

# Chemical Industry of Japan 2009



# Introduction

The chemical industry is frequently described as difficult to understand by people outside of the industry. Numerous definitions describing the chemical industry are used, but among the most comprehensive is the following: "It is the industry that manufactures various products from various raw materials for various purposes by using primarily chemical technologies. However, like steel, those which are categorized separately are excluded." (Mr. Yoshiro Tokuhisa, "Is There A Future for The Chemical Industry?" published by Nikkei Inc.)

Broadly defined that way, the scope of the chemical industry changes depending on what is categorized separately from among manufacturing industries that primarily use "chemical technologies." Although there are a variety of opinions, the statistics on which major charts and tables of this brochure are based conform to the category "17 - Chemical Industry" of the Standard Industrial Classification for Japan (second classification). Its contents are described in detail on Page 7.

Even among published government statistics, the definition of the chemical industry could differ due to differences in the purposes for compilation and use by ministries and agencies. For example, in the trade statistics of the Ministry of Finance, synthetic rubbers, artificial fibers, and materials for photos and movies are excluded from the "Chemical Industry" category and radioactive elements are included because the ministry uses the unified classification under an international treaty.

Moreover, there are cases in which pharmaceuticals are not considered chemical products. An example is the ranking data of the world's chemical companies compiled by Chemical & Engineering News (published in the United States) on Page 12.

Meanwhile, there are separate classifications for "plastic products" and "rubber products," which are classified as downstream industries by the Standard Industrial Classification

for Japan. In any case, total shipments by the chemical industry increased from 28 trillion yen to 44 trillion yen in 2007, making the industry the second most important industry in manufacturing after transportation and the machinery manufacturing industry.

Shipment figures, value-added, and number of employees in the chemical industry under three representative definitions are as follows:

	Amount of value-added (unit: trillion yen)	Amount of shipment (unit: trillion yen)	Number of employees (unit: 10,000 persons)
Chemical industry in a broad sense: "Chemical" +plastics+rubber	16.7 (Ranks second 15.4%)	44.2 (Ranks second 13%)	96 (Ranks fourth 11.3%)
Chemical industry	10.8 (Ranks third 9.9%)	28.3 (Ranks third 8.4%)	36 (Ranks eighth 4.2%)
Chemical industry in a narrow sense:"Chemical"-pharmaceuticals	6.6 (6.1%)	21.2 (6.3%)	26 (3.1%)
(Reference) Other industries	Transportation Machinery 17.7 Industrial Machinery 13.3	Transportation Machinery 63.9 Industrial Machinery 36.3	Foods 114 Industrial Machinery 106 Transportation Machinery 105

\*\* The statistics used in this brochure basically conform to the Standard Industrial Classification for Japan (second classification): "Chemical Industry."

(Source)  
Ministry of Economy, Trade and Industry  
[Census of manufactures], [Basic Survey of Overseas Business Activities]

Ministry of Internal Affairs and Communications  
[Survey of Research and Development]

Ministry of Finance [Financial Statements Statistics of Corporations by Industry]

Ministry of Education, Culture, Sports, Science and Technology  
[Annual Report on the Promotion of Science and Technology]

Ministry of Health, Labour and Welfare [Monthly Labor Survey]

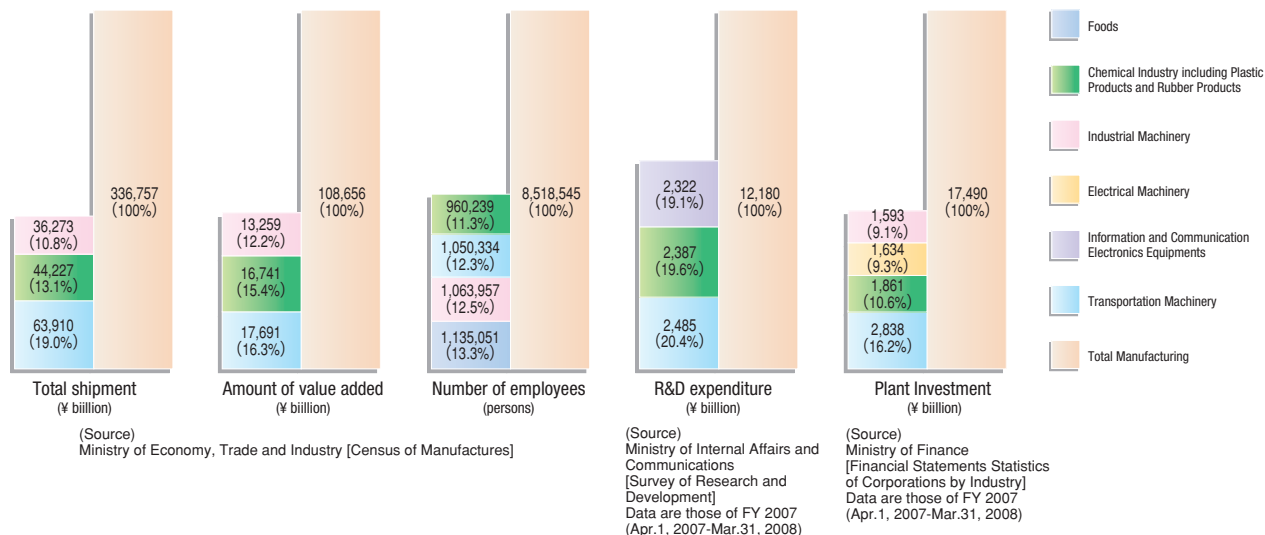
Japan Productivity Center for Socio-Economic Development

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# Highlights

Total shipments amount to approximately 44 trillion yen, which ranks second among all manufacturing industries.  
 Total value-added amounts to approximately 17 trillion yen, which ranks second among all manufacturing industries.  
 Chemical industry is an R&D-driven industry.



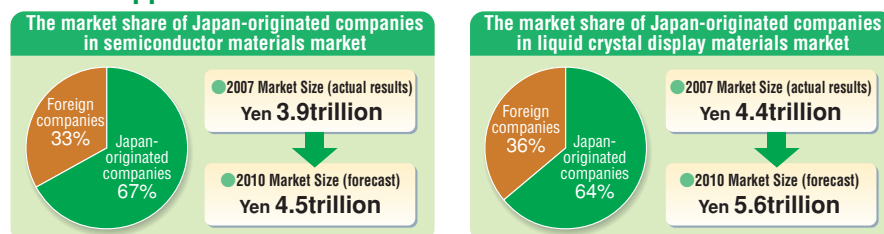
## Exports by chemical industry continue to exceed imports.

	2004	2005	2006	2007	2008
Export	5,221,194	5,848,037	6,793,864	7,745,339	7,268,831
Import	3,816,181	4,321,230	4,909,332	5,471,184	5,737,358
Difference	1,405,013	1,526,807	1,884,532	2,274,155	1,531,473

¥ million

(Source) Ministry of Finance [Trade Statistics]

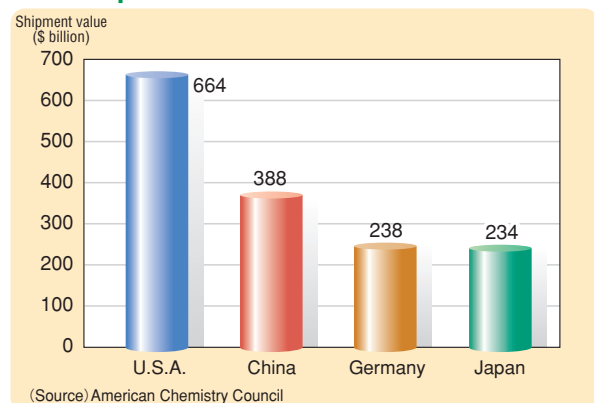
## The Japanese chemical industry supports the manufacturing of electric appliances all over the world.



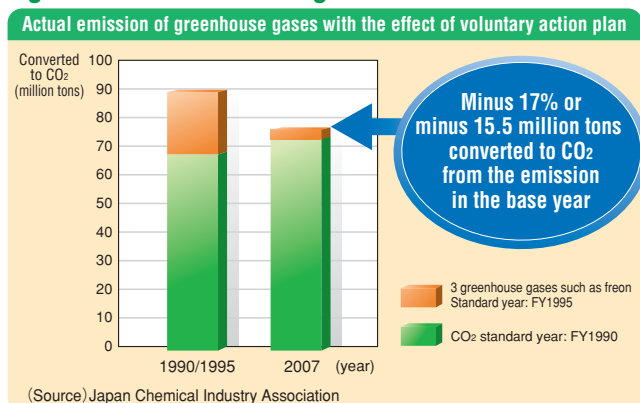
(Source) "White Paper on Monodzukuri 2009" of Ministry of Economy, Trade and Industry (METI)  
 METI compiled the white paper based on "2008 Semiconductor Materials Data Book (Electronic Journal)" and "2008 Liquid Crystal-related Market - Current Situation and Future Prospect (Fuji Chimera Research Institute)".



## Japan-originated chemical companies total shipment ranks fourth.



## Chemical Industry Is Actively Taking Measures against Global Warming.



# Chemical Industry and Technology and Social Needs

Chemical Industry Supports Our Life and Other Industries.

## Raw Materials

Water/air

Salt

Oil  
(Naphtha)

Natural gas

Coal

Ore

Animals  
and plants



## Intermediates

Hydrogen

Oxygen

Carbonic acid gas

Inactive gas

Soda ash

Nitric acid

Phosphoric acid

Ethanol

Propylene

Butadiene

Toluene

Styrene

Nitrogen

Chlorine

Carbon oxide

Caustic soda

Hydrochloric acid

Sulfuric acid

Methanol

Ethylene

Butylene

Benzene

Xylene



## Primary Products

Pigments

Dyes

Industrial gas

Fertilizers

Printing ink

Paints

Synthetic fiber

Synthetic rubbers

Cosmetics

Tooth-powder

Solvents

Fuel

Bleach

Adhesives

Oil and fat products

Photo-sensitive chemicals

Surfactants

Agricultural chemicals

Petrochemicals

Plastics

Pharmaceuticals

Sterilizer

Synthetic detergents



## Chemical Products, Technology and Activities That Meet The Needs of Various Fields



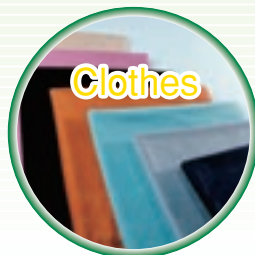
Housing

New materials to cope with "sick house" syndrome, Thermal insulation materials, Modular bath



Food

Plant breeding by biotechnology, Plastic wrap



Clothes

Form-memorizing apparels, Chemical fiber products



Resources and Energy

Solar generation, Fuel cells



Environment

Green chemistry, Disposal of wasted chemicals



Transportation/ Telecommunication/ Electronics

Materials for Cellular phone, Auto mobiles



Medical Treatment/ Health

Genomic medicines, Artificial kidney



Nanotechnology/ New Materials

Materials for Organic electroluminescence, Light emitting diode



Information Disclosure

PRTR, Risk communications, MSDS



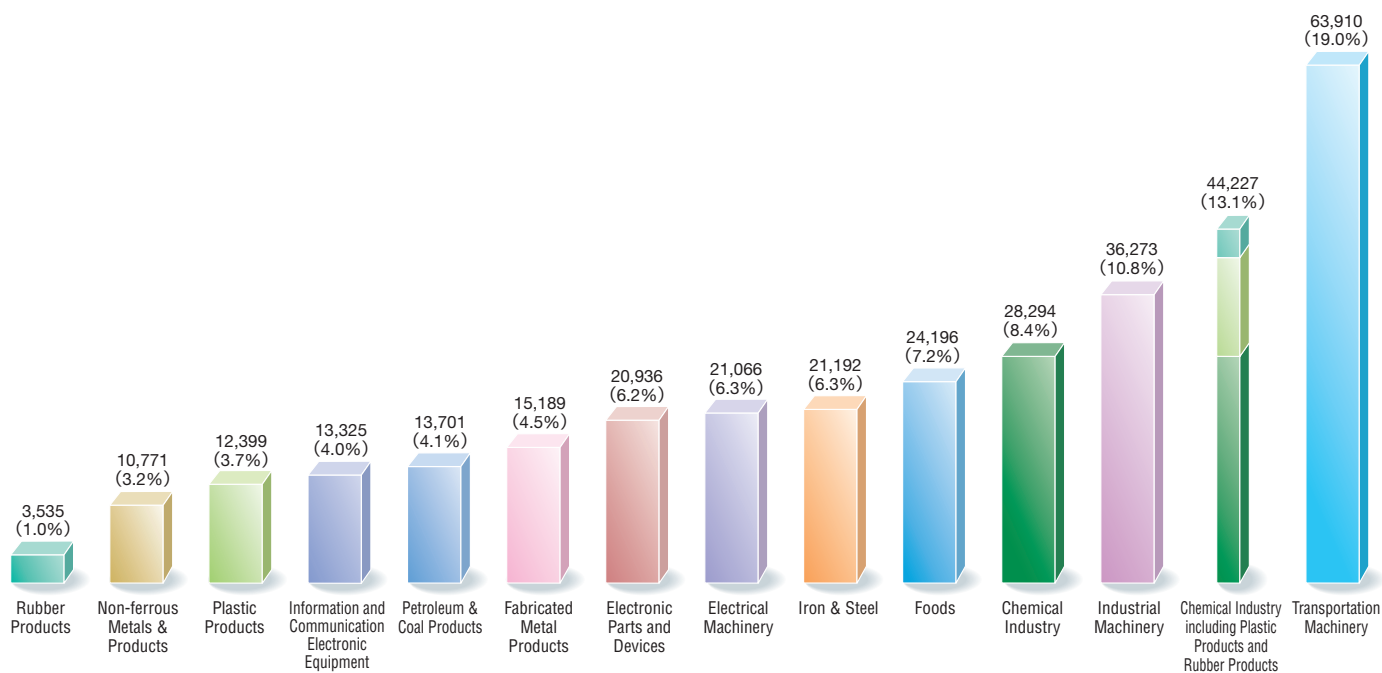
Global

ICCA HPV Initiative (The International Council of Chemical Associations)

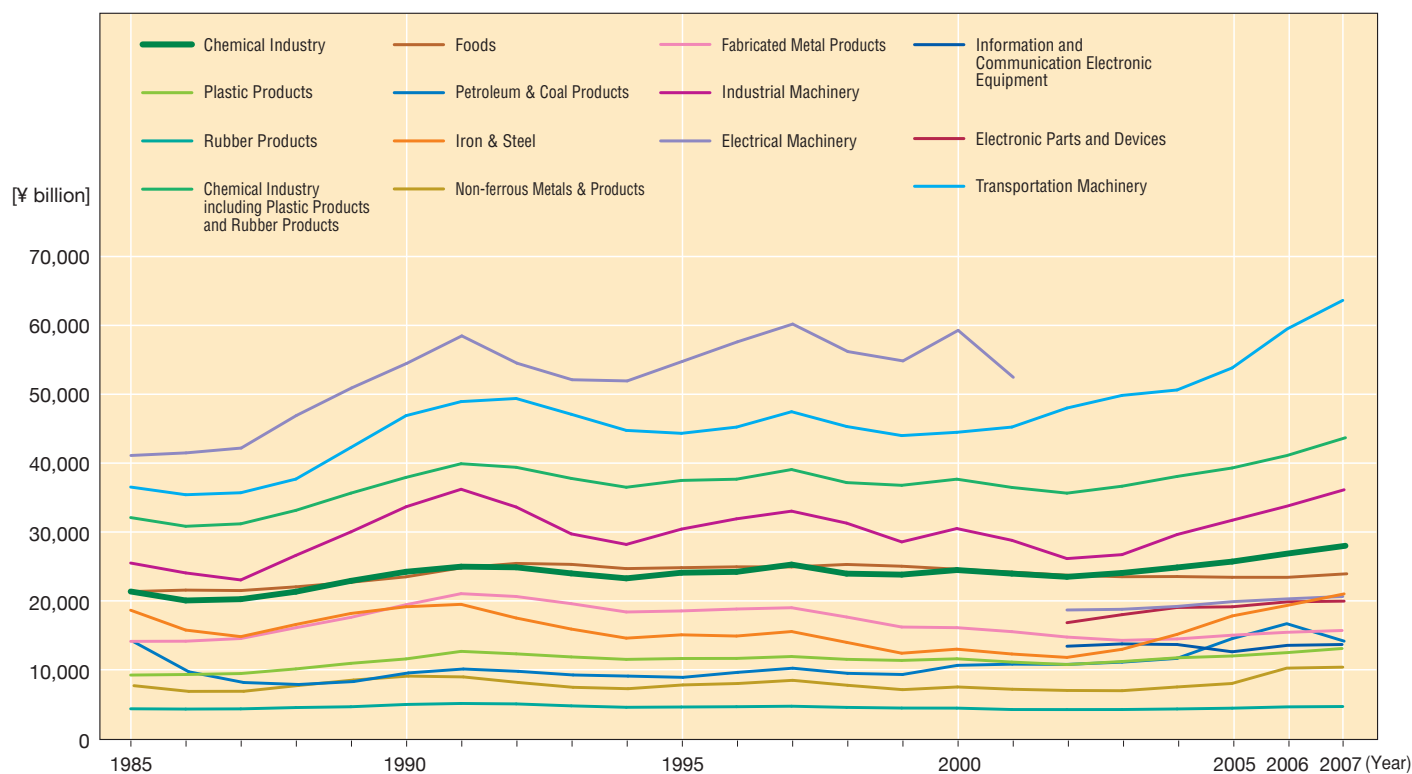
## Total Production (Shipments) of Chemical Industry Amounts to Over Yen 28 Trillion

Chemical industry's total shipment value in 2007 amounted to the record high at yen 28 trillion, accounting for 8.4% of entire manufacturing industry.

Shipment value of the chemical industry in the manufacturing industries in 2007 [¥ billion,%]



## Trend in shipment value



## Shipment value of the chemical industry in the manufacturing industries [¥ billion]

Industry	Year	Every 5th year				Recent three years			
		1985	1990	1995	2000	2005	2006	2007	
Chemical Industry		20,552	23,503	23,363	23,762	25,027	26,200	28,294	8.4%
Plastic Products		8,052	10,466	10,530	10,486	10,906	11,412	12,399	3.7%
Rubber Products		3,008	3,656	3,275	3,107	3,099	3,295	3,535	1.0%
Chemical Industry including Plastic Products and Rubber Products		31,612	37,624	37,168	37,356	39,032	40,906	44,227	13.1%
Foods		20,542	22,748	24,117	23,888	22,678	22,673	24,196	7.2%
Petroleum & Coal Products		12,948	8,298	7,635	9,434	13,429	15,682	13,701	4.1%
Iron & Steel		17,754	18,269	14,073	11,927	16,896	18,473	21,192	6.3%
Non-ferrous Metals & Products		6,384	7,822	6,496	6,191	6,712	9,016	10,771	3.2%
Fabricated Metal Products		13,094	18,574	17,646	15,143	14,016	14,451	15,189	4.5%
Industrial Machinery		24,190	33,225	29,884	29,972	31,211	33,331	36,273	10.8%
Electrical Machinery		40,842	54,529	54,831	59,449	18,812	19,663	21,066	6.3%
Information and Communication Electronic Equipment		—	—	—	—	11,534	12,496	13,325	4.0%
Electronic Parts and Devices		—	—	—	—	18,265	19,004	20,936	6.2%
Transportation Machinery		36,179	46,858	44,215	44,367	54,000	59,836	63,910	19.0%
Others		61,774	75,427	69,965	62,752	48,760	49,303	51,970	15.4%
<b>Total Manufacturing</b>		<b>265,321</b>	<b>323,373</b>	<b>306,030</b>	<b>300,478</b>	<b>295,346</b>	<b>314,835</b>	<b>336,757</b>	<b>100.0%</b>

(Source) Ministry of Economy, Trade and Industry [Census of Manufactures]

<http://www.meti.go.jp/english/statistics/tyo/kougyo/index.html>

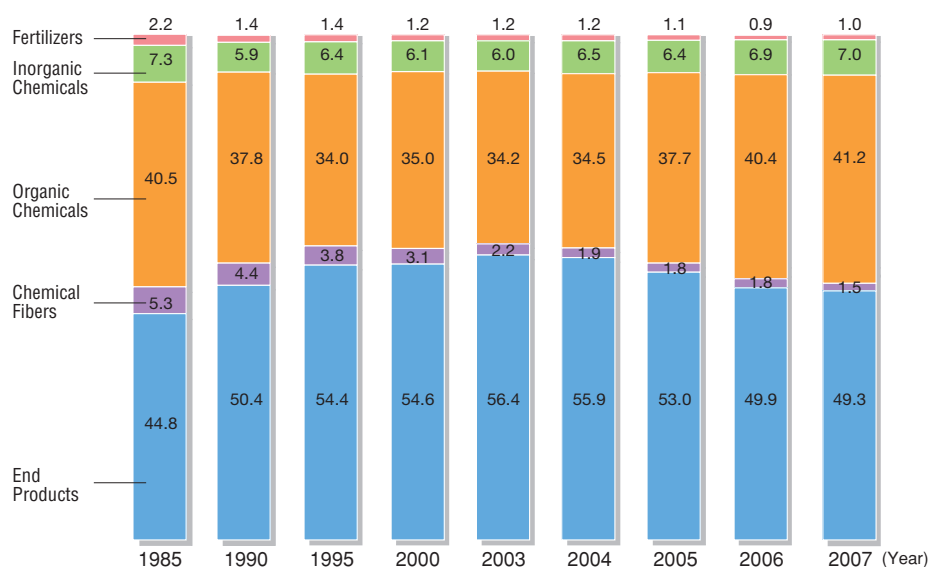
(Note) Statistics of facilities with more than four employees

Electrical machinery was divided into electrical machinery, information and communication electronic equipment, and electronic parts and devices in 2002.

## Chemical Products That Meet The Needs of Various Fields

Products that chemical industry produces are used as raw materials and intermediary products by other industries. At the same time, many end products include drugs & medicines, cosmetics, detergents, paints, film and other materials that help us enjoy a comfortable modern life.

### Trend of shipment composition in chemical industry [%]



### Trend of shipment composition in chemical industry [%]

Industry	Year	Every 5th year				Recent three years		
		1985	1990	1995	2000	2005	2006	2007
Fertilizers		2.2	1.4	1.4	1.2	1.1	0.9	1.0
Inorganic Chemicals		7.3	5.9	6.4	6.1	6.4	6.9	7.0
Organic Chemicals		40.5	37.8	34.0	35.0	37.7	40.4	41.2
▶ Basic Petrochemicals		6.2	5.1	2.6	2.9	6.3	8.7	8.2
▶ Aliphatic Intermediates		5.5	4.5	5.5	7.1	6.1	6.5	7.1
▶ Cyclic Intermediates, Dyestuff, Pigment		7.4	6.9	6.9	6.1	7.6	7.7	7.6
▶ Plastics		14.2	15.4	14.0	13.6	11.0	10.4	11.9
▶ Synthetic Rubbers		2.4	2.3	1.7	1.5	2.0	2.0	1.4
▶ Other Organic Chemicals		4.7	3.6	3.3	3.8	4.7	5.0	5.0
Chemical Fibers		5.3	4.4	3.8	3.1	1.8	1.8	1.5
End Products		44.8	50.4	54.4	54.6	53.0	49.9	49.3
▶ Oil and Fats, Soap, Detergents, Surfactants		3.8	4.1	4.0	3.5	4.1	3.6	3.4
▶ Paints		4.9	4.9	4.6	4.1	3.7	3.8	4.1
▶ Drugs & Medicines		18.6	21.9	25.7	27.0	28.0	26.2	25.0
▶ Agricultural Chemicals		2.2	1.6	1.6	1.4	1.1	1.0	1.0
▶ Cosmetics, Tooth-powder, Other Cosmetics		5.2	5.9	6.4	6.0	5.6	5.2	5.0
▶ Gelatins & Adhesives		0.9	1.0	1.0	1.0	1.0	1.0	1.0
▶ Photo-sensitized Materials		3.6	4.1	4.6	4.4	2.5	2.3	2.6
▶ Other Chemical End Products		5.7	6.9	6.6	7.2	7.0	6.7	7.1
Chemical Industry		100	100	100	100	100	100	100.0
Chemical Industry		65.0	62.5	62.9	63.6	64.1	64.0	64.0
Plastic Products		25.5	27.8	28.3	28.1	27.9	27.9	28.0
Rubber Products		9.5	9.7	8.8	8.3	7.9	8.1	8.0
Chemical Industry in A Broad Sense (including Plastic Products, and Rubber Products)		100	100	100	100	100	100	100

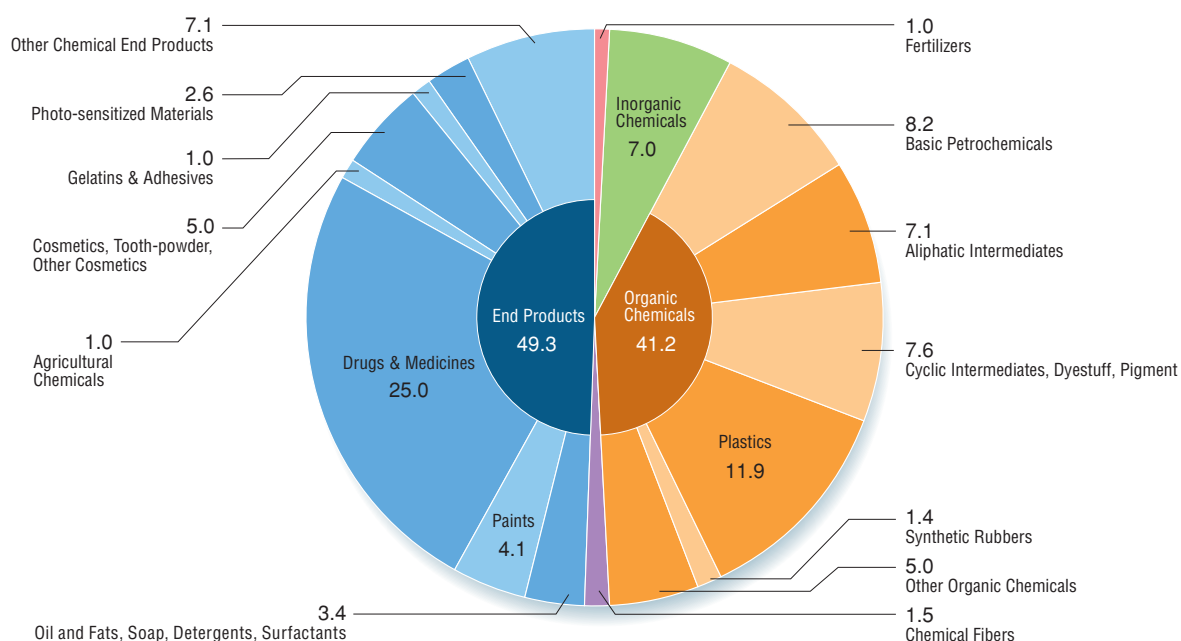
(Source) Ministry of Economy, Trade and Industry [Census of Manufactures]

<http://www.meti.go.jp/english/statistics/tyo/kougyo/index.html>

(Note) Statistics of facilities with more than four employees



## Composition of chemical products shipped in 2007 [%]



## The major chemical industry indices with breakdown by product in 2007

Industry					Composition(%)			
	Number of establishments	Number of employees	Amount of shipment (¥ billion)	Amount of value-added (¥ billion)	Number of establishments	Number of employees	Shipment	Amount of value-added
Fertilizers	158	4,531	277	73	3.1	1.3	1.0	0.7
Inorganic Chemicals	800	34,712	1,970	636	15.9	9.7	7.0	5.9
Organic Chemicals	752	85,258	11,669	3,063	14.9	23.9	41.2	28.4
▶ Basic Petrochemicals	14	4,516	2,328	369	0.3	1.3	8.2	3.4
▶ Aliphatic Intermediates	69	9,477	2,020	751	1.4	2.7	7.1	6.9
▶ Cyclic Intermediates, Dyestuff, Pigment	169	15,824	2,147	553	3.4	4.4	7.6	5.1
▶ Plastics	229	30,803	3,354	835	4.5	8.6	11.9	7.7
▶ Synthetic Rubbers	17	4,586	406	129	0.3	1.3	1.4	1.2
▶ Other Organic Chemicals	254	20,070	1,414	427	5.0	5.6	5.0	4.0
Chemical Fibers	59	8,347	423	138	1.2	2.3	1.5	1.3
End Products	3,265	223,890	13,955	6,891	64.9	62.8	49.3	63.8
▶ Oil and Fats, Soap, Detergents, Surfactants	279	14,309	971	361	5.5	4.0	3.4	3.3
▶ Paints	441	19,456	1,167	327	8.8	5.5	4.1	3.0
▶ Drugs & Medicines	881	94,160	7,083	4,196	17.5	26.4	25.0	38.8
▶ Agricultural Chemicals	75	4,312	281	117	1.5	1.2	1.0	1.1
▶ Cosmetics, Tooth-powder, Other Cosmetics	465	31,408	1,417	870	9.2	8.8	5.0	8.1
▶ Gelatins & Adhesives	155	5,551	295	99	3.1	1.6	1.0	0.9
▶ Photo-sensitized Materials	68	13,287	735	277	1.4	3.7	2.6	2.6
▶ Other Chemical End Products	901	41,407	2,007	645	17.9	11.6	7.1	6.0
Chemical Industry	5,034	356,738	28,294	10,801	100	100	100	100
Chemical Industry	5,034	356,738	28,294	10,801	20.7	37.1	64.0	64.5
Plastic Products	16,021	471,035	12,399	4,516	66.0	49.1	28.0	27.0
Rubber Products	3,221	132,466	3,535	1,424	13.3	13.8	8.0	8.5
Chemical Industry in A Broad Sense (including Plastic Products, and Rubber Products)	24,276	960,239	44,227	16,741	100	100	100	100

(Source) Ministry of Economy, Trade and Industry [Census of Manufactures]

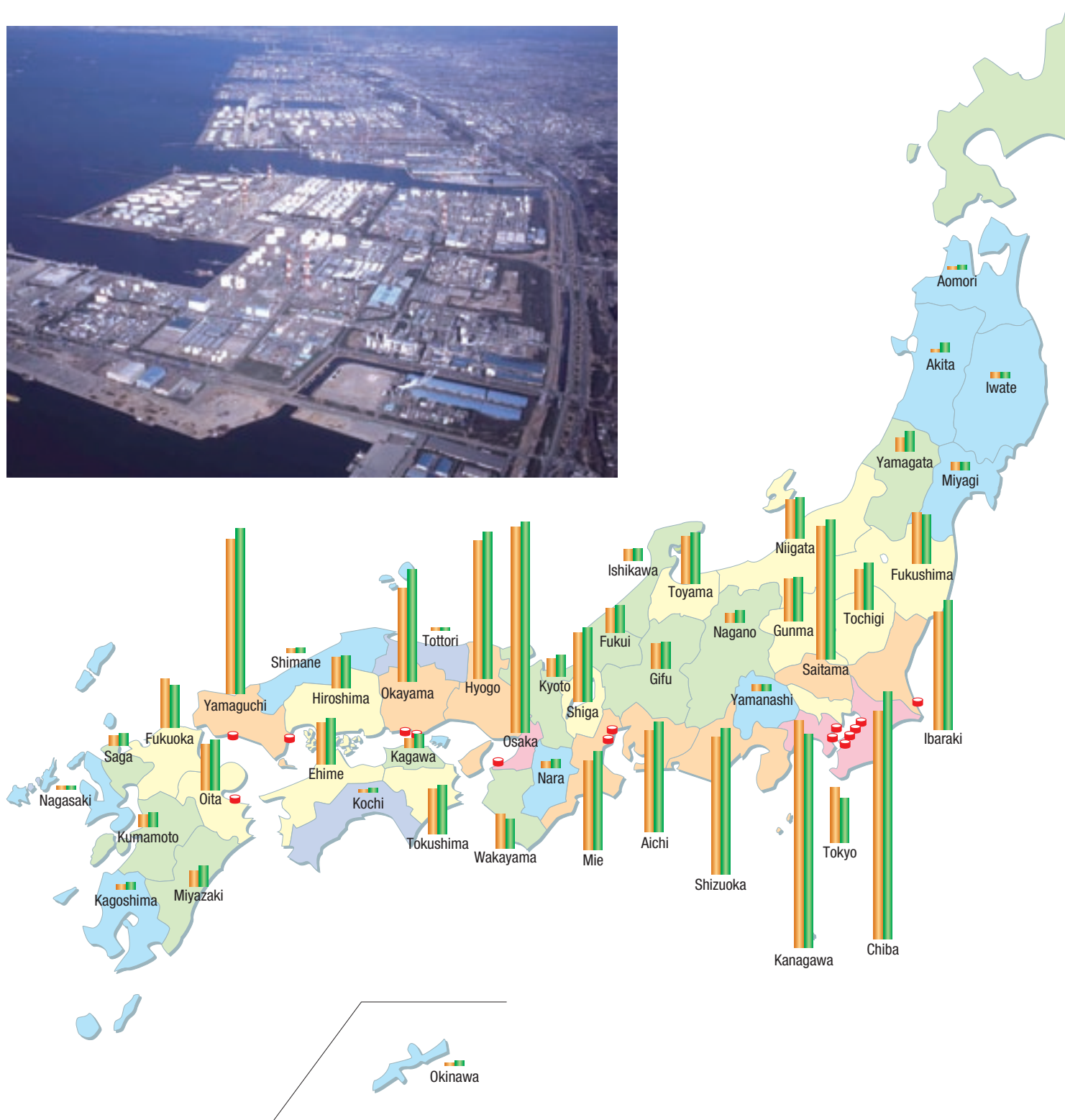
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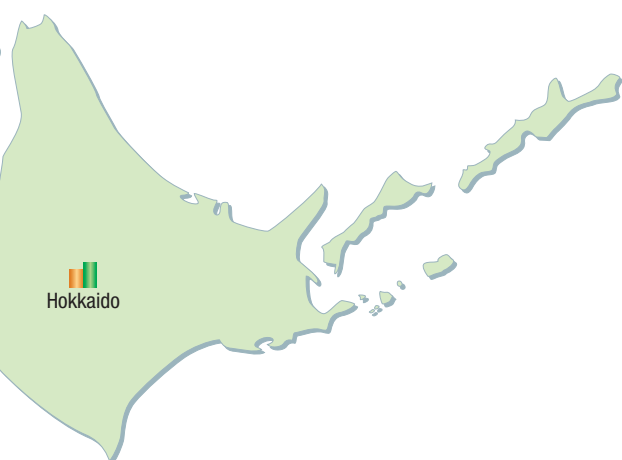
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

## Shipment by Prefecture

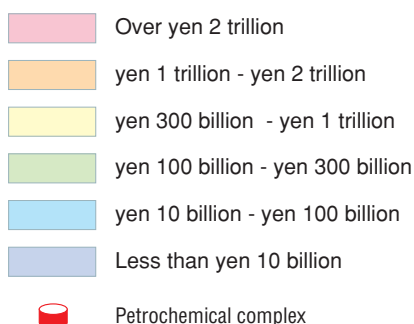
Chiba, Osaka and Kanagawa shipped more than yen 2 trillion each.

Shipment of chemical products by prefecture in 2007





2006  2007 



### Shipment of chemical products by prefecture in 2007

	Prefecture	Shipment (¥100million)	Increase/decrease from previous year(%)	Number of employees
1	Chiba	30,567	113.8%	19,641
2	Osaka	22,669	106.3%	35,209
3	Kanagawa	21,939	93.0%	26,410
4	Yamaguchi	18,118	105.6%	14,261
5	Saitama	15,284	109.6%	22,203
6	Shizuoka	15,248	106.5%	24,093
7	Hyogo	15,242	110.6%	21,553
8	Ibaraki	14,683	109.3%	13,244
9	Okayama	14,410	117.3%	10,836
10	Aichi	12,521	109.7%	16,278
11	Mie	12,012	117.4%	12,066
12	Shiga	7,693	109.3%	7,061
13	Oita	6,300	119.8%	2,272
14	Tokushima	5,544	108.6%	9,107
15	Toyama	5,241	107.1%	11,458
16	Fukushima	5,008	98.1%	8,612
17	Niigata	4,988	115.4%	6,514
18	Gunma	4,918	108.0%	6,854
19	Ehime	4,883	102.0%	4,669
20	Tochigi	4,751	113.8%	5,853
21	Fukuoka	4,577	92.7%	7,401
22	Tokyo	4,452	95.6%	12,360
23	Hiroshima	3,919	116.3%	5,606
24	Fukui	2,932	103.8%	4,028

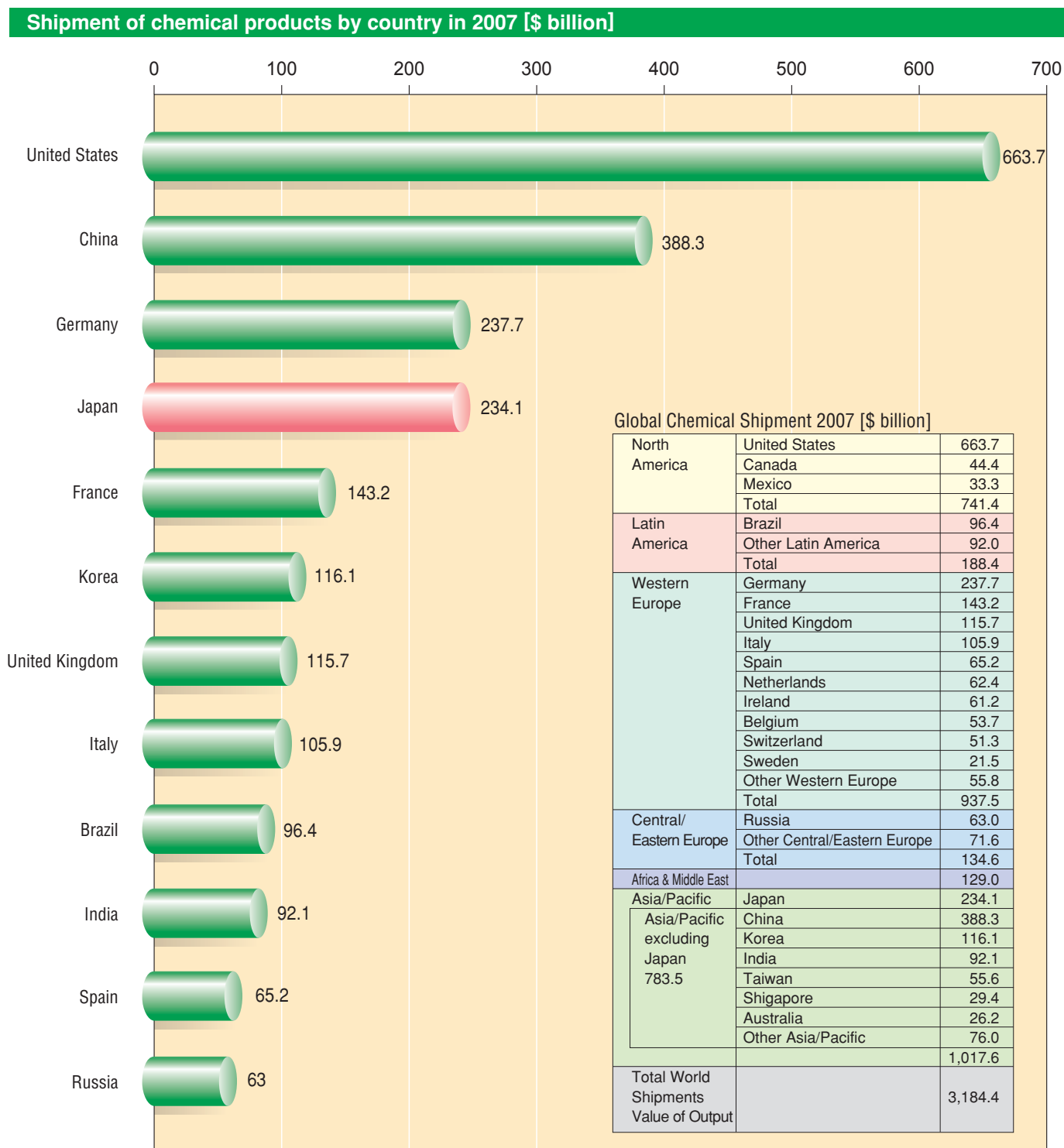
	Prefecture	Shipment (¥100million)	Increase/decrease from previous year(%)	Number of employees
25	Gifu	2,831	101.0%	5,206
26	Wakayama	2,779	92.8%	4,543
27	Yamagata	2,356	111.2%	2,957
28	Kyoto	2,148	120.2%	5,337
29	Miyazaki	1,787	111.2%	2,321
30	Kumamoto	1,593	110.1%	3,660
31	Hokkaido	1,557	115.0%	3,994
32	Ishikawa	1,479	103.3%	1,606
33	Saga	1,355	120.2%	1,788
34	Kagawa	1,259	128.5%	3,037
35	Nagano	1,153	119.2%	2,088
36	Miyagi	855	103.4%	1,750
37	Nara	778	111.1%	3,342
38	Akita	761	188.8%	1,341
39	Yamanashi	640	102.4%	1,337
40	Iwate	569	108.3%	1,460
41	Aomori	371	120.8%	608
42	Shimane	224	119.6%	593
43	Kagoshima	217	126.9%	543
44	Okinawa	111	141.7%	925
45	Nagasaki	107	114.1%	303
46	Kochi	89	120.5%	291
47	Tottori	23	99.5%	119
	<b>Total</b>	<b>282,939</b>	<b>108.0%</b>	<b>356,738</b>

(Source) Ministry of Economy, Trade and Industry [Census of Manufactures]

<http://www.meti.go.jp/english/statistics/tyo/kougyo/index.html>

(Note) Statistics of facilities with more than four employees

## Japan's Chemical Industry, The World's Fourth Biggest in Shipments after The U.S.A., China and Germany



(Source) American Chemistry Council

## The world's leading chemical companies in 2007

Ranking	Company	Chemical Sales [\$ million]			Country	Chemical Operating Profits [\$ million] <sup>(a)</sup>		
			Changes from 2006	Chemical Sales as of Total Sales			Changes from 2006	Operating Profit Margin <sup>(b)</sup>
1	BASF	65,037	20%	82%	Germany	5,898	23%	9%
2	Dow Chemical	53,513	9	100	U.S.	3,887	-19	7
3	Royal Dutch Shell	45,911	26	13	U.K./Netherlands	2,051	93	4
4	Ineos Group <sup>(c)</sup>	37,686	13	100	U.K.	3,015	139	8
5	Exxon Mobil <sup>(d)</sup>	36,826	8	9	U.S.	4,563	4	12
6	China Petroleum & Chemical	30,676	12	19	China	1,748	-8	6
7	SABIC	29,276	48	87	Saudi Arabia	11,107	32	38
8	DuPont <sup>(e)</sup>	29,218	1	100	U.S.	4,153	15	14
9	Total	28,786	10	13	France	1,954	17	7
10	Formosa Plastics Group <sup>(f)</sup>	26,541	29	58	Taiwan	3,306	47	12
11	Bayer	22,644	4	51	Germany	2,328	8	10
12	Mitsubishi Chemical	20,008	8	80	Japan	548	-26	3
13	Basell	16,614	15	97	Netherlands	1,320	56	8
14	Lyondell Chemical <sup>(g)</sup>	16,165	-17	57	U.S.	827	21	5
15	Evonik <sup>(h)</sup>	15,972	3	81	Germany	2,266	3	14
16	Mitsui Chemicals	15,172	5	100	Japan	655	-18	4
17	Akzo Nobel	14,009	2	100	Netherlands	1,743	32	12
18	Air Liquide	13,710	4	85	France	2,483	7	18
19	Sumitomo Chemical	13,662	14	85	Japan	456	-30	3
20	Petrochina	13,498	24	12	China	1,029	55	8
21	Reliance	13,222	4	40	India	1,739	8	13
22	Linde	12,626	49	75	Germany	3,173	50	25
23	Chevron Phillips	12,534	6	100	U.S.	820	-43	7
24	DSM	12,007	4	100	Netherlands	887	-20	7
25	Toray	11,962	7	85	Japan	764	0	6
26	Shin-Etsu	11,688	5	100	Japan	2,438	19	21
27	PPG Industries	10,025	14	90	U.S.	1,411	3	14
28	LG Chem <sup>(i)</sup>	9,942	23	86	South Korea	716	205	7
29	Yara	9,817	19	100	Norway	852	49	9
30	ICI <sup>(j)</sup>	9,808	1	100	U.K.	1,367	36	14

(Source) Chemical & Engineering News July28,2008 Issue

<http://pubs.acs.org/cen/coverstory/86/8630cover.html>

(Note) Financial figures converted at the 2007 average exchange rates of \$1.00 U.S. = 1.946 Brazilian reals, 7.606 Chinese renminbi, 0.729 euros, 41.18 Indian rupees, 117.76 Japanese yen, 5.856 Norwegian crowns, 7.048 South African rands, 928.97 South Korean won, 3.7504 Saudi riyals, 1.120 Swiss francs, 32852 Taiwanese dollars, 0.500 British pounds.

(a) Operating profit is sales less administrative expenses and cost of sales.

(b) Chemical operating profit as a percentage of chemical sales.

(c) C&EN estimates.

(d) Profits and profitability ratios are after tax.

(e) Sales include a significant amount of nonchemical products.

(f) Includes group companies, Nan Ya Plastics, Formosa Plastics, Formosa Chemicals & Fibre and Formosa Petrochemical. Estimates were used for chemical operating income and capital expenditures of Formosa Petrochemical.

(g) Lyondell was purchased by Basell on Dec. 20. 2007.

(h) Formerly Degussa.

(i) Nonconsolidated data; data in 2006 were consolidated.

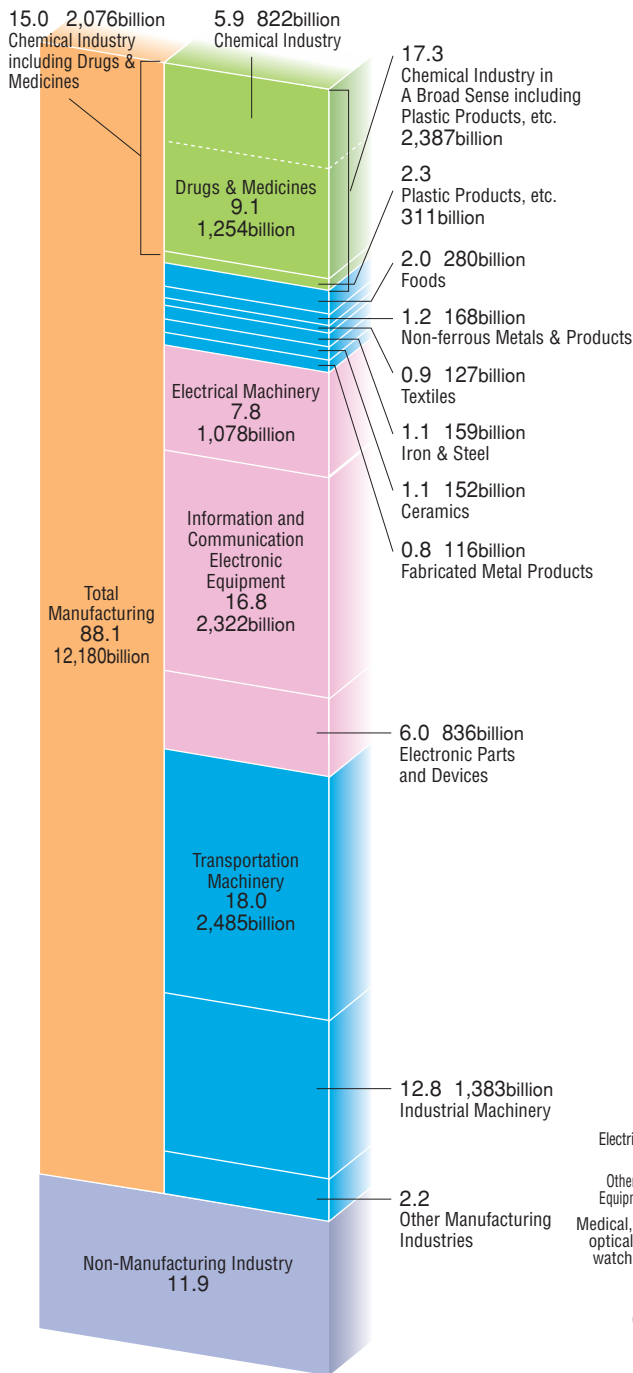
(j) ICI was bought by AkzoNobel on Jan.

Drugs & medicines are excluded.

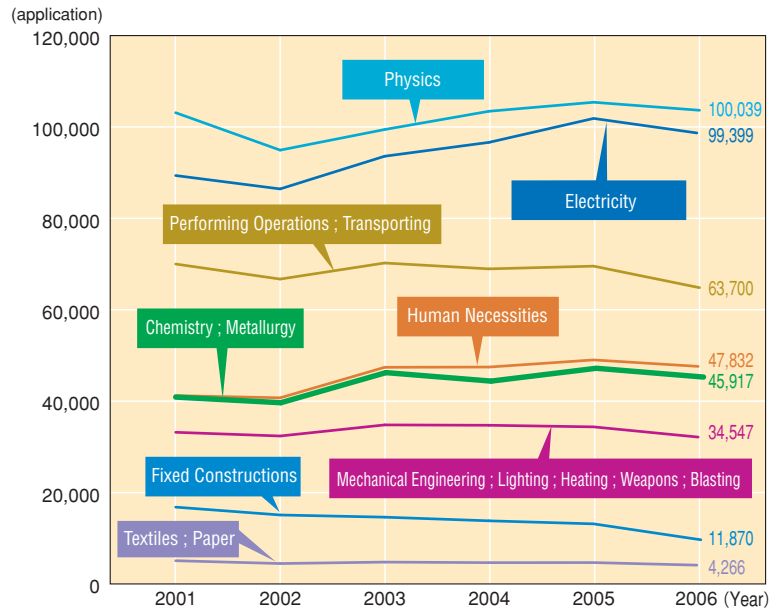
## Yen 2 trillion Spent for Research And Development

Research and development expenditures of chemical industry in FY 2007 (Apr.1, 2007-Mar.31, 2008) in Japan amounted to yen 2 trillion, accounting for 15.0% of all industry R&D expenditures. The percentage of research expenditures to sales was 5.7%.

**Ratio of R&D expenditures by industry in FY 2007 [%]**

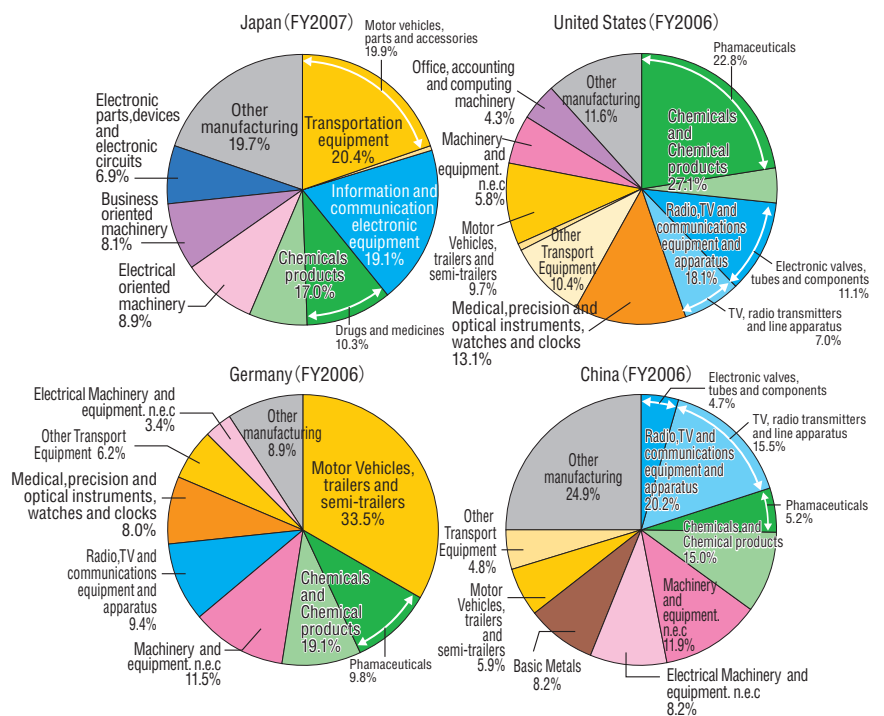


**Trend of number of applications for patents by sector**



(Source) Japan Patent Office

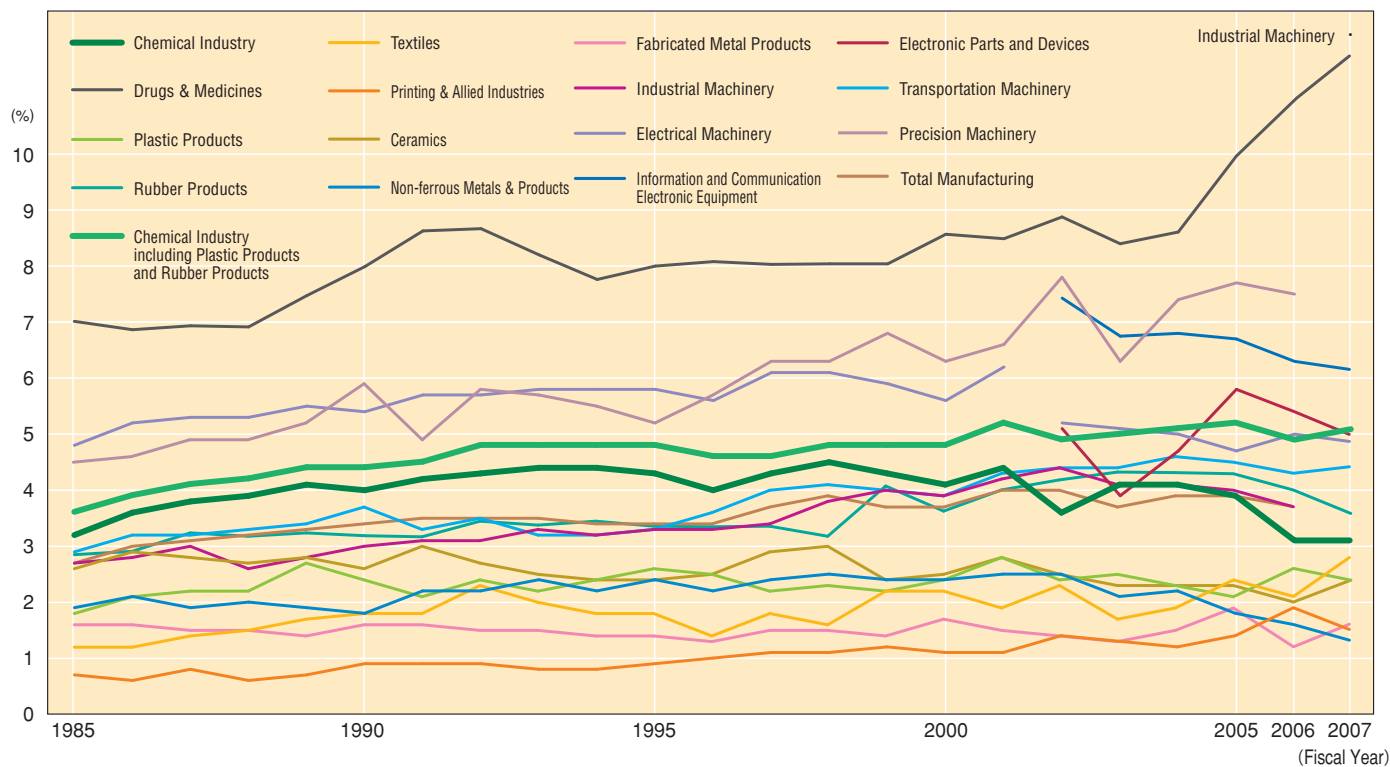
**Chemical industry R&D expenditures in major countries**



(Source) Ministry of Education, Culture, Sports, Science and Technology Indicators of Science and Technology (2009)

<http://www.stat.go.jp/data/kagaku/2008/index2.htm>  
 (Source) Ministry of Internal Affairs and Communications  
 [Survey of Research and Development]  
<http://www.stat.go.jp/english/data/kagaku/index.htm>

## Ratio of R&D expenditures to sales by industry



## Ratio of R&D expenditures to sales by industry [%]

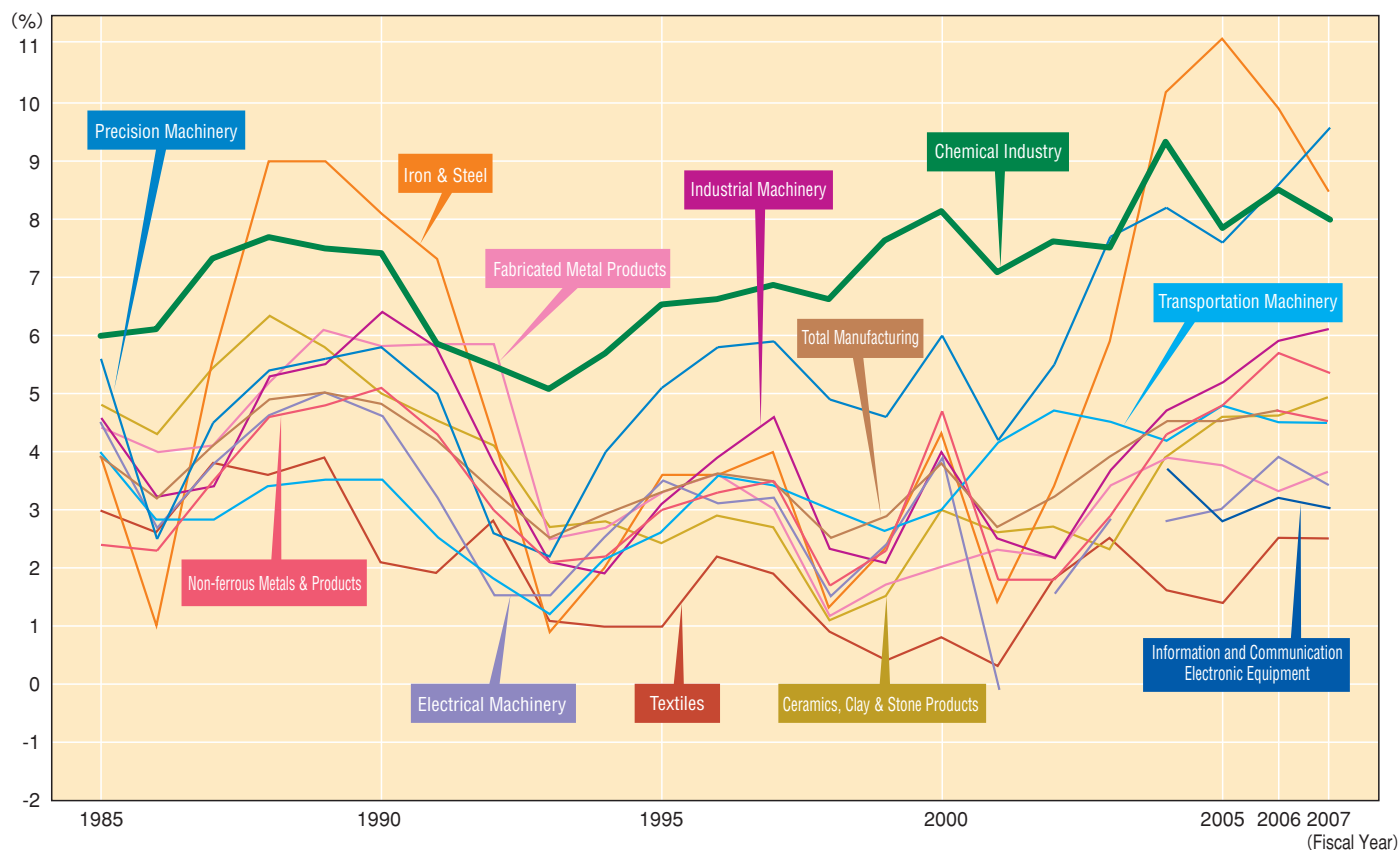
Industry	Fiscal Year	Every 5th year				Recent three years		
		1985	1990	1995	2000	2005	2006	2007
Chemical Industry		3.2	4.0	4.3	4.1	3.9	3.1	3.1
Drugs & Medicines		7.0	8.0	8.0	8.6	10.0	11.0	12.1
Chemical Industry including Drugs & Medicines		4.0	4.9	5.3	5.4	5.9	5.3	5.7
Plastic Products		1.8	2.4	2.6	2.4	2.1	2.6	2.5
Rubber Products		2.9	3.2	3.4	3.6	4.3	4.0	3.6
Chemical Industry including Plastic Products and Rubber Products		3.6	4.4	4.8	4.8	5.2	4.9	5.1
Textiles		1.2	1.8	1.8	2.2	2.4	2.1	2.8
Printing & Allied Industries		0.7	0.9	0.9	1.1	1.4	1.9	1.5
Ceramics		2.6	2.6	2.4	2.5	2.3	2.0	2.4
Non-ferrous Metals & Products		1.9	1.8	2.4	2.4	1.8	1.6	1.3
Fabricated Metal Products		1.6	1.6	1.4	1.7	1.9	1.2	1.6
Industrial Machinery		2.7	3.0	3.3	3.9	4.0	3.7	12.8
Electrical Machinery		4.8	5.4	5.8	5.6	4.7	5.0	4.9
Information and Communication Electronic Equipments		—	—	—	—	6.7	6.3	6.1
Electronic Parts and Devices		—	—	—	—	5.8	5.4	5.0
Transportation Machinery		2.9	3.7	3.3	3.9	4.5	4.3	4.4
Precision Machinery		4.5	5.9	5.2	6.3	7.7	7.5	N.A.
Total Manufacturing		2.7	3.4	3.4	3.7	3.9	3.7	3.6

(Source) Ministry of Internal Affairs and Communications [Survey of Research and Development]  
<http://www.stat.go.jp/english/data/kagaku/index.htm>

(Note) Drugs and medicines are excluded from Chemical Industry. Electrical machinery was divided into electrical machinery, information and communication electronics equipment, and electronic parts and devices in 2002. Precision machinery was included in industrial machinery in 2007.

Operating profit ratio to sales remains high compared to other manufacturing industries.

### Trend of ratio of operating profits to sales by industry



### Trend of ratio of operating profits to sales by industry [%]

Industry	Fiscal Year	Every 5th year				Recent three years		
		1985	1990	1995	2000	2005	2006	2007
Chemical industry		6.0	6.9	6.5	8.1	7.8	8.5	8.0
Textiles		3.0	2.1	1.0	0.8	1.4	2.5	2.5
Ceramics, Clay & Stone Products		4.8	5.0	2.4	3.0	4.6	4.6	4.9
Iron & Steel		3.9	8.1	3.6	4.3	11.1	9.9	8.6
Non-ferrous Metals & Products		2.4	5.1	3.0	4.7	4.8	5.7	5.5
Fabricated Metal Products		4.4	5.8	3.3	2.0	3.7	3.3	3.7
Industrial Machinery		4.6	6.4	3.1	4.0	5.2	5.9	6.1
Electrical Machinery		4.5	4.6	3.5	3.9	3.0	3.9	3.4
Information and Communication Electronics Equipments		—	—	—	—	2.8	3.2	3.0
Transportation Machinery		4.0	3.5	2.6	3.0	4.8	4.5	4.5
Precision Machinery		5.6	5.8	5.1	6.0	7.6	8.6	9.4
Total Manufacturing		3.9	4.8	3.3	3.8	4.5	4.7	4.5

(Source) Ministry of Finance [Financial Statements Statistics of Corporations by Industry]

<http://www.mof.go.jp/english/e1c002.htm>

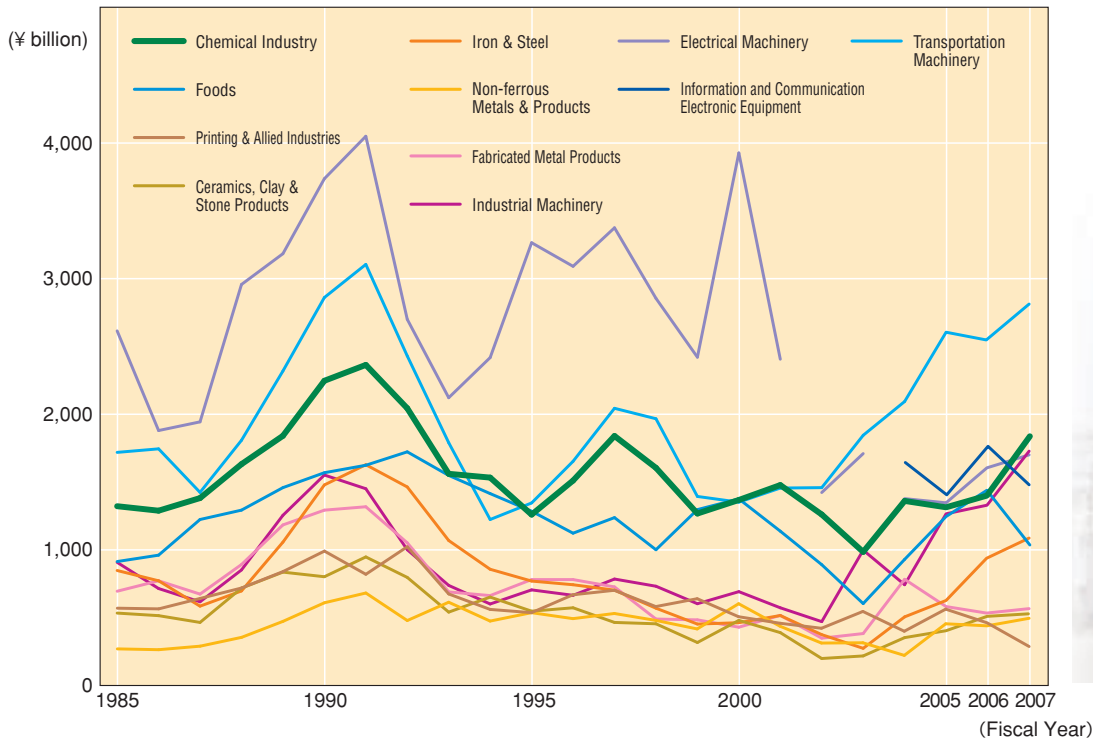
Chemical industry includes plastic products and rubber products. Information and Communication Electronics Equipment includes electronic parts and devices.



# Chemical Industry Ranks High in Plant Investment

Plant investment by the chemical industry accounted for 10.6% of all manufacturing industries.

## Trend of plant investment by industry



## Trend of plant investment by industry [¥ billion]

Industry	Fiscal Year	Every 5th year				Recent three years			
		1985	1990	1995	2000	2005	2006	2007	
Chemical Industry including Plastic Products and Rubber Products		1,322	2,247	1,260	1,368	1,314	1,400	1,861	10.6%
Foods		914	1,569	1,285	1,376	1,246	1,439	1,052	6.0%
Printing & Allied Industries		570	991	537	507	563	462	388	2.2%
Ceramics, Clay & Stone Products		534	802	548	480	404	510	663	3.8%
Iron & Steel		848	1,479	770	463	627	938	1,126	6.4%
Non-ferrous Metals & Products		270	610	537	603	455	440	525	3.0%
Fabricated Metal Products		695	1,293	781	430	582	657	675	3.9%
Industrial Machinery		908	1,552	705	692	1,266	1,329	1,593	9.1%
Electrical Machinery		2,615	3,737	3,265	3,927	1,347	1,605	1,634	9.3%
Information and Communication Electronics Equipments		—	—	—	—	1,407	1,764	1,471	8.4%
Transportation Machinery		1,719	2,861	1,346	1,352	2,605	2,548	2,838	16.2%
Others		2,686	4,341	2,814	2,040	2,530	2,656	3,663	20.9%
Total Manufacturing		13,082	21,483	13,849	13,238	14,343	15,749	17,490	100.0%

(Source) Ministry of Finance [Financial Statements Statistics of Corporations by Industry]

<http://www.mof.go.jp/english/e1c002.htm>

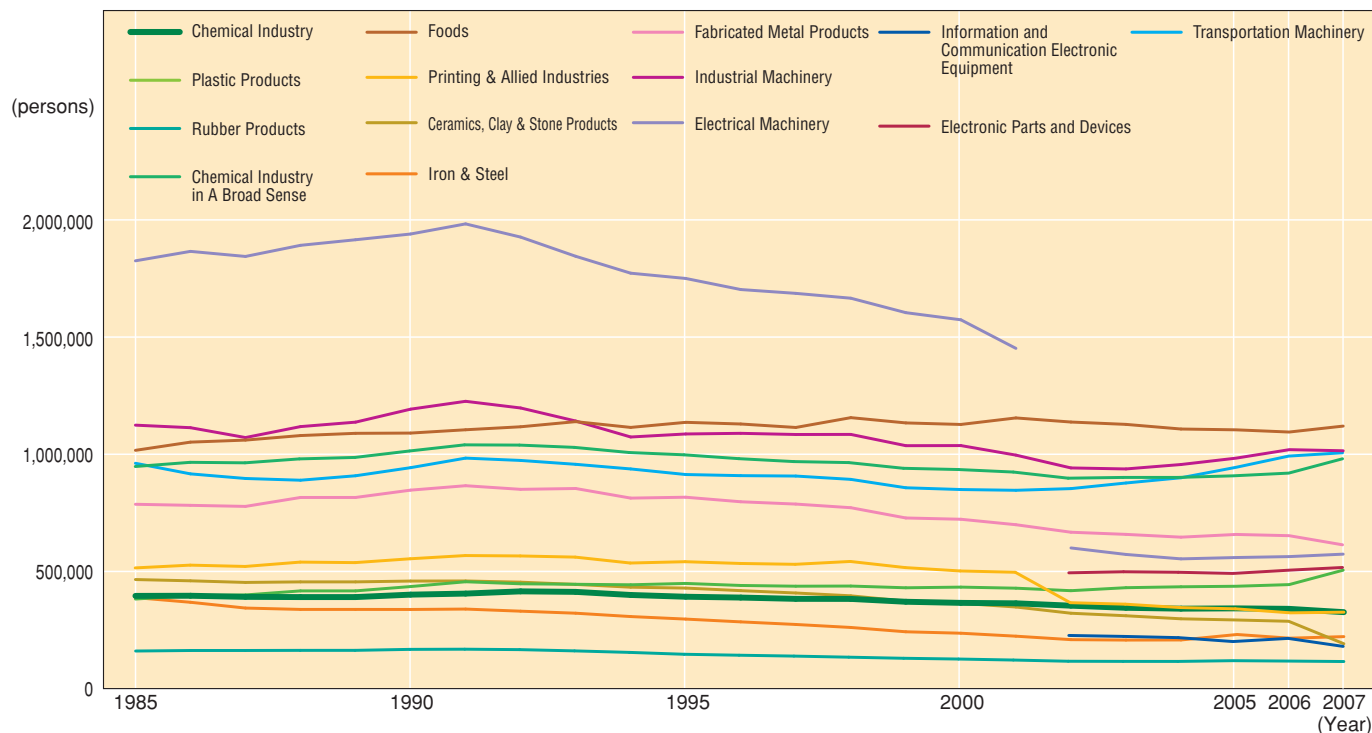
Chemical industry includes drugs & medicines plastic products and rubber products.

Information and Communication Electronics Equipment includes electronic parts and devices.

## 356,000 Workers Are Employed

The number of employees in the chemical industry accounted for 4.2% in entire manufacturing industry.

### Changes in the number of employees by industry



### Changes in the number of employees by industry [persons]

Industry	Year	Every 5th year				Recent three years			
		1985	1990	1995	2000	2005	2006	2007	
Chemical industry		395,748	401,076	392,109	365,953	342,481	343,798	356,738	4.2%
Plastic Products		382,247	435,523	448,939	433,177	436,897	445,334	471,035	5.5%
Rubber Products		165,315	172,284	151,601	131,532	124,613	125,384	132,466	1.6%
Chemical Industry in A Broad Sense		943,310	1,008,883	992,649	930,662	903,991	914,516	960,239	11.3%
Foods		1,016,731	1,090,403	1,136,236	1,127,177	1,104,292	1,093,080	1,135,051	13.3%
Printing & Allied Industries		515,213	554,155	541,688	502,184	340,890	329,830	334,796	3.9%
Ceramics, Clay & Stone Products		465,483	459,040	429,023	363,997	293,013	289,032	293,815	3.4%
Iron & Steel		388,357	337,811	296,824	236,525	213,056	219,858	228,860	2.7%
Fabricated Metal Products		786,604	846,915	816,694	722,425	657,942	655,361	664,082	7.8%
Industrial Machinery		1,124,229	1,192,406	1,086,575	1,037,079	983,449	1,014,715	1,063,957	12.5%
Electrical Machinery		1,825,314	1,939,729	1,750,103	1,573,683	559,413	565,858	581,924	6.8%
Information and Communication Electronic Equipments		—	—	—	—	205,331	217,312	231,485	2.7%
Electronic Parts and Devices		—	—	—	—	490,140	503,244	528,095	6.2%
Transportation Machinery		961,590	942,795	913,535	849,517	944,352	989,730	1,050,334	12.3%
Others		2,863,118	2,800,692	2,357,256	1,840,584	1,461,123	1,432,906	1,445,907	17.0%
Total Manufacturing		10,889,949	11,172,829	10,320,583	9,183,833	8,156,992	8,225,442	8,518,545	100.0%

(Source) Ministry of Economy, Trade and Industry [Census of Manufactures]

<http://www.meti.go.jp/english/statistics/tyo/kougyo/index.html>

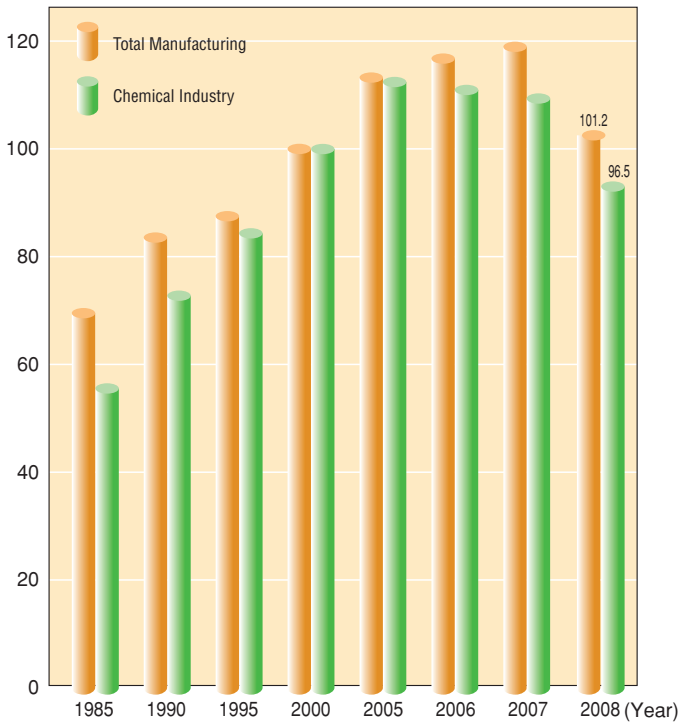
(Note) Statistics of facilities with more than four employees

Electrical machinery was divided into electrical machinery, information and communication electronics equipment, and electronic parts and devices in 2002.

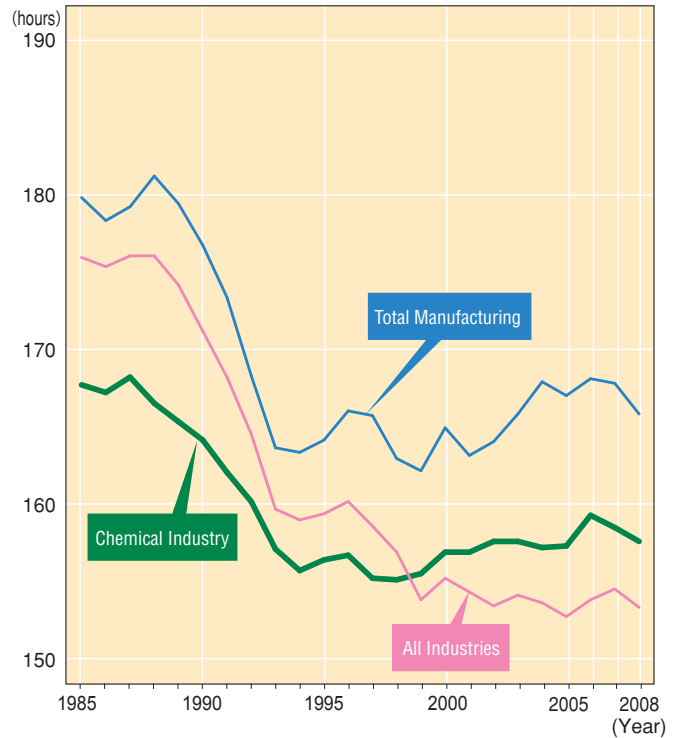
## Labor Productivity / Working Hours

Labor productivity of the chemical industry has decreased for three consecutive years.

**Indices of physical labor productivity**  
[Index, 2000=100]



**Working hours**  
(monthly average of total net working hours)



**Indices of physical labor productivity**  
[Index, 2000=100]

Year	Industry	Total Manufacturing		Chemical Industry	
		Indices	Increase rate %	Indices	Increase rate %
Every 5th year	1985	69.6	2.8	55.5	3.5
	1990	83.6	2.7	72.8	4.6
	1995	87.5	4.4	84.3	8.1
	2000	100.0	6.3	100.0	2.6
	2005	113.2	1.3	112.5	0.4
Recent three years	2006	116.8	3.2	111.0	△1.3
	2007	119.1	2.0	109.5	△1.4
	2008	101.2	△3.5	96.5	△5.7

(Source) Japan Productivity Center for Socio-Economic Development

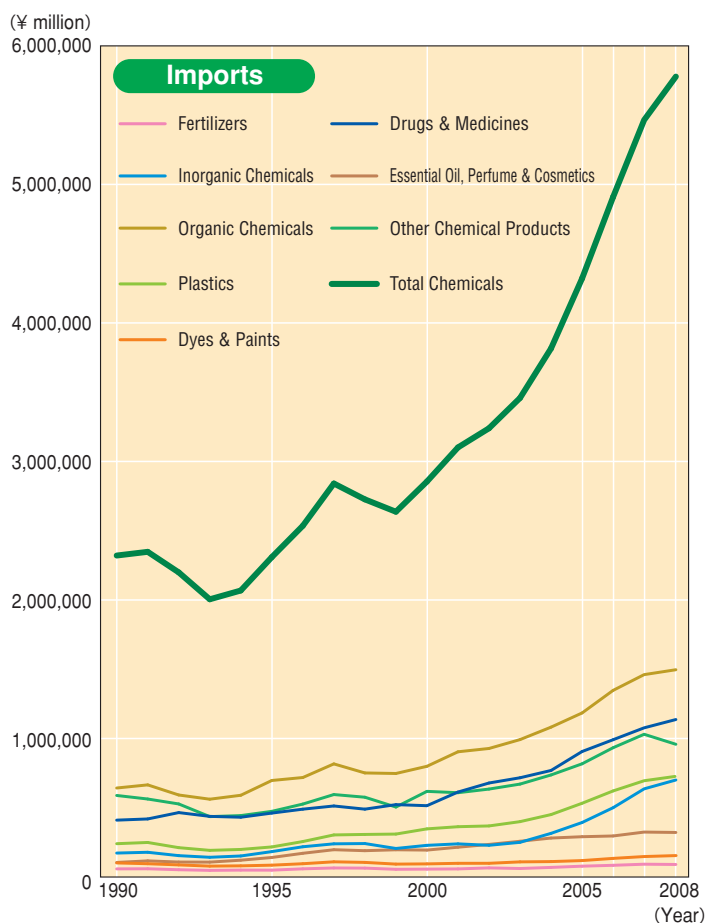
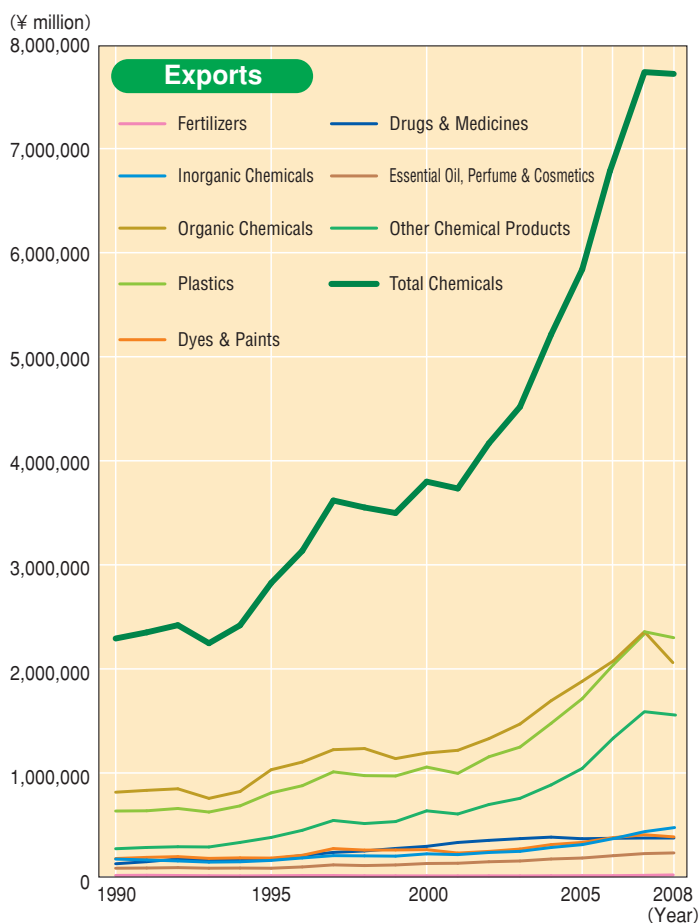
**Working hours (monthly average of total net working hours) [hours]**

Year	Industry	All Industries	Total Manufacturing	Chemical Industry
		1985	175.8	179.7
Every 5th year	1990	171.0	176.6	163.9
	1995	159.1	163.9	156.1
	2000	154.9	164.7	156.6
	2005	152.4	166.8	157.0
	Recent three years	2006	153.5	167.9
2007		154.2	167.6	158.2
2008		153.0	165.6	157.3

(Source) Ministry of Health, Labour and Welfare [Monthly Labour Survey]

In 2008, both export and import increased with trade surplus of 1.5 trillion yen, a consecutive surplus since 1991. Although Japan's shipment to Asia has decreased, overall export has maintained a high level.

### Exports and imports of chemicals



### Exports and imports of chemicals [¥ million]

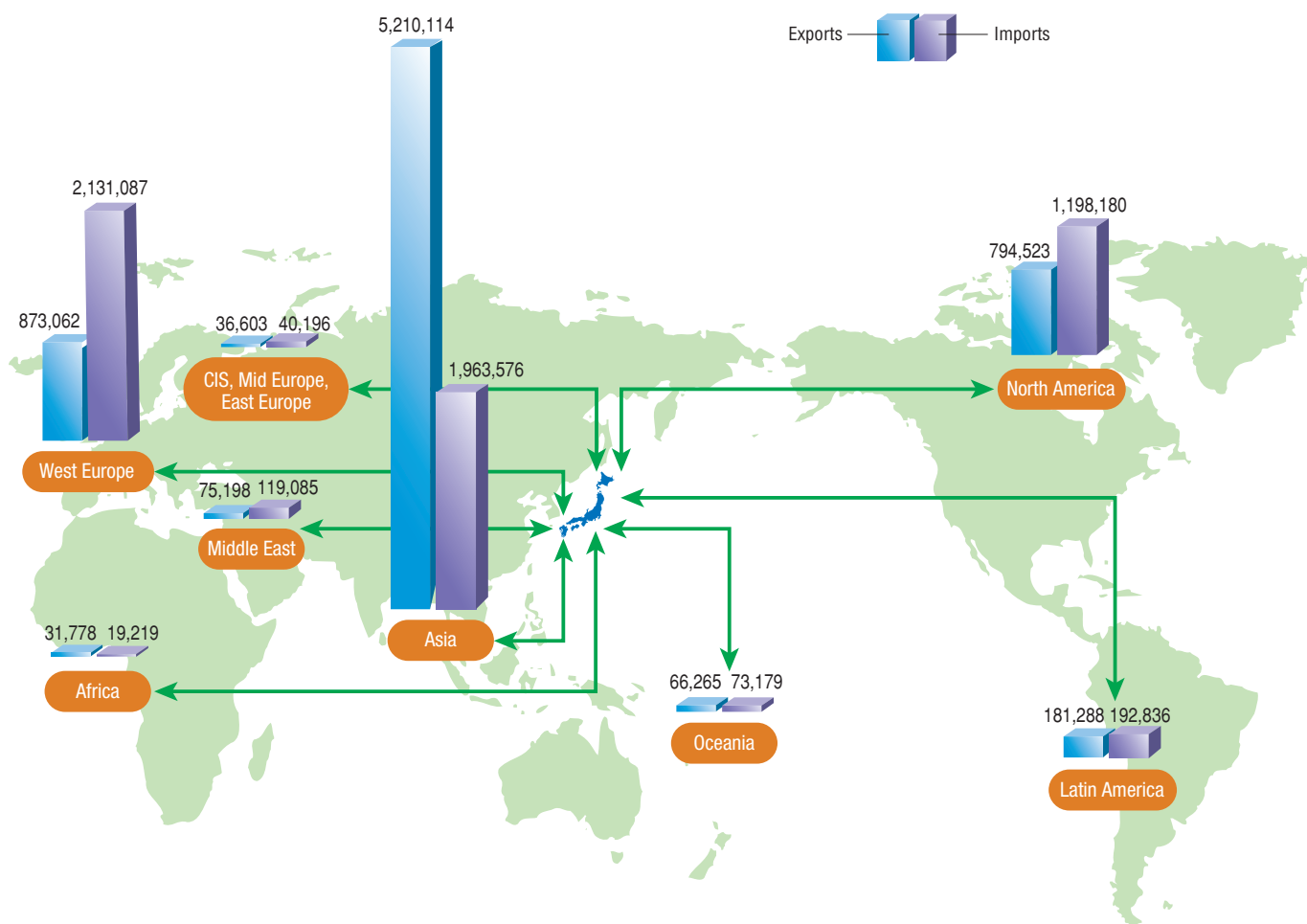
Exports						Articles	Imports					
Every 5th year			Recent three years				Every 5th year			Recent three years		
1990	1995	2000	2006	2007	2008		1990	1995	2000	2006	2007	2008
14,504	11,515	10,029	12,231	15,236	23,382	Fertilizers	58,742	49,566	57,025	84,610	92,522	167,938
171,922	158,905	222,143	68,927	435,877	513,260	Inorganic Chemicals	172,927	183,410	228,712	500,326	636,711	721,101
815,437	1,031,703	1,192,727	2,078,802	2,358,995	2,032,843	Organic Chemicals	642,518	696,878	799,250	1,347,363	1,464,388	1,528,198
634,210	809,104	1,057,477	2,042,533	2,339,365	2,231,691	Plastics	240,549	217,137	347,603	621,503	695,088	743,617
177,009	181,357	262,558	378,119	406,235	391,623	Dyes & Paints	101,669	85,566	94,761	134,501	147,819	154,872
126,735	172,870	294,407	372,115	374,417	379,876	Drugs & Medicines	410,580	461,522	514,885	991,234	1,078,431	1,142,372
83,863	83,787	129,205	204,376	224,704	230,834	Essential Oil, Perfume & Cosmetics	105,074	141,030	194,430	296,330	324,460	315,032
271,333	380,036	636,115	1,336,762	1,590,510	1,465,321	Other Chemical Products	588,753	474,050	618,287	933,465	1,031,765	964,228
2,295,013	2,829,276	3,804,662	6,793,864	7,745,339	7,268,831	Total Chemicals	2,320,813	2,309,160	2,854,954	4,909,332	5,471,184	5,737,358

(Source) Ministry of Finance [Trade Statistics]

[http://www.customs.go.jp/toukei/info/index\\_e.htm](http://www.customs.go.jp/toukei/info/index_e.htm)

(Note) Chemical fiber is excluded from Chemicals in the data.

## Exports and imports of chemical products in 2008 by region [¥ million]



## Exports and imports of chemical products in 2008 by region [¥ million]

Exports						Region	Imports					
Every 5th year			Recent three years				Every 5th year			Recent three years		
1990	1995	2000	2006	2007	2008		1990	1995	2000	2006	2007	2008
1,223,341	1,673,875	2,208,365	4,798,893	5,589,667	5,210,114	Asia	340,871	376,015	624,309	1,556,171	1,772,504	1,963,576
39,893	20,847	20,956	43,188	57,652	75,198	Middle East	84,633	56,846	52,150	90,150	105,002	119,085
457,958	491,648	583,471	847,469	915,065	873,062	West Europe	904,979	969,285	1,137,027	1,899,008	2,088,653	2,131,087
370,409	458,870	695,985	818,026	842,382	794,523	North America	784,185	682,190	781,045	1,065,960	1,171,827	1,198,180
40,110	65,321	139,206	171,931	205,337	181,288	Latin America	84,455	78,928	68,777	194,492	219,549	192,836
6,889	3,328	16,056	25,216	33,640	31,778	Africa	431	2,349	5,166	16,042	16,138	19,219
64,290	44,103	41,420	61,589	68,297	66,265	Oceania	36,680	44,956	44,592	52,369	61,786	73,179
57,489	10,740	8,196	27,552	33,300	36,603	CIS, Mid Europe, East Europe	22,443	15,288	14,623	35,140	35,724	40,196
2,261,805	2,779,713	3,713,655	6,793,864	7,745,339	7,268,831	Total	2,259,687	2,226,126	2,727,688	4,909,332	5,471,184	5,737,358

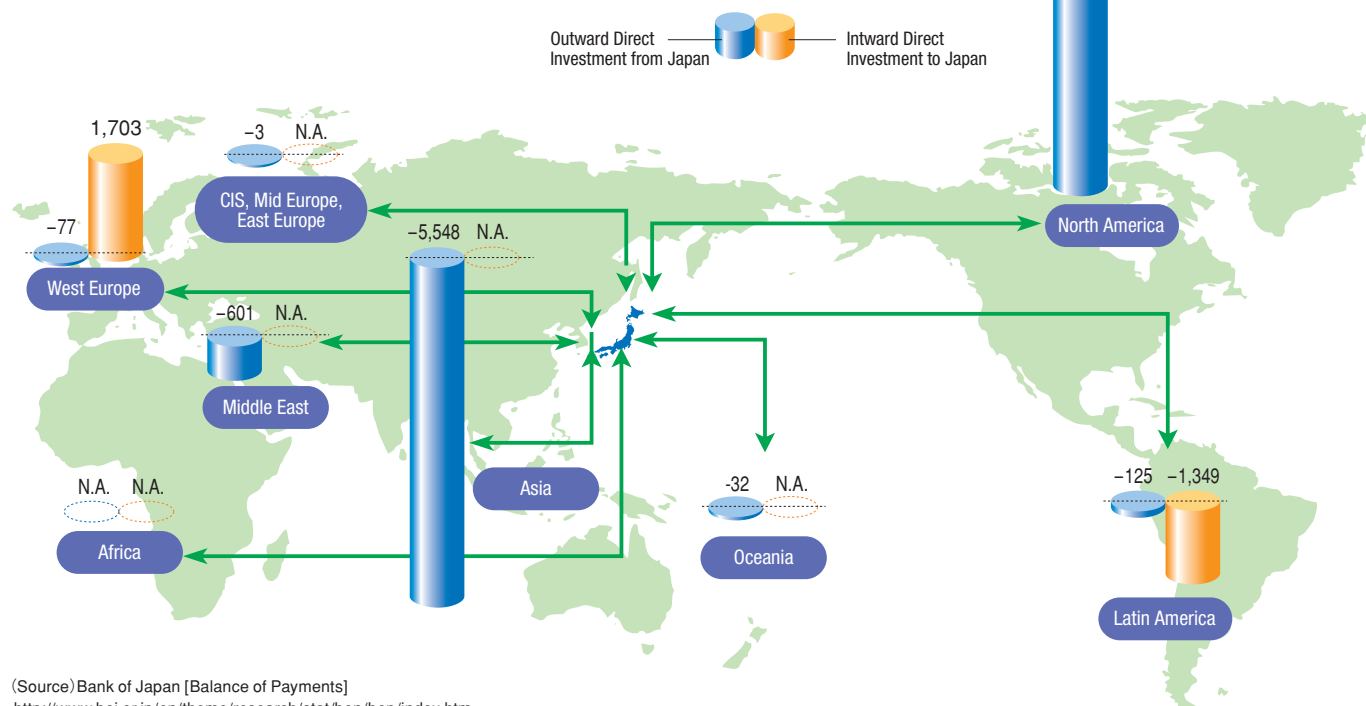
(Source) Ministry of Finance [Trade Statistics]

[http://www.customs.go.jp/toukei/info/index\\_e.htm](http://www.customs.go.jp/toukei/info/index_e.htm)

(Note) Chemical fiber is excluded from chemical products in the data.

## Outward Direct Investment Amounts to Yen 1,180 Billion, While Inward Direct Investment Amounts to Yen 30 Billion

### Outward direct investment of the Japanese chemical industry and inward direct investment to the chemical industry in Japan in 2008 [¥ 100 million]



(Source) Bank of Japan [Balance of Payments]

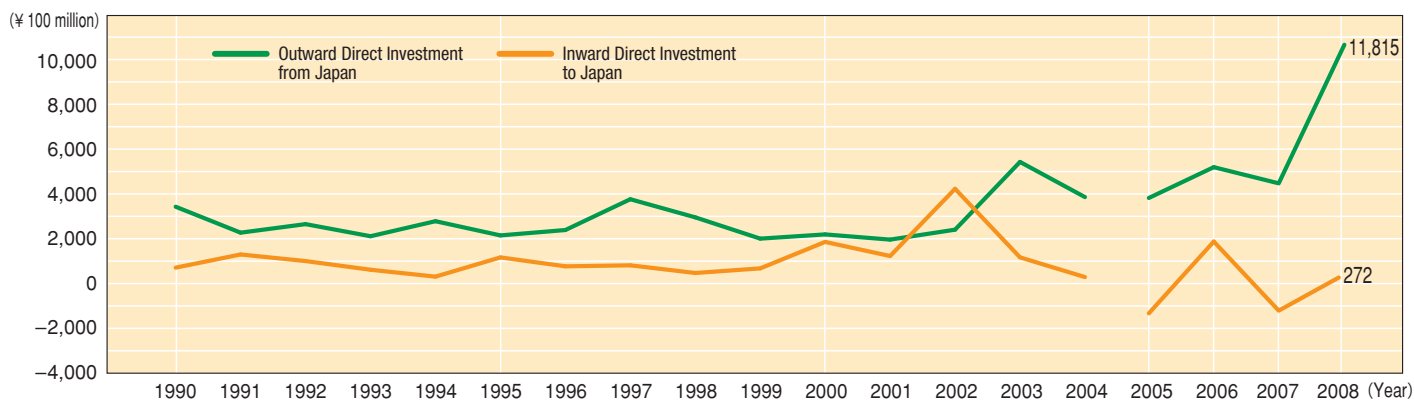
<http://www.boj.or.jp/en/theme/research/stat/bop/bop/index.htm>

When there are no reports, it is indicated as "N.A."

(Note) The figures of outward and inward direct investments show the figures of the inflow of capital to Japan subtracted by the outflow of the capital from Japan.

By the way, the inflow of the capital to Japan in Japan's direct investment abroad shows the figures of the return on investment.

### Actual outward direct investment of the Japanese chemical industry and inward direct investment to the chemical industry in Japan



(Source) Ministry of Finance [Foreign Direct Investment]

<http://www.mof.go.jp/english/e1c008.htm>

Bank of Japan [Balance of Payments]

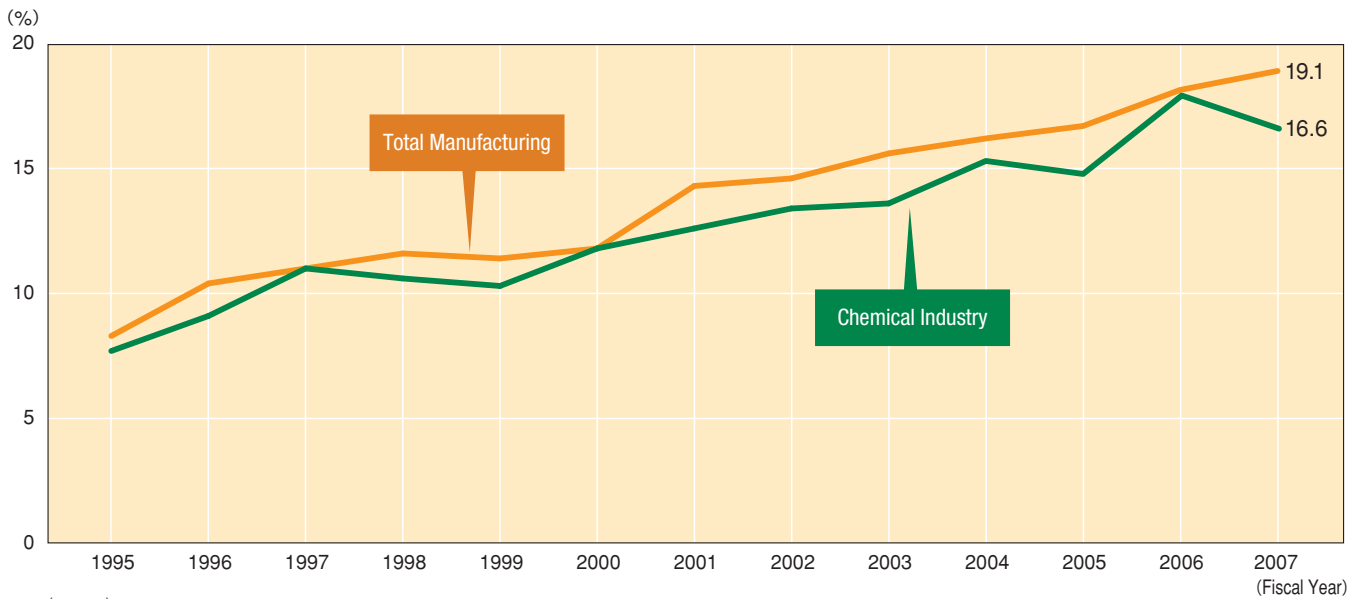
<http://www.boj.or.jp/en/theme/research/stat/bop/bop/index.htm>

Fiscal years from 1990 to 2004 and calendar year from 2005 to 2008

## Overseas Business Activities

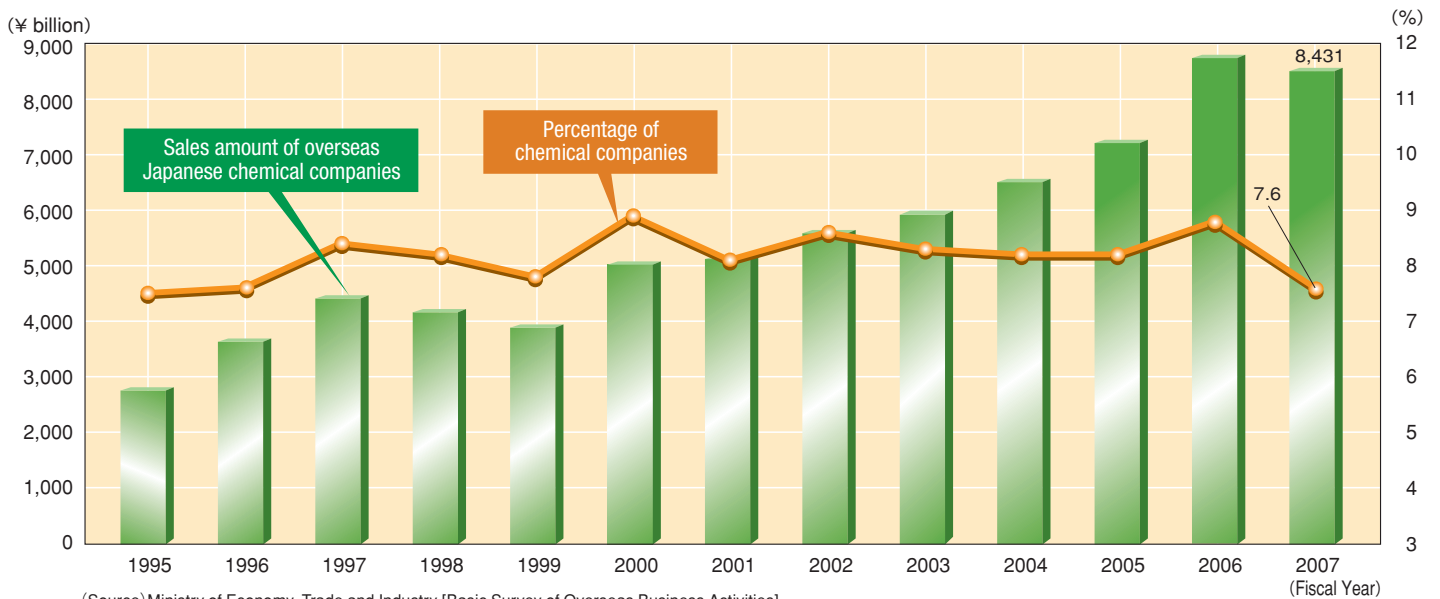
Overseas production of the Japanese chemical industry has been continuously growing. However, in 2007, there was a decline for the first time in 8 years.

### Trend of overseas production of Japanese companies



(Source) Ministry of Economy, Trade and Industry [Basic Survey of Overseas Business Activities]  
<http://www.meti.go.jp/english/statistics/tyo/kaigaizi/index.html>  
 (Notes) Chemical fiber is excluded under Chemical Industry in the data.

### Sales of Japanese chemical companies based overseas and its percentage of all overseas Japanese manufacturing companies' sales



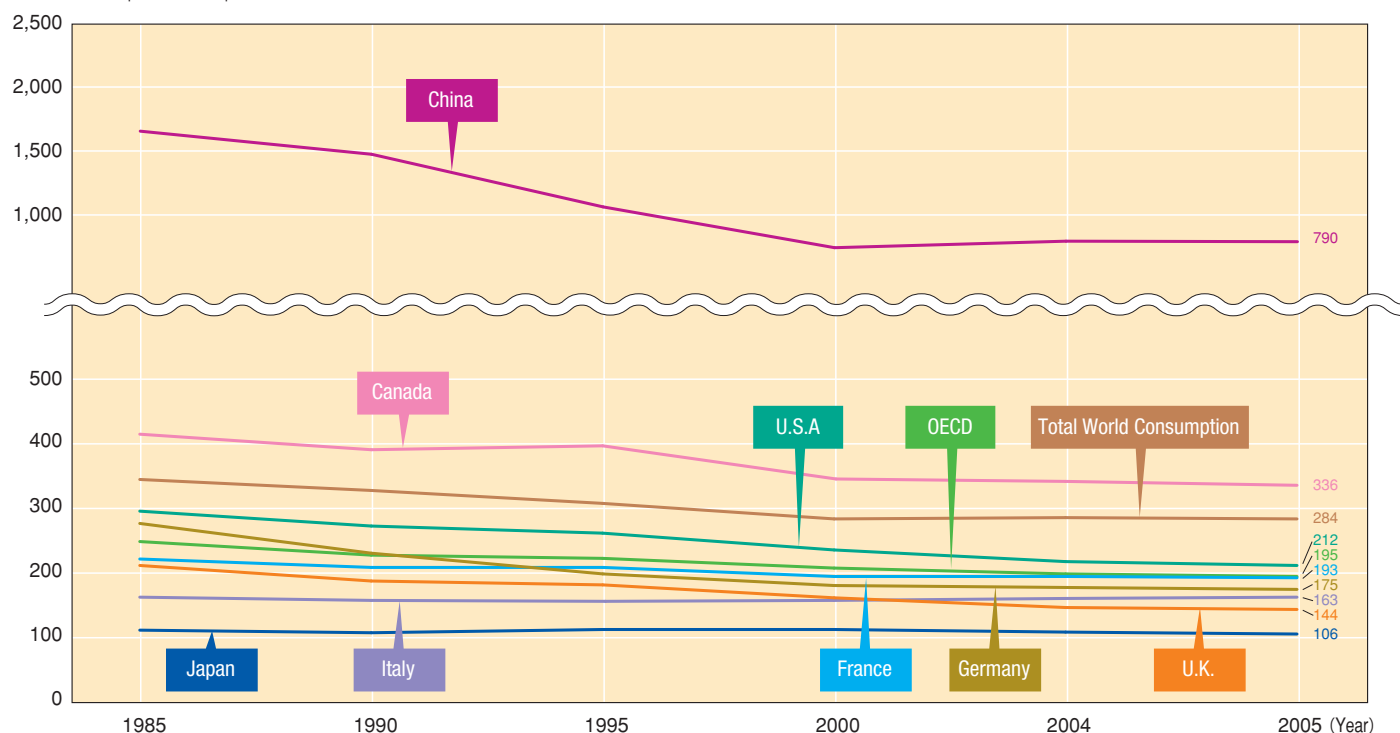
(Source) Ministry of Economy, Trade and Industry [Basic Survey of Overseas Business Activities]  
<http://www.meti.go.jp/english/statistics/tyo/kaigaizi/index.html>  
 (Note) Chemical fiber is excluded under the chemical industry in the data.

## Japan Is An Energy-Saving Superpower

Japan uses the least energy per GDP of all advanced countries.

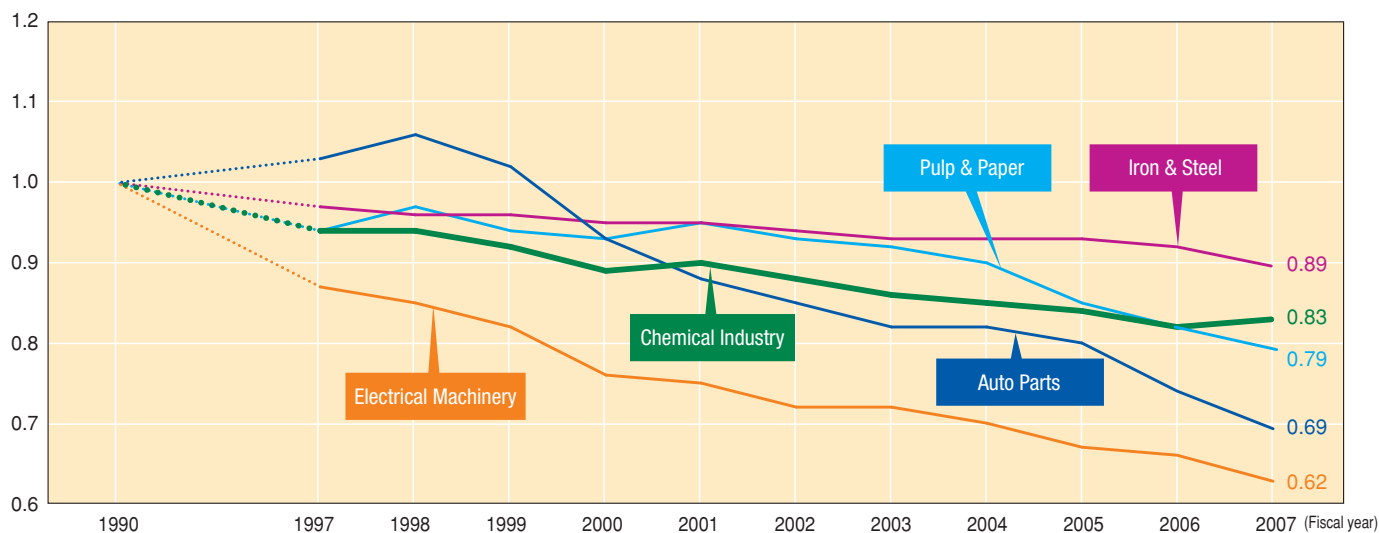
### World's primary energy consumption per GDP

(tons in crude oil equivalent / 2000 price, \$ million)



(Source) The Energy Conservation Center, Japan, [Handbook of Energy & Economic Statistics in Japan]

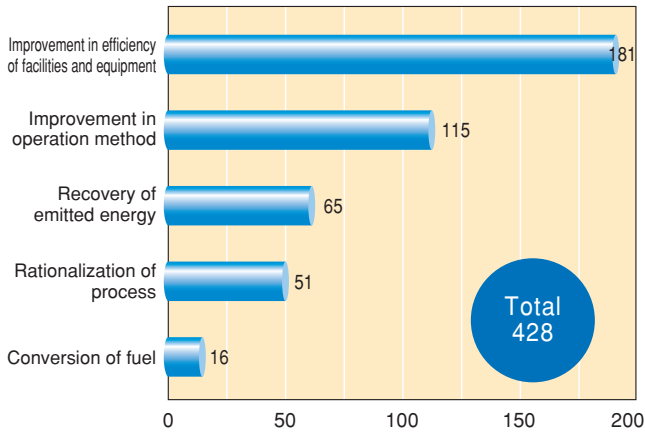
### Energy consumption per unit of major industries in Japan [Index, 1990=1.0]



(Source) Nippon Keidanren [Results of the Fiscal 2008 Follow-up to the Keidanren Voluntary Action Plan on the Environment-Section on Global Warming Measures-]

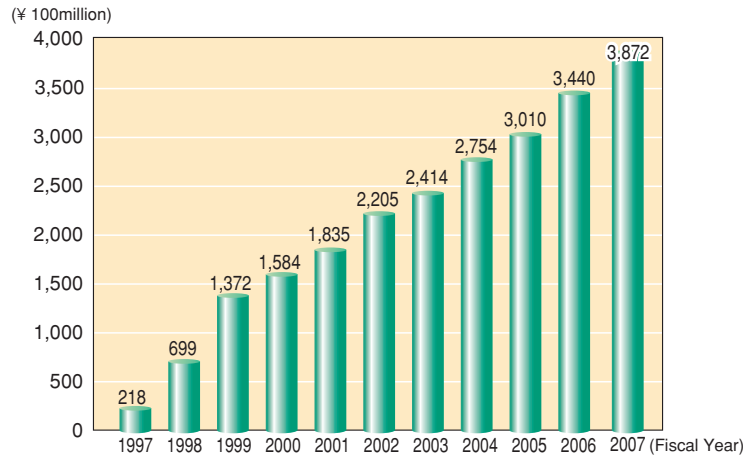


### Energy Conservation Capital Investment (FY2007)



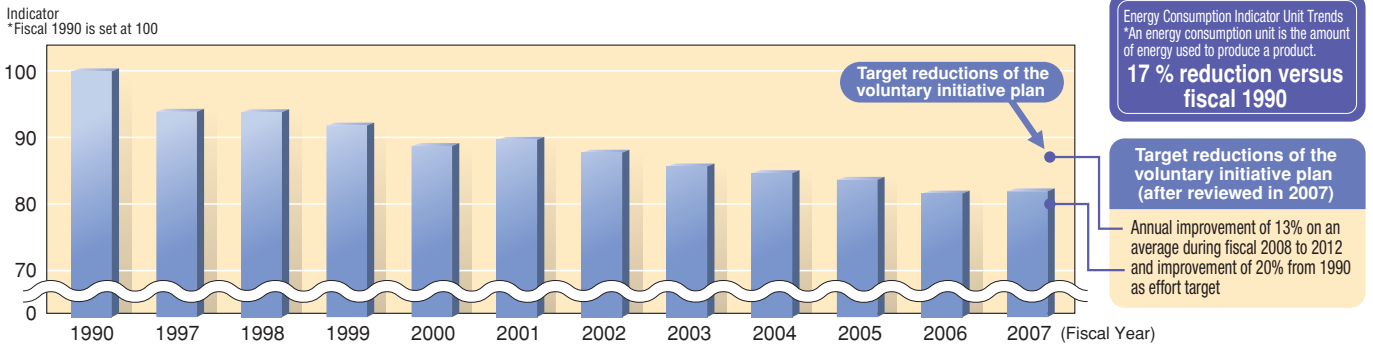
(Source) Japan Chemical Industry Association

### Energy Conservation Capital Investment (Cumulative)



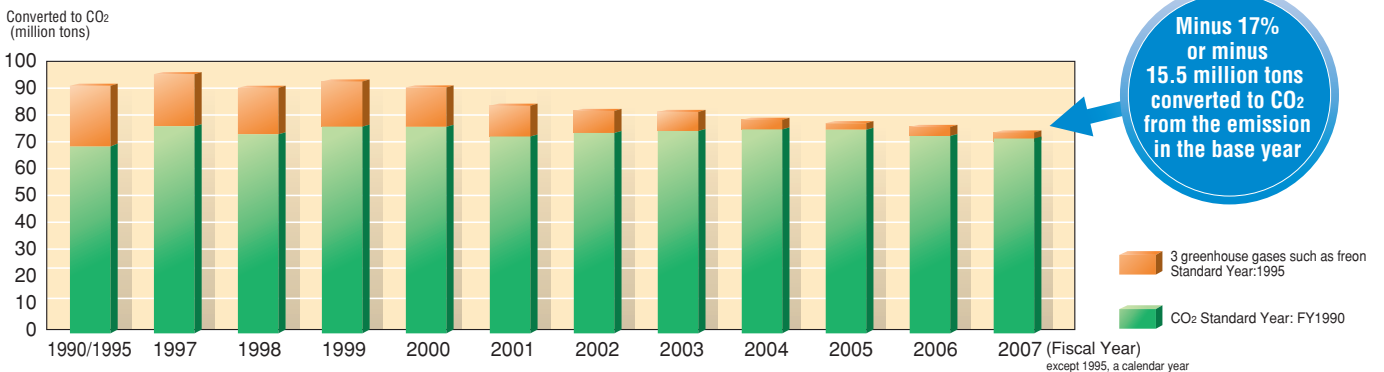
(Source) Japan Chemical Industry Association

### Energy Consumption Indicator Unit Trends



(Source) Japan Chemical Industry Association

### Greenhouse Gases Emissions Under The Voluntary Action Plan of The Chemical Industry



(Source) Japan Chemical Industry Association

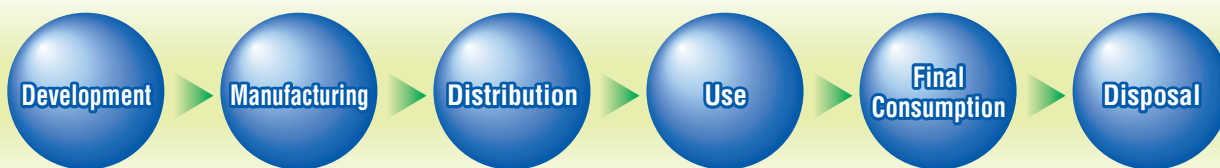
# Do You Know Responsible Care? Efforts of Chemical Industry to Preserve Health, Safety and Environment

## What is Responsible Care?

Chemical substances are vital and indispensable to our daily lives. However, if they are improperly handled, they can be hazardous and can damage human health and the environment. Concerns about health, safety and the environment are increasing due to the escalation of global environmental problems, the expansion of industrialization and new problems arising from technological developments. It is no longer possible to ensure environmental and human health and safety through legislation, and all parties who deal in or

manage chemicals are required to take initiatives to protect health, safety and the environment.

The global chemical industry is working voluntarily to protect health, safety and the environment through every process from the development of chemical substances, their manufacture, distribution, use and final consumption to disposal as well as engaging in dialogue and communication with the public by openly disclosing performance. These initiatives are called "Responsible Care".



Responsible Care was initiated in Canada in 1985 and 1990 marked the establishment of the International Council of Chemical Associations (ICCA). Fifty-three countries around the world now implement Responsible Care (as of April 2009). In 1995, the Japan Responsible Care Council (JRCC) was established within the Japan Chemical Industry Association (JCIA) by 74 corporations, primary

companies engaged in manufacturing and handling chemical substances. With the establishment of the JRCC, the environment, safety and health activities of each company were harmonized and further intensified to promote public understanding of the chemical industry. As of April 2009, the JRCC comprised 100 corporate members.

## The Responsible Care Logo

The logo, depicting a pair of hands and a model of a molecule, express the key message in handling chemical substances with care, and the ICCA has adopted the logo as an international mark to be used by corporations and associations that implement Responsible Care. Permission to use the logo has been granted to chemical industry associations in all ICCA member countries, as well as the respective members of those associations.

In Japan, the Responsible Care logo can be used only by the JCIA, the JRCC and the JRCC members.



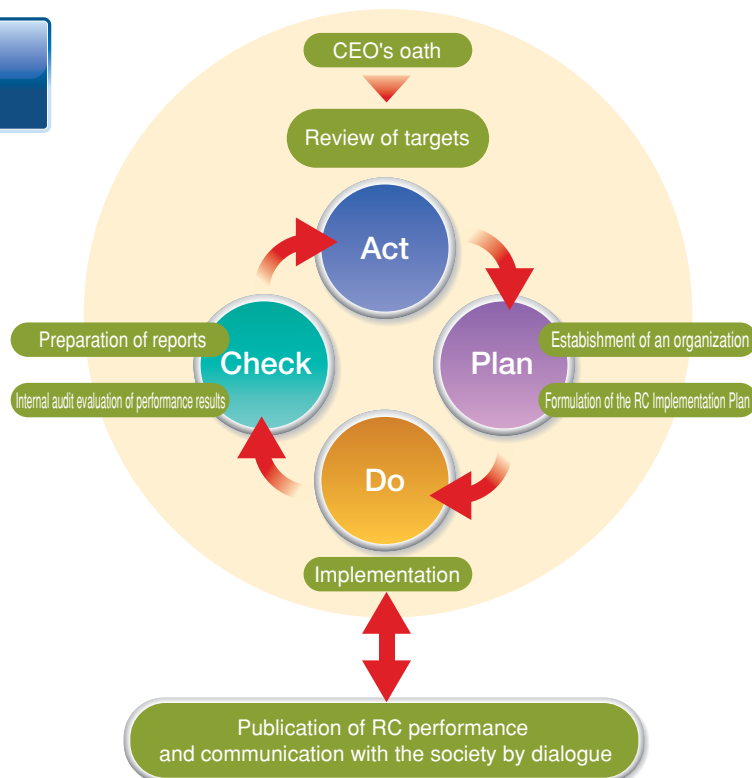
**Responsible Care**<sup>®</sup>  
OUR COMMITMENT TO SUSTAINABILITY

## Procedures for Implementing RC

Member companies of JRCC implement RC in accordance with the Codes and Guidelines for the Implementation of Responsible Care.

RC should be implemented in accordance with the Plan-Do-Check-Act (PDCA) cycle.

Member companies of JRCC should present their implementation plans and performance results to the JRCC annually by submitting a Responsible Care Implementation Plan, a Responsible Care Implementation Report, and a Responsible Care Internal Audit Certificate.



## Responsible Care Implementation Items

The JRCC and its members collectively take action in five principal areas:

- Environmental protection (protecting nature and health globally)
- Process safety and disaster prevention (striving to prevent disasters at industrial facilities)
- Occupational safety and health (protecting the safety and health of workers)
- Chemicals and product safety (clearly identifying the properties and handling methods of chemical products and protecting health, safety and the environment of all persons who handled these products, including customers)
- Distribution safety (preventing accidents during the transportation of chemicals and protecting human, safety and the environment)

and

- The JRCC and its members publicly report the results of these efforts to promote the following :  
Interaction/communication with the society





Chemistry and chemical products play an extremely important role in many aspects of daily living. To raise the awareness and understanding of such chemical technology and products, the Japan Chemical Industry Association has established the "Dream Chemistry 21" Organizing Committee. The "Dream Chemistry 21" campaign aims at promoting the importance of chemical technology and the usefulness of chemical products, particularly by appealing to young people's interest in the wonders of chemistry, and at the same time, fostering internationally active chemists.

The typical activities include "Dream Chemistry 21" Summer Holiday Children's Chemical Experiment Show, "Dream Chemistry 21" Weekend Experiment Classroom, Chemistry Experiment in the Classroom program, Nationwide Senior High School Chemistry Grand Prix Contest, and support for the participation in International Chemistry Olympiad.



## Japan Chemical Industry Association

Sumitomo Rokko Building, 1-4-1 Shinkawa, Chuo-ku, Tokyo 104-0033, Japan  
TEL: +81-3-3297-2555 FAX: +81-3-3297-2615  
URL <http://www.nikkakyo.org/>



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Photos are provided by courtesy of the member companies of the Japan Chemical Industry Association.