Overview of Maritime Industry in Japan

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JAPAN
1. Overview of Shipping & Shipbuilding Industries in Japan

2. Policies of MLIT in Maritime Sector
   2.(1) Reduction of CO2 / SOx / NOx
   2.(2) Big Data Application and IoT for Maritime Industry
   2.(3) Hydrogen Energy

3. Financial Support
1. Overview of Shipping & Shipbuilding Industry in Japan
Overview of Shipping Industry in Japan

Global seaborne trade volume and Japan's merchant fleet share

(Source) 1. Global marine cargo volume according to Clarkusons"SHIPPING REVIEW DATABASE". 2. Japan's merchant fleet share of transport compiled by the Maritime Bureau of the MLIT.
Overview of Shipping Industry in Japan

Vessel type of Japan’s merchant fleets

- Total
  - 119,899,000 ton
  - 2,566 vessels

Outside: Gross Tonnage (1,000)
Inside: number of vessels

(source) Maritime Bureau of MLIT
Competing with China and Korea in the world market.

Due to yen depreciation by Abenomics and the development of energy-saving technologies in parallel with its global standardization, the number of shipbuilding orders to Japanese companies has been growing increasing after 2013. (The Japanese share in 2015 became 29%).

Shipping & shipbuilding market will expand with the world economy’s growth in the long term. In spite of recent sluggish market...

Japan’s share of new order increased, and China lost the share.
**Structure of Maritime Cluster in Japan**

**Shipping industry (Carriers) (overseas / coastal)**
- Number of companies: abt 200 / abt 2,450
- Employees: abt 7,000 / abt 66,000
- Business revenue: abt US$ 39 billion / abt US$11 billion

**Ship owners (overseas / coastal)**
- Number of owners: abt 700 / abt 1,600
- Employees: abt 1,400 / abt 21,000

**Shipbuilding industry**
- Number of Companies: abt 1,000
- Employees: abt 83,000
- Business revenue: abt US$ 20 billion (major 13 companies)

**Ship machinery industry**
- Number of companies: abt 1,100
- Employees: abt 47,000
- Production output: abt US$8 billion

**Cargo owners**
- Transportation service
- Charter contract

**Seafarers**
- Coastal Seafarer abt 27,000
- Overseas seafarers
  - Japanese abt 2,000
  - Foreigner abt 56,000

**Organization for Training**
- Marine Technical Education Agency
  - 8 schools, 450 students/year
- National Institute for Sea Training
  - Independent Administrative Institution
  - 5 school ships
- Nautical colleges and National Institute of Technology
  - 7 schools, 370 students/year

**Academic Institutes**
- Universities
- Technical school (e.g. High school)

**Contributions**
- National Maritime Research Institute (NMRI)
- Academic Institutes
  - Universities
  - Technical school (e.g. High school)
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**Supply of Engineers**
- National Maritime Research Institute (NMRI)
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**Stable Supply**
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**Charter contract**
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**71% are for Japanese fleet**
(27% are for Japanese fleet)

**58% are for shipbuilding companies in Japan**
(58% are for shipbuilding companies in Japan)
2. Policies of MLIT in Maritime Sector
Headquarters for Ocean Policy
- The Headquarters shall be headed by the Director-General of the Headquarters for Ocean Policy, the post which shall be served as Prime Minister.

Development of Basic Plan on Ocean Policy
- Basic Plan on Ocean Policy is to be developed to determine the basic direction of ocean-related policies and to identify measures to be taken by the Government in a comprehensive and planned manner, subject to periodical review (5 years).

Prime Minister Shinzo Abe, in the meeting of the Headquarters for Ocean Policy (December, 2014)
Chapter VIII. Promotion of Marine Industries and Increase in International Competitiveness

(1) Solidifying management base

a. Maritime transport industry, shipbuilding industry and infrastructure system

(i) Increasing competitiveness to obtain orders

- In efforts to make the Japanese shipbuilding and ship machinery industries more competitive to receive new contracts, make efforts toward reducing carbon dioxide, exhaust (NOx and SOx) emissions and other environmental pollutants from ships in compliance with regulations related to the issues and ensuing ship safety.

- Under coordination between the industrial, academic and governmental sectors, implement technological development for high-value-added vessels to help boost international competitiveness of the Japanese shipbuilding, ship machinery and marine resources-related industries.
2.(1) Reduction of CO2 / SOx / NOx
CO2 emissions reduction requirement in IMO

- Improving energy efficiency of international shipping is an important issue because of a constant increase of international shipping transport demands.
- In July 2011, IMO accomplished a introduction of global regulation on energy efficiency of international shipping. The regulation came into effect in January 2013.
- IMO has been developing a data collection system of fuel consumption of ships as a further measure for enhancing the energy efficiency of international shipping.

From 2013, new ships have to meet the energy efficiency, which gradually become strict.

It is not allowed to build ships, which do not satisfy criteria.
Development of CO₂ Emission Reduction Technology

- Technology development project (2009-2012) succeeded in 30% reduction of CO₂ emissions from ships, and achieved IMO requirement by 2025.

- Japan has promoted further developments of maritime environment technology which aim to further reduce CO₂ emissions.

**Examples**

**Engine system**
- Heat recovery system with which low-temperature waste heat is used

**Fuel shift**
- Dual fuel gas engine

**Propulsion system**
- Controllable pitch propeller

**Hull**
- Low-frictional coating

From 2013, new ships have to meet the energy efficiency, which gradually become strict. It is not allowed to build ships, which do not satisfy criteria.
Further Utilization and Promotion of Ships Fueled by Natural Gas

【Strengthening environmental regulation of international shipping】
• Environmental regulation for shipping is getting more strict and SOx regulation will be strengthened in the all sea areas in the world from 2020 at the earliest.

⇒ Natural gas fuel can reduce CO2 and NOx as well as SOx at the same time.

【Expansion of natural gas use】
• Production and the use of natural gas are expanding
• Natural gas will be used as fuel for ships also in North America and Asia also as it is used more in Europe.

Environmental development toward further utilization and promotion of ships fueled by natural gas (FY 2012 budget)

- Smooth implementation of LNG fuel servicing
- Design efficiency improvement by ship yards
- Leading formulation of international standards.
Current Status and Future Trends of Ships Fueled by Natural Gas

**Overview of ships fueled by natural gas**

- In September 2015, Japan's first natural gas-fueled vessel “Sakigake” was delivered.
- Japan’s Ministry of Economy, Trade and Industry and the Ministry of Land, Infrastructure, Transport and Tourism supported this building.
- LNG is supplied to the ship from a tank truck.

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<th>Engine to natural gas and heavy oil as fuel (Niigata Power Systems)</th>
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**Future Trends**

ONatural gas-fueled vessels are mostly used in emission control area, and expected to become popular in the future. ONYK Line is constructing the world’s first natural gas-fueled car carrier ※ and natural gas bunkering vessel. (scheduled to be completed this year).

※ NYK and the joint venture of foreign companies are building

- Natural gas fuel car carriers
- Natural gas fuel supply ship (Image)
- Fuel supply landscape (image)
2.(2) Big Data Application and IoT for Maritime Industry
Dawn of Maritime Broadband Era.

- Development of satellite system and communication technology
- It becomes common to have real time and fixed-rate charged services

Example

Smart operations using real time support from land

- Weather, sea condition, voyage planning
- Ship condition (load, oscillation)
- Monitoring cargo

Effective maintenance

- Trouble alert, preventive system
- On ship repairing support
2.(3) Hydrogen Energy
Main Challenges

3E + S (Energy Security, Economic Efficiency, Environment + Safety)
- Strategic Energy Plan of Japan, April 2014

Energy supply

Greenhouse gas emissions

Source: METI

Source: Greenhouse Gas Inventory Office of Japan
As for future secondary energy, **hydrogen is expected to play a central role**, as well as electricity and heat.

"-Strategic Energy Plan of Japan, April 2014"

### Roles of Hydrogen

1. **Energy Efficiency**
2. **Energy conservation**
3. **Reducing environmental burdens**
4. **Promoting industries and revitalizing regional economies**

Making use of fuel cells to realize high energy efficiency, hydrogen can be manufactured with various methods. In the future, it may be procured inexpensively from regions with low geopolitical risk. Manufactured from renewable energy in Japan, it will lead to the reduction of environmental burdens.

Japan has filed the world's largest number of patent applications. Regional resources like renewable energy can be utilized to manufacture hydrogen.

**Remarkable features of hydrogen**

- **Primary Energy**
  - Natural gas, petroleum, coal, etc.
  - Renewables.

- **Secondary Energy**
  - **Fossil Fuel** (Natural Gas, Oil etc.)
  - Reforming, gasification
  - CCS

- **Hydrogen**
  - Energy security
  - Reducing environmental burdens
  - Energy conservation
  - Promoting industries and revitalizing regional economies

- **Utilization**
  - **Transport** (LH2, MCH etc.)
  - **Electricity**
  - FCV (2014~)
  - Residential fuel cell (2009 ~)

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© TOYOTA
© MHPS
Step by step approach to realize hydrogen society

Expansion usage → Establishment of mass hydrogen supply

**Phase: 1**
Installation Fuel Cell
- 2009: Micro-CHP FC
- 2015: FCV
- 2017: Large-CHP FC
- Around 2020:
  - FCV fuel cost ≤ HEV fuel cost
- Around 2025:
  - FCV cost competitive ≥ HEV

**Phase: 2**
H2 Power Plant / Mass Supply Chain
- Accelerate RD&D
- Realize reasonable H2 Price
- 2nd half of 2020's:
  - H2 cost (CIF): JPY30/Nm³
  - Enhance supply chain in Japan
- Around 2030:
  - Import H2 from overseas
  - Full Scale H2 Power Plant

**Phase: 3**
CO2-free Hydrogen
- Around 2040:
  - Full scale CO2-free H2
    (Renewable energy, CCS, etc.)
Projects for Establishment of Mass Hydrogen Supply

Building hydrogen supply chain

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<th>FY2015 – 2021</th>
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Demonstrate the whole supply chain of hydrogen produced from untapped overseas energy resources

Demonstrations on:

- **Method(s) of hydrogen production** from e.g. by-product hydrogen, brown coal (untapped overseas resources)
- **Transportation and storage** in the form of cryogenic liquid hydrogen or organic hydride
- **Power generation** using (imported) hydrogen

Development of loading system for LH2

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<th>FY2014 – 2018</th>
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Develop ship-shore loading system(s) for cryogenic liquid hydrogen

Key Issues:

- **R&D** (Emergency Release System, swivel joints etc.)
- **Procedures** for loading/offloading operations
- **Safety regulations and standards**

Production  Transportation and storage  Power generation
3. Financial Support
JOIN backs up the financing of projects by holding a portion of the equity of SPC. This equity finance scheme can improve bankability of the project.
JOIN’s Focus to Invest

High-speed railways

Urban railways / transport system

Toll roads

Ships / offshore units

Port terminals

Airport terminals

Urban development

Logistics
**Scope of funding**

Projects, to be supported by JOIN, need to be relevant to overseas transport* or urban/regional development.

* "Transport" includes not only “traditional” sea transport but also offshore projects such as the operation of FPSO, FLNG, PSV, AHTS, shuttle tankers and Logistics Hub.

**Where the funding can go**

- Owning/O&M SPC of the FPSO
- Owning/O&M SPC of the PSV/AHTS

**Example of lease financing structure**

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<th>JBIC</th>
<th>Other Japanese banks</th>
<th>Local bank etc.</th>
<th>Japanese investors</th>
<th>Foreign investors</th>
<th>JOIN</th>
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<tr>
<td>Owning/O&amp;M SPC</td>
<td>Debt</td>
<td>Equity</td>
<td>Charter contract &amp; O&amp;M contract</td>
<td>Oil &amp; gas company</td>
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LNG vessel | PSV | FPSO