Evolving unique chemical company

Second Quarter, 2018 Financial Results

- Consolidated -

SHOWA DENKO K.K.

August 8, 2018

Toshiharu Kato, CFO
Director & Corporate Officer

Performance forecast and other statements pertaining to the future as contained in this presentation are based on the information available as of today and assumptions as of today regarding risk factors that could affect our future performance. Actual results may differ materially from the forecast due to a variety of risk factors, including, but not limited to, the economic conditions, costs of naphtha and other raw materials, demand for our products such as graphite electrodes and other commodities, market conditions, and foreign exchange rates. We undertake no obligation to update the forward-looking statements unless required by law.

Consolidated Companies

- Consolidated subsidiaries: 61
  - Excluded: 1
    - Baotou Showa Rare Earth Hi-tech New Material Co., Ltd. (Electronics, liquidated)
- Equity method applied: 11
  - Newly applied or excluded: none

Selected Data

(Average figure)

	Jan.- Jun. 2017	Jan.- Jun. 2018	Increase/ decrease
■Exchange rates:			
¥/US$	112.4	108.7	Yen appreciated by ¥3.7/$
¥/€	121.6	131.6	Yen depreciated by ¥10.0/€
■Domestic naphtha price: ¥/KL	40,500	48,300	7,800
■Aluminum			
LME price: US$/T	1,886	2,210	325
Domestic market*: K¥/T	267	299	32

Exchange rate at December 31, 2017 ¥113.0/US$, at June 30, 2018 ¥110.5/US$
⇒Yen appreciated by ¥2.5/US$

*Domestic market: data from Nikkei

Summary

2017 (Jan.1 – Jun.30) vs. 2018 (Jan.1 – Jun.30)

(Unit: Billions of Yen)

	Jan.-Jun. 2017	Jan.-Jun. 2018	Increase/ decrease
Net Sales	372.2	455.8	83.7
Operating Income	35.0	78.1	43.1
Non-operating income and expenses, net	-12.8	-0.3	12.5
Interest/Dividends income and expenses	-0.6	-0.5	0.1
Equity in earnings of affiliates	-8.7	0.6	9.3
Foreign exchange gains or losses	-2.9	-0.4	2.5
Other	-0.6	0	0.6
Ordinary Income	22.2	77.8	55.6
Extraordinary Profit	0.2	0.5	0.3
Extraordinary Loss	-9.6	-2.0	7.6
Income before income taxes	12.8	76.3	63.5
Income taxes	-4.2	-15.3	-11.1
Profit	8.6	61.0	52.4
Net income attributable to non-controlling interests	-0.8	-2.9	-2.1
Net income attributable to owners of the parent	7.8	58.1	50.3

Extraordinary Profit/Loss

(Unit: Billions of Yen)

	Jan.-Jun., 2017	Jan.-Jun., 2018	Increase/decrease
■Extraordinary Profit	0.2	0.5	0.3
●Gain on sales of fixed assets	0.2	0.3	0.1
●Gain on liquidation of subsidiaries	—	0.2	0.2
●Other	0.1	0.1	0
■Extraordinary Loss	-9.6	-2.0	7.6
●Loss on sales and retirement of noncurrent assets	-1.2	-1.7	-0.5
●Provision of allowance for doubtful accounts	-2.2	—	2.2
●Provision for loss on guarantees	-4.0	—	4.0
●Other	-2.3	-0.4	1.9
■Extraordinary Profit/Loss, Net	-9.4	-1.5	7.9

Consolidated Sales by Segment

(Unit: Billions of Yen)

	Jan.-Jun. 2017	Jan.-Jun. 2018	Increase/ Decrease	
Petrochemicals	123.9	115.4	-8.5	【Olefins】sales decreased (shipment volumes down due to shutdown maintenance) 【Organic chemicals】sales increased (vinyl acetate, ethyl acetate: market prices up) 【SunAllomer Ltd. 】sales increased (market prices up)
Chemicals	70.1	74.6	4.5	【Basic chemicals】sales slightly increased (AN, caustic soda: market prices up) 【Industrial gases】sales slightly increased 【Electronic chemicals】sales increased (shipment volumes of high-purity gases for electronics up) 【Functional chemicals】sales increased (prices up due to the rise in raw material prices)
Electronics	63.0	54.3	-8.6	【HDs】sales decreased (shipment volumes for mobile PCs down) 【Compound semiconductors】【Rare earths】sales increased (shipment volumes up) 【LIB materials】sales increased (shipment volumes up)
Inorganics	26.6	116.5	89.9	【Ceramics】sales decreased (shipment volumes of general-purpose alumina down due to the withdrawal from ICA) 【Graphite electrodes】sales significantly increased (international market prices up) the effect of the consolidation of SHOWA DENKO CARBON Holding GmbH (4Q, 2017)
Aluminum	50.9	53.3	2.4	【High-purity foil for capacitors】sales increased (shipment volumes up) 【Aluminum specialty components】sales increased (market prices up due to the rise in metal prices) 【Aluminum cans】sales slightly decreased (shipment volumes for domestic market down)
Others	65.0	69.6	4.6	【SHOKO Co., Ltd. 】sales increased 【SiC epitaxial wafers】sales increased (shipment volumes up)
Adjustments	-27.3	-27.9	-0.6	
Total	372.2	455.8	83.7	

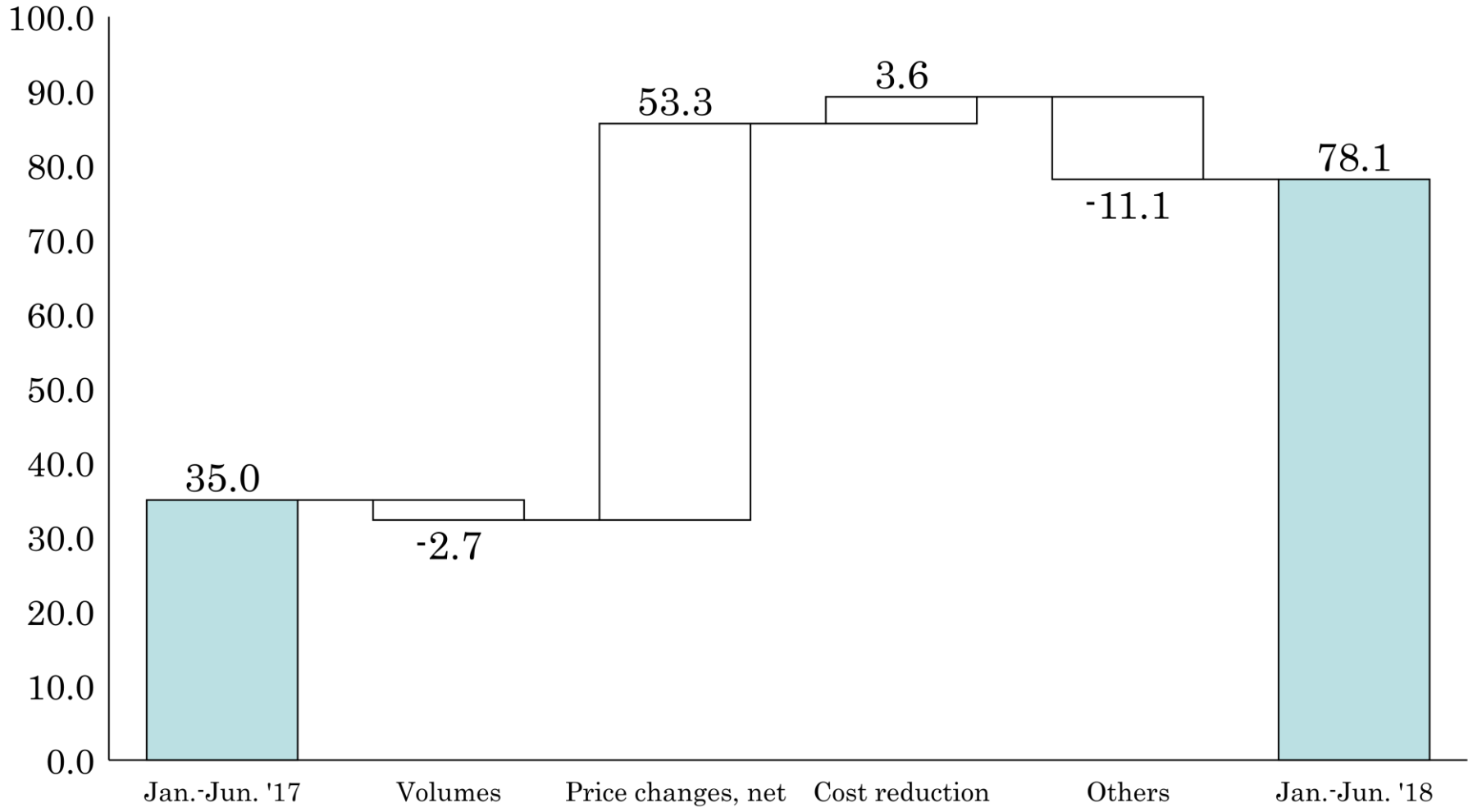
Consolidated Operating Income by Segment

(Unit: Billions of Yen)

	Jan.-Jun. 2017	Jan.-Jun. 2018	Increase/ Decrease	
Petrochemicals	16.2	7.4	-8.7	【Olefins】profit decreased (shipment volumes down due to shutdown maintenance) 【Organic chemicals】profit decreased (time lag between the rise in raw material prices and that in sales prices) 【SunAllomer Ltd. 】profit maintained at the year-earlier level
Chemicals	6.9	7.8	0.9	【Basic chemicals】profit increased (AN, chloroprene rubber, caustic soda) 【Industrial gases】profit increased 【Electronic chemicals】profit increased (shipment volumes of high-purity gases for electronics up) 【Functional chemicals】profit decreased (time lag between the rise in raw material prices and that in sales prices)
Electronics	12.1	5.6	-6.5	【HDs】profit decreased (shipment volumes for mobile PCs down) 【Compound semiconductors】【Rare earths】profit increased (shipment volumes up) 【LIB materials】profit slightly increased
Inorganics	0.1	58.3	58.2	【Ceramics】profit increased (shipment volumes of electronic materials up) 【Graphite electrodes】profit significantly increased (international market prices up) the effect of the consolidation of SHOWA DENKO CARBON Holding GmbH (4Q, 2017)
Aluminum	3.2	2.7	-0.6	【High-purity foil for capacitors】profit slightly decreased 【Aluminum specialty components】profit maintained at the year-earlier level 【Aluminum cans】profit decreased (shipment volumes for domestic market down, metal prices up)
Others	0.1	1.3	1.2	【SHOKO Co., Ltd.】profit increased 【SiC epitaxial wafers】profit increased (shipment volumes up)
Adjustments	-3.6	-5.0	-1.4	
Total	35.0	78.1	43.1	

Operating Income Breakdown by Factor

(Unit: Billions of Yen)



Consolidated Balance Sheet

(Unit: Billions of Yen)

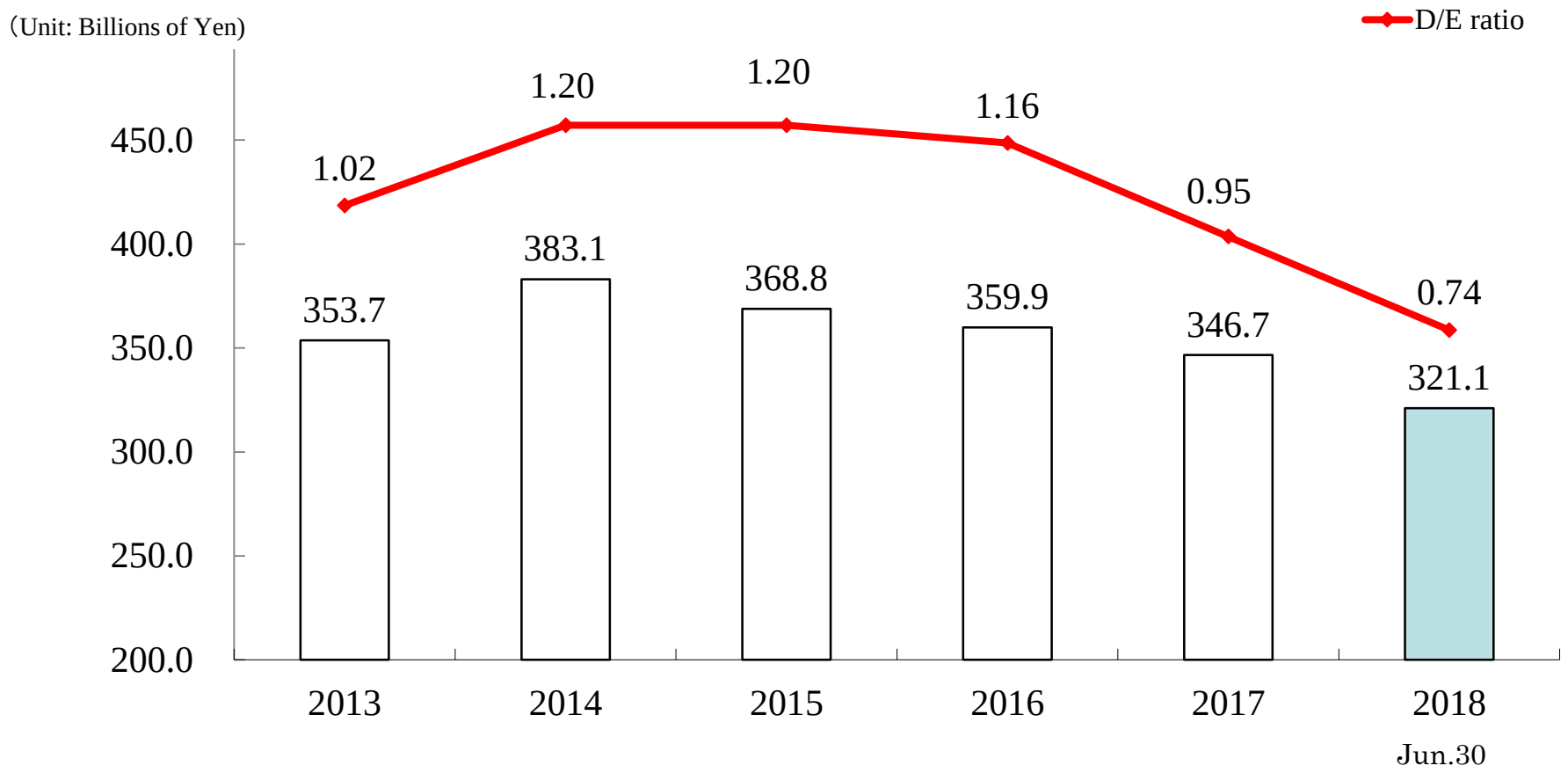
Assets	Dec. 31, 2017	Jun. 30, 2018	Increase/ decrease	Liabilities and Net Assets	Dec. 31, 2017	Jun. 30, 2018	Increase/ decrease
Cash and deposits	77.2	89.3	12.0	Notes and accounts payable	120.8	132.1	11.3
Notes and accounts receivable	176.0	186.1	10.1	Interest-bearing debt	346.7	321.1	-25.6
Inventories	114.9	122.7	12.8	Net defined benefit liability	19.0	16.6	-2.3
Other current assets	37.2	41.0	3.8	Other liabilities	173.3	150.4	-22.8
Total Current Assets	405.3	444.1	38.7	Total Liabilities	659.7	620.2	-39.5
Buildings and structures	85.5	84.6	-1.0	Capital stock	140.6	140.6	0
Machinery and equipment	151.6	153.3	1.7	Capital surplus	61.7	78.9	17.2
Land	245.1	244.9	-0.2	Retained earnings	96.1	147.1	51.0
Other tangible fixed assets	23.7	20.0	-3.7	Treasury stock	-10.5	-1.7	8.9
Total Tangible Fixed Assets	505.9	502.8	-3.1	Total Shareholders' equity	287.9	365.0	77.1
Intangible fixed assets	12.4	13.3	0.8	Valuation difference on available-for-sale securities	16.5	15.0	-1.6
Investments and other assets	101.1	95.7	-5.3	Deferred gains or losses on hedges	3.8	2.2	-1.5
incl. investment securities	89.2	85.0	-4.2	Revaluation reserve for land	29.5	29.5	-0
				Foreign currency translation adjustment	15.5	10.4	-5.1
				Remeasurements of defined benefit plans	-4.7	-3.9	0.8
				Total Accumulated Other Comprehensive Income	60.6	53.2	-7.4
				Non-controlling interests	16.5	17.4	0.9
Total Fixed Assets	619.4	611.8	-7.6	Total Net Assets	365.0	435.6	70.6
Total Assets	**1,024.7**	**1,055.8**	**31.1**	**Total Liabilities and Net Assets**	**1,024.7**	**1,055.8**	**31.1**

Total Assets
Interest-bearing Debt and D/E ratio

(Unit: Billions of Yen)

	Dec. 31, 2017	Jun. 30, 2018	Increase/ decrease
● Total assets	1,024.7	1,055.8	31.1
● Interest-bearing debt	346.7	321.1	-25.6
● Debt/Equity ratio	0.95 times	0.74 times	-0.21p
● Stockholders' equity ratio	34.0%	39.6%	5.6p

Interest-bearing Debt



Equity ratio	30.6%	29.7%	31.5%	31.8%	34.0%	39.6%

Consolidated Cash Flows

(Unit: Billions of Yen)

	Jan.-Jun. 2017	Jan.-Jun. 2018	Increase/ decrease	2018 Revised Forecast*
●CF from Operating Activities	43.0	52.2	9.2	120.0
●CF from Investing Activities	-11.3	-25.5	-14.2	-60.0
●Free CF	31.7	26.7	-5.0	60.0
●CF from Financing Activities	-16.2	-12.9	3.3	-38.0
●Others	-0.2	-1.9	-1.7	-2.0
Increase/decrease in cash and cash equivalents	15.3	11.9	-3.3	20.0

* 2018 revised forecast was announced on Aug. 8, 2018.

Selected Data (Consolidated)

(Unit: Billions of Yen)

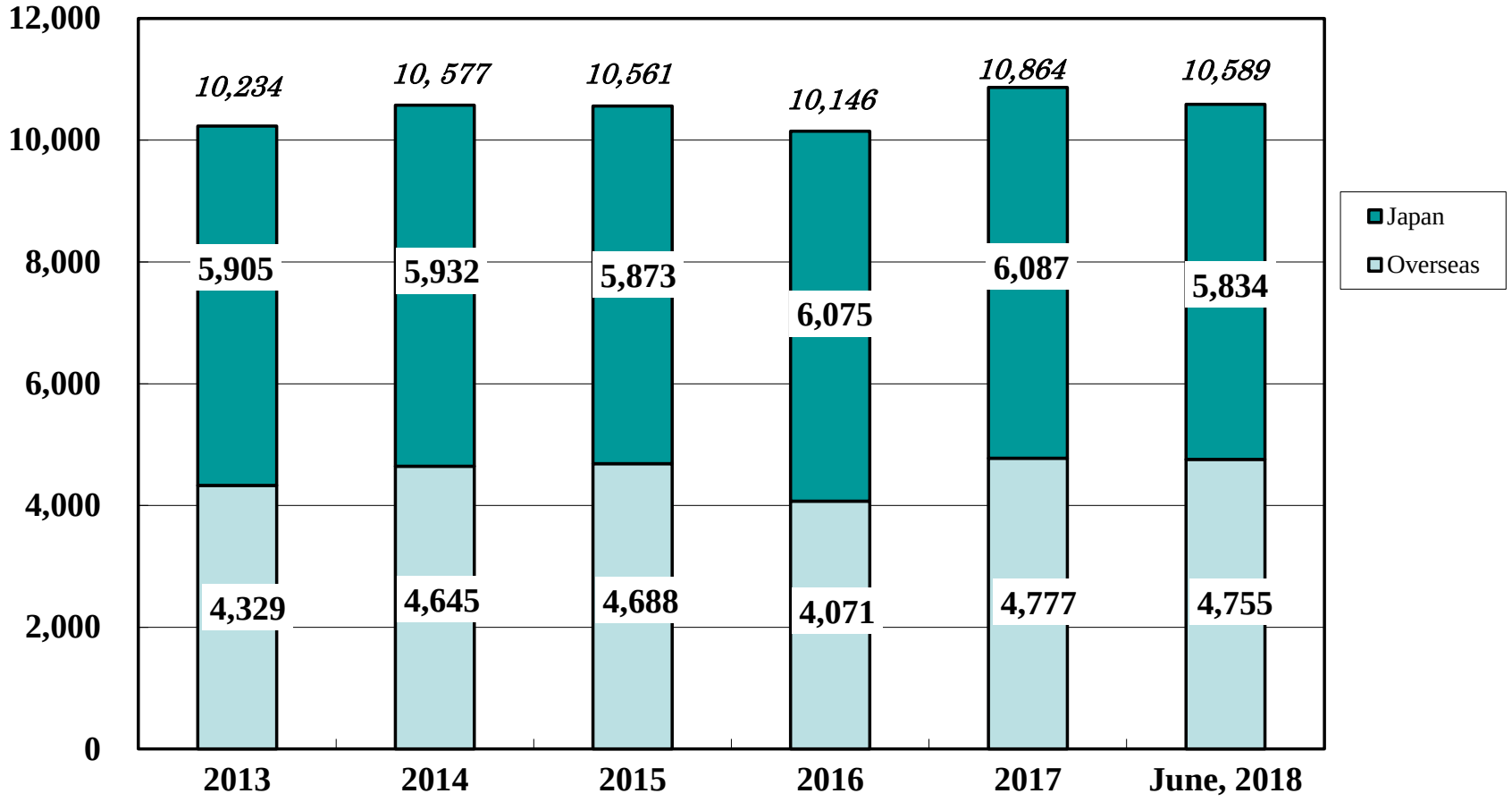
	Jan.-Jun. 2017	Jan.-Jun. 2018	Increase/ decrease
●Interest/dividend income less interest expenses	-0.6	-0.5	0.1
●Capital expenditures	17.4	20.7	3.3
●Depreciation and amortization	18.7	19.8	1.1
●R&D expenditures	9.0	10.3	1.3
●Number of employees	10,097	10,589	492
●Total employment cost	36.2	39.2	3.0

Capital Expenditures/ Depreciation by Segment

(Unit: Billions of Yen)

	Jan.-Jun., 2017		Jan.-Jun., 2018		Increase/decrease	
	Capital expenditures	Depreciation	Capital expenditures	Depreciation	Capital expenditures	Depreciation
Petrochemicals	1.1	3.4	3.7	3.0	2.6	-0.5
Chemicals	5.2	4.1	4.1	4.4	-1.1	0.3
Electronics	5.4	5.0	4.4	4.6	-1.0	-0.4
Inorganics	2.2	2.2	2.1	3.8	-0	1.6
Aluminum	2.6	2.6	3.1	2.7	0.4	0.1
Others	0.8	1.4	3.4	1.4	2.6	0
Total	17.4	18.7	20.7	19.8	3.3	1.1

Total number of employees and breakdown by location



Japan	57.7%	56.1%	55.6%	59.9%	56.0%	55.1%
Overseas	42.3%	43.9%	44.4%	40.1%	44.0%	44.9%

Selected Data, Forecast

(Unit: Billions of Yen)

	2017 Actual		2018 Revised Forecast*		Increase/ decrease	
● Exchange rate: ¥/US$			2018 earlier forecast**	110.0		
	1H	112.4	1H actual	108.7	1H	-3.7
	2H	112.0	2H revised	105.0	2H	-7.0
¥/€$			2018 earlier forecast**	130.0		
	1H	121.6	1H actual	131.6	1H	10.0
	2H	131.7	2H revised	130.0	2H	-1.7
● Domestic naphtha price: ¥/KL			2018 earlier forecast**	41,600		
	1H	40,500	1H actual	48,300	1H	7,800
	2H	40,350	2H revised	48,600	2H	8,250
● Aluminum LME price: US$/T			2018 earlier forecast**	2,250		
	1H	1,886	1H actual	2,210	1H	325
	2H	2,073	2H revised	2,400	2H	327
● Interest-bearing debt at the year end		346.7		300.0		-46.7
● Interest/dividend income less interest expenses		-1.2		-1.2		0
● R&D expenditures		18.5		20.3		1.8
● Number of employees		10,864		10,725		-13.9
● Total employment cost		74.3		78.6		4.3

* 2018 revised forecast was announced on Aug. 8, 2018.
**2018 earlier forecast was announced on Feb. 14, 2018.

2018 Forecast

(Unit: Billions of Yen except Cash dividends per Share and Net income per Share)

	2017 Actual	2018 Revised Forecast*	Increase/ decrease	2018 Earlier Forecast**	Increase/ decrease (against earlier)
Net Sales	780.4	985.0	204.6	935.0	50.0
Operating Income	77.8	170.0	92.2	137.0	33.0
Non-operating income and expense	-13.9	-3.0	10.9	-5.5	2.5
Ordinary Income	64.0	167.0	103.0	131.5	35.5
Extraordinary Profit / Extraordinary Loss	-17.3	-11.5	5.8	-12.0	0.5
Net income attributable to owners of the parent	33.5	115.0	81.5	85.0	30.0
Net income attributable to owners of the parent per share (yen)	234.84	781.27	546.43	577.45	203.82
Cash dividends per share (yen)	50***	90 (planned)	—	70 (planned)	—

* 2018 revised forecast was announced on August 8, 2018. **2018 earlier forecast was announced on May 9, 2018.
*** SDK resolved payment of dividends of ¥30 per share based on the record date of May 11, 2017 at the extraordinary general meeting of shareholders held on June 27, 2017, and paid dividends on the next day. The table above does not include this amount.

Consolidated Net Sales by Segment, 2018 Forecast

(Unit: Billions of Yen)

	2017 Actual	2018 Revised Forecast*	Increase/ decrease	2018 Earlier Forecast**	Increase/ decrease (against earlier)
Petrochemicals	251.1	258.0	6.9	243.0	15.0
Chemicals	148.8	159.0	10.2	155.0	4.0
Electronics	123.1	114.0	-9.1	117.0	-3.0
Inorganics	73.4	255.0	181.6	218.0	37.0
Aluminum	105.4	113.0	7.6	113.0	0
Others	133.6	141.0	7.4	139.0	2.0
Adjustments	-55.1	-55.0	0.1	-50.0	-5.0
Total	780.4	985.0	204.6	935.0	50.0

* 2018 revised forecast was announced on August 8, 2018. **2018 earlier forecast was announced on May 9, 2018.

Consolidated Operating Income by Segment, 2018 Forecast

(Unit: Billions of Yen)

	2017 Actual	2018 Revised Forecast*	Increase/ decrease	2018 Earlier Forecast**	Increase/ decrease (against earlier)
Petrochemicals	33.4	20.0	-13.4	20.0	0
Chemicals	16.5	18.0	1.5	18.0	0
Electronics	21.9	15.0	-6.9	17.0	-2.0
Inorganics	7.1	118.0	110.9	83.5	34.5
Aluminum	6.7	6.0	-0.7	6.0	0
Others	0.6	3.0	2.4	1.5	1.5
Adjustments	-8.4	-10.0	-1.6	-9.0	-1.0
Total	77.8	170.0	92.2	137.0	33.0

* 2018 revised forecast was announced on August 8, 2018. **2018 earlier forecast was announced on May 9, 2018.

Capital expenditures/Depreciation Forecast by Segment for 2018

(Unit: Billions of Yen)

	2017 Actual		2018 Revised Forecast*		Increase/decrease	
	Capital expenditures	Depreciation	Capital expenditures	Depreciation	Capital expenditures	Depreciation
Petrochemicals	2.8	6.9	6.1	5.2	3.3	-1.7
Chemicals	9.6	8.5	8.6	8.9	-1.1	0.4
Electronics	11.2	9.6	9.7	9.2	-1.5	-0.4
Inorganics	7.8	5.5	8.1	7.5	0.3	2.1
Aluminum	8.0	5.4	6.0	5.7	-2.1	0.3
Others	1.8	2.7	6.1	2.9	4.3	0.2
Total	41.3	38.5	44.6	39.4	3.3	0.9

* 2018 revised forecast was announced on August 8, 2018.

Summary (Reference)

CQ1 (Jan.1 – Mar.31), 2018 v s. CQ2 (Apr.1 – Jun.30), 2018

(Unit: Billions of Yen)

	CQ1, 2018	CQ2, 2018	Increase/ decrease
Net Sales	214.7	241.2	26.5
Operating Income	34.4	43.7	9.3
Non-operating income and expenses, net	-1.6	1.3	2.9
Interest/Dividends income and expenses	-0.3	-0.2	0.1
Equity in earnings of affiliates	0.6	0	-0.5
Foreign exchange gains or losses	-2.4	1.9	4.3
Other	0.5	-0.5	-0.9
Ordinary Income	32.8	45.0	12.2
Extraordinary Profit	0	0.5	0.5
Extraordinary Loss	-0.9	-1.1	-0.2
Income before income taxes	31.9	44.4	12.5
Income taxes	-5.7	-9.5	-3.8
Profit	26.2	34.9	8.7
Net income attributable to non-controlling interests	-1.4	-1.5	-0.1
Net income attributable to owners of the parent	24.8	33.4	8.6

(Reference) Consolidated Sales by Segment

(Unit: Billions of Yen)

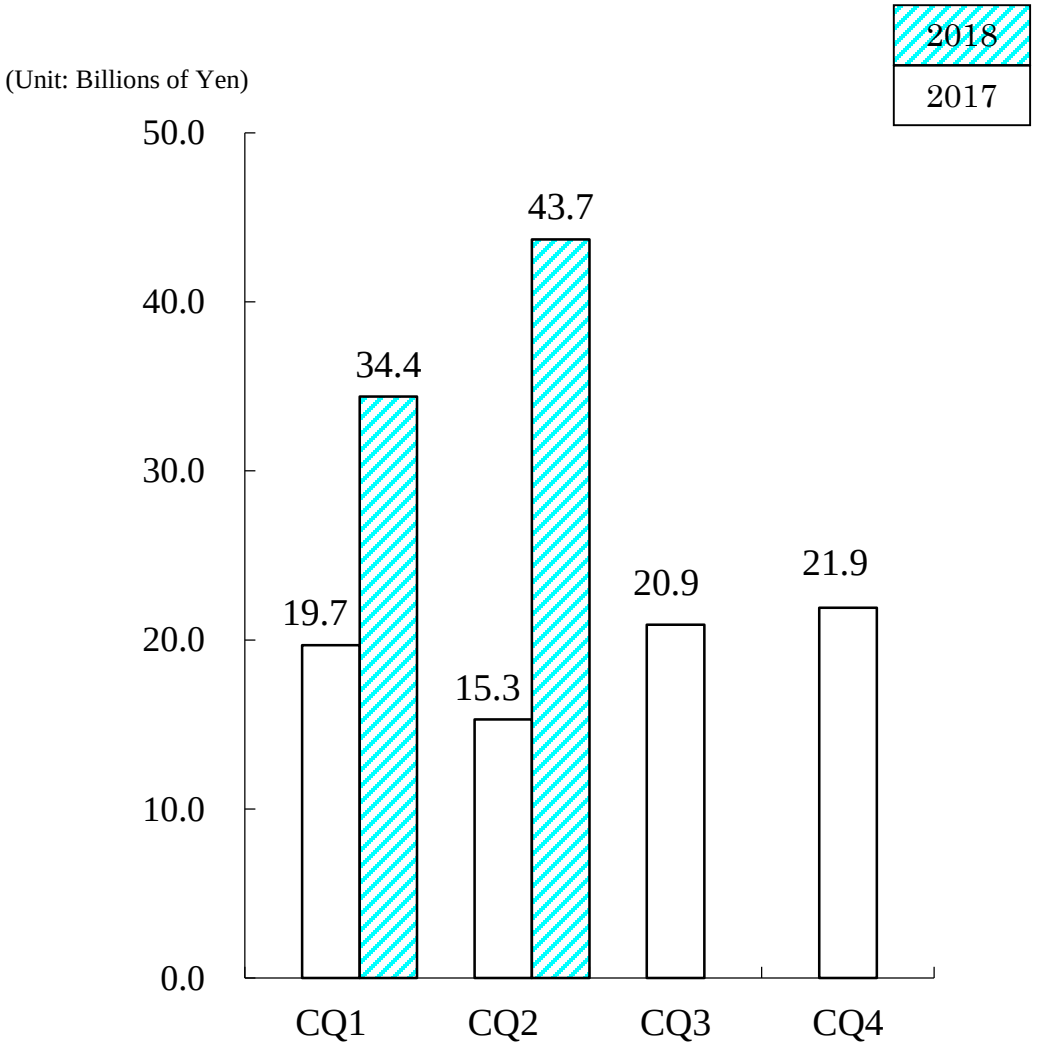
	CQ1, 2018	CQ2, 2018	Increase/ decrease	
Petrochemicals	53.8	61.6	7.8	【Olefins】sales increased (shipment volumes up due to shutdown maintenance) 【Organic chemicals】sales increased (shipment volumes up, market prices up) 【SunAllomer Ltd.】sales increased (market prices up)
Chemicals	36.0	38.6	2.6	【Basic chemicals】sales decreased (shipment volumes of ammonia down) 【Electronic chemicals】sales increased (shipment volumes of high-purity gases for electronics up) 【Industrial gases】sales increased (shipment volumes up by seasonal) 【Functional chemicals】sales increased (shipment volumes of polymers bound for China up)
Electronics	27.7	26.6	-1.1	【HDs】sales slightly decreased 【Compound semiconductors】sales maintained at the CQ1 level 【Rare earths】sales decreased (shipment volumes down) 【LIB materials】sales increased (shipment volumes up due to the end of production adjustment in China)
Inorganics	51.4	65.0	13.6	【Ceramics】sales maintained at the CQ1 level 【Graphite electrodes】sales increased (international market prices up)
Aluminum	24.8	28.4	3.6	【High-purity foil for capacitors】sales slightly increased 【Aluminum specialty components】sales maintained at the CQ1 level 【Aluminum cans】sales increased (shipment volumes up: seasonal in domestic market)
Others	34.3	35.3	0.9	【SHOKO Co., Ltd.】sales increased 【SiC epitaxial wafers】sales increased (shipment volumes up)
Adjustments	-13.4	-14.5	-1.0	
Total	214.7	241.2	26.5	

(Reference) Consolidated Operating Income by Segment

(Unit: Billions of Yen)

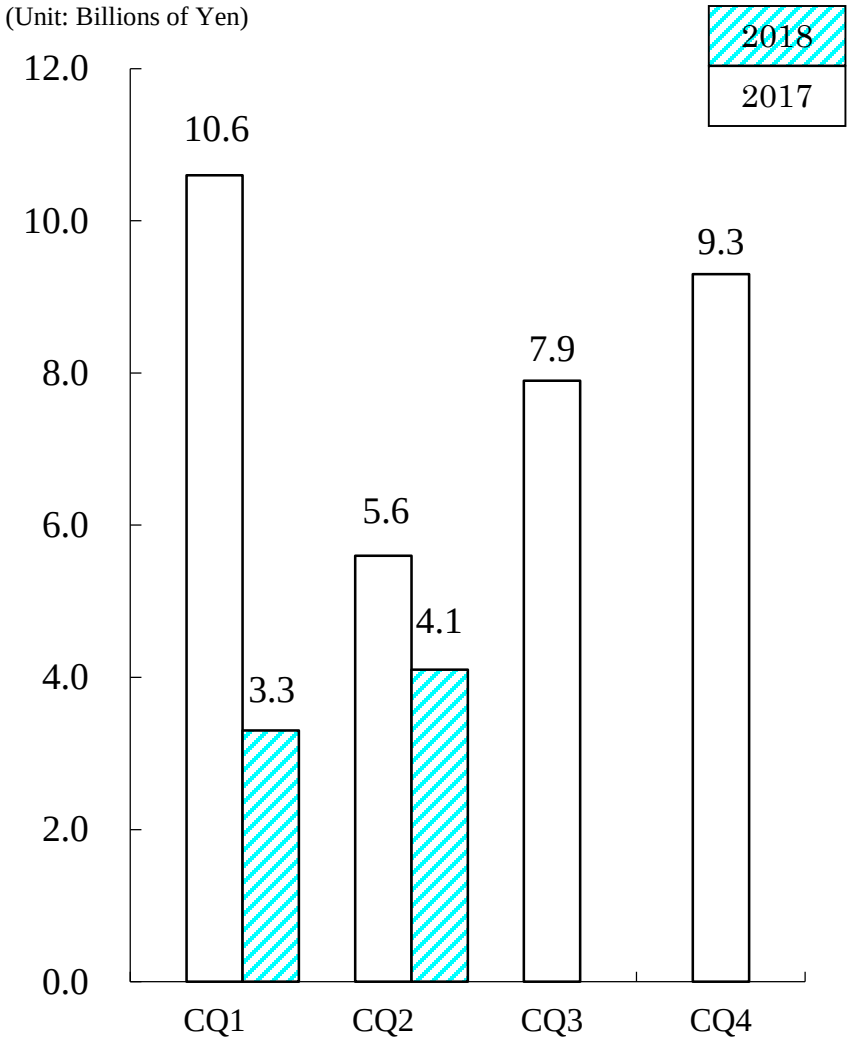
	CQ1, 2018	CQ2, 2018	Increase/ decrease	
Petrochemicals	3.3	4.1	0.7	【Olefins】profit increased (shipment volumes up due to shutdown maintenance) 【Organic chemicals】profit decreased (time lag between the rise in raw material prices and that in sales prices) 【SunAllomer Ltd.】profit slightly increased
Chemicals	3.6	4.1	0.5	【Basic chemicals】profit maintained at the CQ1 level 【Electronic chemicals】profit increased (shipment volumes up) 【Industrial gases】profit increased (shipment volumes up by seasonal) 【Functional chemicals】profit slightly decreased (time lag between the rise in raw material prices and that in sales prices)
Electronics	2.9	2.8	-0.1	【HDs】profit maintained at the CQ1 level 【Compound semiconductors】profit slightly increased 【Rare earths】profit slightly decreased 【LIB materials】profit slightly increased
Inorganics	24.9	33.4	8.6	【Ceramics】profit increased (shipment volumes of high-value added products up) 【Graphite electrodes】profit increased (international market prices up)
Aluminum	1.3	1.4	0	【High-purity foil for capacitors】【Aluminum specialty components】 profit slightly decreased 【Aluminum cans】profit increased (shipment volumes up: seasonal in domestic market)
Others	0.8	0.5	-0.4	R&D costs up 【SHOKO Co., Ltd.】【SiC epitaxial wafers】profit slightly increased
Adjustments	-2.5	-2.5	0	
Total	34.4	43.7	9.3	

(Reference) Quarterly Operating Income

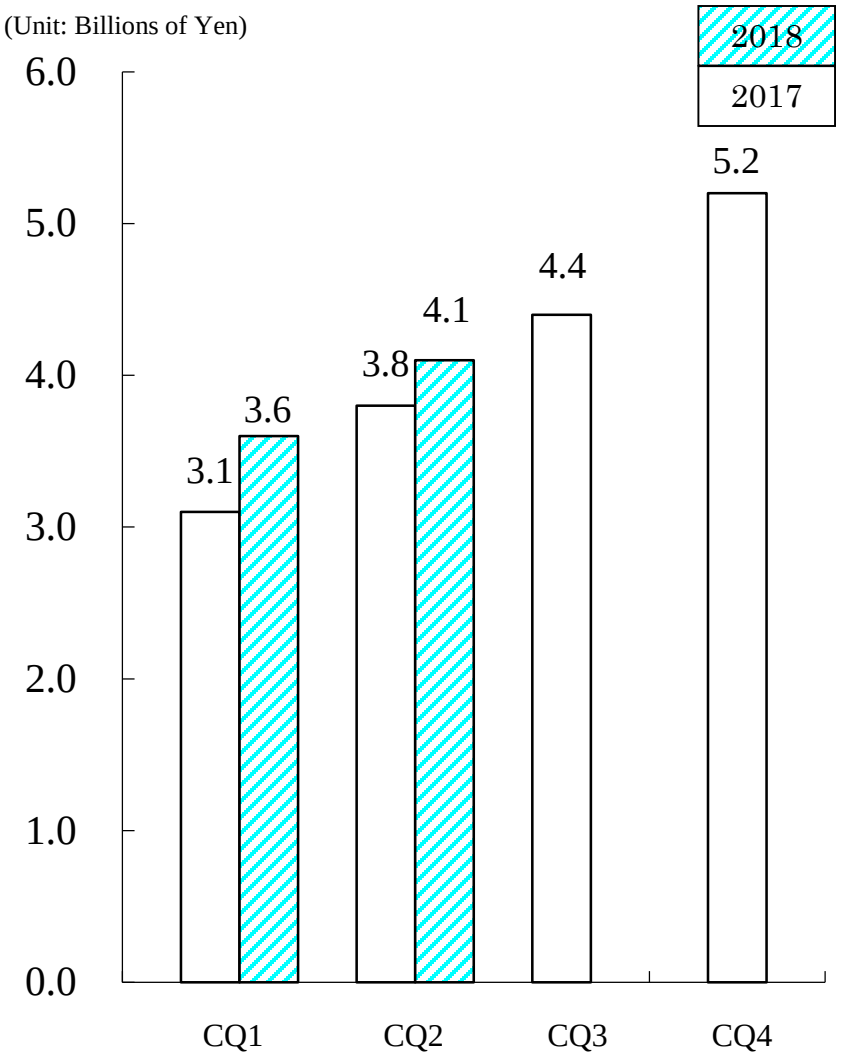


(Reference) Quarterly Operating Income by Segment

《Petrochemicals》



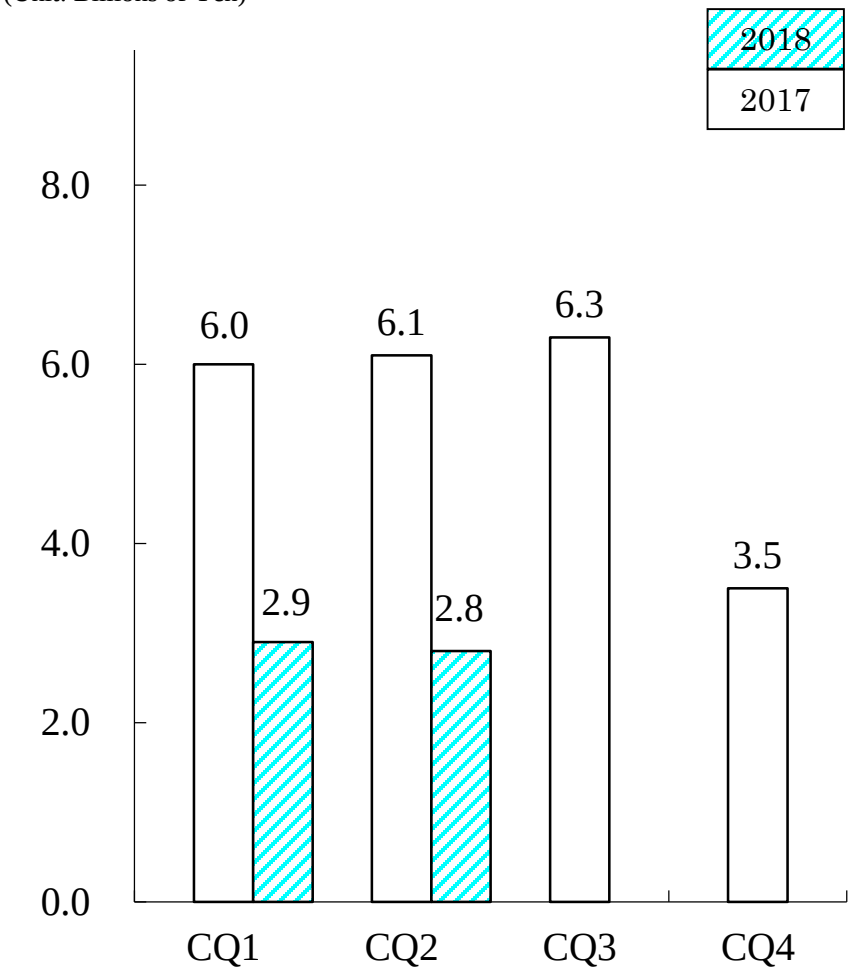
《Chemicals》



(Reference) Quarterly Operating Income by Segment

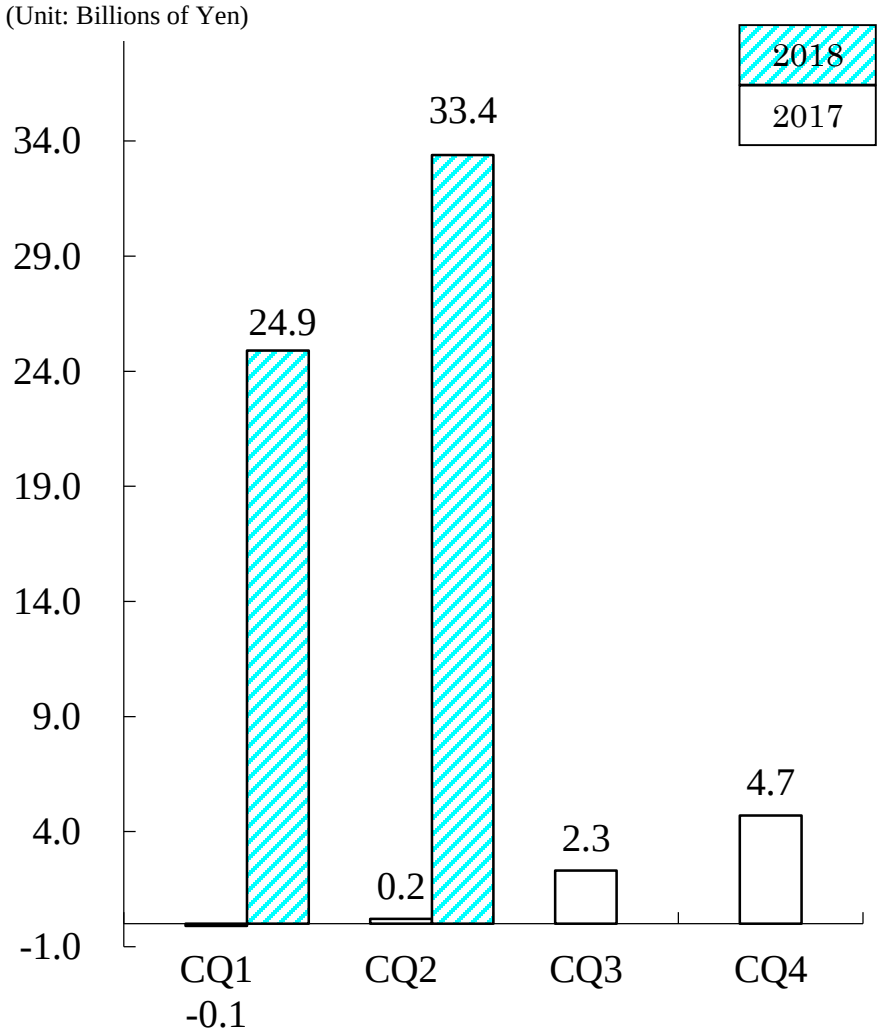
《Electronics》

(Unit: Billions of Yen)



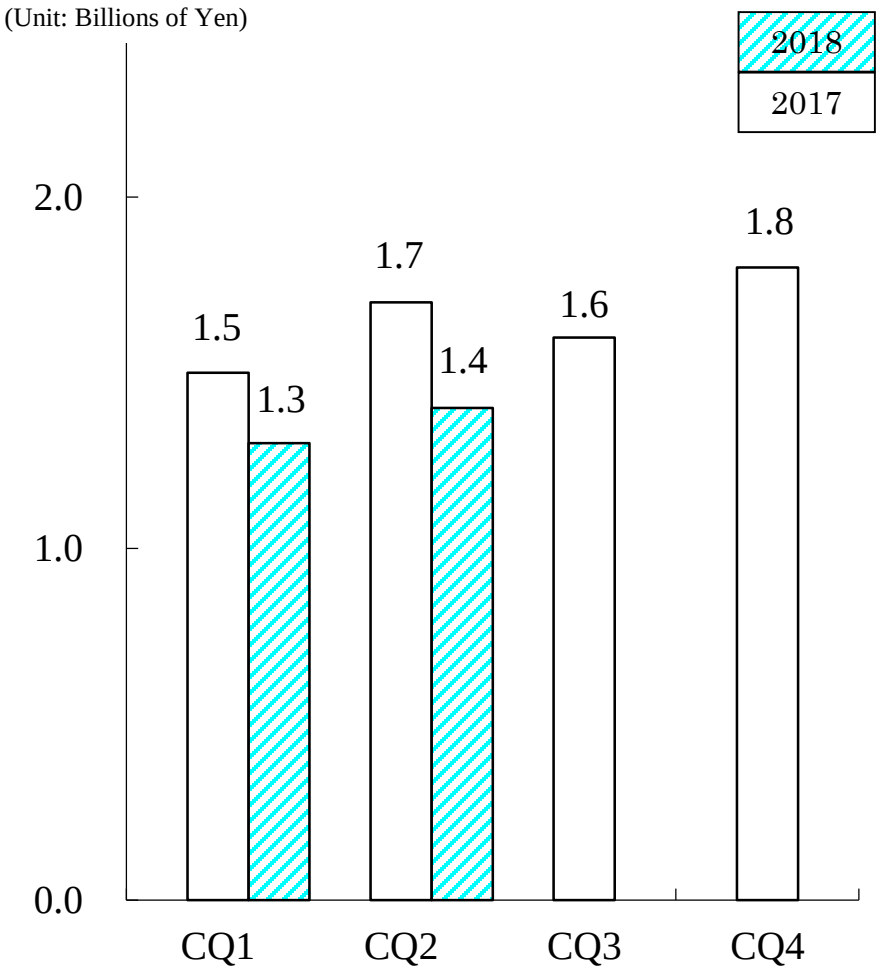
《Inorganics》

(Unit: Billions of Yen)

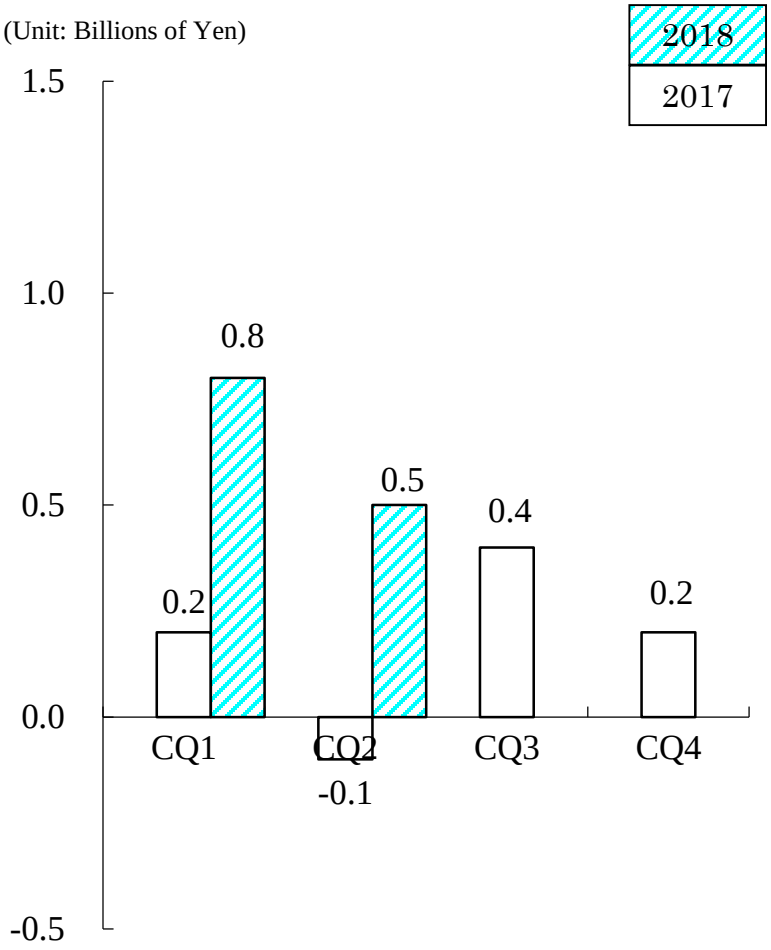


(Reference) Quarterly Operating Income by Segment

《Aluminum》



《Others》



Topics

[General]

- **Received "Top 100 Global Innovators" award, 3 years in a row**

  In January 2018, SDK received "The Clarivate Analytics 2017 Top 100 Global Innovators" award. Clarivate Analytics, formerly the Intellectual Property & Science business of Thomson Reuters, selected the top 100 global innovation-leading companies and organizations by utilizing strict and objective data compiled from its value-added patent citation database which is the world's largest one in this category, its intellectual property intelligence platform, and the company's original basis for evaluation. In the screening process of the award, Clarivate Analytics used scientific and objective methodology involving four main criteria of "patent volume," "application-to-grant success," "globalization" and "citation influence." The Showa Denko Group has designated its intellectual property strategy as an important part of its overall business strategies. The Group will continue promoting its intellectual property strategy through close integration with business and R&D strategies.

- **Incorporated into 3 ESG investment indexes for 2 straight years**

  In July 2018, SDK was incorporated continuously for two straight years into three ESG indexes for investment: "FTSE Blossom Japan Index" provided by FTSE International Limited and Frank Russel Company (FTSE Russel, a member of London Stock Exchange Group); "MSCI Japan ESG Select Leaders Index" and "MSCI Japan Empowering Women Index" provided by MSCI Incorporated (MSCI). FTSE and MSCI are world-famous index providers. Government Pension Investment Fund (GPIF) selected these three stock price indexes and started full-scale "ESG conscious investment" in 2017. FTSE Blossom Japan Index is designed to provide market participants with a tool to identify and measure the performance of Japanese companies that demonstrate strong environment, social and governance (ESG) practices. MSCI Japan ESG Select Leaders Index is constructed using the MSCI Japan IMI Top 500 Index (parent index) and targets best ESG performers among issues included in the parent index. MSCI Japan Empowering Women Index evaluates companies promoting and maintaining gender diversity. In addition to these three ESG indexes, SDK has been included in the "Morningstar Socially Responsible Investment Index (MS-SRI)," which is provided by Morningstar Japan K.K., for five consecutive years and the "SNAM Sustainability Index," which is provided by Sompo Japan Nipponkoa Asset Management Co., Ltd. (SNAM), for seven consecutive years.

Topics

[General]

- Offered treasury stock through International Offering

On March 6, 2018, SDK's Board of Directors resolved that the Company would offer 6 million shares of its treasury stock through an international offering, and the offer price of those shares was determined at ¥4,544 per share on the same day. SDK completed delivery of those shares to investors on March 23, 2018. SDK received about ¥26 billion through this transaction, and the purposes for which SDK will spend this amount are as follows:

1) SDK will spend about ¥16 billion by the end of this year for repayment of a bank loan which the Company borrowed in order to acquire SGL GE Holding GmbH in October 2017, and for investment to realize synergistic effects of the business integration between the two companies.
2) SDK will spend about ¥5 billion by the end of 2019 for investment at home and abroad to expand production capacities of its plants to produce high-purity gases for electronics
3) SDK will spend about ¥2 billon by the end of this year for investment in Vietnam and Thailand to expand/establish facilities to produce aluminum cans.
4) SDK will spend about ¥3 billion by the end of 2019 for investment to strengthen foundation of the LIB material business and to expand the capacity to produce SiC epitaxial wafer.

Through the fund-raising of this time, SDK will promote strategy for each business, aiming to establish and strengthen "individualized businesses," improve the business portfolio, and increase the ratio of overseas sales, and will strengthen the Company's financial standing.

Topics

[General]

- **SDK and Cinnamon starts to develop database system equipped with AI to utilize technical documents**

  SDK and Cinnamon Inc. (Cinnamon) has decided to jointly develop a database system equipped with artificial intelligence (AI) to utilize technical documents. To be specific, SDK and Cinnamon will promote the development of a database system with the object of utilizing technical documents, in which the system will be equipped with AI-based automatic OCR technology to accurately digitize data on paper containing handwritten characters and highly convenient data search function. The two parties will aim to create an intensely practical database system through close cooperation between Cinnamon which has deep expertise and programming technology on AI and image analysis, and SDK which holds abundant real data (technical documents) that contain expertise in many fields including petrochemical, carbon, and aluminum products. This development program has been accredited as a project to be subsidized by the New Energy and Technology Development Organization (NEDO) as a part of NEDO's "Program to Support Joint Development of AI Systems."

[Petrochemicals segment]

- **Completed expansion of n-propyl acetate plant**

  SDK expanded its capacity to produce n-propyl acetate (NPAC), which is used in solvents for special gravure printing, from 16,000 tons a year to 18,200 tons a year through modifications to facilities during the period of regular maintenance and repair of Ota Complex which was implemented in March and April 2018. NPAC is an acetate-based solvent with high safety mainly used for ink for special gravure printing on packaging materials for food. The demand for NPAC is increasing as safe and easy-to-use substitute for toluene and methyl ethyl ketone which has been used as solvent for ink, due to the revision of the Air Pollution Control Act in which a tighter control has been introduced over the emission of volatile organic components. In recent years, the demand for NPAC has been increasing more than 10% a year. In addition to NPAC, SDK has been providing ink producers and printing companies with ethyl acetate, which is widely used as solvents for inks and paints. SDK will strengthen its system to stably supply these products in order to cope appropriately with the expansion of the market for solvents.

Topics

[Petrochemicals segment]

- **JXTG Energy and SDK receive subsidy for project to strengthen bases of petroleum complexes in Oita Complex Area**

  A joint project of SDK and JXTG Nippon Oil & Energy Corporation (JXTG Energy) to strengthen cooperation between oil refinery and petrochemical complex in Oita complex area (Oita City, Oita Prefecture) has been adopted as a subject for the "2018 Subsidy Program to Support Projects to Enhance Resilience of Oil Supply System" (a program to subsidize projects to strengthen business bases of petroleum complexes among programs to enhance productivity and resilience of petroleum complexes) to which Consortium for Resilient Oil Supply System (CROS) organized public invitation. Details of the project are "increasing the number of propylene rectifying towers" and "establishment of an ethane holder." By interchanging and utilizing products through pipelines, the two parties gain advantages. "Subsidy Program to Support Projects to Enhance Resilience of Oil Supply System" is institutionalized by the Agency of Natural Resources and Energy. The program aims to improve productivity of Japanese petroleum complexes which form the core of oil products supply system, secure business bases of those complexes which are essential for the sustainability of domestic oil supply network, and establish sustainable and stable oil products supply system in Japan. Through this joint project, SDK and JXTG Energy will make the most of strong points of facilities in the oil refinery and the petrochemical complex in Oita complex area, and make these complexes prosper with global competitiveness.

[Chemicals segment]

- **Expanded high-purity hydrogen bromide plant**

  SDK expanded its annual capacity to produce high-purity hydrogen bromide (HBr) from 600 tons to 900 tons, 1.5 times as much as the previous level. The expanded plant started to produce HBr in this March. HBr is a specialty gas mainly used for fine-etching of polysilicon in the manufacturing process of semiconductors including DRAMs and NAND flash memories. The demand for HBr has been increasing due to ongoing expansion of the market for semiconductors caused by acceleration in the spread of IoT, big dada analysis, and automatic driving. SDK will continue responding quickly to the expansion of the electronic parts and materials industry's demand for HBr and scaling up its high-purity specialty gas business.

Topics

[Chemicals segment]

- **Opened the second branch of Shanghai Showa Chemicals Co., Ltd. aiming to strengthen sales of high-purity gases for electronics in China**

  In March 2018, SDK established a branch of Shanghai Showa Chemicals Ltd. (SSC) in Wuhan, Hubei Province, China, aiming to strengthen its business to sell high-purity gases for electronics in China. Semiconductor and flat panel display industries are growing rapidly in China due to the Chinese government's policy for the development of these industries and the increase in the global demand for electronic devices. In the past, SDK shipped all of its high-purity gases for electronics to be used by customers in China from SSC located in Shanghai. This time, however, SDK decided to establish a branch of SSC and its warehouse in Wuhan because there has been construction of large factories in Middle China to manufacture semiconductor chips and flat panel displays. The Showa Denko Group will continue enriching its network of bases to sell and distribute high-purity gases for electronics in China, aiming to expand the business in each region of the country and respond properly to the expansion of our customers' businesses.

- **Started to supply low-carbon hydrogen made from used plastics to Hotel's fuel cell**

  SDK started to supply "low-carbon" hydrogen gas made from used plastics (low-carbon hydrogen) at its Kawasaki Plant to KAWASAKI KING SKYFRONT TOKYU REI HOTEL, which started business on June 1, 2018, as energy source for fuel cells. This is the first case in the world to introduce low-carbon hydrogen gas made from used plastics into fuel cells set up in a hotel. KAWASAKI KING SKYFRONT TOKYU REI HOTEL uses low-carbon hydrogen as energy source to be converted into electricity and heat through large-sized fuel cells. In 2003, SDK's Kawasaki Plant introduced a method to extract hydrogen, which is used as raw material to produce ammonia, from used plastics. SDK will continue contributing to creation of sustainable society through development of environment-friendly products and production processes.

Topics

[Electronics segment]

- **LIB material "*VGCF*™" received a Grand Prize in "Low CO_2 Kawasaki Brand '17"**

  In February 2018, SDK's *VGCF*™, carbon-nanofiber additive to cathodes and anodes of lithium ion batteries (LIBs) to improve electrical conductivity, received a Grand Prize in the Product and Technology Category of "Low CO_2 Kawasaki Brand '17." SDK manufactures *VGCF*™ in its Kawasaki Plant. "Low CO_2 Kawasaki Brand" is awarded to products and technologies born in Kawasaki that emit less CO_2 than conventional ones throughout their life cycles from procurement of raw materials to disposal and recycling. *VGCF*™, which is an additive to cathodes and anodes of LIBs, forms electrical conducting paths between electrode materials, taking advantage of its particles' long and narrow shape. Through formation of these electrical conducting paths, *VGVF*™ gives LIBs longer life and larger current-carrying capacity per one cycle of charge and discharge. Thus *VGCF*™ reduces frequency of battery replacement, and reduces CO_2 emission throughout the life cycle of an LIB by about 45% from that of an LIB without *VGCF*™. The Showa Denko Group will continue developing products that reduce environmental burden, and contributing to society through its business activities.

- **Established a subsidiary to sell advanced battery materials in China**

  In April 2018, SDK established a wholly owned subsidiary "Showa Denko Battery Materials (Shanghai) Co., Ltd." (SDBM) to sell battery materials, aiming to strengthen its battery materials business in China. The market for lithium-ion batteries (LIBs) is rapidly expanding not only due to the spread of mobile electronic devices including smartphones but also due to the diffusion of on-board use of LIBs for "New Energy Vehicles" (NEVs) following the popularization of environmental awareness in global scale. Especially in China, the national policy to promote NEVs has been boosting production and sales of electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs) for both personal and commercial use. Under these circumstances, many LIB manufacturers are actively conducting capital investment in China. Until establishment of SDBM, SDK had been conducting business activities to sell LIB materials in China through Showa Denko (Shanghai) Co., Ltd., a management company which has been acting as regional headquarters. This time, however, SDK judged that it is necessary for the Showa Denko Group to establish a new company in order to secure quickness in decision making, strengthen relationships with major LIB manufacturers, and gather detailed information under immediate supervision of Advanced Battery Materials Division of the Company, thereby appropriately taking business opportunities in the rapidly growing LIB market in China. From now on, we give the new company a status as the center of our battery materials business in China, and will aim to expand the business further.

Topics

[Inorganics segment]

- **Decided to transfer shares in Indonesia Chemical Alumina to ANTAM**

  SDK reached basic agreement with PT ANTAM Tbk (ANTAM) on the sale of SDK's whole shares in PT. INDONESIA CHEMICAL ALUMINA (ICA) to ANTAM, in which SDK had a 20% stake. SDK resolved at its Board of Directors meeting held on May 29, 2018 to sell the Company's whole shares in ICA to ANTAM. With regard to ICA, SDK had already recorded about ¥10.0 billion as loss on investment to companies under the application of equity method and about ¥6.7 billion as extraordinary losses concerning SDK's suretyship obligation and loans to ICA in SDK's financial results for the first half of 2017.

[Aluminum segment]

- **Showa Aluminum Can completed second production base in Vietnam**

  Showa Aluminum Can Corporation (SAC), a consolidated subsidiary of SDK, completed construction of its subsidiary's new factory to produce aluminum cans in Quang Nam Province, which is in the suburbs of Da Nang City in mid Vietnam, and had a ceremony for the completion of the new factory on June 8, 2018. The new factory is Hanacans Joint Stock Company's second production base in Vietnam, and its production line has annual production capacity of 700 million can bodies. Hanacans, which is a Vietnamese subsidiary of SAC, is now also working to increase the capacity of the lines to produce can ends set at its factory in Bach Nin Province in the suburbs of Hanoi. When this work is finished in the coming October, Hanacans' two factories' total capacity to produce can bodies and can ends will be that for 2 billion cans a year. Since its acquisition of Hanacans in 2014, SAC has been introducing its leading-edge production technologies and quality control system into Hanacans, and successfully increasing Hanacans' sales in Vietnam centering on northern part of the country. SAC will pursue further increase in its aluminum can sales in mid Vietnam through its effort to make Hanacans' new aluminum can factory the one that quickly and timely offers the best quality products in the region which meet needs of the market.

Topics

[Aluminum segment]

- **Strengthened R&D function for aluminum alloy materials**

In February 2018, SDK established a laboratory named “Aluminum Product Evaluation Center” in its Kitakata Plant located in Fukushima Prefecture. Kitakata Plant is SDK’s base to develop and manufacture cast and forged aluminum products. These days, manufacturers of automotive parts are required to realize considerable weight reduction of parts. SDK’s aluminum products including *SHOTIC*™ are acclaimed by car manufacturers for their high strength, high abrasion resistance, and low thermal expansivity. In order to contribute to further weight reduction of cars, we should furthermore improve our aluminum alloy production technology, aiming to realize higher strength. In the new laboratory, we will develop alloys with higher performance. In addition, the Group aims to propose new multi-material products through composition of organic, inorganic, and metal materials by strengthening the Group’s analysis technology, which will be realized by close cooperation among Aluminum Product Evaluation Center, Analysis & Physical Properties Center, and Computational Science and Technology Information Center. Thus the Group will continue striving to give birth to sprouts of new businesses which will contribute to further growth of the Group in the future.

Topics

[Others segment]

- **Decided to additionally expand capacity for producing high-grade SiC epitaxial wafers for power devices**

  In April 2018, SDK expanded its capacity for producing high-quality-grade silicon carbide (SiC) epitaxial wafers for power devices, which had already been marketed under the trade name of "High-Grade Epi" (HGE), from former 3,000 wafers* per month to 5,000 wafers per month, and started production with expanded facilities. In addition to the traditional use as power sources, SiC-based power devices are now replacing conventional silicon-based power devices for on-board use such as inverter modules for railcars, on-board battery chargers and rapid charging stations for EVs, in parallel with rapid expansion of the EV market. SDK's SiC epitaxial wafer "HGE" has been acclaimed by power semiconductor manufacturers for the lowest incidence of crystal defects and the highest homogeneity of wafers in the world. SDK has already started to re-expand its capacity to produce HGE from 5,000 wafers per month to 7,000 wafers per month by this September. Furthermore, in order to respond to the strong demand for HGE caused by rapid expansion of the market for SiC-based power devices, SDK decided in July 2018 to start the third expansion of HGE production lines in the last two years, which is to be finished by February 2019. After this expansion, SDK's capacity to produce HGE will be 9,000 wafers per month. SDK will continue improving the quality of its SiC epitaxial wafer products and supplying them to the rapidly growing SiC power semiconductor market in a timely and stable manner, while securing top-level market share.

  *This number is based on a conversion into SiC epitaxial wafers for power devices having withstanding voltage of 1,200 V.

PROJECT 2020+

