

The background of the slide is a composite image. In the foreground, a hand is holding a white smartphone. In the background, there is a laptop and a globe. The entire scene is overlaid with a semi-transparent grid pattern. The text 'ABS Technology' is centered over this background.

ABS Technology

James Bond

Vice President, Marine Technology

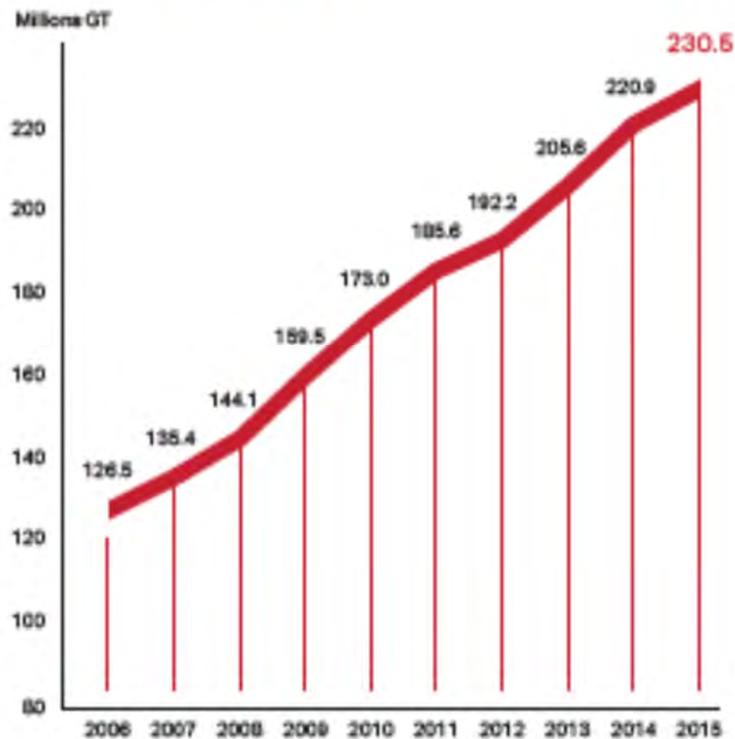
6 July 2016

University of British Columbia

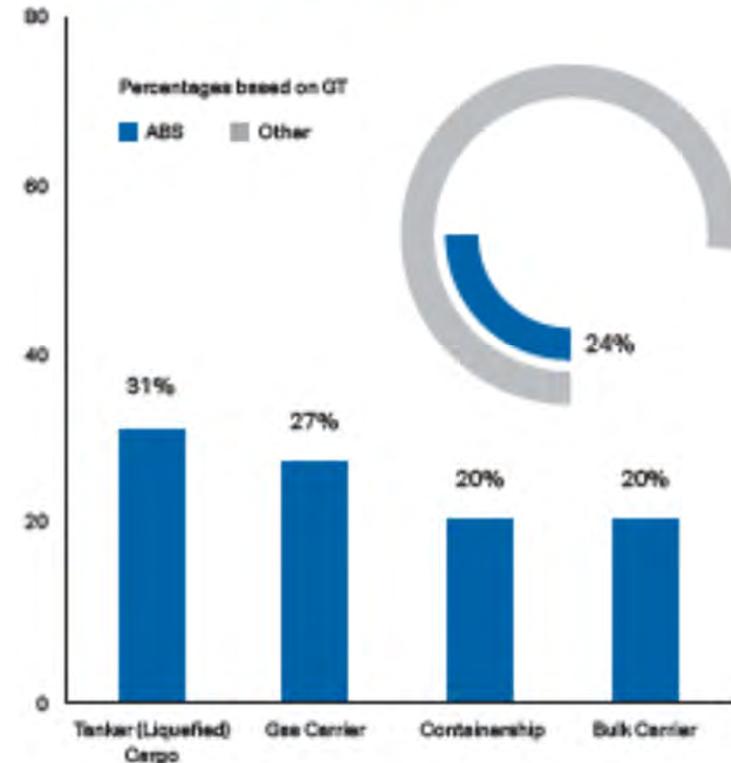
ABS Highlights

- ABS is one of the world's leading Classification Societies
- Strong market growth based on a Class centric business model

EXISTING FLEET 2015

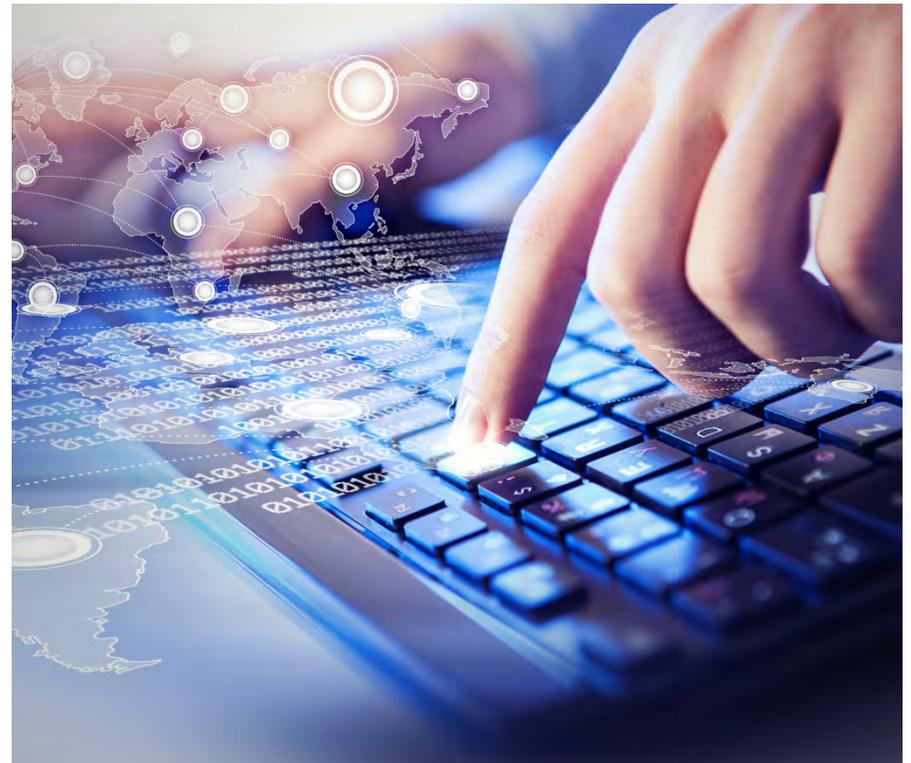


ORDERBOOK SHARE 2015



ABS Technology: Solving Challenges

- Technology advancing at unprecedented rate in marine and offshore industries
- ABS is positioned and prepared to solve challenges of today and tomorrow
 - Energy efficiency
 - HPHT drilling technology
 - Managed pressure drilling & other advanced drilling techniques
 - Cyber security & cyber safety
 - Software integrity
 - Data management & data analytics
 - Risk-informed decision making
 - Environmental performance
 - Human factors & ergonomics



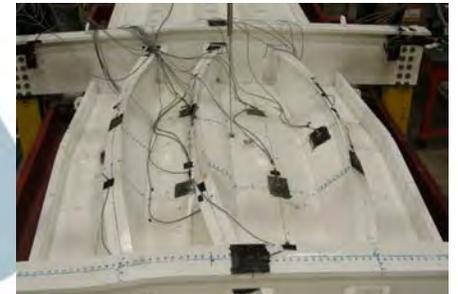
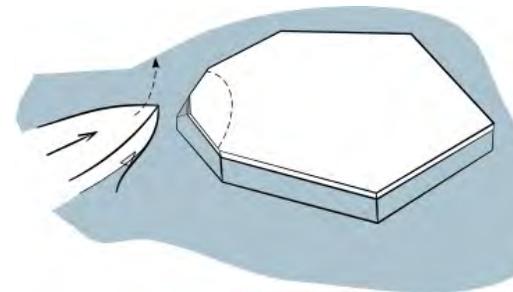
ABS Technology Organization

- Global organization with industry-leading technical experience
- Delivering products & service lines that will define future of classification for years to come
- Helps identify & solve the current & future needs of members, clients & the Marine and Offshore industries



ABS Harsh Environment Technology Center

- Established in 2010 as a partnership with Memorial University of Newfoundland (MUN)
- MUN selection recognizes it as a centre of excellence in Arctic and cold environment research and the capabilities of its faculty
- ABS has, to date, funded approximately C\$1 million in research
- HETC R&D activities are aligned within several major focus areas.
 - Ice-ship interaction
 - Ice actions on offshore structures
 - Winterization (ships and offshore)
 - IMO Polar Code Implementation
 - Human factors in extreme environments
 - Support to ABS Canada business



Top 10 Priorities Identified by Clients

1. Cyber Safety
2. Structural Health Monitoring of Machinery & Systems (Asset Integrity Management)
3. New Technologies for Survey & Non-Intrusive NDT
4. Shaft Alignment Recommendations & Requirements; Analytical Tools & Service
5. Supply Chain Management (Reliability and Traceability)
6. Materials & Component Failures / Lessons Learned Database to Aid Root Cause Analysis and Repair, Maintenance & RBI
7. Managing Ballast Water Treatment and Implementation of Ballast Water Convention
8. Reduction of Onboard Noise (Health & Safety)
9. Helping Crews Deal with Complexity
10. Hull & Propulsion Improvement



2016 Technology Themes

Solutions Supporting Class

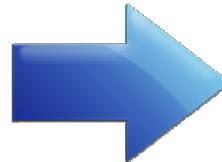
- Expand / improve quality & delivery of service in strategic sectors
- Qualification process for new tools & technologies
- Risk & reliability
- Human factors & ergonomics
- Structure, equipment & systems



2016 Technology Program – and Beyond

Solutions Supporting Class

- Expand/improve quality & delivery of service in strategic sectors
- Qualification process for new tools & technologies
- Risk & reliability
- Human factors & ergonomics
- Structure, equipment & systems



Class of the Future

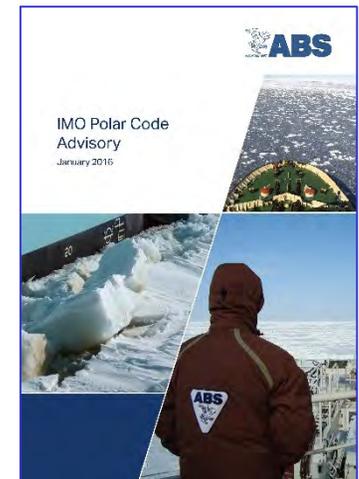
- Data management & analytics (risk-informed decision making)
- Cyber security & software integrity
- Asset integrity management
- Energy efficiency & environmental performance
- Enabling technologies

iSMART Direction: Marine Safety

Lead with World Class Expertise

- Regulatory Compliance
- Structure, equipment & systems
- Qualification process for new tools & technologies
- Risk & reliability
- Human factors & ergonomics

- Safety is core to the ABS Mission
 - *The mission of ABS is to serve the public interest as well as the needs of our members and clients by promoting the security of life and property and preserving the natural environment.*
- ABS works closely with IMO (via IACS) on regulatory issues
- ABS Arctic Navigation
 - ABS IMO Polar Code Advisory
 - ABS Polaris
 - Winterization (risk based & pragmatic)
- Continuing research areas
 - SAR equipment, personnel protection
 - structural capacity of non-ice classed ships
 - Opportunities for collaboration exist



iSMART Direction: Green Ship Technologies

Enabling & Enhancing the State of the Art

- **Structure, equipment & systems**
- **Qualification process for new tools & technologies**
- **Risk & reliability**
- Human factors & ergonomics

- Alternative fuels and alternative propulsion arrangements
- ABS Guides, Guidance Notes & Advisories
 - Guide for LNG Ready Fuels
 - Guide for Propulsion and Auxiliary Systems for Gas Fueled Ships
 - Bunkering of LNG fueled Marine Vessels in North America
- Continuing research areas
 - Advanced power systems and equipment (hybrid electrical power, energy storage, DC power systems, advanced power systems, fault ride thru testing)
 - ABS Advisory & GN imminent
 - Opportunities for collaboration exist!

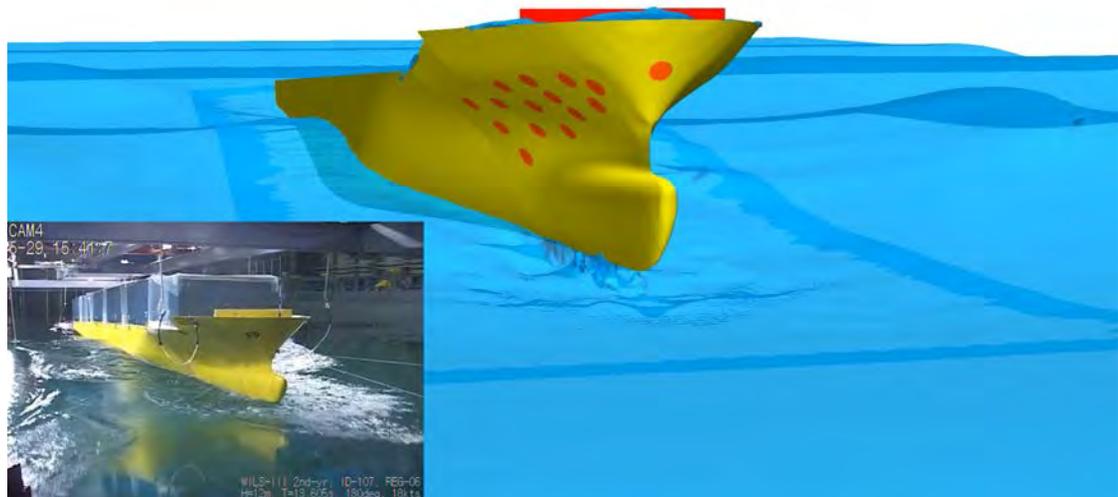


iSMART Direction: Simulation based Design

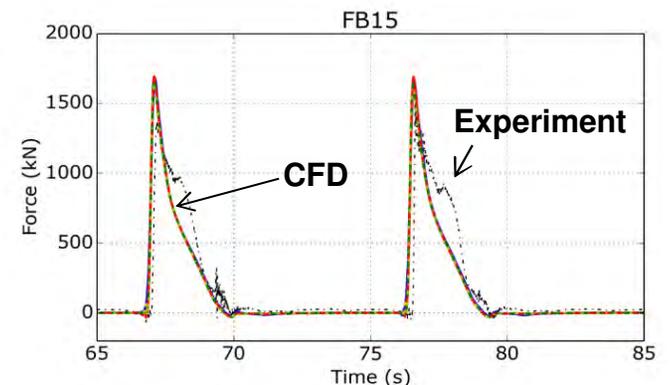
Creating and Validating World Class Expertise

- Structure, equipment & systems
- Qualification process for new tools & technologies
- Creating tools for design validation of tools
- Risk & reliability

- CFD applications help ABS better understand hydrodynamic loading on structures & propulsion performance



- Propulsive efficiency
- Seakeeping, added resistance, sea margin
- Slamming
- Propeller, thruster optimization
- Bulb optimization



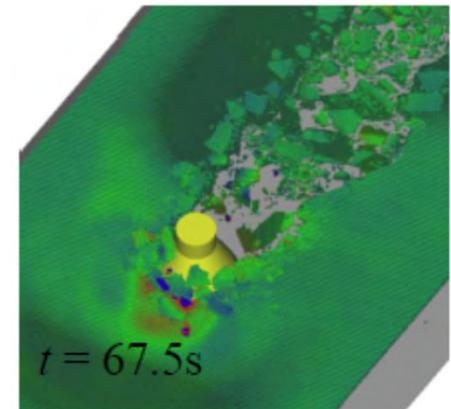
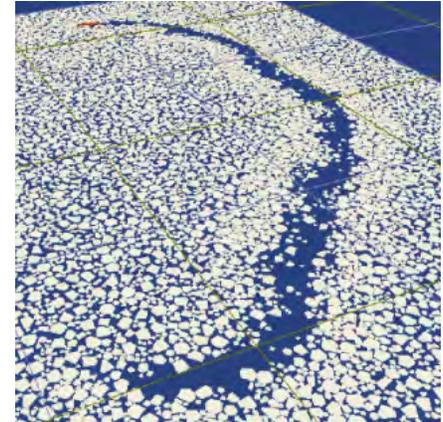
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Creating and Validating World Class Expertise

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- Ice loads on Offshore Structures

- GEM ice management simulation (custom, one-of-a-kind software, MUN led project with strong on-going support from ABS and industry
- DEM ice loads (high concentration, ridges and rubble) correlating well with measured data and design codes. ABS funded Dalian University programming effort.



- Continued research areas

- Ice loads on floating structures (GEM and DEM)
- Opportunities for collaboration exist!

Fostering Technology Innovation: University Partners

ABS supports endowed academic chairs at eight campuses worldwide:

- Chair of Naval Architecture and Marine Engineering and ABS Chair of Marine Transportation at the State University of New York Maritime College
- School of Maritime Policy and Management at California Maritime
- Chair of Metallurgical and Materials Engineering at Colorado School of Mines
- Chair in Ocean Engineering at University of California Berkeley
- Professor in Marine and Offshore Design Performance at University of Michigan
- Chair of Naval Architecture and Marine Engineering at Webb Institute
- Distinguished Chair at the Singapore University of Technology and Design

JOINT RESEARCH PROJECTS WITH THE FOLLOWING UNIVERSITIES

KOREA MARITIME UNIVERSITY
CARNEGIE MELLON UNIVERSITY
DALIAN UNIVERSITY OF TECHNOLOGY
TEXAS A&M UNIVERSITY
WUHAN UNIVERSITY OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
MEMORIAL UNIVERSITY OF NEWFOUNDLAND
NEW YORK MARITIME
PUSAN NATIONAL UNIVERSITY
COPPE/Universidade Federal do Rio de Janeiro
FLORIDA STATE UNIVERSITY

GEORGE WASHINGTON UNIVERSITY
KOREA ADVANCED INSTITUTE OF SCIENCE AND TECHNOLOGY
SEOUL NATIONAL UNIVERSITY
BRIGHAM YOUNG UNIVERSITY
LAMAR UNIVERSITY
UNIVERSITY OF MICHIGAN
SOUTH CHINA UNIVERSITY OF TECHNOLOGY
NATIONAL UNIVERSITY OF SINGAPORE
SHANGHAI JIAO TONG UNIVERSITY
NANYANG TECHNOLOGICAL UNIVERSITY

Fostering Technology Innovation: People

ABS Needs for Graduate Talent

- Well-developed Naval Architecture/Marine Engineering curriculum (accredited school with solid track record)
- Students with 3.0 (US GPA) or higher
- Students with leadership capabilities (critical thinking, presentations, collaboration, problem solving and decision making)
- Students who have applied their education in relevant job/internships

ABS Aspire Program

- Intended to bring young, bright talent into the company
- Provides two year rotational training opportunity (4 rotations – Engineering, Technology, Survey and ABS Consulting)
- Specific training curriculum between each rotation

***Canadian* National Network for Innovative Shipbuilding Marine Research & Training**

- Focus on maritime technology that is internationally deployable
- Work with and create industry that is exportable.
- Know your starting point. Advance the state of the art and tell everyone on the world stage about your work. Promote and export Canadian excellence!
- Reaching Desirable Features / Outcomes
 - Create a limited number of research centres of excellence and promote them as Canadian
 - Fund these individual centres very well. Do not spread financial resources across a broad base.
 - Be very selective on staffing (the right people are critical)
 - Be very selective on student recruitment. Seek intelligence, integrity and passion
 - Push to fail and learn from it!



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