1. Opinion
- Commercial Navigation on the Arctic Sea Routes and Korea's Strategy
- Suggestions for Reviving Fishing Net Business
- Current Status and Future Prospect of 2015 Shipping Industry

2. Ocean Policy
- The Need to Change Safety Inspection Cycle to Secure the Safety of Lock Gate Facilities at Incheon Port
- Needs and Policy Directions for Fishing Vessel Modernization in Anchovy Boat Seine Fishery

3. Research Findings
- Change in Global Trade Patterns and Response Strategies of the Shipping Industry

4. Research Projects

5. KMI News & Events
CJ Korea Express, a Korean transport company is expected to deliver heavy cargoes from United Arab Emirates (UAE) to Yamal Peninsula in Russia, sailing through a part of the Northern Sea Route (NSR). The purpose of this commercial voyage is to transport equipments for the construction of offshore terminals in the Yamal Peninsula. The plan by CJ Korea Express is considered a significant first step in Korea’s efforts to make inroads into the shipping and logistics market in the Arctic. In October 2013, Hyundai Glovis chartered Stena Bulk’s tanker ‘Stena Polaris’ and delivered naphtha cargoes from Port Ust Luga in Russia to Korea’s Gwangyang Port through the Arctic waters. This pilot navigation through the NSR suggested a new Arctic business model and showed a high potential for the Arctic routes. The commercial voyage by CJ Korea Express, scheduled for August, will pass through a section of the NSR and four Korean navigation officers who completed ‘NSR training program’ run by the Ministry of Oceans and Fisheries will be on board.

The Korean government has made various efforts to increase the use of the Arctic shipping. As part of the effort, the government is maintaining a cooperative relationship with coastal countries nearby the Arctic and encouraging Korean companies to tap into the Arctic sea routes. Also, a systematic preparation is underway by training navigation officers and accumulating know-hows in navigation procedures. At the moment, Korea’s development on the Arctic shipping remains at an initial stage. What we need to do is to discover cargoes with regularly scheduled voyages and to diversify sea routes. Also, new shipping markets should be explored through continuous cooperation with coastal countries near the Arctic. With the access and commercial opportunities in the Arctic region increasing, further developing the Northwest Passage instead of the well-known Northeast Passage could reduce logistics costs and expand new maritime transportation services linked with resource development in the Arctic.

The Northwest Passage has attracted keen attention from the world as it is the shortest sea route that links Asia to the east coast of North America via the Arctic waters. The Northwest Passage, also known as the ‘Panama Canal of the North’, would shorten the Pacific - Atlantic route by more than 9,000 Km in comparison to the existing Panama Canal. In the mid to long term, the voyage through the Northwest Passage is expected to increase with environmental changes in the Arctic. It will also be promoted by resource rich coastal states as they are opening their sea routes and expanding related projects. An expansion of the Arctic shipping will not only enhance economic benefits by transporting resources, but also have an impact on the market structure of maritime transportation in the long run.

Based on successful experiences in navigating the Northeast Passage, Korea should actively participate in the expansion of the maritime transportation market through the Northwest Passage and deliver services linked with resource development projects in the region. With the maritime cooperation with countries such as the US and Canada, Korea also needs to broaden transportation services and training of ice navigators. Currently, coastal countries in the Arctic are actively providing policy assistance and establishing strategies in preparation for the Arctic era. For instance, they are striving to secure additional ice breakers for safe marine navigation and strengthening safety measures. Against this backdrop, Korea will be able to establish strategic relationships with coastal countries through active development and implementation of potential cooperation projects.

As such, new economic opportunities are rising in the Arctic as sea routes open and resource development increases. The thawing of the Arctic ice and strategic interests of coastal countries are increasingly contributing to the development of Arctic shipping. As port and logistics facilities are expanded to assist maritime transportation services, competition among major base ports and ports of call are expected to rise. Under these circumstances, Korea should prepare for commercial navigation and active operation of maritime transportation in the Northwest Passage. To achieve this, Korea needs to analyze environmental changes surrounding the Arctic and policies conducted by coastal countries or international organizations including the Arctic Council. At the same time, it is necessary to discover potential cargoes and conduct studies such as an economic analysis.

Based on comprehensive preparations, the mid and long term measures to gain a strong foothold in Arctic shipping should be established by maintaining strategic relationships between shipping companies and cargo owners. In particular, a concrete preparation and review process for implementing
Suggestions for Reviving Fishing Net Business

Current status of Korea’s fishing net business

A fishing net is the most important equipment in fishery industry. In the past, Korea was one of the major producers of fishing nets. However, the fishing net industry is barely surviving due to declining fishery industry and slump in technological development. At present, there are only about 20 fishing net manufacturers in Korea. However, the exact size of the market has not known since most of the companies are extremely small scale businesses. Other than fishing nets, these companies are also producing various types of nets including golf net, bird net, baseball net, football net and cage net.

Type of fishing nets

Fishing nets are classified into knotted fishing nets and knotless fishing nets depending on the use of knot. Recently, demand for knotless fishing net which is more advanced netting is significantly increasing. Without knots, knotless fishing net is smaller in volume, lighter and twice more durable than regular fishing nets with longer than 5 years of lifespan. Particularly, using knotless fishing nets can raise the price of fishing products since knotless netting is very gentle to fish with less bruising and abrasion from knots. The knotless fishing net is divided into 2 strands, 3 strands and 4 strands based on the level of twisting. While domestic companies are only producing 2 strands and 3 strands, 4 strand fishing nets are all imported. This is because Korea does not have netting machines due to the lack of technological development.

Trends and prospects of advanced fishing net industry

Major countries producing 4 strand braided knotless nets include Japan, the US and Europe, with Japan leading the technology. The netting machine for 4 strand fishing net is only produced by Japan. Even though China has tried to copy the machine, it does not have global competitiveness due to poor quality. Currently, supply shortage of 4 strand knotless netting has made consumers wait for more than 6 months after the order. Despite high price, the demand for 4 strand knotless fishing net is expected to rise as it is more durable, increasing added value of fishing products.

Policy direction

Therefore, it is necessary to develop Korea’s own technology for producing 4 strand knotless fishing nets. The fishing net is one type of fabric. Thus, it will not be difficult to develop an alternative technology as Korea’s know-how in fabric technology is combined with fishing net technology. In other words, policy development and assistance is required to combine and converge maritime and fisheries technology and fabric technology. If successful, it is expected to boost competitiveness of Korea’s fisheries industry and lay the strong foundation to take an advantageous position in global fishing net market.

KMI
The container ship and the dry cargo service providers in 2015 have been experiencing downward trend with one exception of oil tanker operators who benefited from the increased cargo volume fueled by the oil price drop. Freight in fact are falling continuously because of China’s tumbling cargo traffic towards the U.S and Europe, resolution of the port gridlock caused by the labor conflict at U.S. West Coast ports, and ultra large container vessels flooding into the market. To make the matter worse, the freight charge for dry cargo service has been decreasing due to the low traffic of iron ore, coal, grain, bauxite and others during the first half of the year and reached its lowest Baltic Dry Index (BDI) point or 509p on February 18. On the other hand, the oil tanker business has enjoyed the highest price tag in five years thanks to the low oil price and a high demand for stockpiling driven by increasing refining margins.

(1) Container Ship Market

Regarding recent trend of the container ship market, the rates for North America routes has been plunging beginning from this year owing to the falling traffic from Chinese ports to the North American harbors and the end of stalemate occurred by the labor strike around the West Coast of the United States. Europe routes also witnessed the plummeting charges as a result of lackluster traffic from China towards European soils and high delivery concentration of large container carriers with a capacity of over 12,000 TEU.

< Half-yearly average rates for North America · Europe routes>

<table>
<thead>
<tr>
<th>Classification</th>
<th>2013 2nd Half</th>
<th>2014 1st Half</th>
<th>2014 2nd Half</th>
<th>2015 1st Half</th>
</tr>
</thead>
<tbody>
<tr>
<td>US West Coast (USD/FEU)</td>
<td>1,872</td>
<td>1,905</td>
<td>2,045</td>
<td>1,823</td>
</tr>
<tr>
<td>US East Coast (USD/FEU)</td>
<td>3,230</td>
<td>3,310</td>
<td>4,144</td>
<td>4,173</td>
</tr>
<tr>
<td>Northern Europe (USD/TEU)</td>
<td>1,170</td>
<td>1,270</td>
<td>1,073</td>
<td>725</td>
</tr>
</tbody>
</table>

A good possibility of oversupply was expected since early 2015, triggered by surging order for ultra large carriers whose capacity is over 18,000 TEU. On top of that, the much-worried Chinese economy has become sluggish and consequently its cargo load towards the U.S and Europe has shrunk. China’s quarterly economic growth has contracted from 7.8% in the first quarter of 2013, down to 7.4% a year later, and finally to 7.0% in 1Q 2015. Yet another caveat: the bunker oil price once was on the decline but bounced up soon and this may put further pressure on the operating cost.

< Supply & Demand Trend and Prospect of North America · Europe routes (Based on Export Volume to Asia)>

<table>
<thead>
<tr>
<th>Classification</th>
<th>Demand</th>
<th>Supply</th>
<th>Load Factor (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cargo load (Thousand TEU)</td>
<td>YOY increase (%)</td>
<td>Shipping capacity (Thousand TEU)</td>
</tr>
<tr>
<td>North America</td>
<td>2014</td>
<td>14,525</td>
<td>5.0%</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>15,730</td>
<td>8.3%</td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>16,813</td>
<td>6.9%</td>
</tr>
<tr>
<td>Europe</td>
<td>2014</td>
<td>15,426</td>
<td>7.7%</td>
</tr>
<tr>
<td></td>
<td>2015</td>
<td>16,406</td>
<td>6.4%</td>
</tr>
<tr>
<td></td>
<td>2016</td>
<td>17,542</td>
<td>6.9%</td>
</tr>
</tbody>
</table>

Then the question is how this price will change until the next year. First, the North American routes will see more favorable supply and demand situation. Nonetheless, the falling Chinese traffic and the withdrawal of strike will offset the gains from the decreased supply to some degree, resulting in a slight price increase. Second, the fares for European routes will go up because of improved supply and demand, despite the declining Chinese traffic to Europe.

< Rates Prospect of Container Ship Market>

<table>
<thead>
<tr>
<th>Classification</th>
<th>2015 1st Half</th>
<th>2nd Half</th>
<th>Yearly Average</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>US East Coast (FEU)</td>
<td>4,173</td>
<td>3,740</td>
<td>3,920</td>
<td>4,030</td>
</tr>
<tr>
<td>US West Coast (FEU)</td>
<td>1,823</td>
<td>1,950</td>
<td>1,897</td>
<td>2,020</td>
</tr>
<tr>
<td>Northern Europe (TEU)</td>
<td>725</td>
<td>880</td>
<td>815</td>
<td>970</td>
</tr>
</tbody>
</table>

(2) Dry Cargo Market

Regarding recent trend of the dry cargo market, the Capesize carriers was hit hard by extreme contraction in demand during the first half and their Time Charter Equivalent (TCE) reached its lowest point, 2,594 USD/day. Pana-
max and Supramax carriers also had to endure nosediving TCEs due to excessive shipping capacities. The BDI, a composite index assessing the freight charge of diverse commodities, likewise indicates this downward tendency and marked the historic low of 509p on February 18.

The market has gradually improved its supply-demand status starting from 2013. Though, this year’s supply growth rate will edge by only 0.5%, the smallest since 2012.

One thing to notice is that the five European major bulk carriers including Greece-based Star Bulk and Norwegian Golden Ocean a while ago formed joint venture firm Capesize Chartering Ltd., operating approximately 150 vessels whose combined shipping capacity accounts for 10% of the global Capesize market. This giant is highly likely to make a considerable impact on the market in the future.

As the lackluster Chinese economy prolongs, however, it slows down the domestic demand and imports of iron ore. With dependency ratio to iron ore imports reaching 77% in 2014, close to the threshold level of 80%, Chinese coal imports are decreasing every year as low-quality coals are no longer allowed due to stringent environmental regulations and import tariff on coals are newly established.

Looking at the freight rates of dry cargo vessels from 2015 to 2016, the market is expected to make a turnaround in the 2nd half of this year. This is because the supply and demand situation of Capsize vessels are significantly improved resulting from the dismantlement of about 100 vessels this year. Also, Panamax and Supramax carriers are expected to see a small increase in freight charges due to India’s rising imports of coal and simultaneous freight rise with Capesize carriers.

### Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand (million tons)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron ore</td>
<td>1,189</td>
<td>1,336</td>
<td>1,408</td>
</tr>
<tr>
<td>Coal</td>
<td>1,179</td>
<td>1,212</td>
<td>1,201</td>
</tr>
<tr>
<td>Crop</td>
<td>387</td>
<td>430</td>
<td>423</td>
</tr>
<tr>
<td>Total</td>
<td>4,331(5.7%)</td>
<td>4,548(5.0%)</td>
<td>4,638(2.0%)</td>
</tr>
<tr>
<td>Supply (million DWT)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAPE</td>
<td>293.8</td>
<td>308.1</td>
<td>306.2</td>
</tr>
<tr>
<td>PMX</td>
<td>184.9</td>
<td>193.3</td>
<td>194.5</td>
</tr>
<tr>
<td>SMX</td>
<td>157.8</td>
<td>165.9</td>
<td>170.7</td>
</tr>
<tr>
<td>Total</td>
<td>724.1(5.7%)</td>
<td>755.9(4.4%)</td>
<td>760.1(0.5%)</td>
</tr>
</tbody>
</table>

Looking at the freight rates of dry cargo vessels from 2015 to 2016, the market is expected to make a turnaround in the 2nd half of this year. This is because the supply and demand situation of Capsize vessels are significantly improved resulting from the dismantlement of about 100 vessels this year. Also, Panamax and Supramax carriers are expected to see a small increase in freight charges due to India’s rising imports of coal and simultaneous freight rise with Capesize carriers.

### Rates Prospect of Dry Cargo Market

<table>
<thead>
<tr>
<th>Classification</th>
<th>2014 (USD/day)</th>
<th>3Q (USD/day)</th>
<th>4Q (USD/day)</th>
<th>yearly average (USD/day) (Y0Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPE</td>
<td>13,800</td>
<td>9,500</td>
<td>17,000</td>
<td>8,770 (-36%)</td>
</tr>
<tr>
<td>PMX</td>
<td>7,718</td>
<td>7,500</td>
<td>9,500</td>
<td>6,670 (-14%)</td>
</tr>
<tr>
<td>SMX</td>
<td>9,818</td>
<td>8,500</td>
<td>11,000</td>
<td>8,270 (-16%)</td>
</tr>
</tbody>
</table>

### (3) Oil Tanker Market

Regarding recent trend of the oil tanker market, the VLCC providers little changed its price table even during the first-half slow season (March to May) and their charge for the Middle East-Japan route during the second quarter reached the highest quarterly average point in 5 years. Ship owners now are in an advantageous position for fee negotiation thanks to increasing traffic towards the Middle East during the first half and the slow supply growth rate, a situation often called ‘Owner’s Market.’ Medium Range (MR) carriers also enjoyed the average price hike during Q2 2015, a 162% increase year on year as a result of the low oil prices and rising ton mile demand fueled by refinement facility expansion projects across the Middle East.

### Average TCE of Middle East – Japan VLCC and MR Carriers

<table>
<thead>
<tr>
<th>Classification</th>
<th>2014 (USD/day)</th>
<th>2015</th>
<th>Y0Y increase (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLCC MR carrier</td>
<td>29,248</td>
<td>57,499</td>
<td>87% 102%</td>
</tr>
<tr>
<td>VLCC MR carrier</td>
<td>10,284</td>
<td>20,801</td>
<td>102%</td>
</tr>
<tr>
<td>SMX MR carrier</td>
<td>11,509</td>
<td>21,695</td>
<td>444% 141%</td>
</tr>
</tbody>
</table>
ume by 1.8% in 2015, owing to the rising operation rate and expansion of refinery facilities around the Asian region as well as greater demand for oil products in stock.

Despite low oil prices, the production volume of North America’s shale oil is expected to increase due to rising M&A, increasing efficiency in equipment collection and mandatory mining period. Also, the competition between the OPEC and Russia toward the Asian market will allow oversupply and low price of crude oil. The petroleum trade volume is expected to increase as the operation rate is close to 90% due to high refining margin. While the expansion of refinery facilities in the Middle East in particular will increase the ton-mile, the distribution hub is expected to shift from Singapore to the Middle East, then to the Far East.

Looking forward, oil tanker freight rates are expected to remain high by the end of this year, owing to positive factors. In particular, the VLCC market is likely to maintain favorable refining margin, increasing production and exports in the Middle East and stagnant growth in shipping capacity. However, the rate is expected to be weakened after 2016 due to the increase in fleet size. Product carriers will also maintain high prices with solid growth of tone-mile.

< Average TCE prospect of VCLL and MR carriers >

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLCC 'Middle East-Japan'</td>
<td>27,462</td>
<td>45,000~55,000</td>
<td>40,500~49,500</td>
</tr>
<tr>
<td>Average MR tanker</td>
<td>12,324</td>
<td>21,850~24,150</td>
<td>23,000~25,000</td>
</tr>
</tbody>
</table>

Contact information
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jwoong01 @kmi.re.kr

Classification | 2014    | 2015         | 2016         |
----------------|---------|--------------|--------------|
Cargo shipments of crude oil (Million tons) | 1,806    | 1,831         | 1.4          |
Cargo shipment of petroleum products (Million tons) | 973      | 991           | 1.9          |

Classification | VLCC Fleet (the number of ships) | MR Fleet (the number of ships) |
----------------|----------------------------------|-------------------------------|
2014            | 635(2.4%)                        | 1,898(2.1%)                  |
2015            | 646(1.7%)                        | 2,000(5.4%)                  |
2016            | 676(4.6%)                        | 2,050(2.5%)                  |
The Need to Change Safety Inspection Cycle to Secure the Safety of Lock Gate Facilities at Incheon Port

Laws related to safety inspection of lock gate facilities

According to the Harbor Act, a lock gate comes under harbor facilities. However, safety inspection of lock gates is carried out including regular inspection, detailed inspection, emergency inspection and precision safety diagnosis in accordance with Special Act on the Safety Control of Public Structures instead of the Harbor Act. This is because the lock gate is categorized as ‘First-class public structure’ which is deemed to require special management for the convenient use and safety of the general public or advanced technology for their maintenance in structural aspects.

Therefore, Korea Infrastructure Safety and Technology Corporation (KISTEC) established under the Ministry of Land, Infrastructure and Transport (MLIT) performs precision safety diagnosis of the lock gate, a harbor facility in pursuant to Article 8 of the Special Act on the Safety Control of Public Structures as well as the Article 10 of the enforcement decree. The precision safety diagnosis should be performed and completed within one year after 10 years from the construction completion date or approval date for use (including temporary use) in accordance with Guidelines of Safety Inspection and Precision Safety Diagnosis for Public Structures promulgated by the MLIT. The next cycle of the precision safety diagnosis is determined by the safety grade, which is the result of previous precision safety diagnosis.

< Inspection Cycle based on Safety Grade of Precision Safety Diagnosis >

<table>
<thead>
<tr>
<th>Safety Grade</th>
<th>Precision Safety Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>More than Once in 6 years</td>
</tr>
<tr>
<td>B · C</td>
<td>More than Once in 5 years</td>
</tr>
<tr>
<td>D · E</td>
<td>More than Once in 4 years</td>
</tr>
</tbody>
</table>

Problems of safety diagnosis in Incheon lock facilities

Lock gates in Incheon port, established in 1974, were constructed to overcome the tidal difference, controlling the water levels of outer and inner ports and facilitate safe navigation of the ships both going in and out of the inner port. With 40 years of operation and maintenance, the lock gates should be operated as long as ships pass though the inner port of Incheon. Therefore, it is necessary to understand accurate status of the lock gates and carry out precision safety diagnosis to ensure safe operation of aging lock gates.

Most of the precision safety diagnosis for lock gates in Incheon port is limited to the tests regarding civil engineering structures which are the very foundation of lock facilities. The precision safety diagnosis for machinery and electrical equipment which are related to the operation of lock facilities are only carried out for apparent performance inspection, checking the measurements. In other word, the performance inspection is clearly not enough for checking the safety compared with the safety test for engineering structures. Since most part of the lock leaves which are major facilities of the lock gates are operated below water, it is difficult to perform safety diagnosis for lower facilities, focusing to evaluate the safety of upper facilities.

Lock gates in Incheon port consist of 8 lock leaves including 50KT-ABCD and 10KT-ABCD. The Incheon port carries out preventative maintenance (safety inspection) on its own for lock gates in dry state by lifting the submerged lock leaves once in 4 years. In accordance with the Guidelines of Safety Inspection and Precision Safety Diagnosis for Public Structures, however, the safety diagnosis for lock gates in Incheon port is performed once in 5 years because the result of previous precision safety diagnosis is B. Although it could have inspected the lock leaves in dry state once in 4 years, it only performs eye-checking inspection for upper facilities due to discordance between the two inspection cycles. Even though the Incheon lock gates have received B grade from precision safety inspection, the safety of the lock leaves, which are core equipment of the lock gates, are hardly assured.

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1) Scope of ‘first-class public structures’ from Article 2, paragraph 1, attachment 1 of Special Act on the Safety Control of Public Structures
2) Korea Infrastructure Safety and Technology Corporation (KISTEC) was established in 1995 under the Ministry of Land, Infrastructure and Transport in accordance with the Special Act on the Safety Control of Public Structures. KISTEC promotes to secure safety of the public facilities, protecting the lives and properties of the people, contributing to sustainable development of Korea.
Improvement measures for safety inspection in Incheon lock gate facilities

Therefore, it is necessary to match the cycle of drying lock leaves (once in 4 years) with the cycle of precision safety diagnosis (once in 5 years) to secure safety and reliability of lock facilities in Incheon port. The current 5 year cycle of safety diagnosis should be shortened to 4 years as one lock gate for each 50KT and 10KT should go through safety diagnosis in consecutive order. This way enables all lock leaves to complete safety inspection within 4 years. To achieve this, it is essential to revise the laws related to safety diagnosis of lock gate facilities. The first suggestion is to shorten the cycle of precision safety diagnosis for Incheon lock gates in accordance with the Special Act on the Safety Control of Public Structures to once in 4 years. The second suggestion is to erase the clause in which lock gate facilities are exempted from safety inspection from the Section 2, Article 29 of the Harbor Law. Instead, a new clause should be inserted that lock leaves of the lock facilities (machinery and electric equipment etc.) should follow equipment inspection standards from the Harbor Law.

In conclusion, it is necessary to adjust the cycle of precision safety diagnosis for lock gates in Incheon port to enhance effectiveness of the safety diagnosis and secure reliability of safety. In doing so, it would ensure safety of the ships passing through the lock gates and prolong the lifespan of the lock gates.

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Needs and Policy Directions for Fishing Vessel Modernization in Anchovy Boat Seine Fishery

1. Anchovy Boat Seine Fishery

Boat seine net fishery or anchovy drag net fishery, once just a traditional fishing gear in Hiroshima, Japan, was introduced to Korea’s offshore anchovy fishery one century ago. The boat seine net fishery is predominantly used for catching anchovies. Since short term changes of anchovy resource is significant, this characteristic leads to fluctuations in the catch. The fishing operation starts from July 1 to the end of March, next year. Anchovies are short-tempered with a high fat content, resulting in fast decay. In order to maintain the freshness of the fish, anchovies should be boiled and dried as soon as being caught. Therefore, catching and processing take place within one fleet, with boil and dry facilities equipped in each fleet.

A fleet consists of 5~6 vessels with 2 main vessels and 1~2 vessels for processing, transporting the catch and detecting the fish schools. Currently, the total tonnage of the fleet for anchovy boat seine fishery is around 285 tons. The total number of fleet is 77 with 385 vessels and the average number of fishing crews per one fleet is about 38.

<table>
<thead>
<tr>
<th>Main Vessel</th>
<th>Fish detecting vessels</th>
<th>Fish carrier</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of vessels</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>The number of fishing crews</td>
<td>16</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>Tonnage</td>
<td>25~30</td>
<td>25</td>
<td>100~150</td>
</tr>
<tr>
<td>Total number of vessels</td>
<td>154</td>
<td>77</td>
<td>154</td>
</tr>
</tbody>
</table>

Source: Internal data, National federation of fisheries cooperatives for anchovy boat seine fishery
Total production of Korea’s anchovy boat seine fishery is estimated to reach about 40,000 tons worth KRW 180 billion ~ KRW 300 billion for the last 5 years. To carry out cost benefit analysis, fishing revenues are divided into 4 categories. The average fishing revenue amounted to KRW 1.77 billion in 2012 fishing seasons and reached KRW 1.32 billion in 2013. The fishery costs are KRW 3.3 billion on average, with high proportions followed by repair cost (41.7%), labor cost (39.9%) and fuel cost (22.4%).

<table>
<thead>
<tr>
<th>Items</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishing gear cost</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Fuel cost</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>6.6</td>
</tr>
<tr>
<td>Repair cost</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>12.3</td>
</tr>
<tr>
<td>Labor cost</td>
<td>11</td>
<td>12</td>
<td>12</td>
<td>11.6</td>
</tr>
<tr>
<td>Others (including the operation cost of fish detecting vessels)</td>
<td>0.6</td>
<td>0.6</td>
<td>0.4</td>
<td>0.5</td>
</tr>
<tr>
<td>Total fishery cost</td>
<td>31.6</td>
<td>34.6</td>
<td>33.4</td>
<td>33</td>
</tr>
</tbody>
</table>

Source: Internal data, National federation of fisheries cooperatives for anchovy boat seine fishery

### 2. Needs for Fishing Vessel Modernization of Anchovy Boat Seine Fishery

1) Improving benefits of fishing crews

- At present, working conditions of fishing crews in main vessels of anchovy boat seine fishery are extremely poor as welfare related facilities are barely in place. Considering nearly 18 hours of fishing operation from departure to port entry, it is an urgent task to establish resting areas and sanitation facilities for fishing crews. As long distance fishing operation has become a commonplace due to the recent shortage of anchovy resources, securing welfare facilities has increasingly become important. Installing the welfare facilities for fishing crews require increase the tonnage of the main vessels. However, it would lead to raise the fishery cost such as fuel cost and exacerbate the fishery management. Therefore, another option is to reduce the number of fish detecting vessels for downsizing the fleet.

- There are two ways to downsize the current fleet of 5 vessels; a fleet of 4 vessels with one less fish detecting vessel; a fleet of 3 vessels with one less fish detecting vessel and one less fish carrier. The formation of the fleet defers between South Gyeongsang province and South Jeolla province. As fishing operation of South Jeolla province takes place in a relatively long distance, fishermen in this province prefer to reduce the current 2 fish carriers to 1 by installing fully-equipped processing facilities.

- In case of a fleet of 4 vessels, the maintenance cost (labor and management costs) for fish detecting vessels is estimated to be reduced KRW 370 million on annual basis which accounts for 12.5% of average cost of anchovy boat seine fishery for the last 5 years. Therefore, the reduction of fish detecting vessels from the whole anchovy seine fishery would cut more than KRW 25 billion in costs.

2) Enhancing fishery management

- The fishery management is increasingly challenging due to high ratio of labor cost and dramatically increasing ship repair cost as the aging of vessels accelerates. The fishing boats aging older than 21 years account for 65.2% of the total vessels. While main vessels aging older than 21 years account for 63.7%, 66.2% of the total fish detecting vessels and fish carriers fall into the category. As a result, the ratio of repair cost is relatively high compared to that of other industries.

### Age of vessels

<table>
<thead>
<tr>
<th>Type of Vessels</th>
<th>Less than 10 years</th>
<th>11~15</th>
<th>16~20</th>
<th>21~25</th>
<th>More than 26 years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Vessel</td>
<td>16</td>
<td>10</td>
<td>30</td>
<td>32</td>
<td>66</td>
<td>154</td>
</tr>
<tr>
<td>(Ratio)</td>
<td>10.4</td>
<td>6.5</td>
<td>19.5</td>
<td>20.8</td>
<td>42.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Fish Detecting vessel</td>
<td>3</td>
<td>5</td>
<td>18</td>
<td>38</td>
<td>13</td>
<td>77</td>
</tr>
<tr>
<td>(Ratio)</td>
<td>3.9</td>
<td>6.5</td>
<td>23.4</td>
<td>49.4</td>
<td>16.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Processing Carrier</td>
<td>10</td>
<td>18</td>
<td>24</td>
<td>46</td>
<td>56</td>
<td>154</td>
</tr>
<tr>
<td>(Ratio)</td>
<td>6.5</td>
<td>11.7</td>
<td>15.6</td>
<td>29.9</td>
<td>36.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>32</td>
<td>72</td>
<td>116</td>
<td>135</td>
<td>385</td>
</tr>
<tr>
<td>(Ratio)</td>
<td>7.5</td>
<td>8.3</td>
<td>18.7</td>
<td>30.1</td>
<td>35.1</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Internal data, National federation of fisheries cooperatives for anchovy boat seine fishery

- Improvements in fishery management following vessel modernization are expected to reduce the overall cost by 12.5% for a fleet of four vessels. For a fleet of three vessels, the cost will be reduced by 18.5% with 5% increasing profits.
3) Policy improvements

○ Anchovy, an object species of boat seine fishery, comes from the lower level of food chain which is a prey to other types of fish. Therefore, fleet reduction of anchovy boat seine fishery is expected to have positive impacts to offshore fishery resource management.

○ The production foundation for fishery is weakening due to rising expenses caused by aging vessels, fishing crews’ reluctance to get on board and environmental pollution. As these challenges prevent new labor resources from coming to the industry and contribute to high cost structure, policy measures are urgently required to improve the competitiveness of fishery industry.

3. Policy Directions for Fishing Vessel Modernization in Anchovy Boat Seine Fishery

○ It is important to push ahead the modernization project after evaluating the results of demonstration project including R&D and test fishing operation for fleet adjustment and fishing gear improvement. At the same time, a demonstration project for developing fishing gear should take place. This is to apply the fishing operation with a fleet of four vessels and to improve fishing gears in accordance with new operation system due to the nature of the anchovy boat seine fishery. The demonstration project will take 3 years including the period of evaluating the demonstration project results as well as building and disposing of the prototype vessel. The test fishing operation should take longer than 1 year during closed seasons. Fishing crews should start operation after adjusting to new fishing vessels and systems. The whole fishing areas are subjected to testing operation.

The result of the demonstration project will include the evaluation on fishing capacity of a new fleet, safety of the vessels and welfare improvements of fishing crews. Simultaneously, the analysis of fishing crews’ opinions and estimation data should be carried out. Also, it is necessary to assess management improvements such as changes in fishery cost and revenue driven by fuel cost of new fleet operation.

○ While carrying out demonstration projects, it is necessary to establish a policy assistance system. This system includes improvement of laws related to tonnage and horsepower of fishing vessels, building measures to finance fishing vessel modernization and budget. Since establishing policy assistance measures will take quite a long time requiring review of the government and national assembly, the modernization project should start 2~3 years in advance for smooth operation of the project. KMI

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The KMI News Letter Ocean & Future

< Improvements in fishery management resulting from fleet adjustment of offshore anchovy boat seine fishery >

<table>
<thead>
<tr>
<th>Items</th>
<th>Fleet of 4 vessels</th>
<th>Fleet of 3 vessels</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in Fishery costs</td>
<td>369,419</td>
<td>544,496</td>
<td></td>
</tr>
<tr>
<td>Operation cost of fish detecting vessel (-)</td>
<td>429,519</td>
<td>429,519</td>
<td>Labor cost KRW 94,421 + Management cost KRW 335,098</td>
</tr>
<tr>
<td>Operation cost of fish carrier (-)</td>
<td>-</td>
<td>619,430</td>
<td>Labor cost (1 Captain, 1 Head of engineer: KRW 65,694) + Operation cost of fish carrier KRW 553,736</td>
</tr>
<tr>
<td>Fuel cost (+)</td>
<td>60,100</td>
<td>360,600</td>
<td>Rising fuel cost due to increase the tonnage of main vessels (20 tons) and fish processing carrier (100 tons): KRW 3,005/ton</td>
</tr>
<tr>
<td>Labor cost (+)</td>
<td>-</td>
<td>143,854</td>
<td>8 crews of fish processing carrier (including 6 foreigners) Increase the number of fishing crews due to expansion of fish processing carrier</td>
</tr>
<tr>
<td>Cost reduction (%)</td>
<td>12.5</td>
<td>18.5</td>
<td>Based on 5-year-average fishery cost (KRW 2.95 billion)</td>
</tr>
<tr>
<td>Fishery revenue increase</td>
<td>-</td>
<td>200,000</td>
<td>The price of Consignment sale increasing 5% (Based on the annual catch worth KRW 4 billion)</td>
</tr>
<tr>
<td>Price increase of the catch</td>
<td>-</td>
<td>200,000</td>
<td></td>
</tr>
</tbody>
</table>

* Two fish processing carriers follow the system in which one vessel is in operation and the other vessel is on standby. The fish carrier on standby is expanded with processing facilities with a captain and head of engineer on board. In case of tonnage increase, additional fishing crews should be hired due to increasing workload. (According to the industry, it requires to hire 60% of existing labor which is 8 people)
Change in Global Trade Patterns and Response Strategies of the Shipping Industry

1. Purposes

- The study aims to develop innovative response strategies for the shipping service providers, shipping companies, and policy support measures for the government as the shipping logistics change due to the change in the global trade patterns. Based on the Theory of the Dynamic Management Strategy (Professor Kim, Inho, refer to the figure below), it aims to evaluate Korean shipping companies’ strategic capabilities to respond to the changes in the shipping logistics.

   - Based on the evaluation, future-oriented, innovative strategies are developed and proposed for the shipping companies of Korea. Furthermore, government’s policy support measures are developed and suggested to execute innovative response strategies at the private sector level.

2. Methodologies and Features

1) Methodologies

Characteristics of the Methodologies

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Major description</th>
<th>Data collection</th>
<th>Reasons for choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic analysis</td>
<td>- Review on factors to change global trade patterns</td>
<td>- Related literatures</td>
<td>- The best data and research methods to explain the change in trade patterns</td>
</tr>
<tr>
<td></td>
<td>- World trade trends and prospects</td>
<td>- Statistical data of major international organizations</td>
<td></td>
</tr>
<tr>
<td>Overseas case analysis</td>
<td>- Case study of major shipper's shipping market internalization cases</td>
<td>- On-site study</td>
<td>- Through an interview with major and influential shippers about their logistics</td>
</tr>
<tr>
<td></td>
<td>- Review of foreign shipping companies’ competition strategies in the shipping</td>
<td>- Interview with domestic and</td>
<td>strategies, the direction of the future change in the shipping market is identified.</td>
</tr>
<tr>
<td></td>
<td>market</td>
<td>overseas major shippers</td>
<td>The interview data is utilized to develop a research result.</td>
</tr>
<tr>
<td>Workshop and expert</td>
<td>- Finding companies' measures to respond to changes in the shipping market</td>
<td>Workshop and expert</td>
<td>- Reflecting opinions and suggestions of related experts including major shippers</td>
</tr>
<tr>
<td>consultant</td>
<td>- Finding cooperation measures among national flag carriers through an analysis</td>
<td>consultant</td>
<td>and working-level officers of shipping companies to analyze internal and external</td>
</tr>
<tr>
<td></td>
<td>on strategic changes of major shippers</td>
<td></td>
<td>conditions of shipping companies and to identify response direction</td>
</tr>
</tbody>
</table>

2) Features

- The study analyzes the influence of the changing global trade patterns on the shipping market and aims to identify the factors that cause changes in the shipping market and the countermeasures. It further suggests response strategies to shipping companies and the government.

   - The study is differentiated as it predicts changes in the shipping market considering changes in the world economy and the trade patterns and seeks for the direction to respond to those changes.

   - And the study can be utilized to establish shipping companies’ countermeasures as it analyzes the factors to change in each market including the markets of container ship, dry bulk and oil tankers in detail and suggests a direction to respond.

3. Results

1) Summary

- Prospect of for the changing global trade patterns

   - The spread of multilateral free trade including WTO and regional free trade agreements including FTA and the development of communications and transportation technologies decrease cost and lower physical trade barrier.

   - Newly-emerging countries are under a spot light as a new trade hub, as the foreign direct investment, production
and trade in developing countries grow and the income of emerging countries increases along with the increasing number of middle-income class.

- China and India witness rapid economic development and economic integrates at an accelerated pace in East Asian countries. It is therefore forecasted that East Asian market will make the world's biggest economic block.

- Advanced countries paid attention on the job-creation and income-generation effects of the manufacturing industry after the global financial crisis. They executed so-called re-shoring strategies in which production base is established on their home land or neighboring countries.

- China and India import a massive quantity of low-priced energy and raw materials from Australia, Brazil, Africa, etc. Therefore, it is predicted that new shipping routes for dry bulk and oil tanker will be in operation and promoted to meet the new demands.

❖ Direction to respond to changes in the shipping market
- Container ship market
  ① Have a strategic alliance with major shipping companies that operate Asian, Middle Eastern and African routes and develop a differentiated service with global shipping companies such as Maersk
  ② Purchase eco ship and super tankers at the right timing to have coast leadership
  ③ Develop a financial support to subsidize the purchase of eco ships and super tankers
  ④ Secure an ability to collect and predict the related market information to have competitive edge in the newly emerging markets and high added-value markets.

- Dry bulk market
  ① Review joint service and a pool system of cape-size fleet before introducing a shipping pool system.
  ② Conduct sales and marketing activities to shippers considering a joint fleet and a pool vessel as the same unit
  ③ Promote a long-term carrier contract such as COA or CVC considering a joint fleet and a pool vessel as a unit
  ④ Develop a fleet organization and service to provide customized services to major shippers of raw material importing and exporting countries

- Oil tanker market
  ① Secure cargo volume of Korean ship owners first and deploy aggressive sales marketing activities in the spot market
  ② Create a fleet pool through cooperation among national flag carriers to be prepared for a freight rate war and secure economically feasible ships

❖ Countermeasures of shipping companies and government
- Countermeasures of shipping companies
  ① Reduce logistics cost systematically and generate profits
  ② Identify high added-value and differentiated businesses including the measures to enter the fresh goods shipping market along with the development of refrigerating shipping containers
  ③ Review an introduction of a shipping pool system, implement sales and marketing activities considering a joint fleet and a pool ship as a unit and have a long-term carrier contract
  ④ Continue to monitor changes in the trade patterns, supply and sea routes by type of major freight and collect related information to build up a database

- Government’s countermeasures
  ① Gradually increase capital of the Shipping Guarantee Agency and the scale of subsidy
  ② Develop additional support measures including utilization of domestic and overseas capital market or subordinated guarantee based on the ship investment company system.
  ③ Provide an intensive support for supertankers through Shipping Financial Center, Maritime Guarantee Agency, and Eco-ship Fund of The Export-Import Bank of Korea.
  ④ Support ship investing firms through private equity funds
  ⑤ Give additional points to the public corporations that consumes raw materials and energy including oil, coal and iron ore and uses national flag carrier when transporting their own cargo.

2) Policy contribution
❖ The study analyzes the factors of change in the shipping markets according to the change in the global trade patterns. It suggests new paradigm that will lead the changes in the shipping market based on the long-term prospects. It also contributes to development of a direction in an inte-
RESEARCH FINDINGS

grated response and policy execution measures.

3) Expected benefits

○ The study seeks for strategic counter measures for shipping companies according to specific market including container ship, dry bulk and oil tanker. It also contributes to development of governmental support measures and institutional improvement measures to strengthen competitiveness of Korean shipping companies.

○ The key factors that lead changes in the shipping market and the structural changes of the market are identified in detail to establish a theoretical foundation for academic research on the structural changes of the shipping market. KMI

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RESEARCH PROJECTS

• A Validity study on Inland Waterway Transport (IWT) between Korea-Mekong River and repair shipyard in Cambodia
• A Study on damage of Chinese fishing boats operating in Northern seas
• Technological development of mobile-rack for transportation to improve loading efficiency and unloading convenience
• A study on economic feasibility, financial analysis and demand estimation for ports development in Columbia
• A review study on economic feasibility and validity of basic plan on Constantza Port, Romania
• A study on construction plan for alternative maritime power (AMP) supply for ships and improvement measures for lighting standards of automated ports
• A comprehensive development plan of fisheries industry in Wando-gun
• The 3rd nationwide costal port master plan revision (prospects for development condition)
• A study on port development condition prospects and reestablishment of development direction for the 3rd basic plan (revised) on national trade ports
• A mid and long term study of effective preservation and smart usage of Suncheon bay
• Yeosu project - SOI support project for CBD
• R&D Technology development for low carbon automation container terminals (2015)
• A Study on developing Korean port security risk assessment system
• The 2nd port redevelopment basic planning (academic research)
• Changes to the 2nd integrated coastal management plan
• A basic study on how to reuse the Mipo Dockyard at Jangsangpo
• R&D on marine environment and ecosystem management nearby Saemanguem
• 2015 Entrusted operation of Port demand prediction center
• Improvement on fishing management system
• Improvement of neighboring roads to secure competitiveness of port logistics
• Study on preparing technology standards for safety management of ports maritime construction equipment
• Analysis on demand and ripple effects while setting up the master plan of special economic zone in Bitung, Indonesia
• A Study on basic strategy of maritime and fisheries industry for driving inter-Korean exchange cooperation
• A Study to promote cooperative relation among Northeast Asian ports
• 2015 Information provider on overseas market for ocean plant service industry
• Consigned operation of 2015 shipping, port and logistics information center homepage
• 2015 National transportation surveys and DB establishment
• 2015 follow-up study on the basic plan of the Arctic policy
• Certification of good logistics warehouses in port area
• 2015 Maritime and fisheries ODA international conference
• A Study on 2015 IMO strategic responses
• Domestic commercialization of CO2 storage at the ocean underground
• A Study on system improvement of non-administrative port construction
• Survey on fisheries equipment industry and promotion measures
• A Study on establishing a national logistics basic plan (2016-2025)
• A validity study on master planning of Russia Far East Port
• A validity study and revised plan (draft) on public water reclamation
• Operation of International Logistics Investment Analysis Center (2015)
• A study on environmental standard establishment for each waters (3rd Study)
• Comprehensive report on Sewol ferry sinking
• Development of evaluation method on climate change impacts and its vulnerability on Fisheries industry
• Operation of private-government-industry-university conference at Ulsan coast and the Gwangyang Bay
• 2015 Study on implementing total pollution loads management in special management waters at Masan Bay
• A Basic Plan on Myanmar port development and its validity
• A Comprehensive plan on maritime and fisheries sector in response to climate change
• A Study on measures to activate ship supplier business
• A Study on building a global network of marine territory expert
• 2015 Yeosu International Academy Project
• China’s one belt one road strategy and measures to utilize: focusing on logistics
• A study on establishing long-term development plan for shipping industry (4th)
• 2015 analysis on actual conditions of beaches and management types
• A Study on management measures on national coastal ports
• Impact of radioactive substance concentration on fisheries products and case study (3rd)
• A Validity study on register regulation in maritime and fisheries sector
• A study on mid-term development direction for fisheries grants in less favored areas and its pricing system
• A study on biz model development and luring of business in Pyeongtaek-Dangjin Port
• A study on establishment of mid and long term development strategy for cruise industry (co-work)
• Korea-China-Japan transportation and logistics cooperation measures (6th)
• A study on international agreements related to marine life resources
• Improvement measures on pricing system of charging exclusive use on public waters
• A policy study on developing GTO customized to Korea
• Actual condition survey of beaches and establishment of basic plan
• 3-2 stage project for building shipping market information networks
• A Study on improvement measures of pilotage system at Jeju ports
• A study on pricing systems of Terminal Operating Companies (TOC)
• Performance evaluation of unified cargo handling equipment and design development of loading/unloading work area (2nd year)
• Operation of Yeosu Youth Ocean Academy
• Consigned host of business forum on Korea-Russia Logistics Cooperation Promotion
• A Study on impact analysis and responsive measures for TPP fisheries sector
• System improvements for attracting overseas fisheries investment in Fareast Russia
• Foundation establishment for undersea tests of ocean drilling equipment
• Manual of coastal development plans and follow-up measures for equipment management
• A study on operation, maintenance and management of floodgate facilities
• A study on advancement into special logistics market (centering on joint logistics, cold chain and project logistics)
• Measures for Establishing FTZ cold chain hub and networks
• Survey on distribution channel of renewable energy cargoes at hinterlands in metropolitan area
• The 9th Seoul International Maritime Forum
• Evaluation of business plan on marina port base development (6 sites)
• Conference on fisheries cooperation of coastal countries in the Arctic Ocean
• A study on fisheries related industry of coastal countries in the Arctic Ocean
• Measures to improve structure of fisheries industry
Major Activities planned in June 2015

1. Academic seminar ‘China’s New Silk Road (One belt, one road) Strategy and Korea’s Choice’
   - Time/Place: June 9 (Tue) 15:00 / Conference room at Korea Chamber of Commerce and Industry
   - Subject: China’s One Belt One Road Strategy and Future Direction
   - Participants: Experts including professor Shu Jianzhong of Institute of International Relations of Nanjing University, professor Choi Pil-Soo of Sejong University, President Eoh Hae-Hyuk of CJ Korea Express General Logistics Research Institute.

Major Activities planned in July 2015

1. The 1st International Seminar on the Arctic Information and Knowledge (ISAIK)
   - Time/Place: July 7 (Tue) 11:00~18:00 / KMI, Conference Hall
   - Subject: Policy development for sustainable growth of the Arctic
   - Presenter/Discussant: Courtney Price (Communications Officer of CAFF), Markku Tapani Heikkilä (Head of Science Communications of Arctic center), James T. Gamble (Executive Director of AIA), Lee Yoo-Kyung (Principal Research Scientist of Korea Polar Research Institute) etc.

2. 2015 China-Korea International Forum on Maritime Economics
   - Time/Place: July 22 (Wed) 09:00, Sejong Hotel, Seoul
   - Subject: China’s Ocean Silk Road Strategy and Korea-China cooperation
   - Participants: 30 experts from KMI, Sandong Academy of Social Sciences in China, CIMA, KIEP and Sungkyun Institute of China Studies