functions of various low voltage protection devices as well as safely operate and maintain switchgear, circuit breakers, protection relays and softstarters. They will also be able to manage the risks of working with electric switchgear and adopt safe working methods in a marine environment.

Main topics:

- General marine power plant
- Generators, motors and transformers overview
- LV switchboard MNS
- Air circuit breakers and molded case circuit breakers
- Softstarters
- Low voltage safety and hazards
- Treatment of electrical injuries and first aid



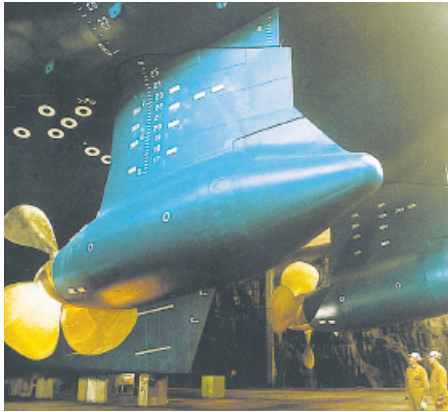




3. Azipod® propulsion

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Azipod® V* technical training



Level: 1 - Product

Duration: 5 days

Student profile: Marine engineers and electro-technical personnel at the operational and management level

Prerequisites and recommendations: Marine power plant basic course for technical staff in ABB propulsion and Azipod® space safety course are advisable.

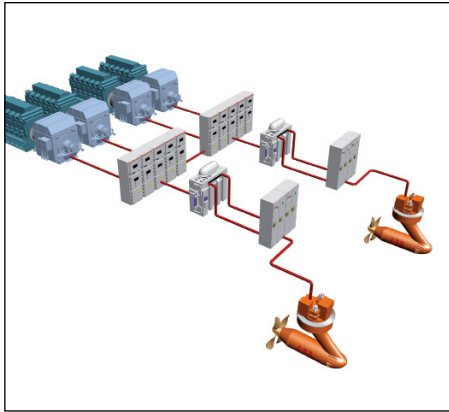
Course objectives

To describe the functions of the sub systems of Azipod® system. Importance of correct maintenance, monitoring possibilities and how to troubleshoot systems and perform adjustments on specific system components.

Main topics:

- Diesel electric Azipod® propulsion system main components and their functions
- Terminology and evolution of Azipod® propulsion
- Slipring unit technology and maintenance
- Power and data transmission system
- Encoder signal fault tracing
- Hydraulic steering gear and steering angle feedback
- Hydraulic pump & motor fault procedures and adjustments
- The ASU360 servo unit settings
- Review of safety aspects inside the Azipod®

Azipod® C technical training



Level: 1 - Product

Duration: 5 days

Student profile: Marine engineers and electro-technical personnel at the operational and management level

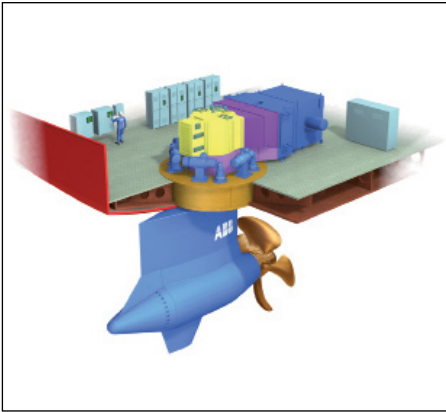
Prerequisites and recommendations: Participants should have attended the marine power plant basic course for technical staff in ABB propulsion and Azipod® space safety course.

Course objectives: Upon completion of this course the participants will have advanced knowledge of Azipod® C system, understand the functioning of propulsion and drive control, operate and maintain ACS800 Azipod® C drive systems, and trace and correct basic faults.

Main topics:

- Azipod® C propulsion system structure
- Drive control and electrical steering gear
- Construction and function of ACS800 single drive and ACS800LC drive
- Fault tracing methods, exchanging the parts and modules
- Theory and exercises on the drive and controller PC tool programs

Azipod® X technical training



Level: 1 - Product

Duration: 5 days

Student profile: Marine engineers and electro-technical personnel at the operational and management level

Prerequisites and recommendations: Marine power plant basic course for technical staff in ABB propulsion and Azipod® space safety course are advisable.

Course objectives

Participants will be able to describe the functions of the different sub-systems of the Azipod® propulsion system and how they interact. They will understand the importance of correct maintenance, be able to describe the monitoring possibilities and how to troubleshooting systems and perform adjustments on specific system components.

Main topics:

- Terminology and evolution of Azipod® propulsion
- ACS800 steering gear drive programming, adjustment and troubleshooting
- Electric steering gear
- Slipring unit technology and maintenance
- Power and data transmission system
- Encoder signal fault tracing
- Steering angle feedback assembly
- Review of safety aspects inside the Azipod®

Azipod® vessel operation, operational level



Level: 2 - Advanced/coaching

Duration: 3 days

Student profile: Azipod® vessel deck personnel at operational level

Prerequisites and recommendations: Experience of watch keeping on modern, preferably Azipod® vessels, and of bridge simulator training.

Course objectives: Upon completion of this training, the participants will be familiar with the operational principles of diesel-electric (DE) Azipod® propulsion systems taking into account vessel safety, passenger comfort and environmental and economical requirements.

This workshop is run in conjunction with an approved maritime simulation center.

Main topics:

- Azipod® vessel operation with emphasis on pilot voyage and harbor maneuvers
- Azipod® vessel system functionalities and power plant behavior in different conditions
- Effects of power plant and propulsion system malfunctions

Azipod® vessel operation, management level



Level: 2 - Advanced/coaching

Duration: 5 days

Student profile: Azipod® vessel deck personnel at management level.

Prerequisites and recommendations: Several years experience of Azipod® vessel operations.

Course objectives

Upon completion of this training, the participants will have full understanding of the operational principles of diesel-electric Azipod® vessels taking into account vessel safety, passenger comfort, environmental and economical requirements and operational efficiency and maintenance needs.

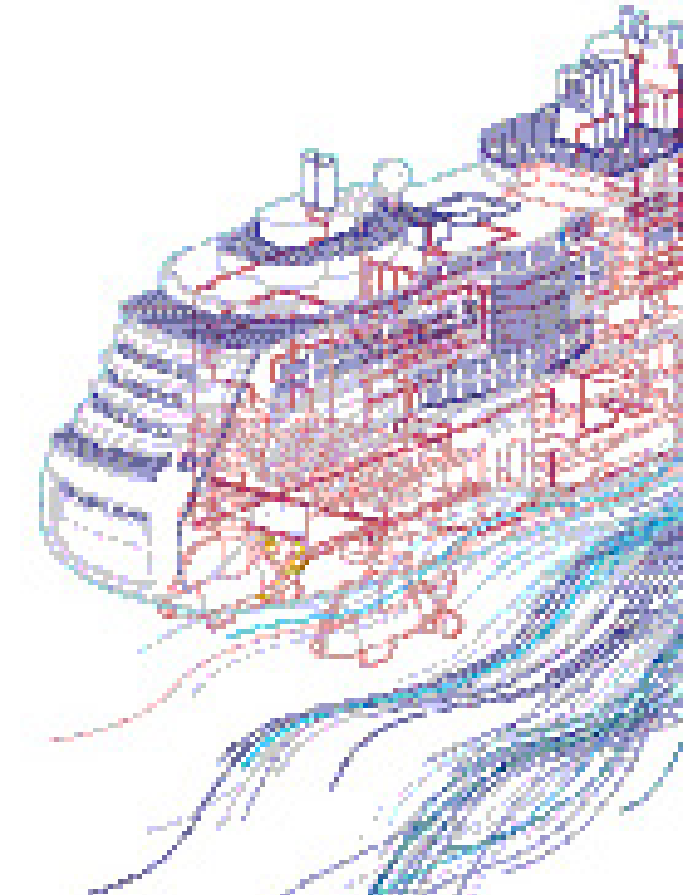
They will be able to utilize the flexibility of the propulsion system and identify potential malfunctions of the propulsion system, and cope with them without sacrificing vessel safety. Clear and concise bridge communication is emphasized.

This workshop is run in conjunction with an approved maritime simulation center.

Main topics:

NOTE: the actual content of each workshop is finalized according to the needs and requests of the company and the participants. Potential main topics include the following:

- Azipod® vessel operation and propulsion system behavior in all conditions
- Azipod® vessel system functionalities, power plant and propulsion system malfunctions
- Azipod® vessel resource management and bridge communication





4. Automation

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Master Advant OCS automation training for operators - Operation and diagnostic



Level: 1 - Product

Duration: 3 days

Student profile: Marine engineers and electro-technical personnel at the support and operational levels

Prerequisites and recommendations: None

Course objectives: The goal of this course is to learn how to operate the Advant automation system and how to use the Advant operator station, in order to understand the system philosophy and process alarms. The aim is to reduce decision time by using the marine automation process controls properly.

Main topics:

- Advant IAMCS philosophy, products overview
- System layout and basic system configurations and setup
- Connection principles of the input and output signals with an automation system
- Operator stations and X-terminals handling through AdvaCommand suite (mimic displays, trend charts, alarms and events)

Master Advant OCS automation training for maintenance users - System diagnostic and troubleshooting



Level: 2 - Advanced

Duration: 5 days

Student profile: Marine engineers and electro-technical personnel at support and operational level.

Prerequisites and recommendations: Students should know the fundamentals of working with automation control systems. Master Advant OCS automation training for operators - operation and diagnostic is advisable.

Course objectives: Upon completion of this course the participants will be able to understand the philosophy of an up-to-date automation system, fully use all operator functionalities in order to maximize productivity, troubleshoot common issues reducing decision time, perform engineering activities for runtime operations and optimize the process.

Main topics:

- Advant IAMCS philosophy, products overview and life-cycle
- System layout and hardware configurations and setup
- AC400 / MasterPiece PLC programming
- System maintenance
- Engineering, diagnosis and troubleshooting

Marine 800xA automation training for operators - Operation and diagnostic



Level: 1 - Product

Duration: 3 days

Student profile: Marine engineers and electro-technical personnel at the support and operational levels

Prerequisites and recommendations: None

Course objectives: Upon completion of this course the participants will be able to understand all process alarms and events, use alarms for fault tracing, optimize equipment use in normal operation and understand and control the automation process

Main topics:

- 800xA IAMCS philosophy, products overview
- Basic configuration principles of a client/server system
- System layout and basic system configurations and setup
- Connection principles of the input and output signals with an automation system
- Operator workplace handling through 800xA suite (mimic displays, trend charts, alarms and events)

Marine 800xA and AC800M automation training - System diagnostic and troubleshooting



Level: 2 - Advanced

Duration: 5 days

Student profile: Marine engineers and electro-technical personnel at the support and operational levels

Prerequisites and recommendations: Students should know the fundamentals of working with automation control system. Marine 800xA automation training for operators - Operation and diagnostic is advisable

Course objectives: Upon completion of this course the participants will be able to understand the philosophy of an up-to-date automation system, fully use all operator functionalities in order to maximize productivity, troubleshoot common issues reducing decision time, performing engineering activities for run-time operations and optimize the process

Main topics:

- 800xA IAMCS philosophy, products overview and life-cycle
- IT architectures on ferry and cruise applications
- Microsoft-based IT devices
- AC800M PLC programming and OPC protocol
- System maintenance
- Engineering, diagnosis and troubleshooting

PMS800 course for power management system



Level: 1 - Product

Duration: 2 days

Student profile: Marine engineers and electro-technical personnel at support and operational level

Prerequisites and recommendations: Basic knowledge of power generation process. Marine power plant basic course for technical staff in ABB propulsion or similar knowledge is advisable.

Course objectives: Upon completion of this course the participants will understand PMS functionalities in order to maximize productivity and troubleshoot common issues to reduce decision time. They will also perform engineering activities for runtime operations and optimize the process. In addition they will be able to manage and understand alarms, events, trends and navigate in the PMS process display and functionalities.

Main topics:

- System layout, hardware configurations and setup
- Power plant process principles
- Diagnosis and troubleshooting

DEGO II and III electronic governor systems



Level: 1 - Product

Duration: 3 - 5 days

Student profile: Marine engineers and electro-technical personnel at the operational and management level

Prerequisites and recommendations: Marine power plant basic course for technical staff in ABB propulsion is advisable. Basic electrical knowledge is required.

Course objectives: Upon completion of this course, students will be able to understand and identify abnormal behavior of the DEGO systems, locate faults in the different units, repair by replacement, perform calibrations and make fine tunings to the system. They will also be able to perform basic maintenance and repairs on ASAC actuators.

Main topics:

- Basic theory of electronic governors
- Generator application
- ASAC actuators
- ABB DEGO II and III governor concept
- Trouble shooting techniques and repair
- Practical exercises

AC800M applications for LNG, tanker and drilling



Level: 1 - Product

Duration: 4 days

Student profile: Electro-technical personnel at the operational level

Prerequisites and recommendations: Students should know the fundamentals of working with automation control systems and Microsoft Windows. Knowledge of ABB drives or similar is advisable.

Course objectives: Upon completion of this course, the participant shall be able to conduct troubleshooting as well as performing backup and recovery of the AC800M control system used in the Marine environment.

Main topics:

- System function of AC800M in Marine application
- AC800M system structure and the function of different components
- Exchange AC800M hardware
- Connect to Process Panel HMI
- Connect to ABB drive units
- System backup and recovery

Marine 800xA and AC400 automation training - System diagnostic and troubleshooting



Level: 2 - Advanced

Duration: 5 days

Student profile: Marine engineers and electro-technical personnel at the support and operational level

Prerequisites and recommendations: Students should know the fundamentals of working with automation control systems. Marine 800xA automation training for operators - operation and diagnostic is advisable.

Course objectives: Upon completion of this course the participant will be able to understand the philosophy of an up-to-date automation system, fully use all operator functionalities in order to maximize productivity, troubleshoot common issues to reduce decision time, perform engineering activities for run-time operations and optimize the process.

Main topics:

- 800xA IAMCS philosophy, product overview and life-cycle
- IT architectures on ferry and cruise applications
- Microsoft-based IT devices
- Industrial IT suite
- AC400 PLC programming and system connection
- System maintenance
- Mimic pages, alarms, events, trends and historical data



5. Safety

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Marine high voltage safety



Level: Basic

Duration: 5 days

Student profile: All deck, engine and electro-technical personnel dealing with high voltage areas.

Prerequisites and recommendations: None. However Marine power plant basic course for technical staff in ABB propulsion or similar knowledge is an advantage

Course objectives: This course fosters an awareness of the risks and hazards involved in working with high voltage marine electrical installations, how to deal with these risks and how to improve the readiness in the case of an emergency situation.

Main topics:

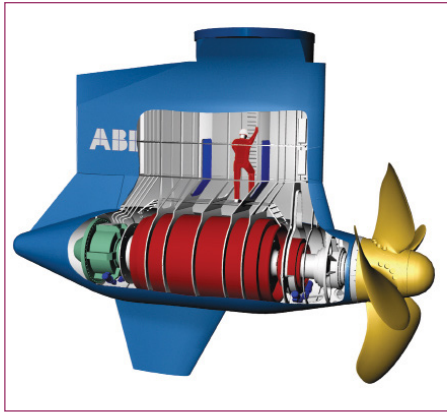
- Safety culture, rules and procedures
- Fundamentals of electricity and power
- Special considerations for off-shore installations
- Dangers of electricity and arc-faults in switchgears
- Personal protective equipment
- Hazardous locations and risk management
- Accident analysis and first aid



This course has been certified in accordance with "DNV Standard for Certification of Learning Programmes - 3.2011"



Azipod® space safety



Level: Basic

Duration: 3 days

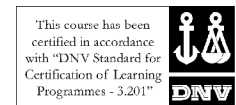
Student profile: All deck, engine and electro-technical personnel responsible for Azipod® entry operations and those personnel who conduct Azipod® space maintenance.

Prerequisites and recommendations: Satisfactory health condition to be able to work inside a confined space

Course objectives: Be able to identify the different hazards and possible consequences when working inside the Azipod® space; enter and work safely inside the Azipod® space; understand duties and responsibilities of confined space personnel; assist during an emergency situation.

Main topics:

- Azipod® as an engineering system
- Occupational risks with the Azipod®
- Confined space regulation
- Rescue operations and duties of involved personnel
- Typical Azipod® entries and entry procedures
- Traumatology (first aid in a confined space)
- Use of protective equipment required for safe entry
- Entering and evacuating an injured entrant from the Azipod® space-simulator



General terms and conditions

Course price includes:

- A qualified instructor with up-to-date technical knowledge and teaching experience
- Training room with infrastructure and training equipment
- Lunch, coffee and refreshments
- Training documentation

Application

In order to arrange and supply the scope of the course, the purchase order and time schedule should be confirmed by the customer 4 weeks prior to the starting date of training.

Travel and accommodation costs

Airline tickets, travel time, accommodation, local transportation of the participants and meals except lunch are not included in the price. ABB Marine Academy can assist in handling accommodation and local transport. These expenses will be charged based on costs + 10% administration fee.

Changes

ABB Marine Academy reserves the right to change names of instructors, and modify the program and contents within scope of the course.

Cancellation

In case of cancellation please advise us as soon as possible. Please note that if a participant is unable to attend the course within the cancellation period the booking can be used by another person within the company.

- Cancellation 7 - 14 working days prior to the course schedule: 50% of course fee will be charged
- Cancellation less than 7 working days prior to the course schedule: 100% of course fee will be charged

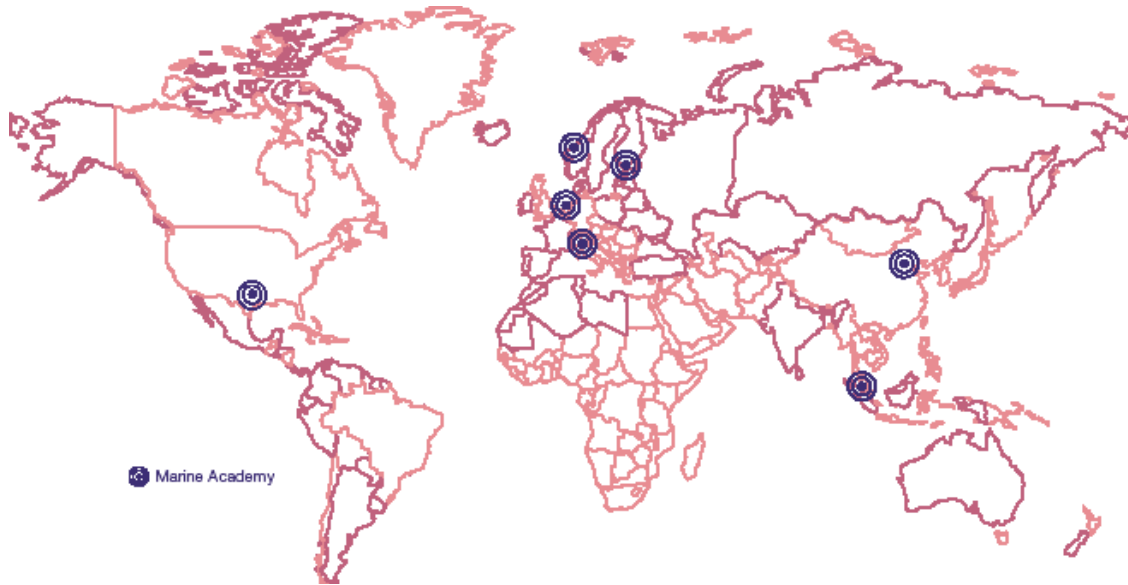
Azipod vessel operation courses cancellation clause:

- 4-6 weeks before scheduled course: 50% of course fee will be charged
- Less than 4 weeks before scheduled course: 100% of course fee will be charged

Requirements for training in locations other than ABB Marine Academy premises

Please see ABB Marine Academy Guidelines sent together with quotation for more details.

ABB Marine Academy current locations



 Marine Academy

Marine service centers:

NAM
North America
Miami
Houston (Academy)

SAM,
South America
Sao Paolo
Rio de Janeiro

NEU
North Europe
Oslo
Ulsteinvik (Academy)
Helsinki (Academy)
Copenhagen
Aberdeen
Murmansk

CEU
Central Europe
Rotterdam (Academy)
Hamburg

MED
Mediterranean
Genoa (Academy)
Marseille
Madrid
Athens

IMA
India, Middle East & Africa
Abu Dhabi
Bangalore
Durban

NAS & SAS
Asia & Oceania
Singapore (Academy)
Shanghai
Beijing (Academy)
Osaka
Busan