

# **Petrochemical Industry of Japan**

**2014**

Japan Petrochemical Industry Association

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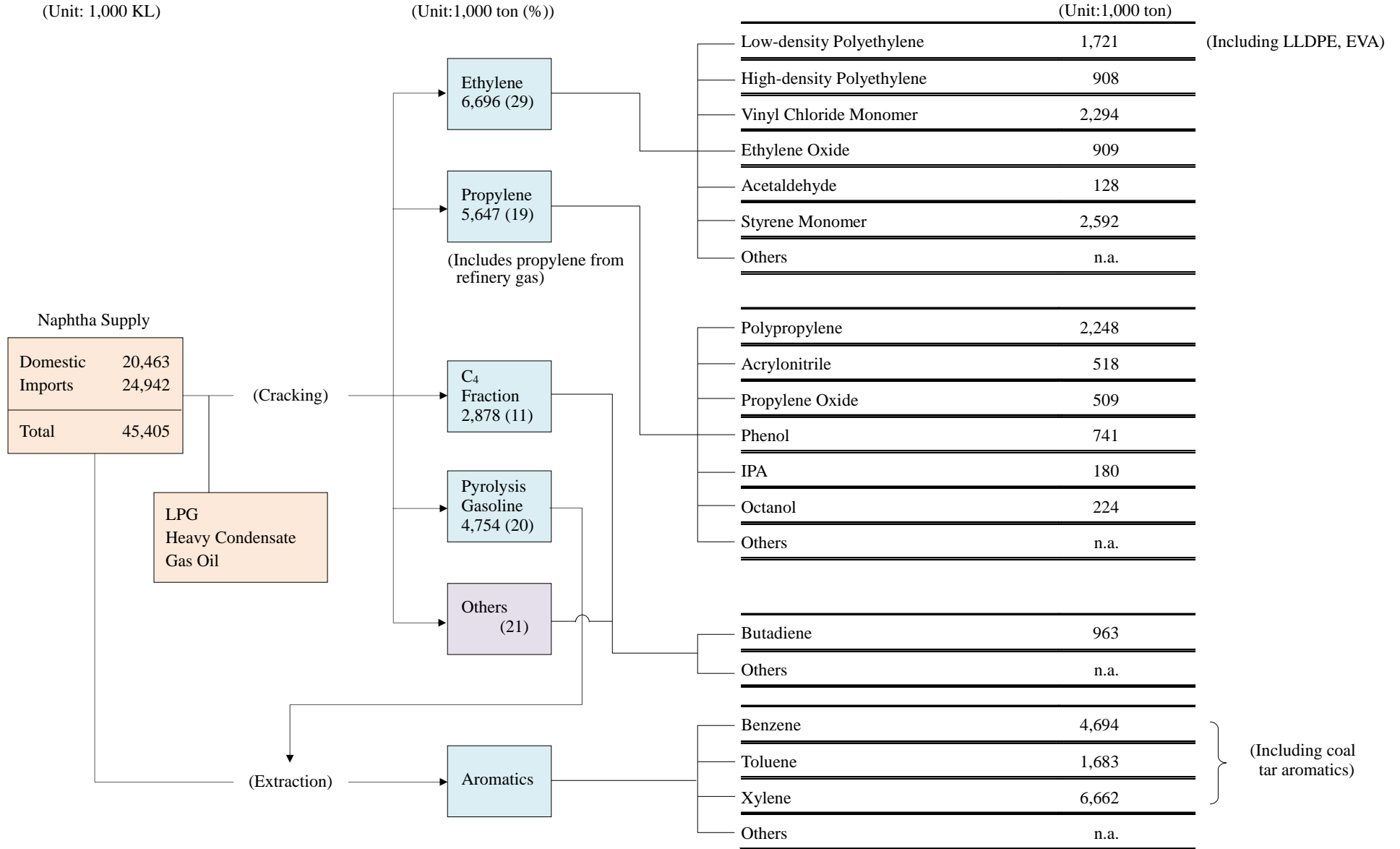
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# Material Flow (2013)

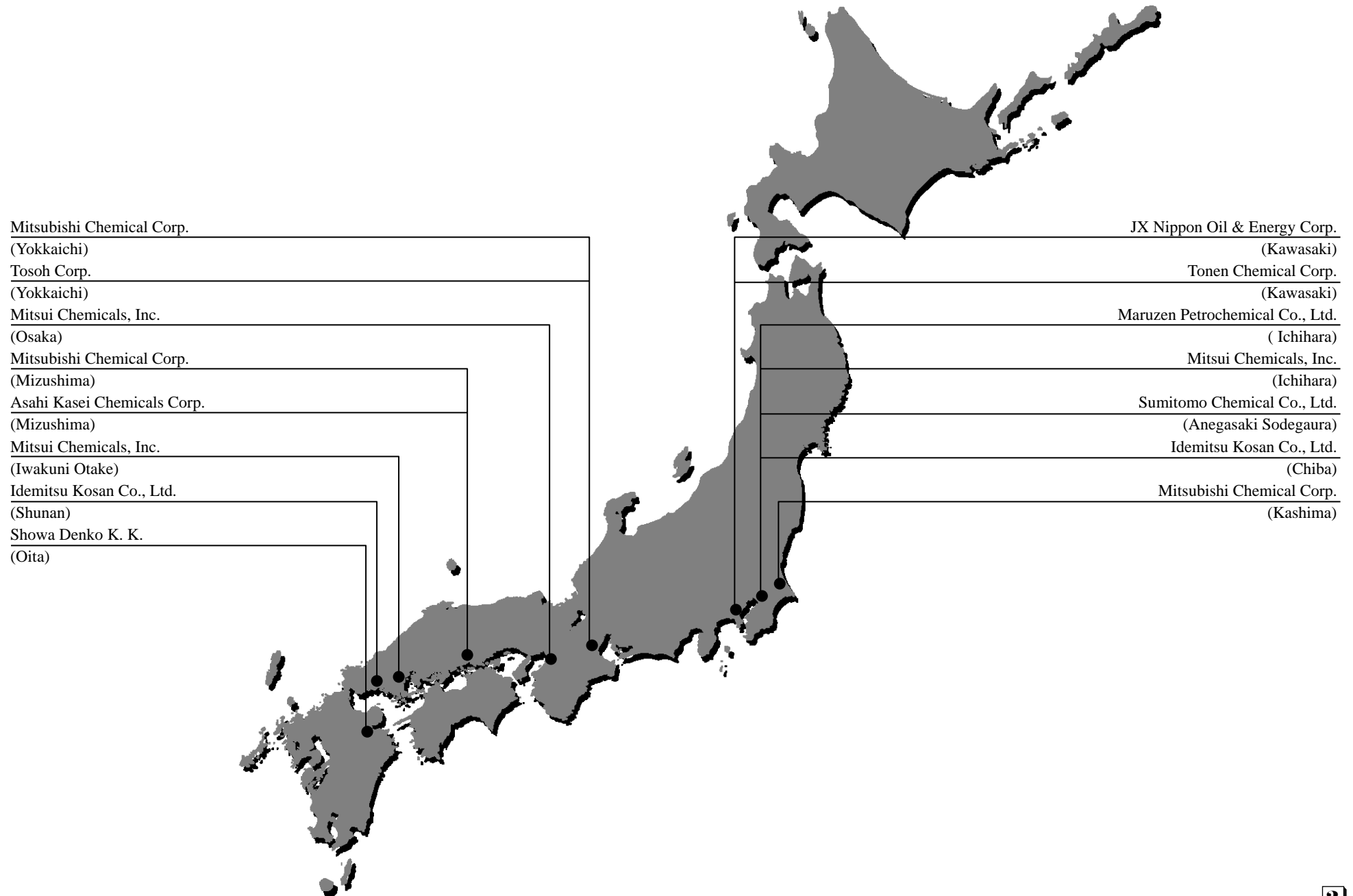
(Unit: 1,000 KL)

(Unit: 1,000 ton (%))

(Unit: 1,000 ton)



# Geographical Locations of Petrochemical Complexes



# Production Capacity (as of December, 2013)

(in 1,000 metric tons)

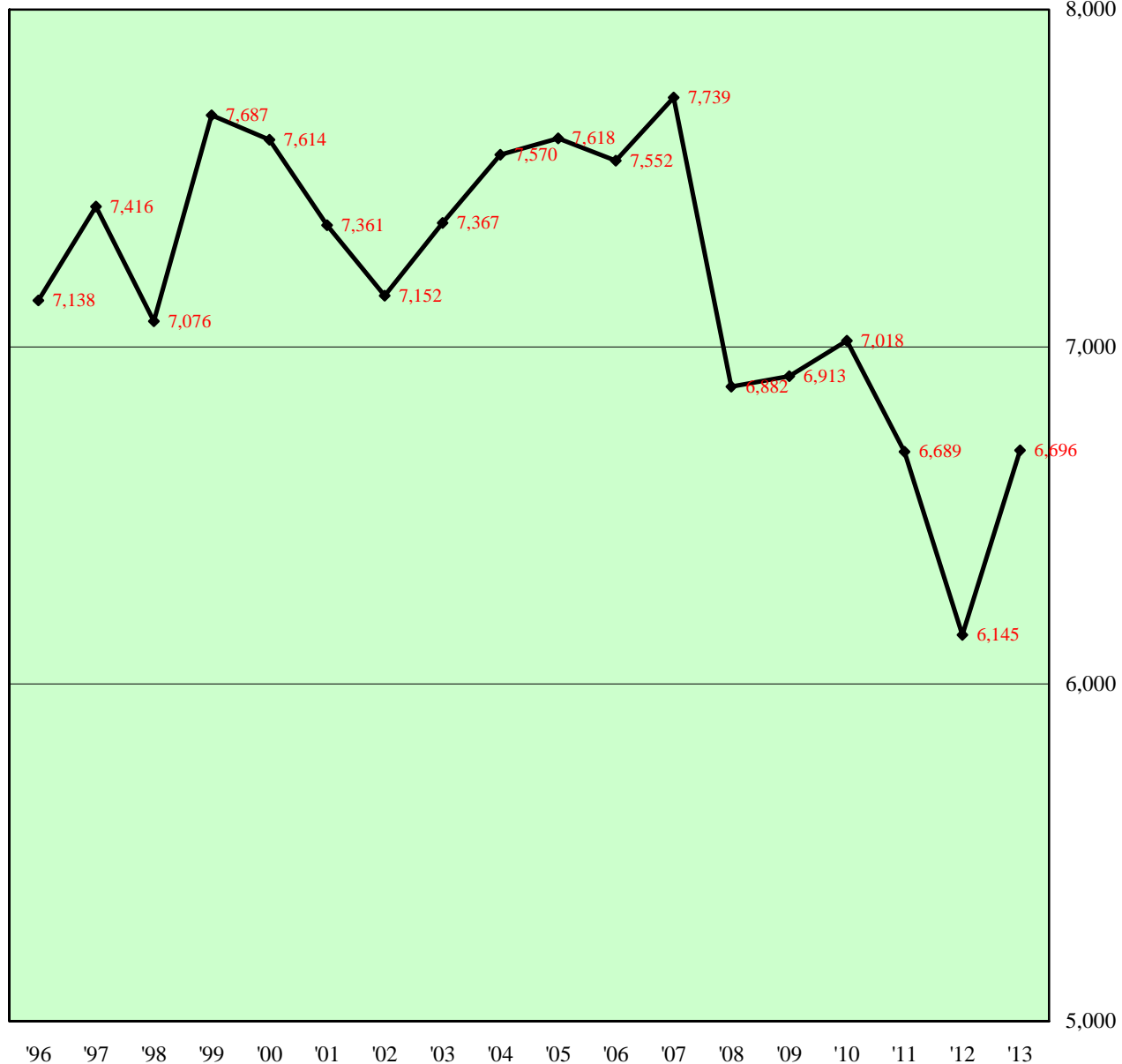
Product		Capacity	Note
Ethylene		7,210	
Benzene		6,254	
Toluene		2,347	
Xylene		8,119	
Para-xylene		3,959	
Low-density Polyethylene		2,370	Including LLDPE, EVA
High-density Polyethylene		1,193	
Polypropylene		2,972	GP · HI
Polystyrene		818	
Polyvinyl Chloride		1,997	
Ethylene Oxide		921	
Acrylonitrile		724	
Synthetic Rubbers	SBR	634	
	BR	284	
Styrene Monomer		2,667	
Vinyl Chloride Monomer		2,574	
Acetaldehyde		289	

# Ethylene Production

(in 1,000 metric tons)

Year	Production	Annual Growth (%)
'96	7,138	3
'97	7,416	4
'98	7,076	▲ 5
'99	7,687	9
'00	7,614	▲ 1
'01	7,361	▲ 3
'02	7,152	▲ 3
'03	7,367	3
'04	7,570	3
'05	7,618	1
'06	7,522	▲ 1
'07	7,739	3
'08	6,882	▲ 11
'09	6,913	0
'10	7,018	2
'11	6,689	▲ 5
'12	6,145	▲ 8
'13	6,696	9

(in 1,000 metric tons)



# Production of Petrochemicals

(in 1,000 metric tons)

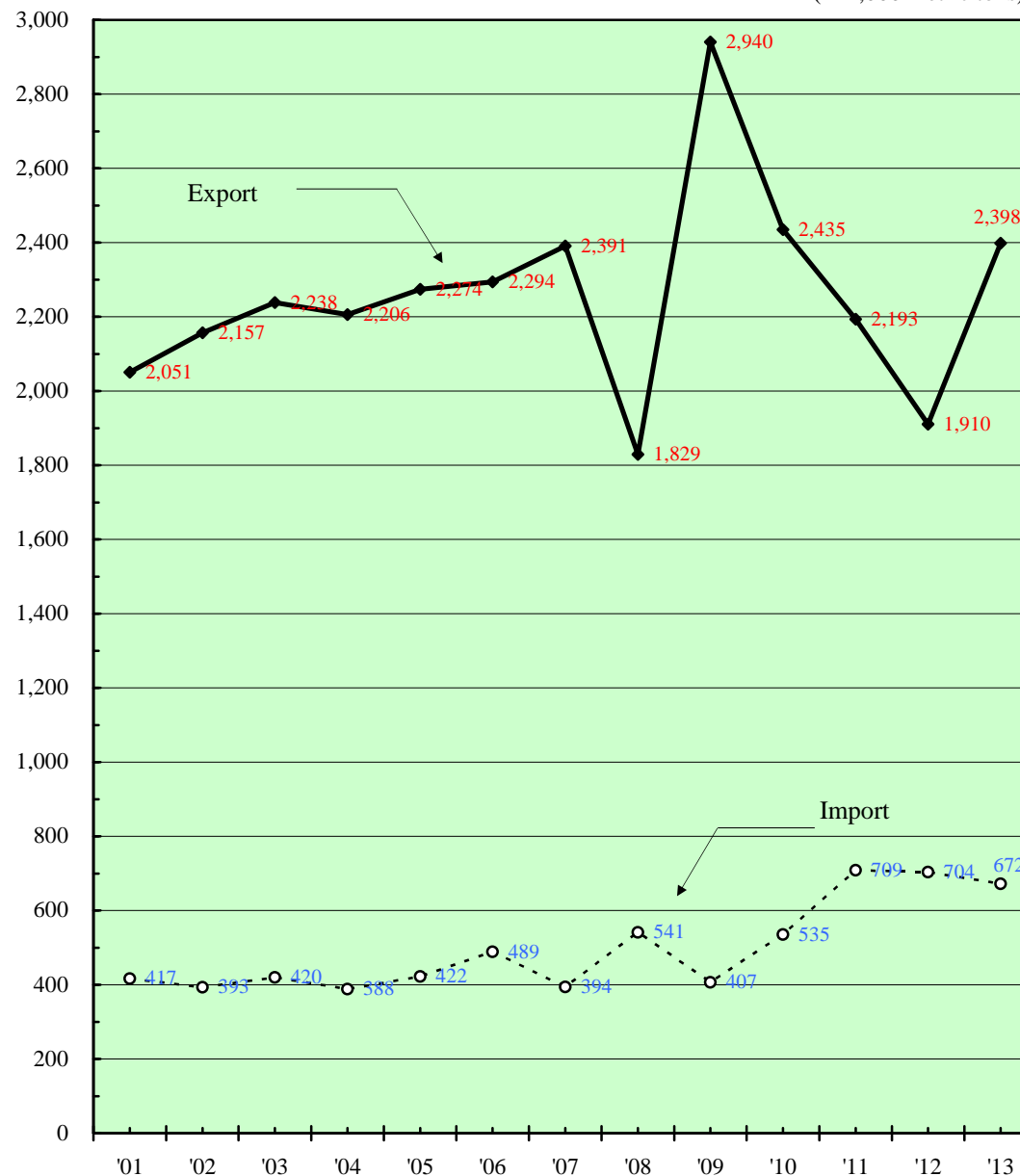
		2006	2007	2008	2009	2010	2011	2012	2013	
<b>Basic Products</b>	Ethylene	7,522	7,739	6,882	6,913	7,018	6,690	6,146	6,696	
	Propylene	6,090	6,286	5,674	5,590	5,986	5,625	5,239	5,647	
	Butadiene	1,002	1,024	953	871	977	934	905	963	
	Benzene	4,874	5,245	4,581	4,259	4,764	4,413	4,214	4,694	
	Toluene	1,633	1,637	1,437	1,415	1,393	1,340	1,391	1,683	
	Xylene	5,727	6,006	5,698	5,628	5,935	5,754	5,975	6,662	
<b>Plastics</b>	Low-density Polyethylene	1,876	1,878	1,818	1,605	1,704	1,664	1,477	1,539	
	EVA	221	219	218	215	244	235	200	184	
	High-density Polyethylene	1,069	1,135	1,052	986	1,015	935	928	908	
	Polypropylene	3,049	3,087	2,869	2,411	2,709	2,448	2,390	2,248	
	Polystyrene	926	932	908	829	690	698	654	589	633
		169	171	168	143	114	124	125	112	111
		134	119	125	126	92	109	78	85	90
		505	523	547	495	348	454	418	382	356
Polyvinyl Chloride	2,146	2,162	1,797	1,668	1,749	1,529	1,331	1,487		
<b>Synthetic Fiber Feedstocks</b>	Ethylene Oxide	974	966	865	759	845	820	847	909	
	Ethylene Glycol	763	754	629	581	596	581	639	720	
	Acrylonitrile	667	743	600	602	663	733	554	518	
	Caprolactam	467	467	432	342	422	397	376	339	
	Para-xylene	3,357	3,301	3,039	3,218	3,177	3,202	3,597	3,871	
	Pure Terephthalic Acid	1,432	1,254	1,015	893	1,131	885	715	757	
<b>Synthetic Rubbers</b>	Styrene-butadiene Rubber	710	727	706	527	670	665	652	656	
	Butadiene Rubber	289	294	290	254	294	275	290	303	
	Others	608	633	655	519	631	671	685	685	
<b>Others</b>	Styrene Monomer	3,295	3,533	2,847	2,996	2,939	2,739	2,392	2,592	
	Vinyl Chloride Monomer	3,228	3,142	2,763	2,996	2,935	2,504	1,879	2,294	
	Acetaldehyde	342	367	281	232	197	176	133	128	
	Acetic Acid	597	587	500	384	450	418	417	425	
	Octanol	280	270	259	267	286	259	249	224	
	Acetone	531	593	491	477	521	471	470	452	
	Phenol	860	961	772	786	853	796	787	741	
	Propylene Oxide	541	520	489	469	501	508	474	509	
Polypropylene Glycol	344	343	308	240	284	265	258	252		

# Export/Import Balance as Ethylene Equivalent

(in 1,000 metric tons)

Year	Export (A)	Import (B)	Net Export (A-B)	Export Ratio (%)	Import Ratio (%)
'01	2,051	417	1,634	27.9	7.3
'02	2,157	393	1,764	30.2	7.3
'03	2,238	420	1,818	30.4	7.6
'04	2,206	388	1,818	29.1	6.7
'05	2,270	422	1,848	29.8	7.3
'06	2,294	489	1,805	30.5	8.6
'07	2,391	394	1,996	30.9	6.9
'08	1,829	541	1,287	26.6	9.7
'09	2,940	407	2,533	42.5	9.3
'10	2,435	535	1,901	34.7	10.4
'11	2,193	709	1,484	32.8	13.6
'12	1,910	704	1,205	31.1	14.3
'13	2,398	672	1,726	35.8	13.5

(in 1,000 metric tons)





# Exports

(in metric tons)

	2006	2007	2008	2009	2010	2011	2012	2013
<b>Low-density Polyethylene</b>	211,912	210,980	188,581	302,885	241,688	175,753	151,859	161,284
<b>High-density Polyethylene</b>	164,890	176,713	139,077	275,157	237,597	179,830	197,653	156,403
<b>Polypropylene</b>	456,026	516,510	387,845	486,274	453,833	386,191	302,133	289,046
<b>Polystyrene</b>	82,146	99,961	84,054	63,740	55,918	52,147	51,893	53,218
<b>ABS Resin</b>	205,633	213,103	191,738	124,800	157,925	135,182	112,922	97,466
<b>Polyvinyl Chloride</b>	766,244	860,923	594,486	728,418	682,772	454,468	268,663	367,881
<b>Styrene Monomer</b>	1,378,024	1,628,083	1,132,468	1,593,313	1,398,480	1,275,641	1,003,246	1,165,267
<b>Vinyl Chloride Monomer</b>	1,028,251	902,431	898,844	1,270,632	1,110,526	925,823	471,064	742,137
<b>Ethylene Glycol</b>	167,698	167,471	44,420	175,586	75,177	147,304	216,880	274,749
<b>Acetic Acid</b>	41,656	56,204	45,973	35,423	28,235	32,093	23,230	29,978
<b>Ethyl Acetate</b>	30,751	45,034	9,637	14,560	1,600	879	2,076	25
<b>Acrylonitrile</b>	121,566	169,747	116,977	262,168	212,336	288,087	128,966	100,741
<b>Acetone</b>	84,473	116,547	74,316	124,030	90,771	52,672	75,404	48,053
<b>Methylethyl Ketone</b>	126,654	154,764	112,869	133,604	129,590	69,406	70,832	113,664
<b>Octanol</b>	88,719	64,210	71,718	118,621	121,280	95,975	98,752	89,154
<b>Ethylene</b>	299,249	282,868	196,496	587,897	459,333	542,981	596,637	876,393
<b>Propylene</b>	507,987	492,904	510,126	832,568	743,002	710,177	822,843	1,456,792
<b>Benzene</b>	247,460	218,245	411,619	224,687	325,400	240,059	428,804	766,543
<b>Toluene</b>	235,260	274,583	232,843	396,878	309,341	187,051	133,670	364,820
<b>Mixed Xylene</b>	232,295	373,647	293,581	343,937	373,529	312,288	210,984	346,412
<b>Para-xylene</b>	2,289,993	2,348,409	2,284,503	2,535,043	2,332,603	2,551,234	3,038,950	3,318,071
<b>Phenol</b>	96,112	197,287	153,260	255,978	216,820	188,791	194,711	190,329
<b>Terephthalic Acid</b>	509,707	317,386	171,359	296,478	331,583	156,260	108,700	119,087
<b>Dimethyl Terephthalate</b>	3,217	3,121	2,091	7,936	10,721	15,255	7,848	15,146
<b>Phthalic Anhydride</b>	30,224	24,527	28,742	39,744	41,584	34,920	47,604	54,267
<b>Caprolactam</b>	238,195	233,553	195,213	192,162	239,295	220,657	211,037	177,654
<b>Synthetic Rubbers</b>	545,521	601,467	574,357	625,474	753,439	699,712	749,019	843,009

# Imports

(in metric tons)

	2006	2007	2008	2009	2010	2011	2012	2013
<b>Low-density Polyethylene</b>	200,531	197,007	261,037	177,237	245,565	339,338	330,130	315,391
<b>High-density Polyethylene</b>	16,104	10,834	27,467	30,423	47,825	97,909	129,180	121,823
<b>Polypropylene</b>	99,863	110,342	194,211	115,225	145,892	197,213	308,229	250,742
<b>Polystyrene</b>	10,034	2,740	7,193	12,938	20,770	33,686	52,524	26,339
<b>Polyvinyl Chloride</b>	10,555	7,359	8,872	10,760	5,659	30,707	20,225	7,540
<b>Styrene Monomer</b>	11,865	9,768	2,995	2,815	54	219	0	30
<b>Ethylene Dichloride</b>	318,409	221,010	43,461	232,873	215,895	140,182	127,299	258,019
<b>Ethylene Glycol</b>	24,513	18,077	19,809	2,083	9,277	47,139	26,080	5,410
<b>Acrylonitrile</b>	40,891	35,893	37,428	4,762	6,754	6,753	4,028	8,464
<b>Propylene Glycol</b>	15,794	16,927	19,690	21,442	18,517	14,806	13,129	17,135
<b>Acetone</b>	46,802	41,418	31,953	8,253	6,647	22,437	9,628	18,377
<b>Butanol</b>	3,562	2,841	3,374	4,153	1,030	10,959	4,684	2,468
<b>Benzene</b>	339,383	269,427	162,254	271,461	90,029	133,501	149,240	173,036
<b>Toluene</b>	16,626	93,859	76,941	105,084	32,422	67,873	58,599	25,577
<b>Mixed Xylene*</b>	41,566	7,927	0	0	0	40,543	56,036	0
<b>Para-xylene</b>	-	-	-	-	9,925	14,844	0	0
<b>Phenol</b>	118,430	89,498	101,955	25,960	42,282	32,444	16,933	13,655
<b>Ethylene</b>	103,991	55,489	142,445	41,756	60,344	41,942	26,872	3,204
<b>Propylene</b>	9,209	6,917	85,462	21,067	21,508	5,119	43,441	16
<b>Butadiene</b>	35,431	26,693	55,263	9,432	30,212	22,667	65,482	37,700
<b>Synthetic Rubbers</b>	180,497	194,081	211,256	138,369	172,289	200,925	180,548	157,904

\* Including Crude Xylene

# Plastics Production

(in 1,000 metric tons)

	2006	2007	2008	2009	2010	2011	2012	2013
<b>Low-density Polyethylene</b>	1,876	1,878	1,818	1,605	1,704	1,664	1,477	1,539
<b>EVA</b>	221	219	218	215	244	235	200	184
<b>High-density Polyethylene</b>	1,069	1,135	1,052	986	1,015	935	928	908
<b>Polypropylene</b>	3,049	3,087	2,869	2,411	2,709	2,448	2,390	2,248
<b>Polystyrene</b>	926	908	829	829	690	698	654	633
	169	168	143	143	114	124	112	111
	134	125	126	126	92	109	78	90
	505	547	495	495	348	454	418	356
<b>Polyvinyl Chloride</b>	2,146	2,162	1,797	1,668	1,749	1,529	1,331	1,487
<b>Polyvinyl Alcohol</b>	213	230	215	192	241	233	207	233
<b>Vinyliden Chloride Resin</b>	68	75	74	68	n.a.	n.a	n.a	n.a
<b>Methacrylate Resin</b>	269	247	219	166	216	203	172	163
<b>Polyamide Resin</b>	273	274	277	189	230	234	223	225
<b>Others</b>	1,644	1,606	1,490	1,072	1,517	1,334	1,230	1,246
<b>Thermoplastic Resin Total</b>	12,573	12,661	11,696	9,884	11,010	10,089	9,326	9,423
<b>Phenol Resin</b>	284	295	288	227	284	276	275	287
<b>Urea Resin</b>	116	110	94	73	68	71	70	70
<b>Melamine Resin</b>	141	141	111	90	91	77	75	81
<b>Unsaturated Polyester Resin</b>	168	164	149	117	120	115	114	113
<b>Urethane Foam</b>	249	235	222	163	180	173	193	193
<b>Others</b>	318	325	296	214	262	231	216	202
<b>Thermosetting Resin Total</b>	1,276	1,269	1,159	884	1,005	943	943	946
<b>Others</b>	201	194	186	147	228	179	272	210
<b>Grand Total</b>	14,050	14,124	12,967	10,915	12,242	11,212	10,540	10,579

# Major Plastics Domestic Demand Breakdowns (2013)

(in 1,000 metric tons)

Market	L. D. Polyethylene		H. D. Polyethylene		Polypropylene	
	Volume	Percentage	Volume	Percentage	Volume	Percentage
<b>Film</b>	641	49.0	196	25.6	466	21.1
<b>Laminating</b>	242	18.5				
<b>Oriented Tape (Flat Yarn)</b>			21	2.8	21	0.9
<b>Injection Molding</b>	76	5.8	94	12.3	1,193	54.1
<b>Blow Molding</b>	41	3.1	170	22.2	14	0.6
<b>Fiber</b>			37	4.8	102	4.6
<b>Pipe</b>	19	1.4	73	9.6		
<b>Wire and Cable</b>	65	5.0				
<b>Others</b>	225	17.2	174	22.7	410	18.4
<b>Domestic Total</b>	1,309	100.0	765	100.0	2,206	100.0

Market	Polystyrene (GP • HI)	
	Volume	Percentage
<b>Electric and Industrial Equipment</b>	91	14.4
<b>Packaging</b>	294	46.7
<b>Miscellaneous, Others</b>	73	11.7
<b>FS</b>	171	27.2
<b>Domestic Total</b>	629	100.0

Market	Polyvinyle Chloride	
	Volume	Percentage
<b>Rigid PVC</b>	599	56.0
<b>Plasticized PVC</b>	252	23.6
<b>Wire and Others</b>	219	20.5
<b>Domestic Total</b>	1,071	100.0

# Production of Spun Yarns

(in metric tons)

	2006	2007	2008	2009	2010	2011	2012	2013
<b>Nylon Yarn</b>	1,073	967	765	512	534	n.a.	n.a.	n.a.
<b>Vinylon Yarn</b>	6,155	6,369	5,453	3,918	4,459	n.a.	n.a.	n.a.
<b>Acrylic Yarn</b>	16,324	16,334	14,088	10,297	10,847	10,643	9,538	7,995
<b>Polyester Yarn</b>	36,293	33,249	31,382	19,372	18,289	18,161	17,498	15,515
<b>Others</b>	1,274	1,196	1,011	800	795	6,604	5,721	5,842
<b>Synthetic Fiber Yarn Total</b>	61,119	58,115	52,699	34,899	34,924	35,408	32,757	29,352
<b>Natural Yarn Total</b>	106,782	98,896	88,849	62,376	62,112	61,189	55,267	53,453
<b>Grand Total</b>	167,901	157,011	141,548	97,275	97,036	96,597	88,024	82,805

# Production of Synthetic Rubbers

(in 1,000 metric tons)

	2006	2007	2008	2009	2010	2011	2012	2013
<b>Styrene-butadiene Rubber</b>	710	727	706	527	670	665	652	656
<b>Butadiene Rubber</b>	289	294	290	254	294	275	290	303
<b>Nitrile-butadiene Rubber</b>	99	109	109	86	115	109	107	115
<b>Chloroprene Rubber</b>	110	112	115	89	130	135	122	126
<b>Ethylene Propylene Rubber</b>	191	187	224	149	193	197	218	202
<b>Others</b>	208	225	207	195	193	230	238	242
<b>Total</b>	1,607	1,655	1,651	1,300	1,595	1,611	1,627	1,644

## The Members of the Association (As of May, 2014)

Company	Address	Phone	URL
<b>Sumitomo Chemical Co., Ltd.</b>	Tokyo Sumitomo Twin Bldg (East), 2-27-1, Shinkawa, Chuo-ku, Tokyo 104-8260, Japan	+81-3-5543-5500	<a href="http://www.sumitomo-chem.co.jp/english/">http://www.sumitomo-chem.co.jp/english/</a>
<b>JX Nippon Oil &amp; Energy Corp.</b>	6-3, Otemachi 2-chome, Chiyoda-ku, Tokyo 100-8162, Japan	+81-3-6275-5057	<a href="http://www.no.ejx-group.co.jp/english/">http://www.no.ejx-group.co.jp/english/</a>
<b>Maruzen Petrochemical Co., Ltd.</b>	Sanshin Hatchobori Bldg., 2-25-10, Hatchobori, Chuo-ku, Tokyo 104-8502, Japan	+81-3-3552-9361	<a href="http://www.chemiway.co.jp/en/index.html">http://www.chemiway.co.jp/en/index.html</a>
<b>Mitsui Chemicals, Inc.</b>	Shiodome City Center, 1-5-2, Higashi-shimbashi, Minato-ku, Tokyo 105-7117, Japan	+81-3-6253-2100	<a href="http://www.mitsuichem.com/index.htm">http://www.mitsuichem.com/index.htm</a>
<b>JSR Corp.</b>	Shiodome Sumitomo Bldg., 1-9-2, Higashi-Shinbashi, Minato-ku, Tokyo 105-8640, Japan	+81-3-6218-3500	<a href="http://www.jsr.co.jp/jsr_e/">http://www.jsr.co.jp/jsr_e/</a>
<b>Nippon Shokubai Co., Ltd.</b>	Kogin Bldg., 4-1-1, Koraibashi, Chuo-ku, Osaka 541-0043, Japan Hibiya Dai Bldg., 1-2-2, Uchisaiwai-cho, Chiyoda-ku, Tokyo 100-0011, Japan	+81-6-6223-9111 +81-3-3506-7475	<a href="http://www.shokubai.co.jp/en/">http://www.shokubai.co.jp/en/</a>
<b>ZEON Corp.</b>	Shin Marunouchi Center Bldg., 1-6-2, Marunouchi, Chiyoda-ku, Tokyo 100-8246, Japan	+81-3-3216-1772	<a href="http://www.zeon.co.jp/index_e.html">http://www.zeon.co.jp/index_e.html</a>
<b>Mitsubishi Chemical Corp.</b>	1-1, Marunouchi, 1-chome, Chiyoda-ku, Tokyo 100-8251, Japan	+81-3-6748-7300	<a href="http://www.m-kagaku.co.jp/index_en.htm">http://www.m-kagaku.co.jp/index_en.htm</a>
<b>Tonen Chemical Corp.</b>	W Bldg., 1-8-15, Konan, Minato-ku, Tokyo 108-8005, Japan	+81-3-5495-6000	<a href="http://www.tonengeneral.co.jp/apps/tonengeneral/english/index.html">http://www.tonengeneral.co.jp/apps/tonengeneral/english/index.html</a>
<b>NUC Corp.</b>	W Building, 1-8-15 Kohnan, Minato-ku, Tokyo 108-0075	+81-44-299-5711	<a href="http://www.unicar.jp/">http://www.unicar.jp/</a>
<b>JNC Corp.</b>	Shin Otemachi Bldg., 9F, 2-2-1 Otemachi, Chiyoda-ku, Tokyo 100-8105, Japan	+81-3-3243-6760	<a href="http://www.jnc-corp.co.jp/english/index.html">http://www.jnc-corp.co.jp/english/index.html</a>

<b>Company</b>	<b>Address</b>	<b>Phone</b>	<b>URL</b>
<b>Showa Denko K.K.</b>	1-13-9, Shiba Daimon, Minato-ku, Tokyo 105-8518, Japan	+81-3-5470-3235	<a href="http://www.sdk.co.jp/english/">http://www.sdk.co.jp/english/</a>
<b>Mitsubishi Rayon Co., Ltd.</b>	1-1, Marunouchi, 1-chome, Chiyoda-ku, Tokyo 100-8253, Japan	+81-3-6748-7500	<a href="http://www.mrc.co.jp/english/index.html">http://www.mrc.co.jp/english/index.html</a>
<b>Du Pont-Mitsui Polychemicals Co., Ltd.</b>	Shiodome City Center, 1-5-2, Higashi-shimbashi, Minato-ku, Tokyo 105-7117, Japan	+81-3-6253-4000	<a href="http://www.mdp.jp">http://www.mdp.jp</a>
<b>Idemitsu Kosan Co., Ltd.</b>	3-1-1, Marunouchi, Chiyoda-ku, Tokyo 100-8321, Japan	+81-3-3213-3115	<a href="http://www.idemitsu.com/">http://www.idemitsu.com/</a>
<b>Asahi Kasei Chemicals Corp.</b>	1-105 Kanda Jinbocho, Chiyoda-ku, Tokyo 101-8101, Japan	+81-3-3296-3200	<a href="http://www.asahi-kasei.co.jp/asahi/en/index.html">http://www.asahi-kasei.co.jp/asahi/en/index.html</a>
<b>Daicel Chemical Industries, Ltd.</b>	Mainichi Intecio., 3-4-5, Umeda, Kita-ku, Osaka 530-0001, Japan	+81-6-6342-6111	<a href="http://www.daicel.com/en/">http://www.daicel.com/en/</a>
	JR Shinagawa East Bldg., 2-18-1, Konan, Minato-ku, Tokyo 108-8230, Japan	+81-3-6711-8111	
<b>Denki Kagaku Kogyo K.K.</b>	Nihonbashi Mitsui Tower, 2-1-1, Nihonbashi-Muromachi, Chuo-ku, Tokyo 103-8338, Japan	+81-3-5290-5055	<a href="http://www.denka.co.jp/eng/top.htm">http://www.denka.co.jp/eng/top.htm</a>
<b>Ube Industries Ltd.</b>	Seavans North Bldg., 1-2-1, Shibaura, Minato-ku, Tokyo 105-8449, Japan	+81-3-5419-6110	<a href="http://www.ube-ind.co.jp/english/index.htm">http://www.ube-ind.co.jp/english/index.htm</a>
	1978-96, Kogushi, Ube-shi, Yamaguchi 755-8633, Japan	+81-836-31-2111	
<b>Tosoh Corp.</b>	Shiba-koen First Bldg., 3-8-2, Shiba, Minato-ku, Tokyo 105-8623, Japan	+81-3-5427-5118	<a href="http://www.tosoh.com/">http://www.tosoh.com/</a>
<b>Nippon Steel &amp; Sumikin Chemical Co., Ltd</b>	Akihabara UDX, 13F, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan	+81-3-5207-7600	<a href="http://www.nssc.co.jp/english/index.html">http://www.nssc.co.jp/english/index.html</a>



<b>Company</b>	<b>Address</b>	<b>Phone</b>	<b>URL</b>
<b>Tokuyama Corp.</b>	Kasumigaseki Common Gate West Tower, 2-1, Kasumigaseki 3-chome, Chiyoda-ku, Tokyo 100-8983, Japan	+81-3-6205-4800	<a href="http://www.tokuyama.co.jp/eng/index.html">http://www.tokuyama.co.jp/eng/index.html</a>
	1-1, Mikage-cho, Shunan city, Yamaguchi 745-8648, Japan	+81-834-34-2000	
<b>Kuraray Co., Ltd.</b>	Ote Center Bldg., 1-1-3, Otemachi, Chiyoda-ku, Tokyo 100-8115, Japan	+81-3-6701-1000	<a href="http://www.kuraray.co.jp/en/">http://www.kuraray.co.jp/en/</a>
	Umeda Hankyu Building Office Tower, 8-1, Kakudacho, Kita-ku, Osaka 530-8611, Japan	+81-6-7635-1000	
<b>Mitsubishi Gas Chemical Co., Inc.</b>	Mitsubishi Bldg., 2-5-2 Marunouchi, Chiyoda-ku, Tokyo 100-8324, Japan	+81-3-3283-5000	<a href="http://www.mgc.co.jp/eng/index.html">http://www.mgc.co.jp/eng/index.html</a>
<b>KH Neochem Co., Ltd</b>	NBF Nihonbashi Muromachi Center Bldg., 3-2-15, Nihonbashi-Muromachi, Chuo-ku, Tokyo 103-0022, Japan	+81-3-3501-3550	<a href="http://www.khneochem.co.jp/en/">http://www.khneochem.co.jp/en/</a>
<b>SunAllomer Ltd.</b>	Tennoz Central Tower 27F, 2-2-24, Higashi-shinagawa, Shinagawa-ku, Tokyo 140-0002, Japan	+81-3-5781-5610	<a href="http://www.sunallomer.co.jp/eng/index.php">http://www.sunallomer.co.jp/eng/index.php</a>
<b>Japan Polyethylene Corp.</b>	Palace Bldg. 1-1-1, Marunouchi, Chiyoda-ku, Tokyo 100-8251, Japan	+81-3-6748-7189	<a href="http://www.pochem.co.jp/english/jpe/index.html">http://www.pochem.co.jp/english/jpe/index.html</a>
<b>Japan Polypropylene Corp.</b>	Palace Bldg. 1-1-1, Marunouchi, Chiyoda-ku, Tokyo 100-8251, Japan	+81-3-6748-7190	<a href="http://www.pochem.co.jp/english/jpp/index.html">http://www.pochem.co.jp/english/jpp/index.html</a>

<b>Company</b>	<b>Address</b>	<b>Phone</b>	<b>URL</b>
<b>Prime Polymer Co., Ltd.</b>	Shiodome City Center, 1-5-2, Higashi-Shimbashi, Minato-ku, Tokyo 105-7117, Japan	+81-3-6253-4500	<a href="http://www.primepolymer.co.jp/english/index.html">http://www.primepolymer.co.jp/english/index.html</a>
<b>Taiyo Oil Co., Ltd.</b>	Hibiya kokusai Bldg., 15F, 2-2-3, Uchisaiwai-cho, Chiyoda-ku, Tokyo 100-0011, Japan	+81-3-3502-1601	<a href="http://www.taiyooil.net/english/">http://www.taiyooil.net/english/</a>

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# **Report on the Japanese Petrochemical Industry**

# The Japanese Petrochemical Industry in 2013

## 1. Status and Outlook of the Japanese Economy

- 1) According to government statistics, the latest estimates show that Japanese GDP growth (real GDP growth, seasonally adjusted) improved from 1.4% in 2012 to 1.5% in 2013. Especially from Q2, the Japanese economy gradually revived through 2013.
- 2) GDP growth in Q1 was minus 0.1% year-on-year due to a decrease in personal consumption and a decline in exports reflecting the slowdown of the Chinese economy which started from the second half of 2012. However, Q2 shows 1.3% growth, and Q3 and Q4 grew by 2.4% and 2.5% year-on-year, respectively. Reasons were the correction of the appreciation of the Japanese yen which improved export conditions, and the government's monetary policy which stimulated the domestic economy.
- 3) Supported by a slight recovery of the US and Chinese economies and continuation of the government's monetary and fiscal policies, the Japanese economy is expected to maintain a reasonable condition in 2014. We expect that continuation of the government's economic growth strategies will expand the domestic economy and bring a recovery from the slowdown of domestic personal consumption due to the consumption tax increase in April.

### Japan Economic Indexes in 2013 (changes from the previous year)

	Unit	2012	2013	Q1	Q2	Q3	Q4
GDP growth <sup>1)</sup>		1.4%	<b>1.5%</b>	-0.1%	1.3%	2.4%	2.5%
Industrial production index <sup>2)</sup>	2010=100	97.6	<b>97.0</b>	94.7	96.1	97.7	99.5
			<b>-0.6%</b>	-6.5%	-3.0%	1.9%	5.7%
Car production <sup>3)</sup>	Thousand	9,943	<b>9,630</b>	2,382	2,279	2,465	2,504
		18.4%	<b>-3.1%</b>	-14.1%	-7.9%	1.3%	10.7%
Housing starts <sup>4)</sup>	Thousand	883	<b>980</b>	210	241	258	271
		5.8%	<b>11.0%</b>	5.1%	11.8%	13.5%	12.9%
Exchange rate <sup>5)</sup>	¥/USD	80.8	<b>97.6</b>	92.4	98.8	99.0	100.5
		0%	<b>0%</b>	15.1%	21.6%	24.2%	22.2%
Crude oil processing <sup>2)</sup>	Thousand KL	198,138	<b>200,637</b>	52,834	46,910	50,777	50,116
		0%	<b>1%</b>	-0.9%	-0.1%	3.7%	2.6%

1) Cabinet Office - Government of Japan, real GDP growth, seasonally adjusted

2) Ministry of Economy, Trade and Industry, seasonally adjusted index

3) Japan Automobile Manufacturers Association, Inc.

4) Ministry of Land, Infrastructure, Transport and Tourism

5) Sumitomo Mitsui Banking Corporation

## 2. General Situation of the Japanese Petrochemical Industry

- 1) Domestic ethylene production in 2013 amounted to 6,696 kt, increasing by approximately 9% from that of the previous year which was 6,145 kt. The Japanese petrochemical industry recovered compared to 2012, due to a slight recovery in ethylene demand and increased exports of ethylene and its derivatives as a result of the recovery of the Chinese economy and the depreciation of the Japanese yen. Operating

rates of naphtha crackers increased, as higher domestic demand was covered by domestic production and import quantity declined. Benefited by good export conditions, export quantity of olefins and their derivatives also increased notably. Japanese production of olefin derivatives other than HDPE and C3 derivatives increased.

#### Japan Ethylene Indexes in 2013 (changes from the previous year)

	unit	2012	2013	Q1	Q2	Q3	Q4
Production	Thousand	6,145	<b>6,696</b>	1,659	1,623	1,614	1,800
	MT	-8.1%	<b>9.0%</b>	7.5%	14.5%	2.3%	12.0%
Demand (Ethylene equivalent)	Thousand	4,941	<b>4,967</b>	1,233	1,222	1,167	1,344
	MT	-5.1%	<b>0.5%</b>	2.5%	-0.3%	-4.8%	4.6%
Export (Ethylene equivalent)	Thousand	1,908	<b>2,401</b>	589	577	617	618
	MT	-13.0%	<b>25.8 %</b>	19.0%	45.2 %	19.2 %	24.0%

Ministry of Economy, Trade and Industry

#### Japan Petrochemical Production in 2013 (thousand MT)

	LDPE	HDPE	PP	PS	SM	PVC	Total of 5 main resins	EG	AN
2011	1,664	935	2,448	654	2,739	1,529	7,230	581	733
2012	1,477	928	2,390	589	2,392	1,331	6,715	639	554
2013	1,539	908	2,248	633	2,592	1,487	6,815	720	518

Ministry of Economy, Trade and Industry

- 2) Due to the ongoing gradual growth of the US and the Chinese economies, and the depreciation of the Japanese yen, we expect that Japanese petrochemical demand in 2014 will also show continuous gradual growth. It will be a turnaround season in NEA in 2014. Firm olefin demand and reduced output due to turnarounds will enable naphtha crackers to maintain high operating rates while olefin prices stay at a comfortable level.

### 3. Challenges facing the Japanese petrochemical industry

Construction of new large-scale petrochemical facilities in the Middle East and China and increased reliance on shale gas in North America have forced the Japanese petrochemical industry to strengthen its competitiveness in the global market. Thus, the Japanese petrochemical industry needs to implement rationalization as much as possible under the given conditions, and seek growth markets, especially in Asia, as follows.

- 1) Restructuring of the Japanese petrochemical industry

One important task is the optimization of domestic crackers. A number of policies and plans to shut down naphtha crackers have been announced. Mitsubishi Chemical announced that its Kashima No. 1 naphtha cracker will be closed in 2014. Sumitomo Chemical will shut its naphtha cracker in Chiba in autumn 2015, and Mitsui Chemicals will withdraw from the Keiyo Ethylene joint venture in Chiba. In Mizushima, the naphtha crackers of Asahi Kasei Chemicals and Mitsubishi Chemical are scheduled for unification on the Mitsubishi Chemical facility in April 2016.

Also, it is very important to promote the operational integration of refineries and petrochemical complexes, for instance by interchange of feedstock, striking the best mix of diversified raw materials, co-operation on utilities or logistics, and increasing synergy for both sides. In Japan, an entity called “Research Association of Refinery Integration for Group Co-Operation” (RING) was established in 2000 to help the optimization of complex operation and to promote closer co-operation between the refining and petrochemical sectors, and a number of projects have been advanced.

2) Producing value-added products

The Japanese petrochemical industry lacks cost competitiveness because each complex is relatively small in scale and dependent on imported feedstock. On the other hand, it is a good provider of material solutions, and it has been successful in producing high performance products with customers. The key to producing value-added products is partnership with downstream industries such as automotive, electronics, eco-products, and healthcare. Petrochemical companies and downstream industries need to integrate more technologies, markets, and products in order to generate new markets.

3) Promoting “environmentally friendly” technologies

Renewable energy from natural resources such as sunlight, wind, hydro, waves, geothermal, and biomass is sustainable and safe. Contrasted with fossil energy resources such as petroleum, coal, and natural gas, which will gradually be exhausted, renewable energy is naturally replenished and we can use it far into the distant future. Additionally, the energy is called environmentally friendly because it does not contribute to CO<sub>2</sub> emissions and climate change. Thus, the market for renewable energy resources is expected to expand.

The petrochemical industry is also expected to be a major source of profits because many petrochemical materials are applied for renewable energy technologies like solar cells and lithium-ion batteries.

However, new technologies have not been developed as quickly as had been hoped. Although a number of R&D programs are in progress, many companies, government institutes, and academic institutions need to co-operate in the form of consortiums in order to speed up invention.

4) Maintaining safe and stable operations

It is of the utmost importance for the petrochemical industry to maintain safe and stable operations. Japanese petrochemical companies have accumulated knowledge and experience about safe and stable operations over a long period, and developed techniques to achieve safe operations. Petrochemical companies must continue to further improve both hardware and human aspects of safe operation.

#### **4. Realizing new opportunities through petrochemistry**

1) Shale gas is the alternative feedstock for naphtha. Petrochemical production from US shale gas is highly cost competitive, and consequently production from naphtha is poised to decline in the near future.

2) Olefins derived from shale gas and oil, coal-to-olefins, and propane dehydrogenation will accelerate change in the olefins market and petrochemical feedstocks. As mentioned above, three naphtha crackers in Japan will shut down permanently within two years. Operators of the remaining Japanese crackers should work to achieve further cost reductions, develop high-value derivatives, develop new technology to convert surplus fractions to propylene, butadiene, etc., and integrate with nearby refineries to enhance their competitiveness.

**Table-1 Changes in Production, Exports & Imports of Main Products**

(Unit: 1,000MT)

	Production			Import			Export		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
<b>Ethylene</b>	6,689	6,145	6,696	42	27	3	543	597	876
<b>LDPE</b>	1,664	1,477	1,539	339	330	315	176	152	161
<b>HDPE</b>	935	928	908	98	129	122	180	198	156
<b>PP</b>	2,448	2,390	2,248	197	308	251	386	302	289
<b>PS(GP,HI)</b>	654	589	633	34	53	26	52	52	53
<b>PVC</b>	1,529	1,331	1,487	31	20	8	454	269	368
<b>Total Main5 Resins</b>	7,230	6,715	6,815	699	840	722	1,248	973	1,027
<b>EG</b>	581	639	720	47	26	5	147	217	275
<b>SM</b>	2,739	2,392	2,592	0	0	0	1,276	1,003	1,116
<b>AN</b>	733	554	518	7	4	8	288	129	101

Source: For Production, METI; For Export and Import, MOF



**Table-2 Production Capacity of Major Petrochemicals by Producers (End of 2013)****Ethylene**

(Unit: 1,000MT/Year)

	Turnaround Year	Full Operation Year
Idemitsu Kosan Co., Ltd.	997	1,101
Keiyo Ethylene Co., Ltd.	690	768
Maruzen Petrochemical Co., Ltd.	480	525
Mitsubishi Chemical Corp.	1,209	1,374
Mitsui Chemicals, Inc.	553	612
JX Nippon Oil & Energy Corp.	404	443
Osaka Petrochemical Industries, Ltd.	455	500
Asahi Kasei Chemicals Corp.	443	504
Showa Denko K.K.	615	691
Sumitomo Chemical Co., Ltd.	380	415
Tonen Chemical Corp.	491	540
Tosoh Corp.	493	527
Total	7,210	8,000

**Polyolefin**

	LDPE (Including L-LDPE)	HDPE	PP
Asahi Kasei Chemicals Corp.	120	163	—
JNC Corp.	—	63	—
Du Pont-Mitsui Polychemicals Co., Ltd.	170	—	—
Evolue Japan Co., Ltd.	300	—	—
Japan Polyethylene Corp.	711	475	—
Japan Polypropylene Corp.	—	—	1,075
Maruzen Petrochemical Co., Ltd.	—	111	—
Mitsui Chemicals, Inc.	—	5	—
Nippon Unicar Co., Ltd.	252	48	—
Prime Polymer Co., Ltd.	156	203	973
Sumitomo Chemical Co., Ltd.	305	—	316
SunAllomer Ltd.	—	—	408
Tokuyama Polypro Ltd., Co.	—	—	200
Tosoh Corp.	183	125	—
Ube-Maruzen Polyethylene Co., Ltd.	173	—	—
Ube Polypropylene Co., Ltd.	—	—	—
Ukishima Polypro Co., Ltd.	—	—	—
Total	2,370	1,193	2,972

### Polystyrene, Styrene Monomer

	Polystyrene	Styrene Monomer
Asahi Kasei Chemicals Corp.	—	678
Chiba Styrene Monomer Limited Company	—	—
DIC Corp.	173	—
Denki Kagaku Kogyo K.K.	—	270
Idemitsu Kosan Co., Ltd.	—	550
Japan Polystyrene Inc.	—	—
Mitsubishi Chemical Corp.	—	—
Nihon Oxirane Co., Ltd.	—	412
Nippon Steel Chemical Co., Ltd.	—	422
PS Japan Corp.	315	—
Taiyo Petrochemical Co., Ltd.	—	335
Toyo Styrene Co., Ltd.	330	—
Total	818	2,667

### Vinyl Chloride Monomer

Kaneka Corp.	540
Kashima Vinyl Chloride Monomer Co., Ltd.	600
Keiyo Monomer Co., Ltd.	200
Tokuyama Corp.	330
Tosoh Corp.	904
V-Tech Corp.	—
Total	2,574

### Polyvinyl Chloride

Kaneka Corp.	369
Shin Dai-Ichi Vinyl Corp.	255
Shin-Etsu Chemical Co., Ltd.	550
Taiyo Vinyl Corp.	558
Tokuyama Sekisui Co., Ltd.	117
Tosoh Corp.	28
V-Tech Corp.	120
Total	1,997

### Ethylene Oxide

Mitsubishi Chemical Corp.	300
Mitsui Chemicals, Inc.	100
Nippon Shokubai Co., Ltd.	324
Maruzen Petrochemical Co., Ltd.	197
Total	921

### Acetaldehyde

Sumitomo Chemical Co., Ltd.	69
KH Neochem Co., Ltd.	60
Showa Denko K.K.	160
Total	289

### Acrylonitrile

Asahi Kasei Chemicals Corp.	419
Mitsubishi Rayon Co., Ltd.	196
Showa Denko K.K.	57
Sumitomo Chemical Co., Ltd.	52
Total	724

### Synthetic Rubber

	SBR	BR	IR
Asahi Kasei Chemicals Corp.	130	35	—
Japan Elastomer Co., Ltd.	44	16	—
JSR Corp.	296	65	40
Mitsubishi Chemical Corp.	42	—	—
Ube Industries, Ltd.	—	110	—
ZEON Corp.	122	58	38
Total	634	284	78

Source: METI

**Table-3 World Supply and Demand for Ethylene Derivatives by Area**

#### 1. Ethylene Derivatives Demand (As Ethylene Equivalent)

(Unit: Million Ton,%)

	World	Asia	Western Europe	North, Central and South America	Middle East
Demand 2011	122.7	54.3	22.2	30.6	8.4
2017	153.1	69.9	23.8	36.5	12.2
Increment 11-17	30.4	15.6	1.7	6.0	3.9
Annual Growth Rate 11-17	3.8	4.3	1.2	3.0	6.5

#### 2. Ethylene Derivatives Capacity (As Ethylene Equivalent)

(Unit: Million Ton,%)

	World	Asia	Western Europe	North, Central and South America	Middle East
Capacity 2011	149.6	52.9	27.0	39.3	24.9
2017	182.1	67.4	26.3	50.3	30.1
Increment 11-17	32.5	14.5	-0.7	11.0	5.2
Annual Growth Rate 11-17	3.3	4.1	-0.4	4.2	3.2

Source: METI (2013.4)

**Table-4 Major Development Related to Petrochemical Industry Restructuring**

<b>I Merger</b>	<b>1</b>	Merger of Nippon Petrochemical and Nippon Petroleum refining into continuing firm known as Nippon Petroleum Refining.	08.4
	<b>2</b>	Mitsubishi Rayon Co., Ltd. finished acquisition of Lucite International.	09.5
	<b>3</b>	Nippon Oil Corp. and Nippon Mining Holding merged as JX Holding.	10.4
	<b>4</b>	Idemitsu Kosan Co., Ltd. and Mitsui Chemicals, Inc. established a Limited Liability Partnership (LLP) called Chiba Chemicals Manufacturing LLP	10.4
	<b>5</b>	Asahi Kasei Chemicals Corp. and Mitsubishi Chemical Corp. established a Limited Liability Partnership (LLP) called Nishi Nippon Ethylene LLP	11.4
<b>II Business Integration</b>	<b>1 Polyolefins Sector Integration</b>		
	①	Sumitomo Mitsui Polyolefin Co., Ltd. was established by Mitsui Chemicals, Inc. and Sumitomo Chemical Co., Ltd. with fifty fifty joint venture.	02.4
	②	Sumitomo Mitsui Polyolefin Co., Ltd. was dissolved.	03.10
	③	Mitsui Chemicals, Inc. and Idemitsu Kosan Co., Ltd. integrated the polyolefine business and established Prime Polymer Co., Ltd. The capital ratio was 65 %, 35%.	05.4
	<b>2 PE Sector Integration</b>		
	①	Japan Polyethylene Corp. was established by Japan Polychem Corp., Japan Polyolefins Co., Ltd. and Mitsubishi Shoji Plastics Corp. with the stake 50%, 42%, 8% each.	03.9
	②	Ube Industries Ltd. and Maruzen Petrochemical Co., Ltd. established Ube-Maruzen Polyethylene Co., Ltd., LDPE integrated company by fifty fifty equity.	04.10
	③	Maruzen Petrochemical Co., Ltd. Absorbed Maruzen Polymer Co., Ltd.	05.4
	<b>3 PP sector Integration</b>		
	①	Tokuyama Polypro Ltd. Co. was established by Idemitsu Petrochemical Co., Ltd. and Tokuyama Corp. with fifty fifty joint venture.	01.4
	②	Mitsui Chemicals, Inc. absorbed Grand Polymer Co., Ltd.	02.4
	③	Japan Polychem Corp. and Chisso Corp. integrated their polypropylene business and established Japan Polypropylene Corp. with the stake 65%, 35% each.	03.10
	④	SunAllomer Ltd. Absorbed Ukishima Polypro Co., Ltd.	07.4
	<b>4 PVC Sector Integration</b>		
	①	V-Tech Corp. was established by Mitsubishi Chemical Corp. and Toagosei Co., Ltd. with the stake 60%, 40% each. The capital ratio was changed to 85.1%, 14.9% (04.03)	00.4
	②	Mitsubishi Chemical Corp. Toagosei Co., Ltd. announced to dissolve V-Tech by September 2011.	11.2
	③	Asahi Glass Co., Ltd., ADEKA Co. and Kaneka Co. announced to withdraw their capital investment from both Kashima Denkai and Kashima PVC Monomer.	11.12
	<b>5 PS Sector Integration</b>		
	①	PS Japan Corp. was established by Asahi Kasei Corp., Mitsubishi Chemical Corp. and Idemitsu Petrochemical Co., Ltd. with the stake 45%, 27.5%, 27.5% each. A&M Styrene Co., Ltd. was disbanded.	03.4
	②	Mitsui Chemicals, Inc. and Sumitomo Chemical Co., Ltd. announced disband of Japan polystyrene Co., Ltd..	09.4
	③	PS Japan Corp. announced to stop the operation of Yokaichi plant by March 2011.	09.2

	④	Mitsubishi Chemical Corp. announced to withdraw their capital investment from PS Japan.	09.4
	<b>6</b>	<b>ABS Sector Integration</b>	
	①	UMG ABS Ltd. was established by Ube Industries Ltd., Mitsubishi Rayon Co., Ltd. and General Electric Co. with the stake 42.7%, 42.7%, 14.6% each	02.4
	②	JSR Corp. and Mitsubishi Chemical Corp. decided to disband Techno Polymer Co.,Ltd..	08.11
	③	Share ratio of UMG ABS Ltd. was changed into Ube Industries Ltd., Mitsubishi Rayon Co., Ltd. with the stake 50%, 50% each due to General Electric Co's withdrawal of their capital investment.	12.11
<b>III Business Transfer</b>	<b>1</b>	Chisso Corp.transferred commercial rights on polyvinyl chloride business to Kaneka Corp.	00.4
	<b>2</b>	Tokuyama Corp. will transfer its polypropyrene business to Idemitsu Petrochemical Co., Ltd.	01.7
	<b>3</b>	Kureha Chemical Industry Co., Ltd. will transfer its polyvinyl chloride business to Taiyo Vinyl Corp.	03.1
	<b>4</b>	Mitsui Chemicals, Inc. transfered SM business to Taiyo Petrochemical Co., Ltd.	04.1
	<b>5</b>	Tosoh Corp. withdraws from Nippon Styrene Monomer (NSM, Nippon Steel Chemical Group 65%, Tosoh 35%), which becomes a 100% subsidiary of the Nippon Steel Chemical Group.	08.3

Source: Japan Petrochemical Industry Association