<1> Council for Rationalization of Shipping and Shipbuilding Industries (CRSSI) (Japan): Announced in December, 1991

<2> Association of West European Shipbuilders (AWES): Announced in October, 1992

<3> Association for Structural Improvement of the Shipbuilding Industry (ASIS) (Japan): Announced in March, 1993

These building demand forecasts were made by nearly the same method (Material 8) and their results are as follows.

* Results of shipbuilding demand forecasts (World's yearly average shipbuilding demand; Unit : Million DWT)

Period / Announced by	<1> : 1991 - 1995 <3> : 1992 - 1995	1995 - 2000	2000 - 2005
<1> Council for Rationalization of Shipping and Shipbuilding Industries (CRSSI)	27.2	39.5	35.9
<3> Association for Structural Improvement of the Shipbuilding Industry (ASIS)	27.7	37.4	35.9

With regards to the forecast made by <2> Association of West European Shipbuilders (AWES), refer to Material 9.

(2) Reflection of Demand Forecasts in Shipbuilding Policy

The following common trend should be recognized from these demand forecasts. The newbuilding demand of the global shipbuilding industry will increase steadily in future because the seaborne freight volume will increase slowly along with the stable growth of the world economy, and also because replacement building demand will gradually arise for a large number of large tankers etc. built in the mid-1970s. The building demand will peak around 2000. After that, the demand will decrease because replacement demand mainly for large tankers will have been more or less met. (Material 10)

Therefore, shortsighted expansion of shipbuilding facilities, or labor increases to meet the temporary demand increase during the 1990s will bring about a large demand imbalance again when the building demand decreases after 2000. This can lead to a worldwide shipbuilding depression again.

Being aware of the above danger, Japan has taken a policy of meeting temporary demand increases by raising productivity through mechanization and labor savings without increasing the shipbuilding capacity from the current level.

3. Current State and Prospects in the Ship Scrapping Industry

(1) Scrapping and the Shipbuilding Industry

Because the continuing aging of vessels worldwide (Material 11) has recently become one of the causes of maritime accidents frequently occurring, there are movements to promote the exclusion of substandard vessels, such as old vessels, by applying stricter regulations to port state control and vessel inspections. The environmental regulations applied to vessels have also been strengthened from the viewpoint of oceanic environment preservation. Meanwhile, tankers etc. built in large quantity during the 1970s are approaching their replacement season. The smooth scrapping of aged vessels that are excluded from the shipping market is the key to stabilizing both the business of the shipping industry and the shipping market. Also, it is one of the factors that exert influence on the shipbuilding market. Therefore, attention must be paid to scrapping from the standpoint of the shipbuilding industry as well.

(2) Current State of Ship Scrapping

* Actual

The world's scrapping volume peaked in 1985, but has decreased since then owing to the global improvement of the shipping market in the late 1980s. The scrapping volume has stayed at only about 2 million gross tons (GT) per year over the past several years, accounted for mainly by medium-sized and small vessels scrapped by developing countries, such as India, Bangladesh, and Pakistan. Taiwan and Korea, which used to be major scrapping countries in the past, left the scrapping business on account of soaring labor costs, etc. (Material 12)

Meanwhile, 1992 showed a sign that indicates the scrapping volume will increase because the vessel transactions for scrapping increased to about 11 million tons.

* Scrapping methods

Scrapping methods can be classified broadly into 2 types <1> the Grounded method and <2> the Afloat method.

<1> Grounded method
This means to ground a vessel ashore and scrap it manually using winches. This method is employed in countries like China, India, Pakistan, and Bangladesh. This method is applied to medium-sized and small vessels.

<2> Afloat method
This means to berth a vessel alongside a quay and scrap it while unloading cut parts using a crane. This method was employed in Taiwan and Korea, which have already left the scrapping business. At present, it is used at some scrapping yards in China. This method is applicable even to large vessels, such as VLCCs.

* Characteristics of the scrapping business

The scrapping business has the following characteristics.

<1> Although this business does not require a large investment for facilities, it needs shorelines, quays, etc. that are suitable for scrapping operations as well as an abundant, inexpensive, labor force.

<2> There must be a clear domestic demand for products of scrapping, such as rolled steel. The rolled steel that is obtained from scrapped vessels is rerolled and made mostly into steel bars used for construction work. Since there is no large international market for steel bars for construction use, they must be consumed in the domestic market.

<3> The purchase prices of vessels for scrapping tend to have wild ups and downs due to fluctuations of the shipping market. Also, the selling prices of scrapping products fluctuate violently depending on the demand for steel. Therefore, scrapping is a risky business which does not have stable profitability.

(3) Prospects of Scrapping Volume

A large number of vessels, starring with the large tankers that were built during the 1970s, will reach scrapping age in the late 1990s, and so a large volume of scrapped vessels is forecast. According to the forecast made by the joint committee of the Shipbuilders' Association of Japan and Japanese Shipowners' Association, the average annual scrapping volume is anticipated to be 18.6 million GT between 1996 and 2000. It is predicted to exceed 20 million GT in the peak year. (Material 13)

(4) Forecast of Scrapping Capacity

The joint committee of the Shipbuilders' Association of Japan and Japanese Shipowners' Association has dispatched study teams to Taiwan, Korea, China, India, Pakistan, and Vietnam since June, 1992. The study team has surveyed the current state of the scrapping business in these countries and estimated the future scrapping capacity based on the survey results.

According to the results obtained by the survey, the current worldwide scrapping capacity is about 10 million gross tons (GT) per year. The future scrapping capacity is roughly estimated to be between 14 million GT and 26 million GT per year in the late 1990s when the volume of scrapping vessels is anticipated to largest.

(5) Future Actions

It is predicted that a large scrapping demand will arise in the future. One of the greatest concerns of the world's shipping and shipbuilding industries is whether or not the global scrapping capacity will be able to meet the demand.

If old and outworn vessels cannot be scrapped smoothly, this can bring about problems in navigational safety as well as from the aspect of marine environment protection. Since the future shipbuilding demand will be accounted for mainly by demand produced by the replacement of old vessels, smooth scrapping of old and outworn vessels is important from the viewpoint of creating stable shipbuilding demand as well.

Since there is a need for an international framework for dealing with the scrapping of old and outworn vessels, the shipping and shipbuilding countries in the world must work on this problem in cooperation.

4. Activities of the OECD Council Working Party on Shipbuilding

(1) The OECD Council Working Party on Shipbuilding

In 1965, the OECD Council Working Party on Shipbuilding was established for the purpose of discussing measures against the depression of the shipbuilding industry. Since then, OECD countries have made strategic discussions regarding the shipbuilding business at this working party.

The following countries are the members of this working party.

* Members (16 countries, 1 organization)

  Japan, U.K., France, Germany, Netherlands, Belgium, Denmark, Ireland, Italy, Greece, Spain, Sweden, Norway, Finland, U.S.A., Korea, EC Committee

* Observers (3 countries)

  Turkey, Canada, Portugal

(2) Shipbuilding Related International Agreements at OECD

The working party has continued to hold discussions with an aim to establish order in the shipbuilding market. They have adopted international agreements (gentlemen's agreements without any sanctions) that should be observed voluntarily by the Government of each country. The following international agreements have been adopted.

<1> Understanding on export credits for ships

- This was adopted in 1969. In 1979, it was revised to the current conditions shown below after several revisions.
- Export credit conditions participated by Governments or governmental institutions are to be regulated with an aim

to restrict governmental aid, which distort normal competitive conditions of the world's shipbuilding market, in the form of ship export credits. In principle, credit conditions that are more advantageous than these conditions are not to be given.

- Conditions

Payment by delivery:		Not less than 20% of the contract price
Maximum duration	:	8.5 years (10 years for vessels transporting LNG)
Interest rate	:	Not below 8%/year

<2> General arrangement for the progressive removal of obstacles to normal competitive conditions in the shipbuilding industry

- This arrangement was adopted in 1972 and revised in 1983.

- Its aim is to remove the fostering measures that distort normal competition in the shipbuilding industry as soon as possible. Under this agreement, each Government must progressively remove <1> government subsidized export credits <2> direct subsidies, and <3> customs tariffs and other obstacles, and, furthermore, must not introduce new fostering measures.

<3> General guidelines for government policies in the shipbuilding industry

- This guideline was adopted in 1976 and revised in 1983.
- It stipulates actions related to the reduction of excess capacity and the prohibition of furtherance subsidies that each Government should take in the midst of the worsening shipbuilding depression which has lasted since the 1st Oil Crisis.

- Its specific contents are outlined below.
  a. Appropriate adjustment of the shipbuilding capacity
  b. Prohibition of any measures that prolong the structural imbalance in the shipbuilding market
  c. Supervise vessel prices for ensuring moderate order receiving and production capacity.
  d. Suppress the creation of new shipbuilding capacity.

(3) Direction of Future Activities

The Working Party has been functioning consistently with an aim to "the progressive removal of obstacles to normal competitive conditions in the shipbuilding industry". Its activities will be oriented to the following direction in future.

<1> Establishment of an international treaty for the reduction of government assistance that is currently under discussion, and its execution

<2> Creation of common understanding through the exchange of information related to shipbuilding demand trends and policy harmonization based on this understanding

(4) Negotiation for an International Treaty for the Reduction of Government Assistance

* History

In 1989, the Shipbuilders' Council of America (SCA) filed suit against Japan, Korea, West Germany (at the time), and Norway to the United States Trade Representative (USTR) on the basis of Article 301 of the U.S. Trade Act. In this suit, the SCA claimed that the governmental assistance measures of these countries were dealing a large blow to the American shipbuilding industry, and demanded that the USTR take countermeasures. However, this case was withdrawn on condition that the problem of decreasing governmental

assistance be discussed at a multi-national meeting. Since then, the OECD Council Working Party on Shipbuilding has been working on the preparation of a new agreement having binding force that will replace the various agreements that had been produced by the working party.

* Contents of the New Agreement under discussing

The essence of the new agreement is as follows.

<1> Actions for governmental assistance measures that distort shipbuilding market

- Step-by-step reduction of existing measures
- Prohibition of introduction of new measures

<2> Prevention of dumping related to vessel prices

<3> Strategic measures for ensuring the execution of the Agreement and dispute settlement procedures

5. Trends of Environmental Regulations Applied to Ships

(1) OPRC Convention (International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990)

The standing accident of a tanker "Exxon Valdez" that occurred off Alaska, in the U.S., in 1989, polluted the seas along the Gulf of Alaska with oil and brought about enormous damage to the habitats of important animals and plants as well as to marine life.

The cause of this accident is said to be a maneuvering mistake made by the captain and the crew. However, it has been pointed out that the delay of initial oil control actions was the direct cause of such a massive oil spill despite the fact that "the

Exxon Valdez" was a tanker of the latest model. In other words, it took 1 hour to start actual oil control operations after the accident because oil control materials and machine did not arrive quickly enough.

For this reason, the IMO decided to establish an international treaty that contains a framework for international cooperation related to actions for large-scale oil spill accidents and the preparation of countermeasure plans. After carrying out studies for about 1 year, the IMO prepared "International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 (OPRC Convention)" in November, 1990. The aim of this convention is raise the oil control ability worldwide under international cooperation.

The main contents of the convention are as follows. <1> Vessels and land facilities must keep manuals of emergency actions for prevention of oil pollution. In the event of an accident, they should quickly report it to coastal countries. <2> Each country should construct a control system for oil spill accidents. Countries must cooperatively construct a regional system. <3> In the event of an accident, each country should cooperate by offering advice, materials, machines, etc. <4> The IMO is to have the function of mediating information and giving technological support.

This convention was to be put into effect in 1 year after being ratified by 15 countries. However, it has not yet been put into effect because its enaction requirements have not been met (ratified by 5 countries as of now).

(2) Manual of emergency actions for the prevention of oil pollution

A decision was made to effectuate the regulations for ships earlier than the other parts of the OPRC Convention by revising MARPOL 73/78 (Protocol of 1978 Relating to the International

Convention for the Prevention of Pollution from Ships, 1973). This revision was effectuated on April 4th, 1993, and has been enforced.

This revision demands a tanker not smaller than 150 tons (GT) and a non-tanker not smaller than 400 tons (GT) to keep a manual (Shipboard Oil Pollution Emergency Plan). This manual is to be a guideline for actions which should be taken by the crew immediately.

This manual is to contain the following information: <1> Procedures related to the reporting of an oil spill accident; <2> A list of the authorities to which an accident must be reported; <3> Actions that should be taken immediately by the crew in the event of an accident ; and <4> Procedures for coordinating the related authorities and actions on boat related to oil control and the communication system within the ship.

(3) Strengthening of Tanker Structure Regulations

Triggered by the accident of "Exxon Valdez," the OPA '90 (the US Oil Pollution Act, 1990), a domestic act that obligates a double hull structure for tankers, was established in the U.S.

MARPOL 73/78 already comprised regulations for limiting the amount of oil spilled from a tanker. Tank sizes and tank layout have been regulated. The disaster of Exxon Valdez raised the demand to further strengthen the current international regulations.

In April of 1992, a revision of MARPOL 73/78 which strengthens structural standards for oil tankers, such as the double hull structure, was adopted by the IMO.

This revision is to be put into effect on July 6th, 1993. Its contents are as follows.

<1> Regulations for newbuilding oil tankers

a) Structural standards for tankers not smaller than 5,000 DWT

- Double hull structure (Double bottom and double side)

or

- Double side structure with an intermediate deck, etc.

b) Structural standards for tankers not smaller than 600 DWT, but smaller than 5,000 DWT

- Double bottom structure

and

- Double side structure or tank capacity limitation (below 700 m^3)

<2> Regulations for existing oil tankers

a) Applicable tankers

Crude oil tankers not below 20,000 DWT
Refined oil tankers not below 30,000 DWT

b) Beginning of application

July 6th, 1995

c) Contents of regulation

A tanker should comply with the standards for a newbuilding tanker by age 25 or 30 (applicable if fixed structural requirements are met).

6. Current State and Future Trends of Port State Control (PSC)

(1) Background for PSC Strengthening Movement

Conventions related to maritime safety and marine environmental protection, such as SOLAS (International Convention for the Safety of Life at Sea, 1974) and MARPOL (International Convention for the Prevention of Pollution from Ships, 1973), have been established under the principle of so-called flag country control, which means that flag countries establish laws and regulations that are necessary for enforcing these international regulations and ensure their observance. Port state control has played the role of complementing flag country control. However, the frequency of maritime accident occurrences have raised the awareness that port state control for so-called substandard ships that do not meet the criteria of conventions, etc. must be strengthened.

In order to raise the effectiveness of port state control, it should be enforced to as many ships as possible rather than to limited organizations and people. It is also important not to place an unnecessary burden on the ships that are placed under the control. Therefore, countries within a particular area have recently begun to cooperate in executing port state control, such as by exchanging information on ships to which port state control has been enforced.

(2) Main Movements

<1> IMO (International Maritime Organization)

In 1981, the port state control procedure for excluding substandard ships was adopted as a general meeting procedure. In 1991, a resolution to promote the construction of a regional cooperation system for the enforcement of port state control was adopted.

<2> European MOU

14 advanced European countries (U.K., France, Germany, Finland, Norway, Sweden, Denmark, Belgium, Netherlands, Italy, Ireland, Spain, Portugal and Greece) are enforcing port state control on foreign ships entering ports based on the MOU (Memorandum of Understanding) adopted at a minister-level conference of the EC in 1982. They annually carry out random surveys on 25% of ships that enter their ports. This means that each ship is given an occasional survey once every 4 years on average.
They plan to strengthen supervision on the qualification and ability of the crew and positively support the improvement of a cooperation system outside Europe.

<3> Asia/Pacific region

In February, 1992, a preliminary meeting related to port state control in the Asia/Pacific area was held in Tokyo. The aim of this meeting is to improve regional cooperation for port state control and its execution system. Nine countries participated in the meeting. A regional agreement targeted at the enforcement of port state control based on unified standards is planned to be adopted in the first part of 1994 in Tokyo. Details, such as the participating countries and target number of ships, are not yet determined. Its future movement must be watched.

Japan already cooperates with the MOU member countries through exchanges of information, etc. Japan plans to further strengthen the cooperative relationship with these countries in the future. At the same time, Japan is playing the leading role in establishing a PSC cooperation system in the Asia/Pacific area. Japan plans to gradually strengthen PSC with a target of enforcing PSC on 25% of the foreign ships (about 10,000 ships) that enter Japanese ports. (The target for 1997 is 5,500 ships.)

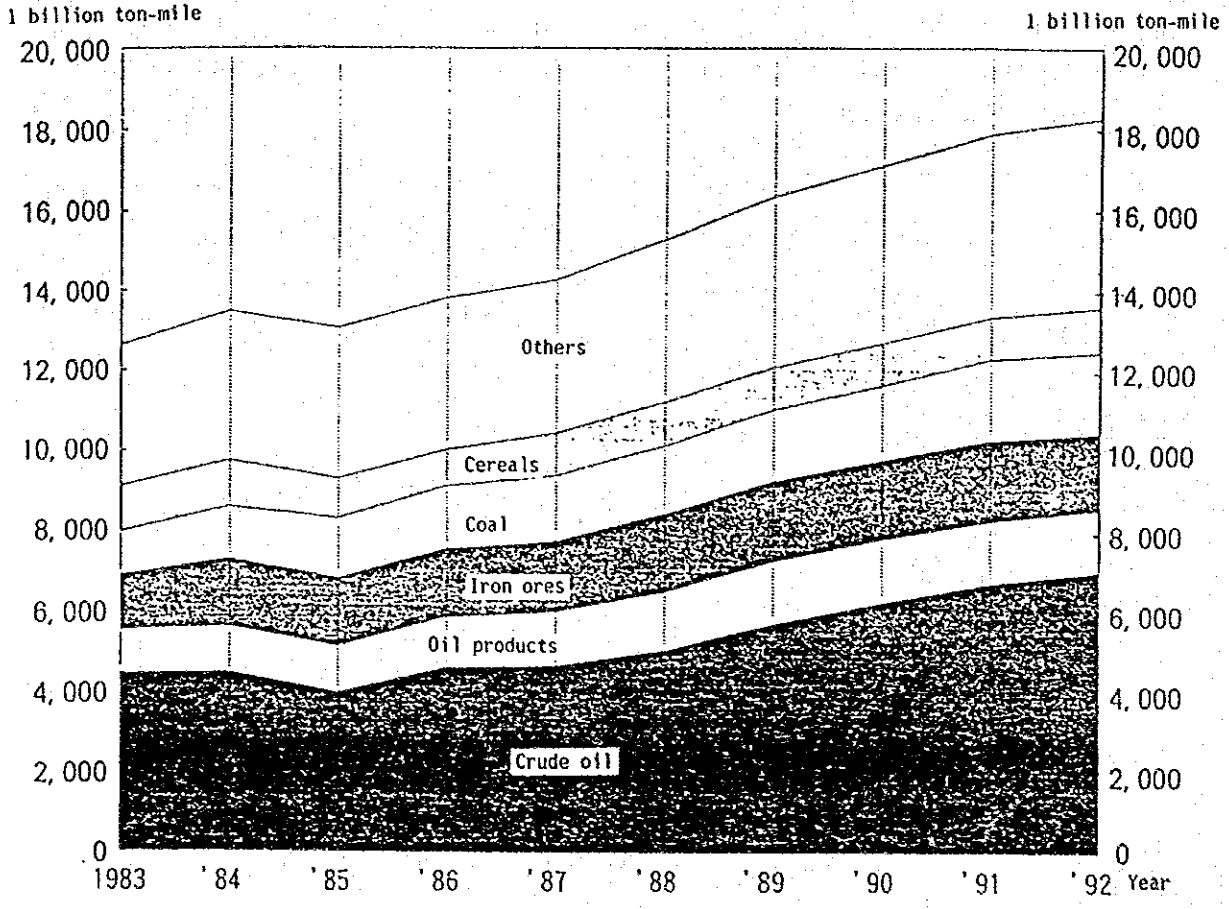
<4> Central and South American region

In November of 1991, a regional agreement was signed by 10 Central and South American countries in Chile. It was agreed to enforce port state control on 15% of ships that enter ports by 1995.

Material 1

Transition of Global Seaborne Freight Volume

Unit : Ton-mile



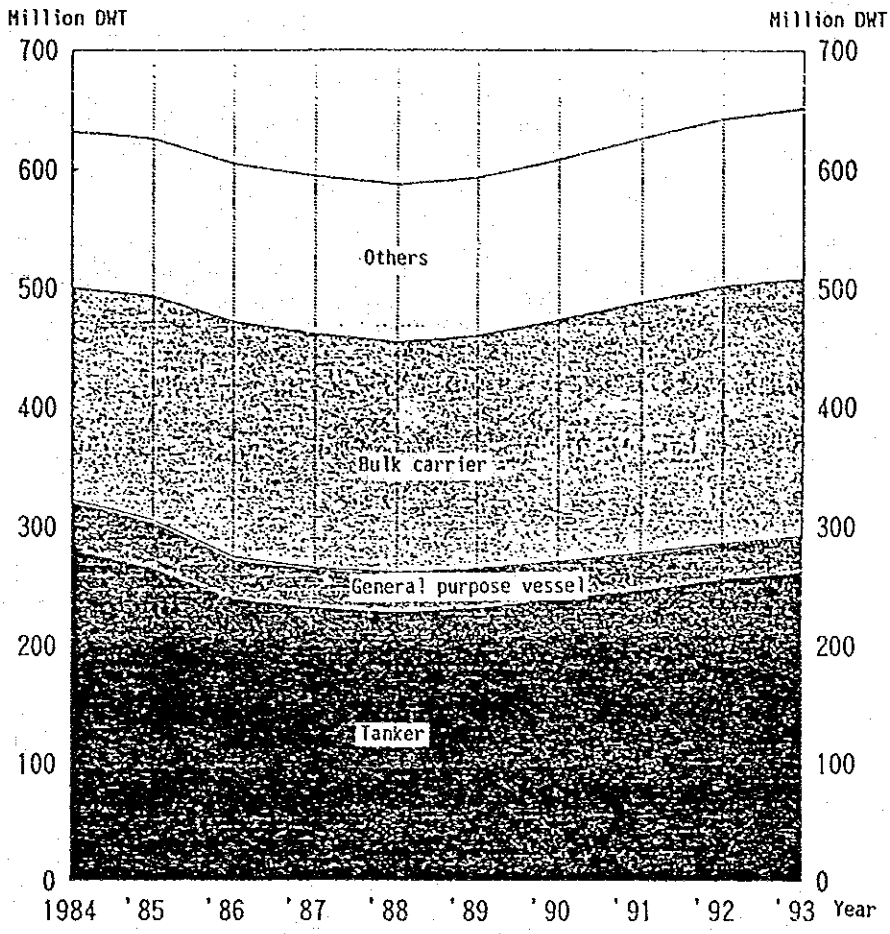
Unit: 1 billion ton-mile

	Crude oil	Oil products	Iron ores	Coal	Cereals	Others	Total
1983	4,478	1,080	1,359	1,074	1,135	3,510	12,636
1984	4,508	1,140	1,670	1,289	1,157	3,720	13,484
1985	4,007	1,150	1,702	1,473	1,004	3,750	13,086
1986	4,640	1,265	1,699	1,558	914	3,780	13,856
1987	4,671	1,345	1,761	1,622	1,061	3,840	14,300
1988	5,065	1,445	1,950	1,682	1,117	4,040	15,299
1989	5,736	1,540	2,012	1,752	1,095	4,250	16,385
1990	6,261	1,560	1,978	1,849	1,073	4,400	17,121
1991	6,757	1,530	2,008	1,999	1,069	4,510	17,873
1992	7,070	1,540	1,890	2,000	1,130	4,650	18,280

(Notes) 1. Based on Fearnleys "Review".
2. The values for 1992 are estimated values.

Material 2

Transition of Global Tonnage



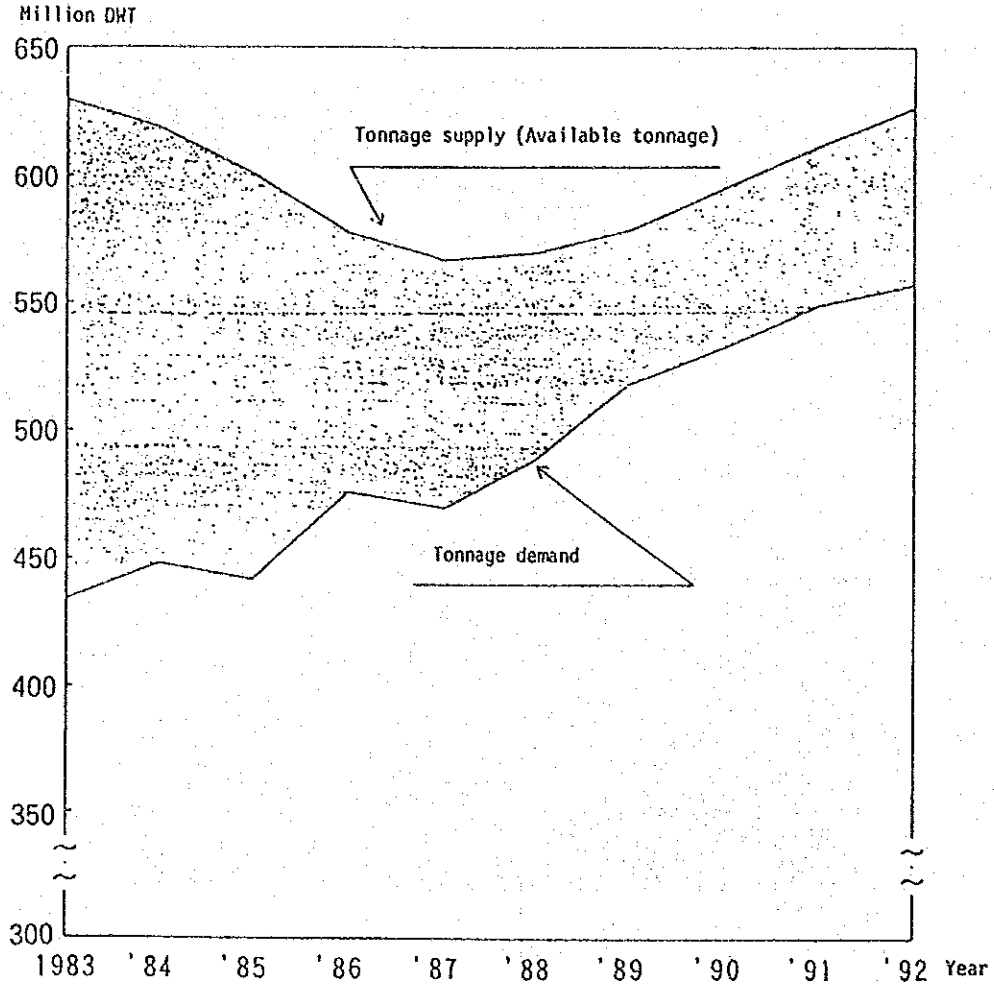
Unit: Million DWT

Type \ Year	1984	'85	'86	'87	'88	'89	'90	'91	'92	'93
Tanker	280	265	239	233	229	232	239	246	256	261
Combination carrier	42	41	36	33	34	33	32	32	31	31
Bulk carrier	178	188	198	196	193	196	203	211	216	216
Others	132	133	133	133	132	133	135	138	141	144
Total	632	626	605	595	588	594	609	627	643	652

(Notes) 1. Based on Fearnleys "Review" and "World Bulk Fleet".
2. For each year, the figures as of January 1 are given.
3. The table gives data for tankers, combination carrier and bulk carriers not below 10,000DWT and other vessels not below 1,000GT.
4. The values given for 1993 are tentative values.

Material 3

Transition of Surplus Tonnage



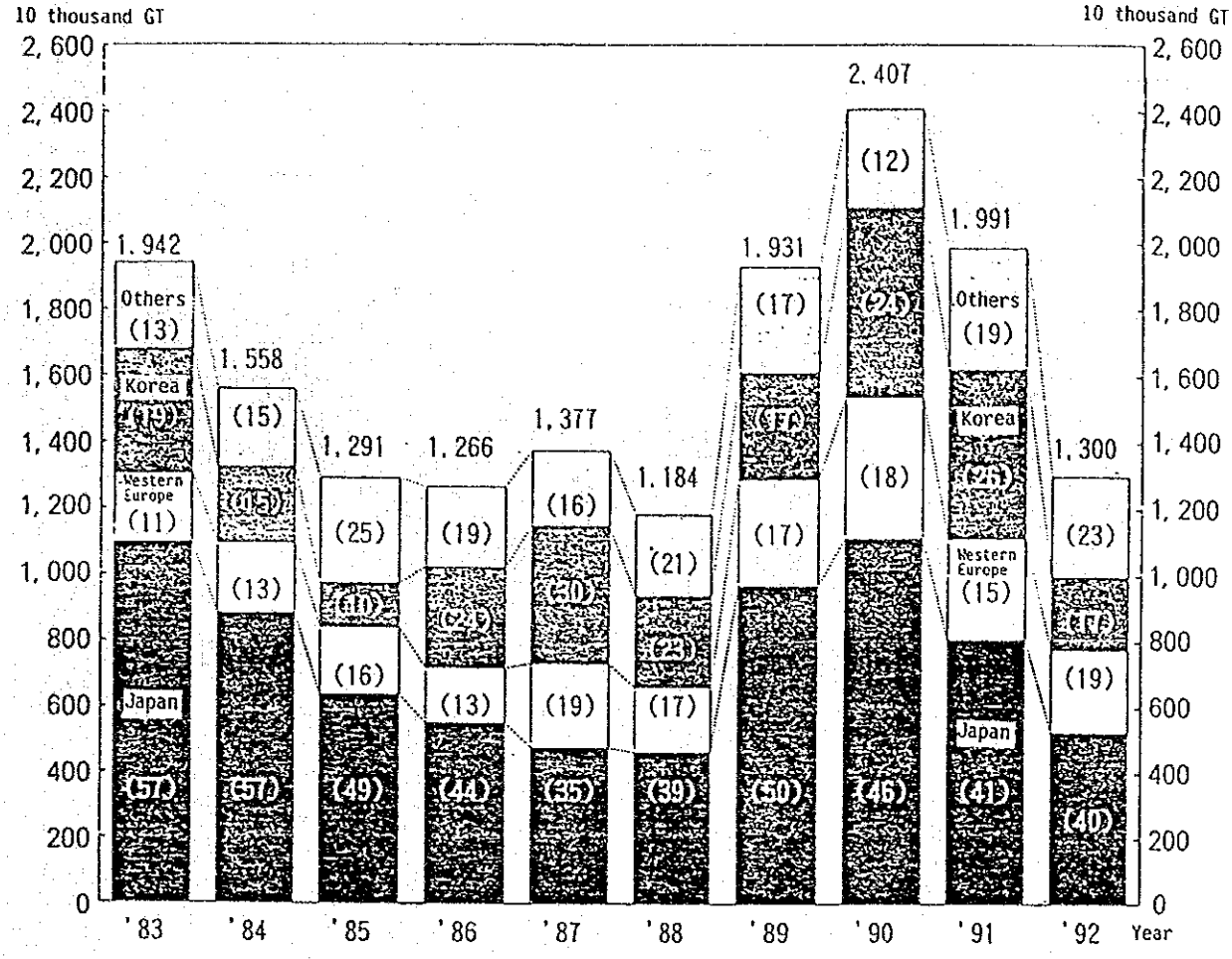
Unit: Million DWT

Item \ Year	1983	'84	'85	'86	'87	'88	'89	'90	'91	'92
Available tonnage	630	619	601	578	567	570	579	596	612	627
Surplus tonnage	196	171	159	102	97	81	61	63	63	70
Ratio of surplus %	30	28	26	18	17	14	11	11	10	11

(Notes) 1. Based on Lloyd's Shipping Economist.
2. LPG, LNG boats, general purpose vessels as well as tankers and bulk carriers below 10,000DWT are not included.

Material 4

Transition of Global Orders Received by Region



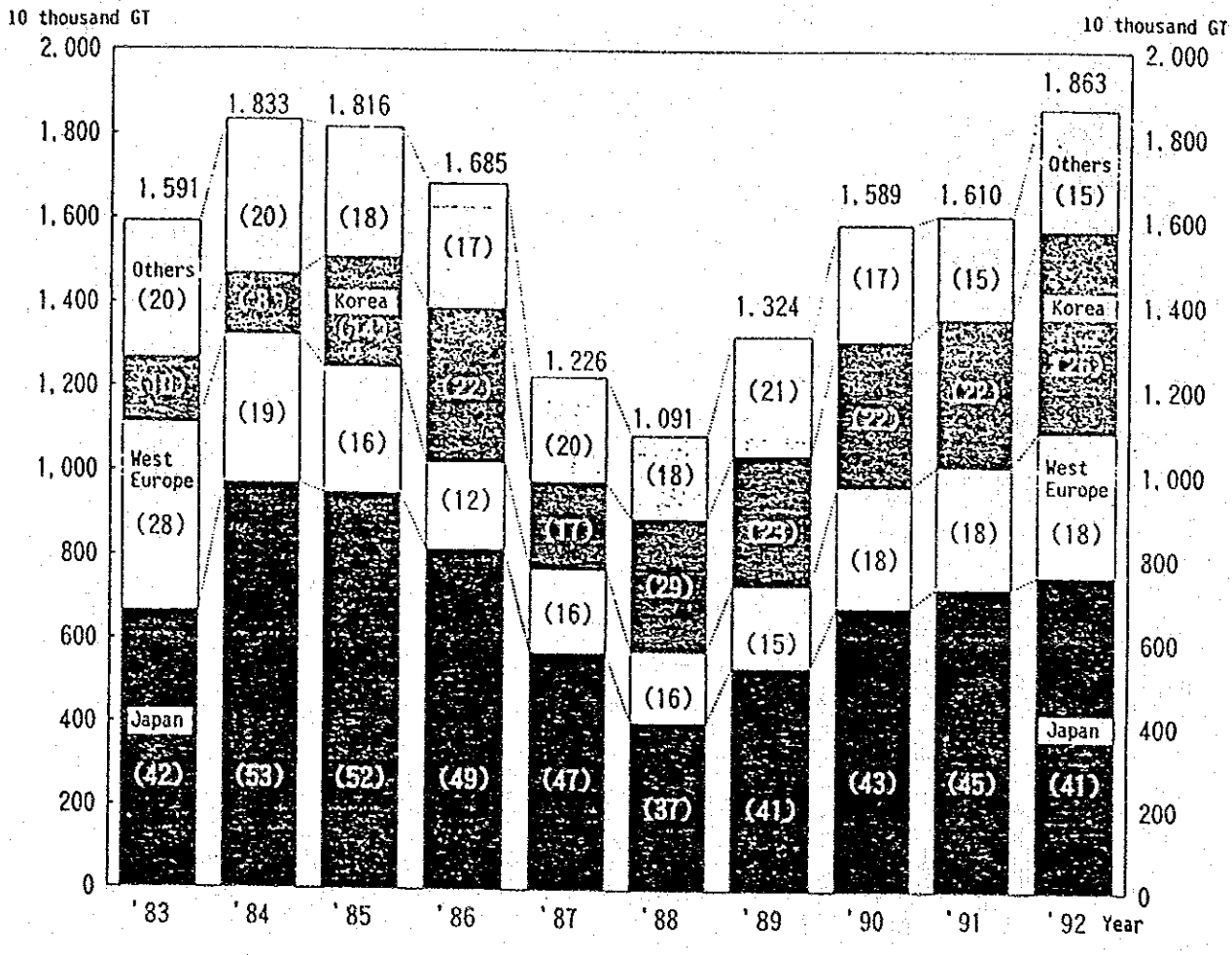
(Notes)
1. Based on materials of Japan Ship Exporters' Association.
2. The figures in parentheses are shares.
3. The orders received was the highest (72,810 thousand GT) in 1973.
4. The values for 1992 are quick report values.

Unit: 10 thousand GT

Year	1983	'84	'85	'86	'87	'88	'89	'90	'91	'92
Japan	1,098	884	636	552	477	463	970	1,114	807	525
Western Europe	207	210	204	167	257	200	320	423	305	252
Korea	373	229	134	306	416	276	322	574	510	221
Others	264	235	317	242	226	246	319	296	368	302
Global total	1,942	1,558	1,291	1,226	1,377	1,184	1,931	2,407	1,991	1,300

Material 5

Transition of Global Completion Volume by Region



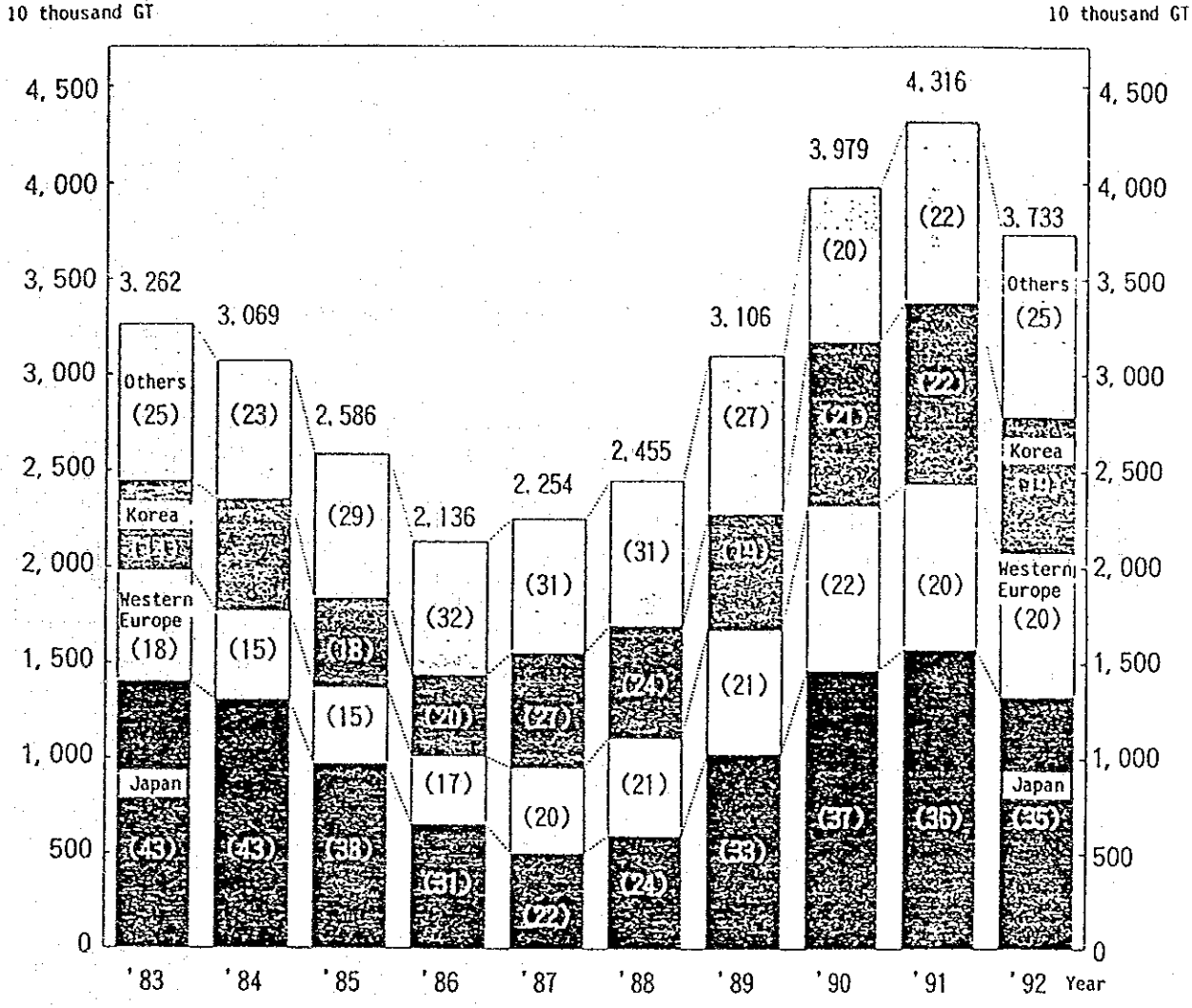
(Notes) 1. Based on Lloyd's statistics.
2. The figures in parentheses are shares.
3. The completion volume was highest (34,200 thousand GT) in 1975.

Unit: 10 thousand GT

Year	1983	'84	'85	'86	'87	'88	'89	'90	'91	'92
Japan	667	971	950	818	571	404	537	682	728	758
Western Europe	446	350	296	206	199	171	196	285	289	341
Korea	154	147	262	364	209	317	310	346	350	477
Others	325	365	308	296	248	198	281	276	243	288
Global total	1,591	1,833	1,816	1,685	1,226	1,091	1,324	1,589	1,610	1,863

Material 6

Transition of Global Backlog by Region



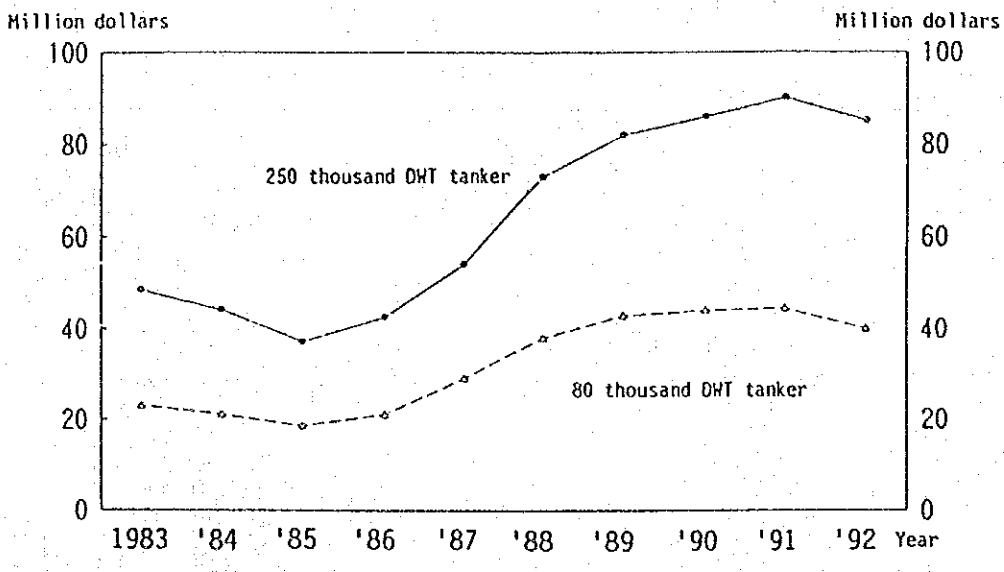
(Notes) 1. Based on Lloyd's quarterly statistics.
2. The figures in parentheses are shares.
3. For each year, figures as of the end of a year are given.

Unit: 10 thousand GT

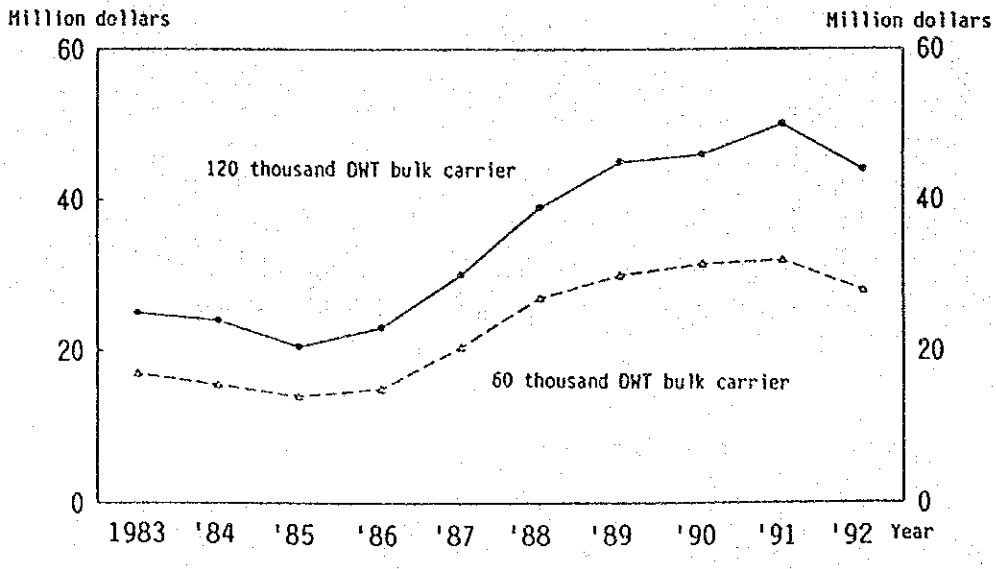
Year	1983	'84	'85	'86	'87	'88	'89	'90	'91	'92
Japan	1,403	1,307	973	656	503	595	1,027	1,465	1,572	1,325
Western Europe	581	464	398	360	451	516	649	856	861	755
Korea	462	580	467	422	602	856	602	852	943	703
Others	817	718	748	697	697	756	825	806	940	951
Global total	3,262	3,069	2,586	2,136	2,254	2,455	3,106	3,979	4,316	3,733

Material 7

Transition of Prices of Newbuilding Vessels



Tanker	1983	'84	'85	'86	'87	'88	'89	'90	'91	'92
250 thousand DWT tanker	48.5	44.0	37.0	42.5	54.0	73.0	82.0	86.0	90.0	85.0
80 thousand DWT tanker	23.0	21.0	18.5	21.0	29.0	38.0	43.0	44.0	44.5	40.0



Bulk carrier	1983	'84	'85	'86	'87	'88	'89	'90	'91	'92
120 thousand DWT bulk carrier	25.0	24.0	20.5	23.0	30.0	39.0	45.0	46.0	50.0	44.0
60 thousand DWT bulk carrier	17.0	15.5	14.0	15.0	20.5	27.0	30.0	31.5	32.0	28.0

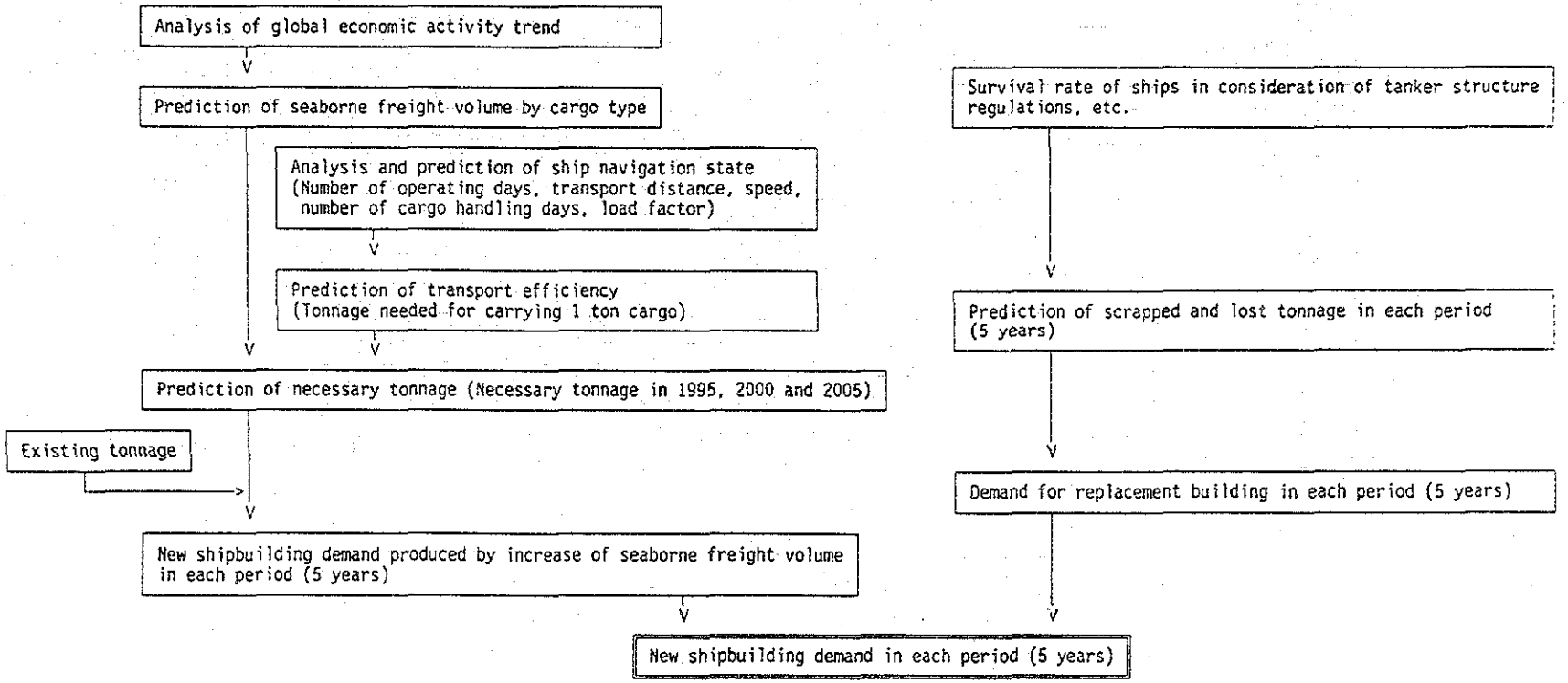
(Notes) 1. Based on Fearnleys "Review".
2. For each year, the figures as of the year end are given.

Outline of Demand Forecast Procedure for Newbuilding Oceangoing Vessels (Sample)

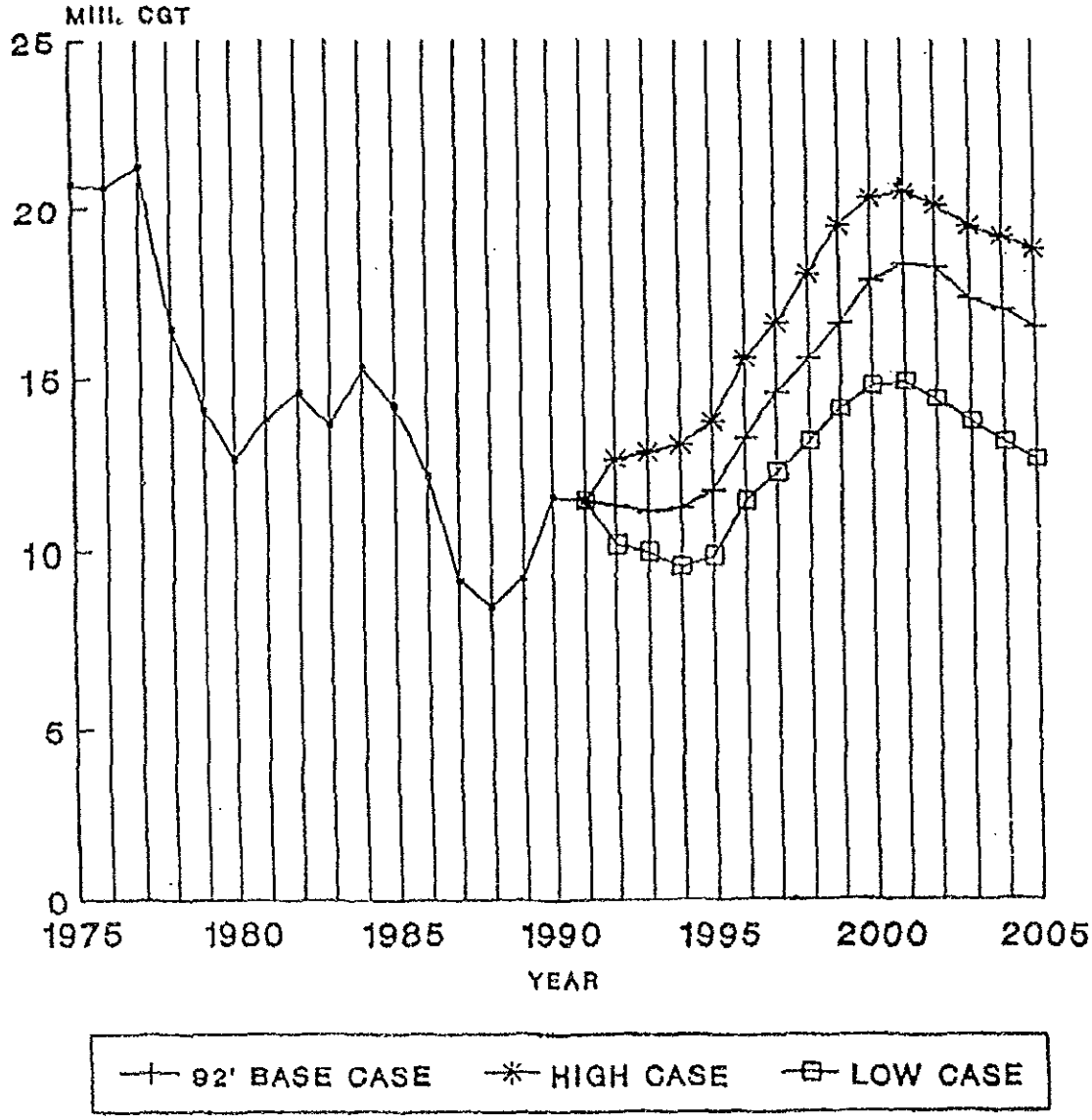
I. Forecast of building volume by cargo type, vessel type, and vessel class

- Predict marine freight volume classified by the following types of cargo
  Oil (Crude oil and oil products)
  Dry cargo: 5 major bulk cargo (iron ores, coal, cereals, bauxite/alumina, phosphate rock), other dry cargo (general cargo)
  LPG
  LNG
- Compute tonnage classified by the following ship types and ship sizes needed for carrying the above cargo.
  (1) Tanker (- 60 thousand DW, 60 - 100 thousand DW, 100 - 200 thousand DW, 200 thousand DW -)
  (2) Bulk carrier (- 60 thousand DW, 60 - 100 thousand DW, 100 thousand DW -)
  (3) LPG carrier
  (4) LNG carrier
  (5) Other cargo vessels

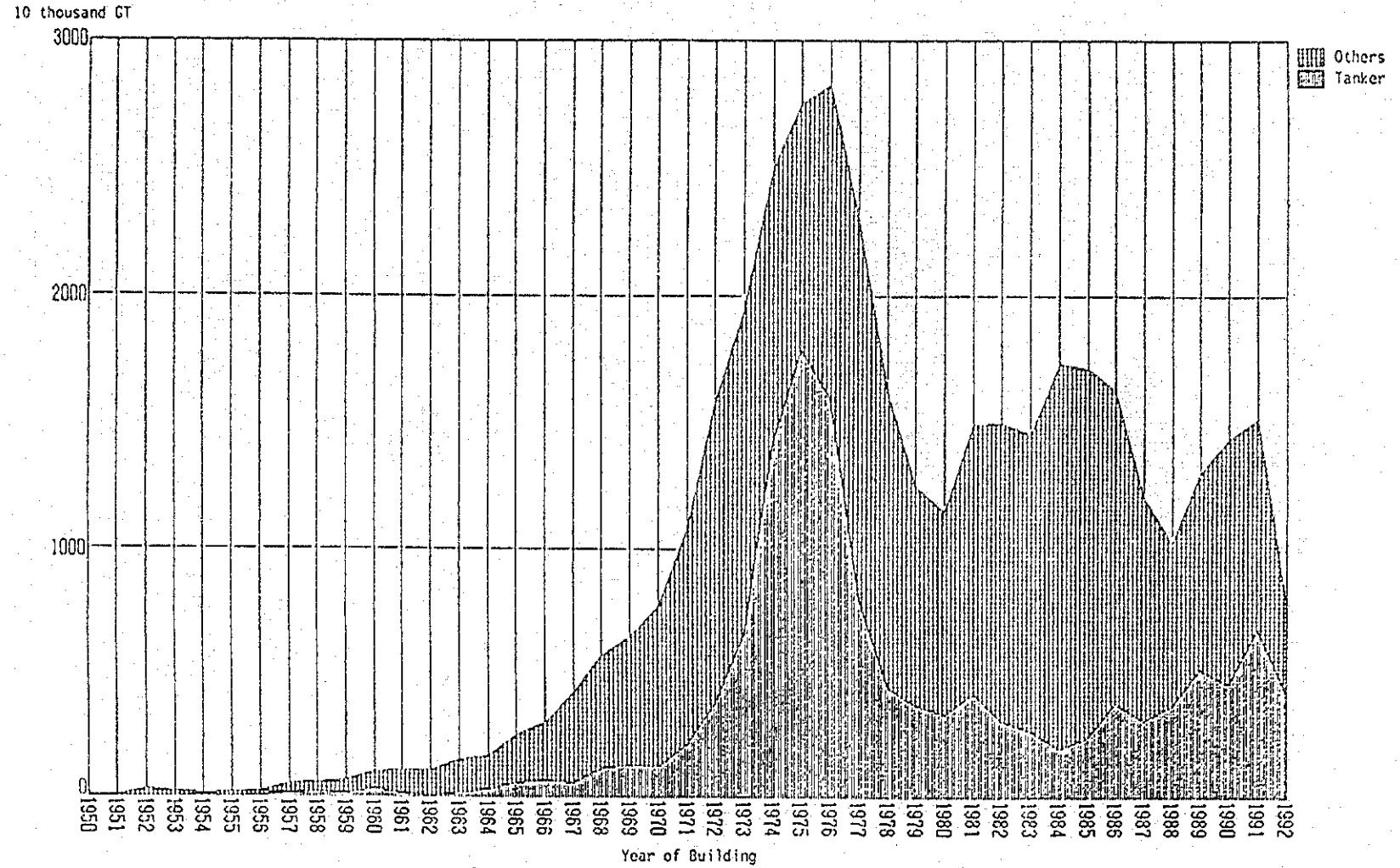
II. Flow of operations



TONNAGE COMPLETED 1987-91 AND TO BE COMPLETED 1992-2005 AND PROJECTED REQUIREMENT

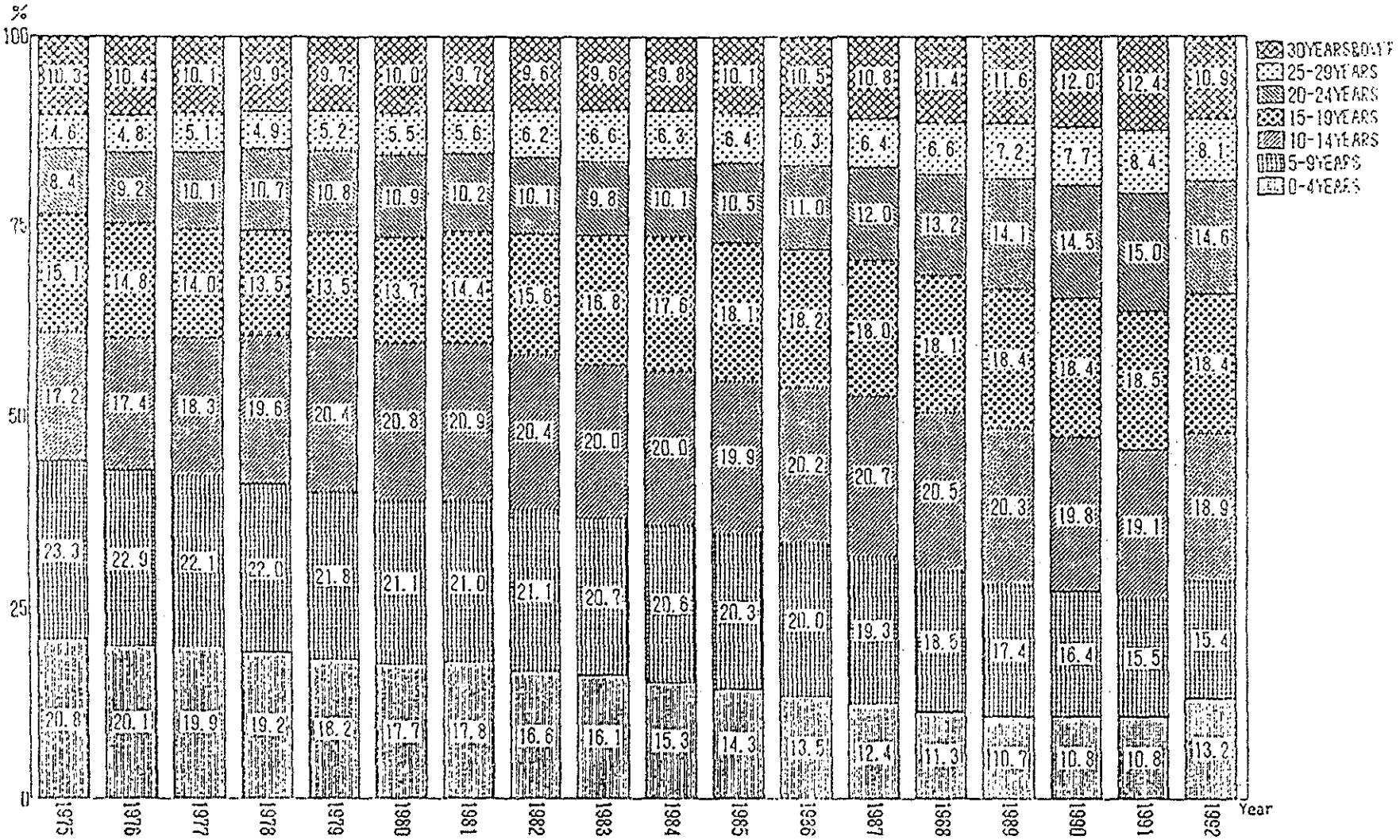


Vessel Age Structure of Existing Tonnage



(Notes) 1. Based on Lloyd's statistics.
2. Tankers below 20 thousand DW were excluded.
3. Other vessels below 2000 GT were excluded.
4. As of end of July, 1992

Transition of Age Group Ratio



(Notes) 1. Based on Lloyd's statistics (number of vessels). (As of July in each year)
2. Vessels below 100 GT were excluded.

Estimated Capacity of the Five Major Ship-Scrapping Nations

March 1993

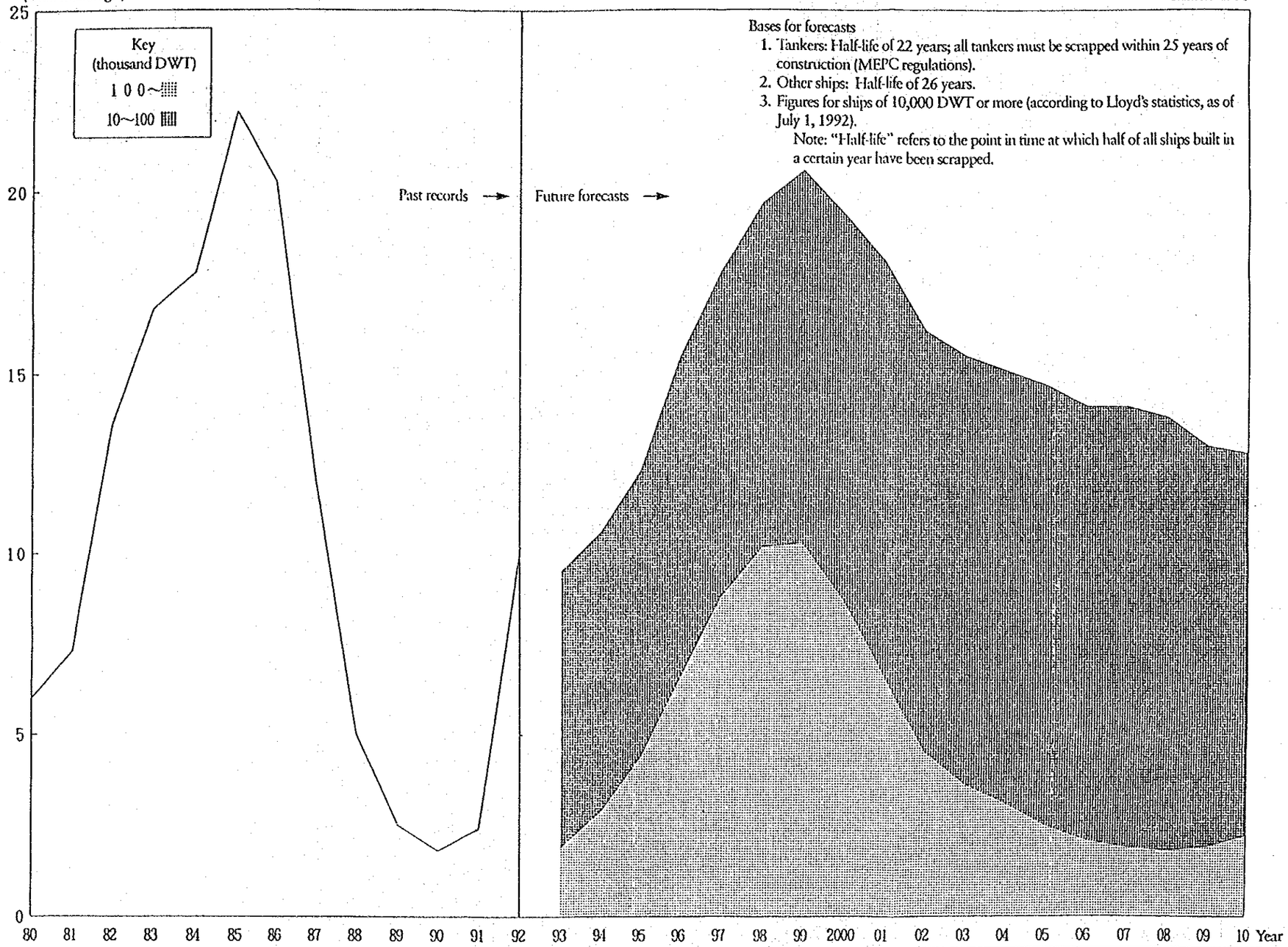
	1980s trends (LR)			1992 forecasts	1992 contract volume for large-sized ships*	Principal ship-scrapping yards	Important factors pertinent to evaluations of ship-scrapping capacity (including potential sources of instability)	Present capacity (estimate)	Outlook for scrapping capacity in the peak period of 1996–2000		
	Bottom	Peak	Bottom						Up to 100,000 DWT	Over 100,000 DWT	Total
China	(thousand grt) 0 ('82)	(thousand grt) 5,020 ('85)	(thousand grt) 80 ('90)	(thousand grt) 4,000	(thousand grt) 3,980 (17)	— 10 scrapping yards for large-sized ships — Many yards for small- and mid-sized ships	— Flourishing domestic demand for rerolled steel (due to economic liberalization) — Scrapping yards spread widely; no technological problems — Government and private sector both enthusiastically involved in fostering the ship-scrapping industry — 46 large-sized ships purchased in 1992 — China National Ship Scrapping Association: present capacity is 6 million grt/year, but can be raised by enhancing efficiency to 9 million grt/year	(thousand grt) 5,000	(thousand grt) 2,000 ⟆ 4,000	(thousand grt) 4,000 ⟆ 6,000	(thousand grt) 6,000MINI ⟆ 10,000MAX
India	140 ('80)	1,680 ('87)	460 ('88)	3,000	220 (0)	— 80 plots in the Alang district — Scrapping yards for small- and mid-sized ships in Calcutta and Bombay, also — Plans for expanding the Alang yards from 80 to 160 plots	— Domestic demand for steel rising due to advancement of economic liberalization policies — Central and state governments both enthusiastically involved in fostering the ship-scrapping industry — 15% import tariff imposed on ships for scrapping (10% on scrap) due to industrial policies—makes products internationally uncompetitive — Heavy interest burden: 21–22% — Lack of financial ability—scrapping of small- and mid-sized ships predominates — Difficulty in obtaining LPG (due to government controls) — Excavation of sea floor required for VLCC scrapping	3,000	3,000 ⟆ 4,000	1,000 ⟆ 4,000	4,000 ⟆ 8,000
Pakistan	300 ('80)	1,690 ('83)	0 ('90)	1,000	830 (5)	— 125 plots in the Gadani district — VLCC scrapping possible at 20 to 30 plots	— Import tariff of $100/LDT imposed on ships for scrapping in line with government policy of protecting electric-furnace mill steel industry—makes products internationally uncompetitive — Weak domestic demand for steel — Imbalance in supply and demand for steel materials would prompt government to suspend issuance of import licenses for ships to be scrapped — Lack of financial ability—payments for ships made after scrapping and sale of products	1,000	100 ⟆ 500	1,000 ⟆ 1,500	1,100 ⟆ 2,000
Bangladesh	0 ('80)	820 ('85)	220 ('90)	700	710 (4)	— Chittagong district: exactly at sea level — Heavy rain during the rainy season (March–October) occasionally prevents work	— Rainy seasons in both spring and autumn — Occasional cyclones	700	—	1,000 ⟆ 1,500	1,000 ⟆ 1,500
Turkey	0 ('83)	410 ('86)	70 ('91)	100 ('91)	50 (0)	— 73 plots in the Aliaga district — Large-sized ship scrapping possible at 15 plots	— Can draw on labor supply from former Soviet Union — Close to Grecian docks	100	100 ⟆ 500	400 ⟆ 500	500 ⟆ 1,000
Five-nation total	440	9,620	830	8,800	5,850			9,800	5,200 ⟆ 9,000	7,400 ⟆ 13,500	1,260 ⟆ 2,250
Taiwan	4,410 ('80)	7,830 ('82)	0 ('90)	0	50			—	0	0	0
South Korea	170 ('80)	4,150 ('84)	0 ('90)	0	0			—	0	0	0
Others	460 ('80)	1,350 ('86)	170 ('90)	300	—			300	500 ⟆ 1,500	1,000 ⟆ 2,000	1,500 ⟆ 3,500
World total	6,020 ('80)	22,220 ('85)	1,810 ('90)	9,100	5,760			10,100	5,700 ⟆ 10,500	8,400 ⟆ 15,500	14,100MINI ⟆ 26,000MAX

*Figures for ships of 100,000 DWT or more; figures inside parentheses are for contracted VLCCs.

Past Records and Future Forecasts for Global Ship-Scrapping Volume

(Unit: million grt)

March 1993



10000DWT	93	94	95	96	97	98	99	2000	01	02	03	04	05	06	07	08	09	10
100 +	1.9	2.9	4.4	6.6	8.8	10.2	10.3	8.7	6.6	4.5	3.6	3.1	2.5	2.1	1.9	1.8	1.9	2.2
10~100	7.6	7.7	7.9	8.9	9.0	9.5	10.3	10.7	11.5	11.7	11.9	12.0	12.2	12.0	12.2	12.0	11.1	10.6

Chapter 2

Recent Machinery & Equipment Investment and Cost Reduction in Shipbuilding Industry (Particularly in the Medium and Small Shipbuilding Industry) in Japan

By

Masaru Kakishima

1. Present Situation of the Shipbuilding Industry in Japan

1) Amount of shipbuilding (Table 1)

1-1. The world shipbuilding industry plunged into a prolonged recession triggered by a huge amount of order cancellation for tankers coupled with changes in the type of ships due to the first oil crisis which occurred in 1973. Japan was no exception.

1-2. After that, we experienced a mini-boom centering around Panamax Bulk Carriers and Handy Sized Bulk Carriers due to the low prices of ships, however, the boom merely represented a pre-supply of the demand and resulted in, on the contrary, an increase in the tonnage supplied which led to the really hard times of a prolonged stagnant freight market suffered by the marine transportation industry.

1-3. During the period of three years from 1986 to 1988, the Japanese shipbuilding industry again carried out a reduction of shipbuilding capacity by 23% in line with the expected and reduced future demand for shipbuilding due to the substantial cool down in world shipbuilding demand on the back of the simultaneous global recession.

1-4. As the economy in Japan as well as in Europe turned to recovery from the second half of 1988, the demand for shipbuilding turned upwards and the ship prices also recovered rapidly.

Table 1. Shipbuilding Permission Granted

Fiscal year	Larger Ship than 2,500 G.T.		Coastal Ship		Steel Fishing Vessel	
	No.	Thou. G.T.	No.	Thou. G.T.	No.	Thou. G.T.
1983	633	12,428	245	141.5	252	57.1
1984	299	7,210	343	178.3	213	48.5
1985	248	6,451	337	178.6	215	49.6
1986	139	4,832	339	183.3	250	61.2
1987	134	4,371	423	241.2	241	56.8
1988	189	4,849	461	265.7	247	50.5
1989	261	8,632	396	257.2	231	53.7
1990	279	10,702	366	256.2	179	33.6
1991	200	8,150	390	302.7	144	27.0
1992	159	5,180			41	10.8

Sources: Ministry of Transport and Fisheries Agency

Passenger boats and ferry boats are included in Coastal Ships. A part of Coastal Ships are included in Larger Ships of more than 2,500 G.T.

1-5. However, the shipbuilding demand again took a fall from the second half of 1991. In particular, as Germany, newly born out of the unification of east and west Germany adopted a high interest rate policy for curbing inflation, the European economy became stagnant. While in Japan, consumption increased on the back of the then excessive monetary situation since 1989 and consequently the machinery & equipment investments were further stimulated. Thus, the economy picked up sharply. However, the Japanese government took inflation restraint measures which led to a deep economic trough. Naturally, the volume of cargo movements decreased and the freight fell down. These were the causes of the decreased shipbuilding demand.

1-6. As a result, the total tonnage of shipbuilding permitted for fiscal 1992 in Japan was only 5,180,000 G.T. Naturally, the total tonnage of order backlog for shipbuilding was reduced. Ship prices started to decline from the beginning of 1993. In addition to the above, an

unfavorable factor emerged from around last March. It was the sharp appreciation of the yen that was acting as a significant restrictive factor on the marketing activities of shipbuilders.

1-7. In Japan, a substantial number of coastal ships and fishing vessels are built at medium and small sized shipbuilding yards. The task of such shipbuilding is considered as their own job. With regard to the coastal ships, the current issue is a shift from truck transportation to ship transportation, i.e., the modal shift. Therefore, great expectations are held for the future of shipbuilding of coastal ships from this viewpoint too. On the other hand, the shipbuilding of fishing vessels is now following a downward trend due to the loss of fishing grounds in addition to the decline in fish prices and not much can be expected in the future.

Table 2. Summary of the Shipbuilding Industry in Japan

Year	No. of yards	Employees				Steel vessels launched		Steel vessels completed		Ships repaired	Amount of steel consumed
		No. of clerical staff	No. of engineers	No. of workers	Total	No. of ships	Thou. G.T.	No. of ships	Thou. G.T.	No. of ships	(tons)
1983	651	12,742	24,639	69,512	106,893	1,153	6,833	1,192	6,459	56,005	3,233,357
1984	671	13,078	24,322	66,881	104,281	1,261	9,435	1,318	9,631	53,614	3,726,541
1985	649	11,011	21,503	60,070	92,584	1,148	9,101	1,218	9,906	52,066	3,517,206
1986	649	8,858	17,108	42,823	68,789	960	7,183	1,063	7,656	50,151	2,412,666
1987	675	8,132	15,680	34,851	58,663	912	4,096	1,060	5,651	50,097	1,798,135
1988	700	7,820	14,780	31,717	54,317	1,041	4,432	1,098	3,879	49,865	1,973,498
1989	635	7,867	14,489	30,897	53,253	1,002	6,063	1,087	5,262	47,311	2,302,046
1990	634	8,160	15,343	31,279	54,792	937	6,390	1,051	6,476	44,563	2,578,107
1991	611	8,624	16,430	31,044	56,098	865	7,362	906	7,008	43,382	2,666,498
1992 (Jan.-Oct.)	585	8,352	16,315	30,528	55,195	692	6,416	743	6,128	34,092	2,273,861

Sources: Research and Data Processing Dept., Ministry of Transport

No. of employees, etc. are given as of the end of each year respectively (except for 1992, which is as of the end of October.)

No. of workers includes subcontractors' labor.

2) Amount of steel consumed (Table 2)

2-1. Even in the midst of the recession, the amount of steel consumed exceeded three million tons each year during the period from 1983 to 1985. Meanwhile, the consumption amount in 1986 shrank by about 30% compared with the preceding year and a further decrease was observed in 1987 when the amount of consumption was below two million tons.

2-2. The amount of shipbuilding increased again from 1989 and the amount of steel consumption also increased. However, the amount of the latter still stays on the 2 million ton mark.

2-3. The amount of steel consumption has been substantially reduced for the same model of ship thanks to the efforts made toward light-weight oriented design of ships accompanied by using high tensile steel.

3) Labor (Table 2)

3-1. The shipbuilding industry in Japan was employing or using 184,198 persons at the end of 1974.

3-2. Since then, however, the number of personnel employed by the shipbuilding industry has decreased substantially to only 55, 195 (a 70% decrease) as of the end of October 1992 through the two waves of massive work force adjustments.

3-3. Although there has been some fluctuations in the number of employees since 1988, the year from which the amount of workload has been increasing, the number of employees is leveling out as a whole.

3-4. In terms of workers only, the total number of workers employed has almost flattened off since 1988, while the numbers of engineers and clerical staff are showing a tendency forwards increase. The above reflects a management policy which would preserve the engineering force and pay due attention to development and which, on the other hand, would not increase the current number of workers and would cover the shortfall in terms of the production capacity through facilities and equipment.

3-5. As a result, when we see the amount of steel used per worker on Table 3, the figure was increasing year by year except for the two years, 1986 and 1987. The figure was 46.5 tons in 1983, and 85.9 tons in 1991, while in 1992 (Jan. - Oct.) it was 89.4 tons, thus representing an almost doubled productivity efficiency.

3-6. With regard to the ratio between the numbers of engineers and workers, it was 1:2.82 in 1983 and decreased to 1:1.87 in October 1992. This indicates the increased role played by engineers.

Table 3. Recent Features of the Shipbuilding Industry in Japan

Year	Amount of steel used per worker per year (tons)	Ratio between numbers of engineers and workers	Composition of personnel (%)		
			Clerical staff	Engineers	Workers
1983	46.5	1:2.82	11.9	23.1	65.0
1984	55.7	1:2.75	12.5	23.3	64.2
1985	58.6	1:2.79	11.9	23.2	64.9
1986	56.3	1:2.50	12.9	24.9	62.2
1987	51.6	1:2.22	13.9	26.7	59.4
1988	62.2	1:2.15	14.4	27.2	58.4
1989	74.5	1:2.13	14.8	27.2	58.0
1990	82.4	1:2.04	14.9	28.0	57.1
1991	85.9	1:1.89	15.4	29.3	55.3
1992 (Jan.-Oct.)	89.4	1:1.87	15.1	29.6	55.3

Prepared from Table 2.

2. No Cost Reduction can be Realized under the Working Budget

When a ship is built, a working budget is generally prepared as a construction budget.

2-1. Generally, there are two major objectives. One is to give a yardstick for the cost required for carrying out the construction, while the other is the goal to be achieved absolutely.

2-2. The working budget corresponds to the plan of "PLAN-DO-CHECK-ACTION," and is just the first step in the cost control.

2-3. The working budget is generally prepared based on the terms and conditions already given to the shipbuilding yard. In the working budget, no information is given as to how to reduce the working hours (means) therein, but only indications to the workers within a certain field of

expertise possessed by the construction staff. Effort is focused on keeping the costs from exceeding the working budget.

2-4. The successful control of the working budget depends upon the career of the person preparing the working budget. If the person preparing the working budget has an overall experience in design, construction, or materials, then the authority of the working budget could be maintained, otherwise, the working budget would be prepared only by the past records and the subjective point of view of the preparer. The budget would be both groundless and impractical.

2-5. Even in cases where the working budget is given with instructions that the budget should be achieved at all cost, for example, if the working budget is prepared in a way where each item is given a flat thirty percent below the past record out of the blue, then, there will be resistance from the people in charge of the production and the result would, on the contrary, substantially exceed the working budget. Instructions that the working budget should be achieved at all cost should mean that the budget so given should be within a frame work where the budget can be achieved under normal conditions. Namely, the scope would be at most one or two percent below the past record.

2-6. The working budget is prepared in connection with the construction cost, and the number of controllable items is limited as given below:

Material cost

(i) Machinery and equipment to be purchased

(ii) Steel materials (iii) Amount to be consumed

(iv) Unit price

Labor cost

(v) Number of working hours

(vi) Unit price

Expenses

(vii) Number of working hours

(viii) Unit price

Out of the above items, the controllable items are (i), (iii), (iv), and (v) (and (vii)) but in many cases (i) and (iv) are already given at the time of business estimation or the like. Therefore, (iii) and (v) will be particularly important.

3. Six Key Factors that Make Cost Reduction Possible

Although costs will be incurred in the course of some business activities to be carried out, the production department will be affected by the activities of other departments since each of the activities is related to each other in the business operation. Especially, in the case of production based on order acceptance, all of the activities of the up-stream will be reflected on the production department, which is the farthest down-stream.

3-1. Content of orders

It is well known that the shipbuilding cost for any one type of ship will decrease substantially from the second ship on until it reaches a certain level. For subsequent ships, no working hours for mold lofting will be required due to the unnecessity of the design. In addition to the above, in the construction department, the number of working hours will be reduced through "experience," the preparation of materials will be improved, and substantial savings in the number of hours for receiving materials

will be possible. The cost of machinery and equipment will be reduced as the shipbuilders can purchase them in one lot required for several ships at one time.

Furthermore, there are the following ways of receiving orders which would reflect on the cost of the ship:

(i) Orders to be received constantly
(ii) Orders to be received after a period during which a substantial study is made
(iii) Orders of the type of ships to be received meeting the capacity of the facilities
(iv) Orders to be received for which the specifications have been fixed
(v) Orders to be received corresponding to the level of technology of the shipbuilding yard
(vi) Orders of the number of ships to be received which would fill the shipbuilding capacity of the yard

3-2. Design

Although the price of the ship will reflect the market price, the design department will make up the basis of the ship price taking into account the wishes of the shipowner after deciding the specifications and major machinery and equipment to be installed before the contract is signed. Therefore, most of the costs involved will be determined at this stage. And the final cost will be determined in the course of finalizing the detailed design and engineering the drawings after the specification negotiations are finished. Therefore, it is said that 90 to 95 percent of the construction cost depends upon the design.

The following are designs which would prevent the cost from being decreased:

(i) Designs in which the satisfaction of the shipowner is preferentially considered to an excessive degree
(ii) Complicated construction
(iii) Designs in which excessive accuracy in terms of necessity is required
(iv) Designs which use many custom made products
(v) Too much emphasis is given on a specific area (e.g., light-weight oriented design) and overlooking other cost increasing factors
(vi) Specific shapes of construction and method of construction which are rather difficult to use the given facilities.

3-3. Facilities

To be given later.

3-4. Production control

Production control generally means a series of activities to reduce costs under certain given conditions. However, it can be better explained as such activities as those which would make good use of the labor directly in the production of the object insofar as possible by removing pointless, impossible, and uneven factors involved in the cost.

It is said that the job of the staff is to firmly making arrangements. By firmly making arrangements, wait time can be eliminated and frequent moving of things can be avoided. What then, are these arrangements? Some of them are given below:

(i) First, confirm that the relevant drawings are furnished as scheduled from the design department and after the drawings are furnished, check the drawings, themselves. Then, if there are any areas

which would require changes or corrections for ease of construction, or due to any conveniences or irregularities in connection with materials, negotiate with the person in charge of drawing about modifying the drawings. Make clear the instructions on crucial points concerning the construction.

(ii) Always confirm that the materials are available when needed. Also stock such materials as had best be stocked at the construction site beforehand.

(iii) Allocate the labor required for each job. Confirm that the work is proceeding as scheduled. If progress is stalled, study how to catch up for the time cost. If the labor on hand is not sufficient, decide whether the required arrangement can be made internally or not. If arrangements can be made internally, arrange for temporary workers or subcontractors. If not, it is important to avoid any further delay by making contact with the subcontractor works as necessary.

(iv) Instruct the use of appropriate tools at the time of giving instructions concerning the work method, and try to reduce costs by using jigs. With regard to any broken tools, have such broken tools repaired beforehand.

3-5. Production technology

This is one of the cost reducing measures to be taken by the leaders, such as leaders of foremen groups and staff members of the production department, of the workers engaging in the production activities. The points of production technology to be noted are given below:

(i) Ease to construction
(ii) Ability to be finished quickly
(iii) To be able to do it easily
(iv) Ability to do it with a smaller amount of materials
(v) Reduction of movement of material and personnel
(vi) Use of appropriate tools

These measures can be made feasible by improving the method and order of the work concerned as well as developing the tools. In some cases, the measures could extend to the development of machinery and equipment.

In making the above possible, it is indispensable that both of the design department and production department should continually cooperate with each other under a close relationship, and that, at the same time, the staff members should always respond flexibly to everything. If the staff members of the design department are quite familiar with the actual situations at the construction site, we shall be able to expect good results.

3-6. Creative construction

Everyone in charge of production should take part in reducing costs, and in particular, it is important that regular workers should take part in reducing the cost.

The workers actually working at the site should be quire familiar with the actual situation. Therefore, we shall be able to expect them to participate positively in reducing costs by making them aware of certain working procedure for improvements.

The measures being taken in Japan in connection with inducing creative construction include the following:

(i) QC activities
(ii) Small group activities
(iii) Target control
(iv) Suggestion system
(v) Zero defects
(vi) Value engineering

4. Why is Productivity Increase Necessary?

There are two objectives in a business. One is to make a profit. The other is to maintain competitive power. To achieve these objectives, a business carries out machinery & equipment investment and employee training programs.

4-1. Functions of profit

The reason why profit is obtained is that profit has the following functions:

(i) Machinery & equipment investment
(ii) Resources for repayment of loans
(iii) Research and development
(iv) Absorption of rising costs related to personnel expenses, etc.
(v) Preparation for accidents and extraordinary losses
(vi) Social contribution (paying of taxes, etc.)

4-2. Maintenance of competitive power

The most principal competitive power is low cost, especially low wages. However, because wages are rising every year, competitive power is weakened as the wages rise.

As a business continues its operations for a long time, it will not be able to compete with its competitors only by

low cost, because much severer requests involving the delivery period and quality of products will be made by its customers. For observing the delivery period required, the business may be able to solve the problem by inducing a large amount of labor. However, the business cannot avoid the resultant rising costs and deteriorating level of product quality. Therefore, a need for further mechanization and rationalization will emerge.

4-3. Characteristics of the shipbuilding industry

The following are the three major characteristics of the shipbuilding industry:

(i) Labor intensive industry
(ii) Heavy goods transportation industry
(iii) Experience oriented industry

With regard to (i) above, the shipbuilding industry in Japan is trying hard to reduce the degree of their dependence on labor. One of the reasons for the above is the appearance of other countries, namely South Korea, which have almost caught up to Japan in terms of their competitiveness. Needless to say, the facilities are alternative measures for coping with this.

With regard to the (ii) above, it is necessary to shorten the length of distance of moving things. For achieving this target, improvement in the layout or introduction of the most efficient layout, improvement of the crane system, and planning of other cheaper methods of transportation will be necessary.

With regard to the (iii) above, we have been building ships based on the rules of experience in the past taking into account the unfathomable, enormous strength of the sea, but now we are building ships based on scientific

judgement in addition to the rules of experience in line with the developments in computers.

4-4. The role played by facilities in terms of productivity

The formula given on the right is a greatly simplified profit and loss statement.

Sales
-) Material cost
Added value
-) Fixed cost
Labor cost
Expenses
Profit

In here, in order to increase profits, one or more of the following should be realized:

(i) Increase in sales
(ii) Reduction in material cost
(iii) Reduction in fixed cost
→ (iv) Increase in added value

There are two measures which would increase the added value; one is the labor force and the other is the facility. (These two factors possess mutual alternativity.) This can be formularized as follows:

$$\frac{\text{Added value (Sales - Material cost)}}{\text{Number of personnel}} = \frac{\text{Added value}}{\text{Machinery and equipment}} \times \frac{\text{Machinery and equipment}}{\text{Number of personnel}}$$

(Added value per person) = (Capital efficiency) × (Labor-equipment ratio)

(Note) Instead of the machinery and equipment, tangible fixed assets (except for construction in progress a/c) may be used.

We can say that, if machinery and equipment investment is carried out (the labor-equipment ratio will rise), the capital efficiency will drop in most cases. However, the capital efficiency will not drop any more than the proportion in which the labor-equipment ratio rises.

Therefore, the added value per person (in other words, labor productivity) will be improved even though the amount of improvement might be small.

Ultimately, the business will try to increase its productivity in order to obtain much greater profit than before.

5. Relationship between Machinery & Equipment Investment and Productivity

5-1. In general, the amount of machinery & equipment investment will be decided as a part of the management policy just as the organization, personnel affairs, and order acceptance targets are decided. The details will be decided in accordance with the future prospects.

5-2. Machinery & equipment investment can be classified into the following major items:

(i) Expansion of production
(ii) Rationalization of production
(iii) Prevention of environmental pollution
(iv) Welfare
(v) Rationalization of office work

5-3. The following major merits can be considered by making machinery & equipment investments:

(i) Machinery and equipment (including software) can be purchased. Provided that only the funds are available, the business can quickly obtain the same competitive power as other competitors have.

(ii) If similar types of facilities are used, the method of operating them becomes easier year by year, and

at the same time the speed and functionality will be increased. Furthermore, the minimum knowledge required for their operation will be provided by the manufacturers, therefore, the facilities can be operated from the day after its purchase in the earliest case. (As a matter of fact, some training is given in connection with the relevant software to the new operators before bringing in the machinery concerned.)

(iii) In most cases, introduction of new facilities will lead to saving of operation time, therefore, the business can definitely increase its productivity.

(iv) In the past, it was said that welfare facilities would have no direct relationship with production since such facilities only serve as the place for taking a rest and for cultivating friendships. Now, the situation has been changed. Such facilities are considered indispensable as places to rest up so that the workers can work fully at the production site.

5-4. Nowadays, the whole shipbuilding industry in Japan, from the leading shipyards down to one medium and small shipyards, are quite active in their machinery & equipment investments. The following are the major reasons:

(i) There was a situation where university graduates and others left the shipyards as working places since, in big shipyards with shipbuilding capacities of more than 5,000 gross tons, they experienced two large waves of cutbacks of shipbuilding capacity and work force adjustments in the past.

(ii) The shipbuilding companies were under the necessity of continuing operation while securing the minimum

number of personnel as they did not want to cutback on their personnel again.

(iii) No other ways are left for them to increase the production under such circumstances than to cover the requirements by additional or improved facilities.

(iv) Their current active machinery & equipment investments are a reaction to all the situations where the maintenance has been insufficient and no investments have been made in connection with the renewal of facilities more than 10 years.

(v) Machinery & equipment investments have become necessary due to the rising requirements of double-hull tankers and advance outfitting.

5-5. The machinery & equipment investments in production are made in accordance with their respective objectives. (Some of them are being redundant.) Needless to mention, all of them are related to the shortening of working hours.

(i) Levelling off of the operation ratio

Except for the method of order acceptance, the factor which would change the operation ratio is the climate (rainy weather and direct rays of the sun in summer). The costs will be reduced when such changes occur in an average manner. For achieving these objectives, in-door work will be required.

(ii) Reduction of the workload

If the size of the block is made bigger, the workload on the ground will be increased, however, the amount of loading work onto the building berth will be reduced. It is well known that the amount of hours to be increased in the former is far smaller than those reduced by the latter. The vehicle which would make this possible is a large type of crane. However, even in this case, the amount of loading work onto the building berth will not be zero.

(iii) Zero workload

It is possible to totally eliminate a certain job. Through the introduction of the numerical control cutter, at least the mold lofting and marking on the steel plate will become unnecessary.

(iv) Simultaneous execution of number of jobs

Some of the facilities will allow a number of jobs to be carried out simultaneously. A frame planer will be able to make several number of flat bars at once, while a multi-electrode automatic welder will make it possible to weld several points at the same time. Another example is a simply-structured machine using a band saw which can simultaneously cut several angle bars.

(v) Increased speed

By using machines, work can be done faster than before. A plasma cutter can achieve at least a twofold performance increase in terms of speed over a traditional gas cutter. In cases of making

small sized parts out of thin plate, a shearing cutter can perform far quicker work than a gas cutter can.

(vi) Increased accuracy

Double advantages can be obtained by using machines; not only in saving time in working hours but also in the increased accuracy of the products, thus allowing easier fabrication. A typical example of this is a numerical control cutter. In the area of welding, a certain leg length can be obtained if an automatic carbonic acid gas welder is used.

(vii) Utilization of female workers

In the past, it was rare to find female workers in the yards of shipbuilding companies in Japan. However, recently, their numbers have been gradually increasing little by little. This is closely related to the progress of automation and robotization. Of course, the number of woman-workers engaged in gas cutting and welding is increasing. But in addition to the above, the number of employees employed as the operators of robots is also increasing. In such work places, through only training in how to push the operation buttons, they will be able to grow into excellent workers in a short time.

(viii) From the work at the construction site to the work in the office

The software for robots and numerical control machines (such as for working order, welding conditions, etc.) are prepared in the office and

not at the workplace at the site. Only the information itself will be provided to the work place. The work can now be performed only by the operator pushing the buttons. The actual work place has already moved into the office.

(ix) Consideration of the working environment

If three or four gravities are operated by an operator, the work efficiency will be improved. However, if we take the health of the operators into consideration, it is better to use an automatic carbonic acid gas welder even though its working speed would be slower. The use of an automatic carbonic acid gas welders from this point of view is increasing.

6. What is the Role Played by Depreciation?

The funds invested in the facilities will be collected back over a long period of time as the depreciation cost. In view of the above, the depreciation cost will have the following major functions:

6-1. Cost

It will constitute one item of the cost as the depreciation cost.

6-2. Self-financing

Although the depreciation cost is one of the cost items, the difference of it compared to the other items is that it is not accompanied by cash disbursement. This means that the cash equivalent to the depreciation is reserved within the company. (However, the above only applies to

cases where the profit before depreciation is a surplus at the time of settlement of accounts.)

Therefore, since the cash for that amount is reserved, it can be appropriated for other payments. (As a matter of fact, however, in many cases the amount of depreciation is not always reserved in cash but is unconsciously used for other purposes.) This is referred to as self-financing.

6-3. Absorption of increased cost

In cases where the depreciation is carried out under the declining balance method, the amount of depreciation cost is decreased in order from the next year of acquisition.

In many countries, costs will increase more or less year by year due to the rise of the basic wage rate, etc. However, the depreciation cost will be decreased in turn, therefore, it will absorb the overall increase to some extent. Therefore, if the amount of depreciation cost is large, the company will have an advantage in terms of cost, and hence can maintain its competitive power.

5. 当該国訪問機関へ提出した英文所見の日本語要約

1) わが国の協力の基本的スタンス

我々の協力の基本的スタンスは、下記の理由に基づいて、援助対象国の商船隊(内航船、外航船両方を含む)整備の資する造船業を育成することと位置付けた。

① 援助対象国の自国商船隊の整備が、当該対象国の経済活動を支える観点から重要であること(外航海運による貿易のための手段、内航海運による国内産業物資輸送手段)

② 自国商船隊の整備は外貨の節約に有効であること

③ 自国商船隊への新造船舶の供給、船舶の質を維持(メンテナンス)するためのサービスを自国造船業により行うことは外貨の節約に有効であること

2) 訪問国(アルゼンティン及びブラジル)における造船業の問題点

両国の造船業の根本的問題は、両国とも政府の自国海運・造船政策の欠落による自国海運業の衰退とこれにより造船業の規模が過剰になっているということである。

よって、上記のわが国の協力の基本的スタンスに基づき、以下の2点を中心に英文所見をまとめ、訪問国関係機関へ提出した。

① 海運・造船振興策の策定と確実な実行

自国経済の発展を図る上で、内航海運、外航海運の果たす役割の重要性を認識し、これら海運業と海運業を支える造船業の総合的な振興策を官民の協力のもとに策定し、確実に実行していくことが必要である。

② 造船業の経営の効率化

1) アルゼンティン

アルゼンティン造船業界では

① 民営化が一層進む、

② 政府よりの資金援助、仕事発注は漸減する、

③ 国内船主(国営船社)は高い国内船建造を嫌い、中古船取得が増える、

④ 倒産、事業縮小が全体的に続く、

という認識のもと、以下の提案を列挙した。

A. 経済省、外務省も含めて、造船所・船主の間で定期的協議の場を設ける。それによって今後両者のあるべき姿・問題点を検討する。

B. 経営者自らが競争国または先進国(修繕業におけるシンガポール)を視察し、国際競争力、コスト低減などを身をもって体験する。

C. 経営者自らが経営に対して責任と自覚を持つ。

D. アルゼンティン造船業と輸出国との船価比較(船主がとった見積、契約、仕様書などから)

E. 修繕能力(船型、工期、仕上がり度、工員動員力など)について船主の要望、現状の分析を行なう。

F. 近辺諸国との購入品比較(価格、納期、関税など)

G. 管理者教育を行なうと共に国営企業管理方式からの脱皮をする。

H. 建造、修繕作業について請負方式導入の検討

I. コスト引き下げをあらゆる角度から検討すると共に、ユニオンの協力を得て、再教育、未熟練労働者から熟練労働者への入れ換え、就業条件の見直しを行なう。

J. コスト引き下げ(利益獲得)の目処をつけた上で、金融機関と特に設備資金について話し合いを行なう。

K. 以上が行なわれた上で個々の造船所が生産管理、設備改善を実施すべきであり、個々の造船所のみの合理化は制約が多く難しいと言わざるを得ない。

2) ブラジル

ブラジル造船業界では、

① イシブラス1社が規模、技術水準とも飛び抜けている、

② しかし、1社だけでは関連企業は成り立たない、

③ したがって、造船業の底上げが必要、

との認識のもと、イシブラスとそれ以外の造船所と対象を分けて、以下の提案を列挙した。

・対イシブラス以外

A. 造船マーケット及び競争国の実態をもっと調査することが必要。船種、船価、納期など現状と掛け離れている。

B. 建造期間、修繕期間はともに長過ぎる。これでは世界マーケットで名のある船主には敬遠される。何が障害になっているか調査し、工程管理を研究する。

C. 生産管理(適正人員、人員配置、適切な指示、作業方法、目標設定など)の基礎を見直す。

D. なぜ、資金不足で建造が中断されていたのか、その原因を調べる必要があろう。その原因如何では、追加の造船基金(2.5億ドル)の効果は期待しえない。

E. 各社で資金の使い方(コスト外への使用、経営外への使用など)を再度チェックすべきである。

F. コンピューターを使用することは経営上欠かせないが、現場での精度の低さ、ネスティングの粗さを無視している。まず現場のレベルアップを図らなければならない。

H. 設備更新と合理化設備を検討する(作業時間は余りに多過ぎる)。

I. 輸出船(造修とも)が1／2を越える企業には設備の輸入税免除も考えなければならない。

J. 税金が赤字の原因の1つだとしても、生産現場の改善は不十分であり、まず、上記のことを行なうべきである。

K. 資金の独自調達方法を検討する。

・対イシブラス

A. 今後の短納期船を考えると、コンピューターを導入し、工期短縮、精度アップを図る。

B. NCマーキング機の導入が決まっているが、実務上それほど意味があるとは思えない。切断機の採用を検討すべきである。

C. 作業車、ロンジ製造設備、CO_2溶接機増設など必要以上に人手がかかる、船価の対象にならない。(足場等)ものに合理化機械採用を進める。

D. 老朽設備更新、今後の競争力のもとである「ブロック大型化」への対処を検討する。

JICA