

Evolving unique chemical company

Third Quarter, 2017 Financial Results

- Consolidated -

SHOWA DENKO K.K.

November 14, 2017

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, market conditions, and foreign exchange rates. We undertake no obligation to update the forward-looking statements unless required by law. Performance forecast does not include the effect of the integration of graphite electrode businesses between Showa Denko K.K. and SHOWA DENKO CARBON Holding GmbH (former SGL GE Holding GmbH) conducted on October 2, 2017 nor the goodwill to be recorded pertaining to this business integration, because it takes time to securely grasp business condition and asset evaluation of former SGL GE Holding GmbH.

Consolidated Companies

■ Consolidated subsidiaries: 51

3 companies newly consolidated after the end of 2016

Showa Denko New Material (Zhuhai) Co., Ltd. (Chemicals segment)

Shanghai Showa Highpolymer Trading Co., Ltd. (Chemicals segment)

Showa Chemicals of America Inc. (Chemicals segment)

1 company newly consolidated after the end of June 2017

Showa Chemicals of America Inc. (Chemicals segment)

■ Equity method applied: 12

The same as it was at the end of 2016 and at the end of June 2017

Selected Data

(Average)

	2016		2017		Increase/decrease	
	Jan.-Sept.	Jul.-Sept.	Jan.-Sept.	Jul.-Sept.	Jan.-Sept.	Jul.-Sept.
■ Exchange rate: ¥/US\$	108.7	102.4	111.9	111.0	Yen depreciated by ¥3.2/\$	Yen depreciated by ¥8.6/\$
■ Domestic naphtha price: ¥/KL	32,400	31,300	39,050	36,100	6,650	4,800
■ Aluminum LME price: US\$/T	1,577	1,633	1,933	2,027	356	395
Domestic market*: K¥/T	223	215	271	279	48	63

Exchange rate at December 31, 2016 ¥116.5/US\$, at September 30, 2017 ¥112.7/US\$
⇒ Yen appreciated by ¥3.8/US\$

*Domestic market:
data from Nikkei



Summary

Jan. 1 – Sept. 30, 2016 vs. Jan. 1 – Sept. 30, 2017

(Unit: Billions of Yen)

	Jan.-Sept. 2016	Jan.-Sept. 2017	Increase/ decrease
Net Sales	484.4	563.8	79.4
Operating Income	25.5	55.9	30.5
Non-operating income and expenses, net	-4.8	-13.6	-8.7
Interest/Dividends income and expenses	-1.3	-1.0	0.3
Equity in earnings of affiliates	4.1	-8.5	-12.6
Foreign exchange gains or losses	-5.4	-2.8	2.5
Other	-2.2	-1.3	1.0
Ordinary Income	20.7	42.4	21.7
Extraordinary Profit	1.2	0.4	-0.8
Extraordinary Loss	-7.9	-9.8	-2.0
Income before income taxes	13.9	32.9	19.0
Income taxes	-1.4	-7.9	-6.5
Profit	12.6	25.1	12.5
Net income attributable to non-controlling interests	-1.0	-1.6	-0.6
Net income attributable to owners of the parent	11.5	23.4	11.9

Extraordinary Profit/Loss

(Unit: Billions of Yen)

	Jan.-Sept. 2016	Jan.-Sept. 2017	Increase/ decrease
■ Extraordinary Profit	1.2	0.4	-0.8
● Gain from sales of fixed assets	0.3	0.1	-0.2
● Gain on sales of investment securities	0.1	0.2	0.2
● Gain on bargain purchase	0.7	—	-0.7
● Other	0.1	0.0	-0.1
■ Extraordinary Loss	-7.9	-9.8	-2.0
● Loss on sales and retirement of noncurrent assets	-2.6	-1.6	1.1
● Provision of allowance for doubtful accounts	—	-2.4	-2.4
● Provision for loss on guarantees	—	-3.1	-3.1
● Other	-5.2	-2.7	2.5
■ Extraordinary Profit/Loss, Net	-6.7	-9.4	-2.7

Consolidated Sales by Segment

(Unit: Billions of Yen)

	Jan.-Sept. 2016	Jan.-Sept. 2017	Increase/ decrease	
Petrochemicals	130.1	183.2	53.0	【Olefins】 sales increased (price up due to naphtha price up) 【Organic chemicals】 sales increased (vinyl acetate, ethyl acetate: shipment volumes up, market price up) Consolidation of SunAllomer Ltd. (2H, 2016)
Chemicals	98.8	108.5	9.7	【Basic chemicals】 sales increased (chloroprene rubber: export steady, AN: market price up) 【Electronic chemicals】 sales increased (high purity gases for electronics: shipment volumes up) 【Functional chemicals】 sales increased (shipment volumes for domestic automotive up) 【Industrial gases】 sales slightly decreased
Electronics	86.8	95.3	8.5	【HDs】 sales increased (shipment volumes up) 【Compound semiconductors】, 【Rare earths】 sales increased (shipment volumes up) 【LIB materials】 sales decreased (shipment volumes bound for China down)
Inorganics	37.5	42.6	5.1	【Ceramics】 sales increased (shipment volumes for steel and electronic materials up) 【Graphite electrodes】 sales increased (shipment volumes up, China market price up)
Aluminum	72.5	77.3	4.8	【High-purity foil for capacitors】 sales increased (shipment volumes up) 【Aluminum specialty components】 sales increased (shipment volumes of large-sized aluminum extrusions and aluminum cylinders for LBPs up) 【Aluminum cans】 sales increased (Hanacans Joint Stock Company: shipment volumes up)
Others	92.9	98.1	5.1	【SHOKO Co., Ltd.】 sales increased
Adjustment	-34.3	-41.1	-6.8	
Total	484.4	563.8	79.4	

(note) From 2017 SDK changes the segmentation (LIB materials is transferred from “Others” to “Electronics”) . Figures of 2016 are based on the new segmentation.

Consolidated Operating Income by Segment

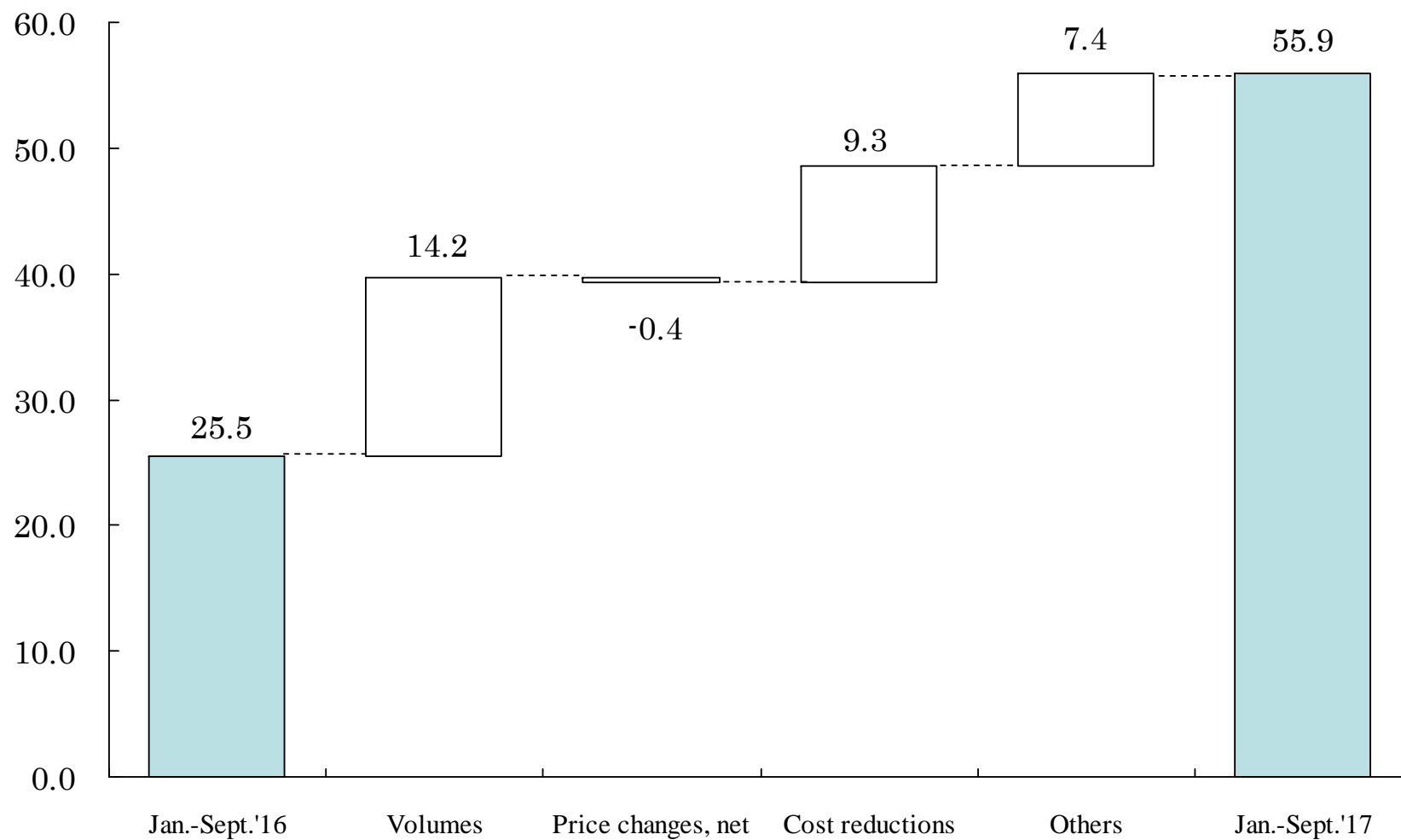
(Unit: Billions of Yen)

	Jan.-Sept. 2016	Jan.-Sept. 2017	Increase/ decrease	
Petrochemicals	13.4	24.1	10.7	【Olefins】 profit significantly increased (continuation of high operation, market price up) 【Organic chemicals】 profit maintained at the year-earlier level Consolidation of SunAllomer Ltd. (2H, 2016)
Chemicals	9.7	11.3	1.6	【Basic chemicals】 profit increased (AN: market price up, chloroprene rubber: export steady, market price up) 【Electronic chemicals】 profit increased (shipment volumes up) 【Industrial gases】 , 【Functional chemicals】 profit slightly decreased 【Power generating business】 profit decreased (fuel price up)
Electronics	9.2	18.4	9.2	【HDs】 profit increased (shipment volumes up, cost reduction) 【Compound semiconductors】 profit increased (shipment volumes up) 【Rare earths】 profit increased (improvement in the loss on reduction in the book value of inventories, shipment volumes up) 【LIB materials】 profit decreased (shipment volumes bound for China down)
Inorganics	-5.0	2.4	7.4	【Ceramics】 profit increased (shipment volumes up) 【Graphite electrodes】 profit significantly increased (high operation and shipment volumes up, renovation of the hydropower facilities, China market price up)
Aluminum	2.8	4.8	2.1	【High-purity foil for capacitors】 profit increased (shipment volumes up) 【Aluminum specialty components】 profit increased (shipment volumes up) 【Aluminum cans】 profit increased (Hanacans Joint Stock Company: shipment volumes up)
Others	0.5	0.4	-0.1	【SHOKO Co., Ltd.】 profit decreased
Adjustment	-5.1	-5.6	-0.4	
Total	25.5	55.9	30.5	

(note) From 2017 SDK changes the segmentation (LIB materials is transferred from “Others” to “Electronics”) . Figures of 2016 are based on the new segmentation.

Operating Income Breakdown by Factor

(Unit: Billions of Yen)





Summary

CQ3 (Jul.1 – Sept.30), 2016 vs. CQ3 (Jul.1 – Sept.30), 2017

(Unit: Billions of Yen)

	CQ3, 2016	CQ3, 2017	Increase/ decrease
Net Sales	165.7	191.6	25.9
Operating Income	13.9	20.9	7.0
Non-operating income and expenses, net	-1.0	-0.8	0.2
Interest/Dividends income and expenses	-0.4	-0.4	0.0
Equity in earnings of affiliates	1.4	0.3	-1.2
Foreign exchange gains or losses	-1.3	0.1	1.4
Other	-0.7	-0.7	0.0
Ordinary Income	12.9	20.1	7.2
Extraordinary Profit	0.7	0.1	-0.6
Extraordinary Loss	-1.8	-0.2	1.6
Income before income taxes	11.8	20.1	8.3
Income taxes	-2.1	-3.7	-1.6
Profit	9.7	16.4	6.7
Net income attributable to non-controlling interests	-0.5	-0.8	-0.3
Net income attributable to owners of the parent	9.2	15.6	6.4



Consolidated Sales by Segment

CQ3 (Jul.1 – Sept.30), 2016 v s. CQ3 (Jul.1 – Sept.30), 2017

(Unit: Billions of Yen)

	CQ3, 2016	CQ3, 2017	Increase/ decrease	
Petrochemicals	44.1	59.2	15.1	【Olefins】 sales increased (naphtha price up) 【Organic chemicals】 sales increased (ethyl acetate, allyl alcohol: shipment volumes up) Consolidation of SunAllomer Ltd. (2H, 2016)
Chemicals	33.9	38.4	4.5	【Basic chemicals】 sales increased (AN: shipment volumes up, market price up) 【Electronic chemicals】 sales increased (shipment volumes up) 【Functional chemicals】 sales slightly increased 【Industrial gases】 sales slightly decreased
Electronics	31.4	32.3	0.9	【HDs】 sales maintained at the year-earlier level 【Compound semiconductors】, 【Rare earths】 sales increased (shipment volumes up) 【LIB materials】 sales slightly decreased
Inorganics	12.6	16.0	3.4	【Ceramics】 sales increased (shipment volumes for electronic materials up) 【Graphite electrodes】 sales increased (shipment volumes up, China market price up)
Aluminum	24.7	26.4	1.7	【High-purity foil for capacitors】 sales increased 【Aluminum specialty components】 sales increased (shipment volumes of large-sized aluminum extrusions and aluminum cylinders for LBPs up) 【Aluminum cans】 sales slightly increased (Japan: shipment volumes slightly down, Hanacans Joint Stock Company: shipment volumes up)
Others	29.9	33.0	3.1	【SHOKO Co., Ltd.】 sales increased
Adjustment	-10.9	-13.8	-2.9	
Total	165.7	191.6	25.9	

(note) From 2017 SDK changes the segmentation (LIB materials is transferred from “Others” to “Electronics”). Figures of 2016 are based on the new segmentation.



Consolidated Operating Income by Segment

CQ3 (Jul.1 – Sept.30), 2016 v s. CQ3 (Jul.1 – Sept.30), 2017

(Unit: Billions of Yen)

	CQ3, 2016	CQ3, 2017	Increase/ decrease	
Petrochemicals	6.0	7.9	1.9	【Olefins】 profit increased (cracked fuel oil: market price up) 【Organic chemicals】 profit decreased (vinyl acetate: shipment volumes down) Consolidation of SunAllomer Ltd. (2H, 2016)
Chemicals	4.3	4.4	0.1	【Basic chemicals】 profit slightly decreased (ammonia: raw materials price up) 【Electronic chemicals】 profit increased (shipment volumes up) 【Functional chemicals】 profit decreased (raw materials price up) 【Industrial gases】 profit slightly decreased 【Power generating business】 profit increased
Electronics	4.4	6.3	1.9	【HDs】 profit increased (effects of cost reduction and exchange rate) 【Compound semiconductors】, 【Rare earths】 profit increased (shipment volumes up) 【LIB materials】 profit slightly decreased
Inorganics	-0.7	2.3	2.9	【Ceramics】 profit slightly increased (shipment volumes for electronic materials up) 【Graphite electrodes】 profit significantly increased (shipment volumes up, cost reduction, China market price up)
Aluminum	1.3	1.6	0.3	【High-purity foil for capacitors】 profit maintained at the year-earlier level 【Aluminum specialty components】 profit increased (shipment volumes of large-sized aluminum extrusions and aluminum cylinders for LBPs up) 【Aluminum cans】 profit maintained at the year-earlier level
Others	0.2	0.4	0.2	【SHOKO Co., Ltd.】 profit slightly increased
Adjustment	-1.7	-2.0	-0.3	
Total	13.9	20.9	7.0	

(note) From 2017 SDK changes the segmentation (LIB materials is transferred from “Others” to “Electronics”). Figures of 2016 are based on the new segmentation.



Consolidated Balance Sheet

(Unit: Billions of Yen)

Assets	Dec. 31, 2016	Sept.30, 2017	Increase/ decrease	Liabilities and Net Assets	Dec. 31, 2016	Sept.30, 2017	Increase/ decrease
Cash and deposits	69.9	89.3	19.4	Notes and accounts payable	104.0	111.4	7.4
Notes and accounts receivable	143.8	151.1	7.3	Interest-bearing debt	359.9	351.0	-8.9
Inventories	91.3	97.0	5.6	Net defined benefit liability	21.9	19.4	-2.5
Other current assets	30.0	36.4	6.4	Other liabilities	135.6	143.6	8.0
<u>Total Current Assets</u>	335.1	373.8	38.7	<u>Total Liabilities</u>	621.5	625.5	4.0
Buildings and structures	77.4	79.4	1.9	Capital stock	140.6	140.6	0
Machinery and equipment	110.2	130.9	20.6	Capital surplus	62.0	61.7	-0.4
Land	242.8	242.7	-0.1	Retained earnings	65.4	84.7	19.3
Other tangible fixed assets	56.7	31.8	-24.9	Treasury stock	-10.5	-10.5	0
<u>Total Tangible Fixed Assets</u>	487.1	484.7	-2.4	<u>Total Shareholders' equity</u>	257.5	276.4	18.9
Intangible Fixed Assets	11.7	11.9	0.2	Valuation difference on available-for-sale securities	4.5	10.2	5.7
Investments and other assets	98.8	94.8	-4.0	Deferred gains or losses on hedges	0.3	3.2	2.9
incl. investment securities	75.0	80.1	5.2	Foreign currency translation adjustment	14.2	13.1	-1.2
				Revaluation reserve for land	31.0	31.0	-0
				Remeasurements of defined benefit plans	-11.0	-10.1	0.9
				<u>Total accumulated other comprehensive income</u>	39.1	47.4	8.3
				Non-controlling interests	14.7	15.8	1.2
<u>Total fixed assets</u>	597.6	591.3	-6.3	<u>Total net assets</u>	311.2	339.7	28.4
Total Assets	932.7	965.1	32.4	Total Liabilities and Net Assets	932.7	965.1	32.4

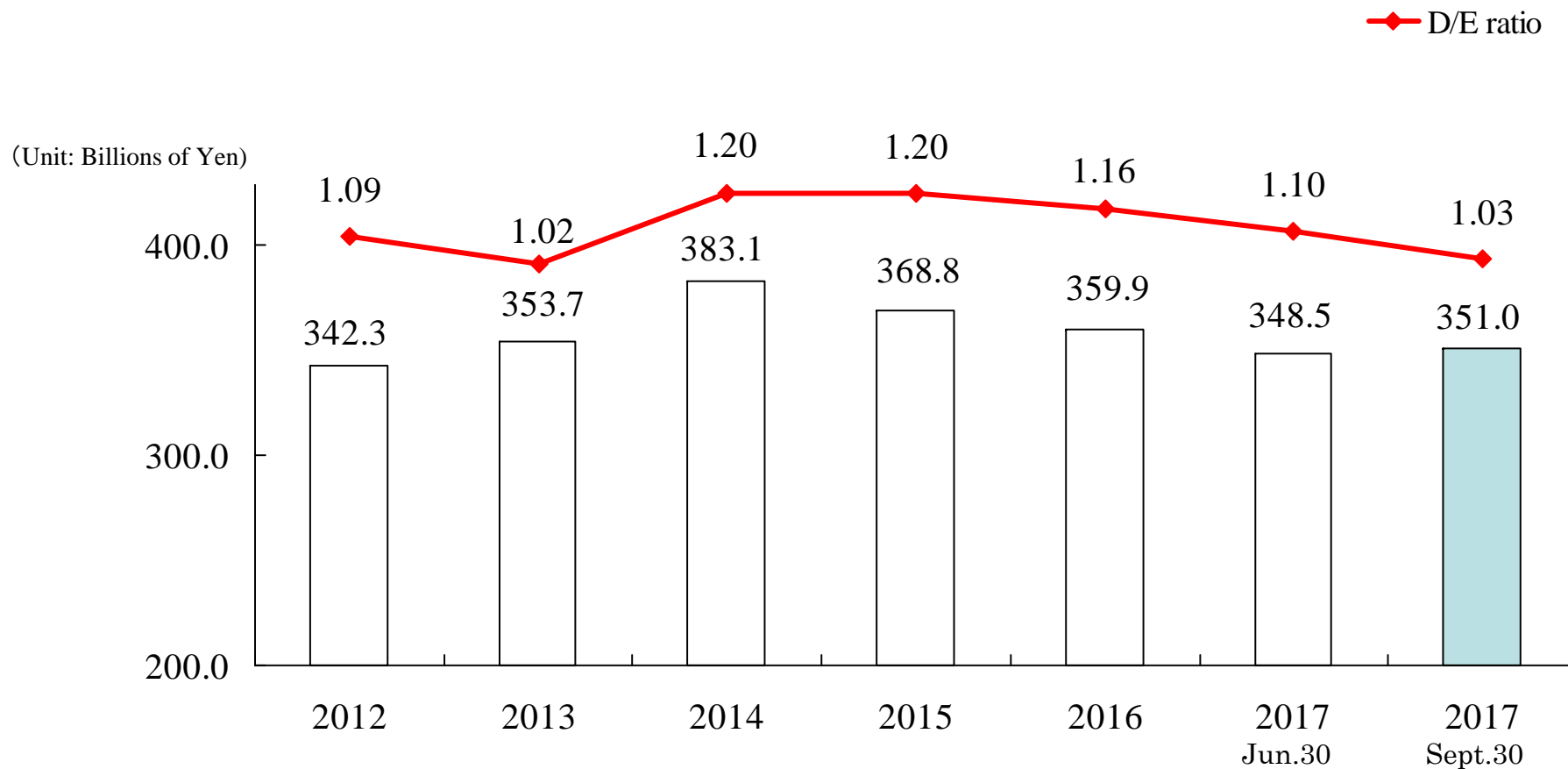
Total Assets

Interest-bearing Debt and D/E ratio

(Unit: Billions of Yen)

	Dec. 31, 2016	Sept. 30, 2017	Increase/ decrease
● Total assets	932.7	965.1	32.4
● Interest-bearing debt	359.9	351.0	-8.9
● Debt/Equity ratio	1.16 times	1.03 times	-0.13p
● Stockholders' Equity ratio	31.8%	33.6%	1.8p

Interest-bearing Debt



Equity ratio	29.2%	30.6%	29.7%	31.5%	31.8%	32.6%	33.6%
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(Reference) **Summary**
 CQ2 (Apr.1 – Jun.30), 2017 vs. CQ3 (Jul.1 – Sept.30), 2017 (Unit: Billions of Yen)

	CQ2, 2017	CQ3, 2017	Increase/ decrease
Net Sales	189.0	191.6	2.6
Operating Income	15.3	20.9	5.6
Non-operating income and expenses, net	-10.8	-0.8	10.0
Interest/Dividends income and expenses	-0.3	-0.4	-0.1
Equity in earnings of affiliates	-10.4	0.3	10.6
Foreign exchange gains or losses	0.1	0.1	-0.1
Other	-0.2	-0.7	-0.5
Ordinary Income	4.5	20.1	15.6
Extraordinary Profit	0.0	0.1	0.1
Extraordinary Loss	-8.0	-0.2	7.8
Income before income taxes	-3.4	20.1	23.5
Income taxes	-2.9	-3.7	-0.8
Profit	-6.3	16.4	22.7
Net income attributable to non-controlling interests	-0.4	-0.8	-0.4
Net income attributable to owners of the parent	-6.7	15.6	22.3



(Reference) Consolidated Sales by Segment

CQ2 (Apr.1 – Jun.30), 2017 vs. CQ3 (Jul.1 – Sept.30), 2017

(Unit: Billions of Yen)

	CQ2, 2017	CQ3, 2017	Increase/ decrease	
Petrochemicals	59.3	59.2	-0.1	【Olefins】 sales slightly decreased 【Organic chemicals】 sales increased (vinyl acetate, ethyl acetate: shipment volumes up) 【SunAllomer Ltd.】 sales maintained at the CQ2 level
Chemicals	36.8	38.4	1.6	【Basic chemicals】 sales decreased (AN: difference of market price, chloroprene rubber: shipment volumes down) 【Electronic chemicals】 sales slightly increased 【Industrial gases】 sales increased (seasonal) 【Functional chemicals】 sales maintained at the CQ2 level
Electronics	33.3	32.3	-1.0	【HDs】 sales slightly decreased 【Compound semiconductors】, 【Rare earths】 sales maintained at the CQ2 level 【LIB materials】 sales slightly decreased (shipment volumes bound for China down)
Inorganics	13.5	16.0	2.5	【Ceramics】 sales maintained at the CQ2 level 【Graphite electrodes】 sales increased (shipment volumes up, China market price up)
Aluminum	27.3	26.4	-0.9	【High-purity foil for capacitors】 sales decreased (shipment volumes down (seasonal)) 【Aluminum specialty components】 sales increased 【Aluminum cans】 sales decreased (Hanacans Joint Stock Company: sales up, Japan: shipment volumes down due to inclement weather)
Others	33.0	33.0	0.0	
Adjustments	-14.2	-13.8	0.4	
Total	189.0	191.6	2.6	

(note) From 2017 SDK changes the segmentation (LIB materials is transferred from “Others” to “Electronics”). Figures of 2016 are based on the new segmentation.



(Reference) Consolidated Operating Income by Segment

CQ2 (Apr.1 – Jun.30), 2017 vs. CQ3 (Jul.1 – Sept.30), 2017

(Unit: Billions of Yen)

	CQ2, 2017	CQ3, 2017	Increase/ decrease	
Petrochemicals	5.6	7.9	2.4	【Olefins】 profit increased (market price steady) 【Organic chemicals】 profit slightly decreased 【SunAllomer Ltd.】 profit increased
Chemicals	3.8	4.4	0.7	【Basic chemicals】 profit decreased (ammonia: raw materials price up, AN: deference of market price, chloroprene rubber: shipment volumes down) 【Electronic chemicals】, 【Functional chemicals】 profit maintained at the CQ2 level 【Industrial gases】 profit increased (seasonal) 【Power generating business】 profit increased (conducted shutdown maintenance in CQ2)
Electronics	6.1	6.3	0.2	【HDs】 profit maintained at the CQ2 level 【Compound semiconductors】, 【Rare earths】 profit slightly increased 【LIB materials】 profit maintained at the CQ2 level
Inorganics	0.2	2.3	2.0	【Ceramics】 profit maintained at the CQ2 level 【Graphite electrodes】 profit increased (shipment volumes up, China market price up)
Aluminum	1.7	1.6	-0.1	【High-purity foil for capacitors】 profit slightly decreased (seasonal) 【Aluminum specialty components】 profit slightly increased 【Aluminum cans】 profit maintained at the CQ2 level
Others	-0.1	0.4	0.5	【SHOKO Co., Ltd.】 profit increased (synthetic resin business steady)
Adjustments	-2.0	-2.0	-0.0	
Total	15.3	20.9	5.6	

(note) From 2017 SDK changes the segmentation (LIB materials is transferred from “Others” to “Electronics”). Figures of 2016 are based on the new segmentation.

(Reference) Quarterly Summary 2017

(Unit: Billions of Yen)

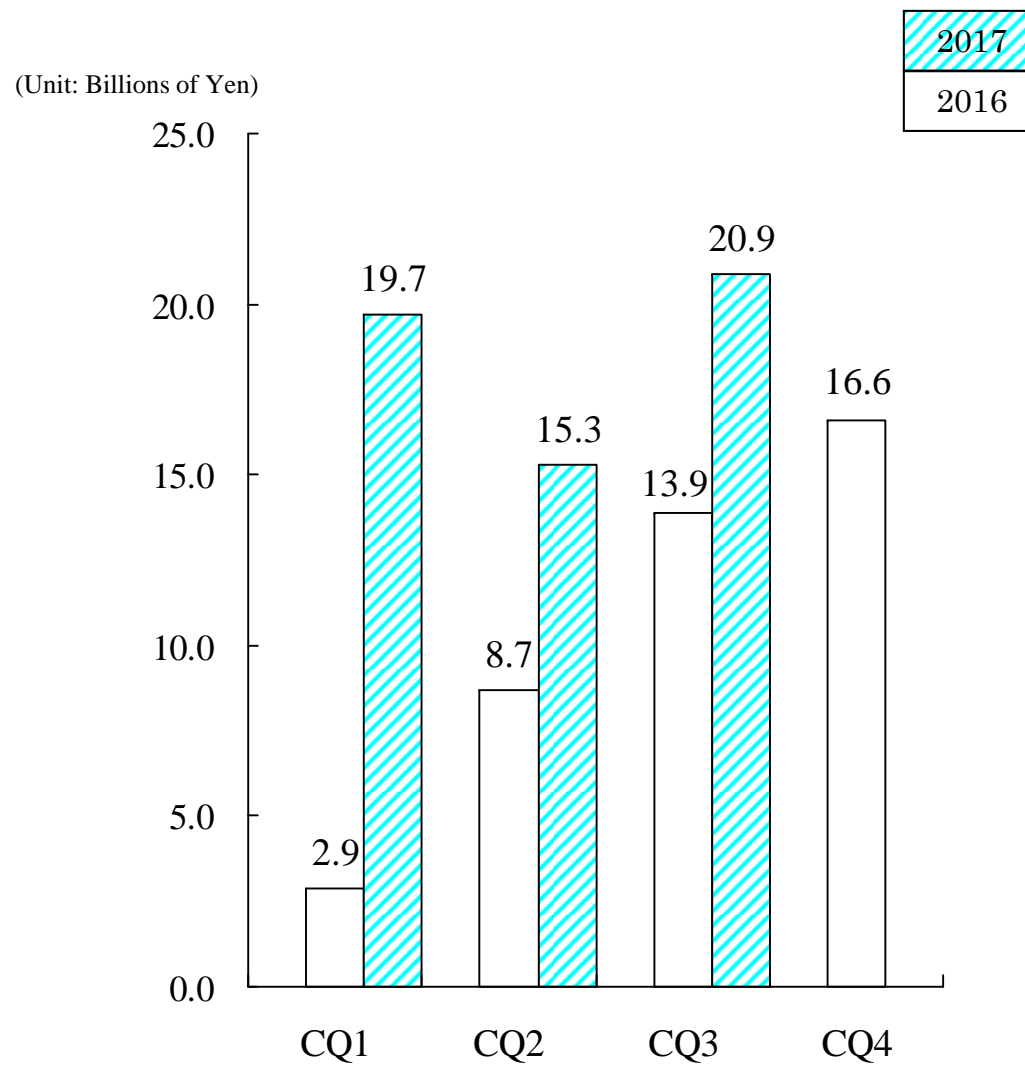
	CQ1, 2017	CQ2, 2017	CQ3, 2017	Jan. – Sept. 2017	2017 Forecast*
Net Sales	183.2	189.0	191.6	563.8	762.0
Operating Income	19.7	15.3	20.9	55.9	60.0
Net income attributable to owners of the parent	14.6	-6.7	15.6	23.4	21.0

*Forecast was revised on July 24, 2017.

The forecast stated above does not include the expected financial results of SHOWA DENKO CARBON Holding GmbH (SDCH), which is to be consolidated in the fourth quarter of 2017. At this point in time, we expect that, in the fourth quarter of 2017, SDCH's net sales will be about ¥10,000 million, and its operating income will be in the small black. On the other hand, SDK will additionally incur cost of the acquisition of SDCH.

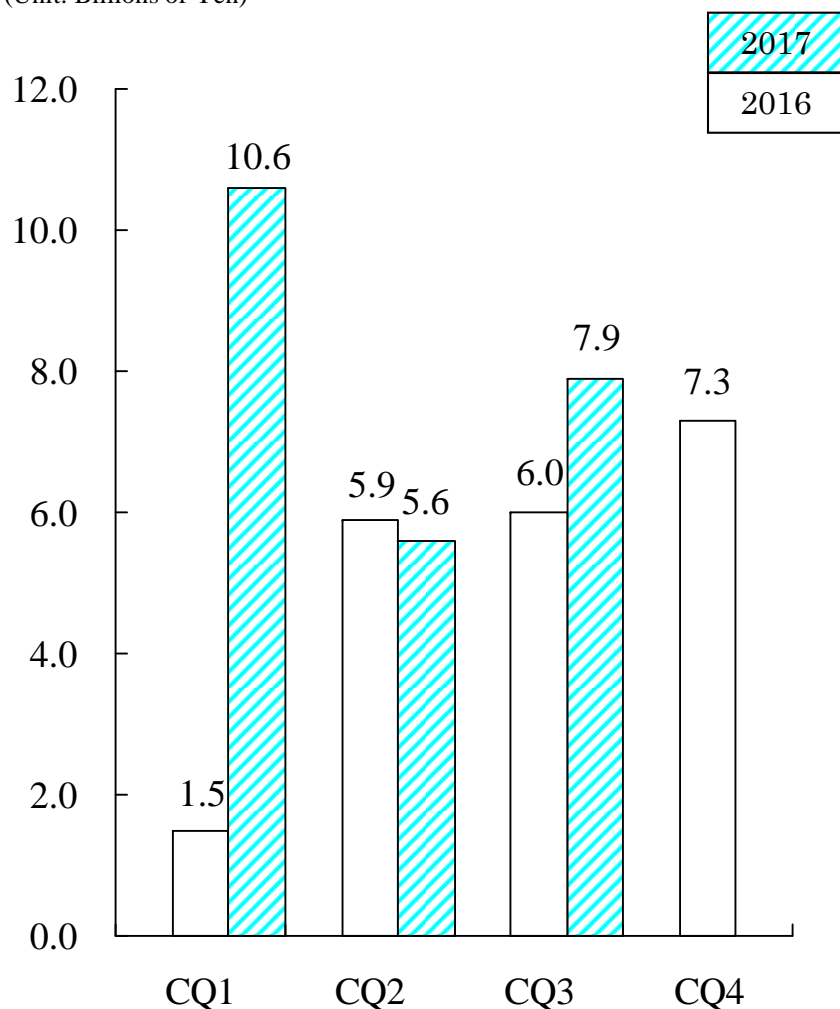
Since our close examination of the value of SDCH's assets and other management indexes is expected to take time, we plan to report the expected influence of the consolidation of SDCH on SDK's net income attributable to owners of the parent and the amount of goodwill resulting from the acquisition of SDCH as soon as they are fixed.

(Reference) Quarterly Operating Income



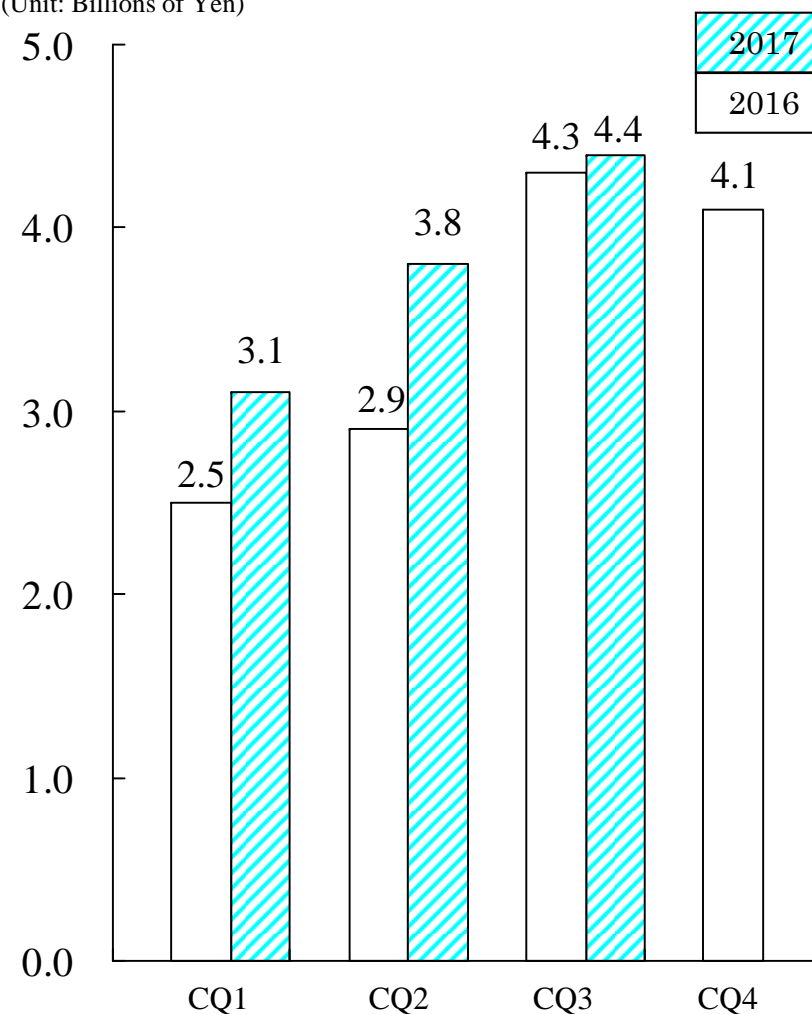
《Petrochemicals》

(Unit: Billions of Yen)



《Chemicals》

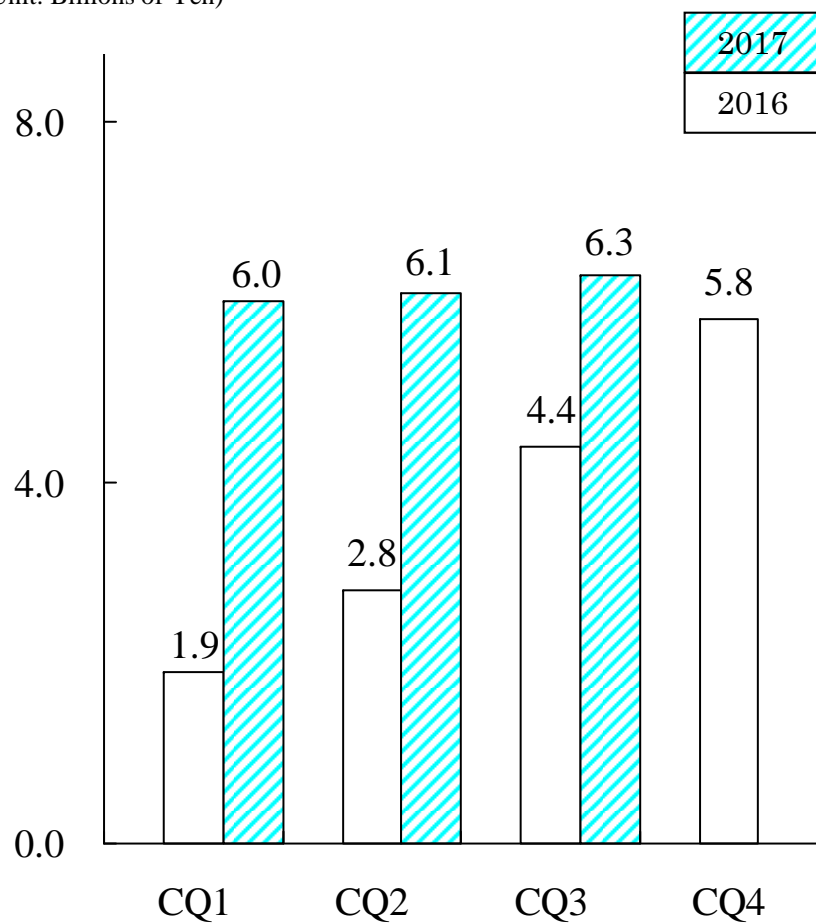
(Unit: Billions of Yen)



(Reference) Quarterly Operating Income by Segment

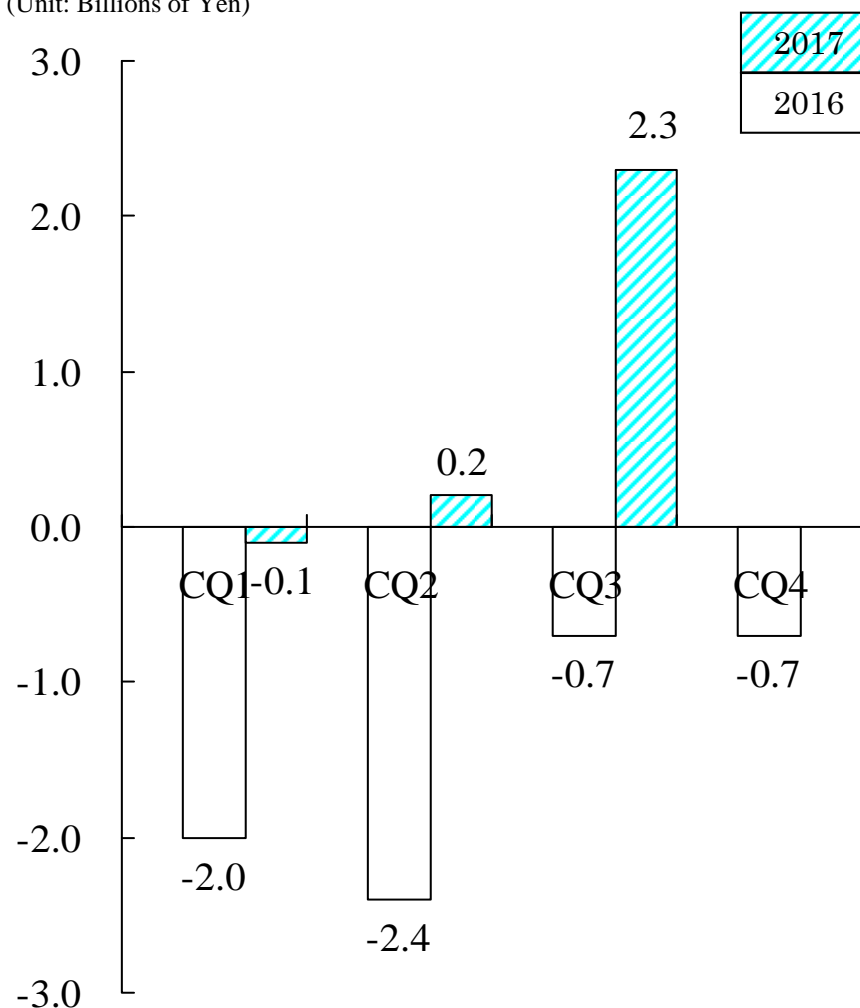
《Electronics》

(Unit: Billions of Yen)



《Inorganics》

(Unit: Billions of Yen)

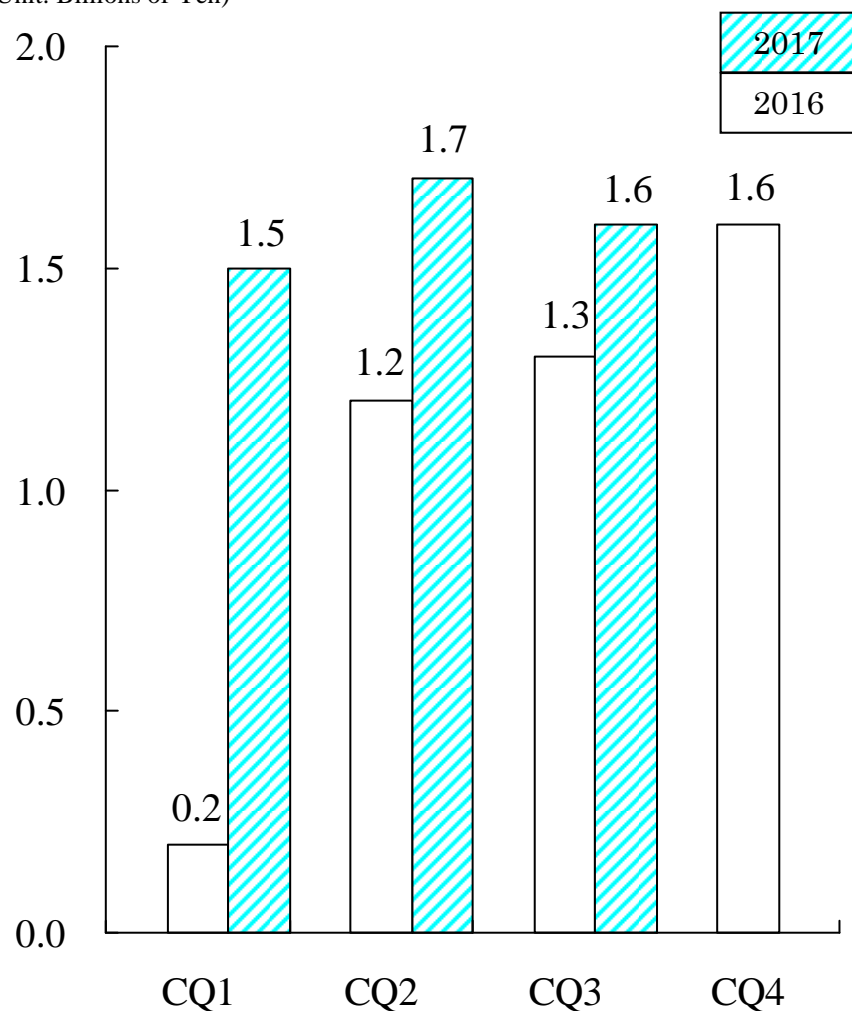


(note) From 2017 SDK changes the segmentation (LIB materials is transferred from "Others" to "Electronics"). Figures of 2016 are based on the new segmentation.

(Reference) Quarterly Operating Income by Segment

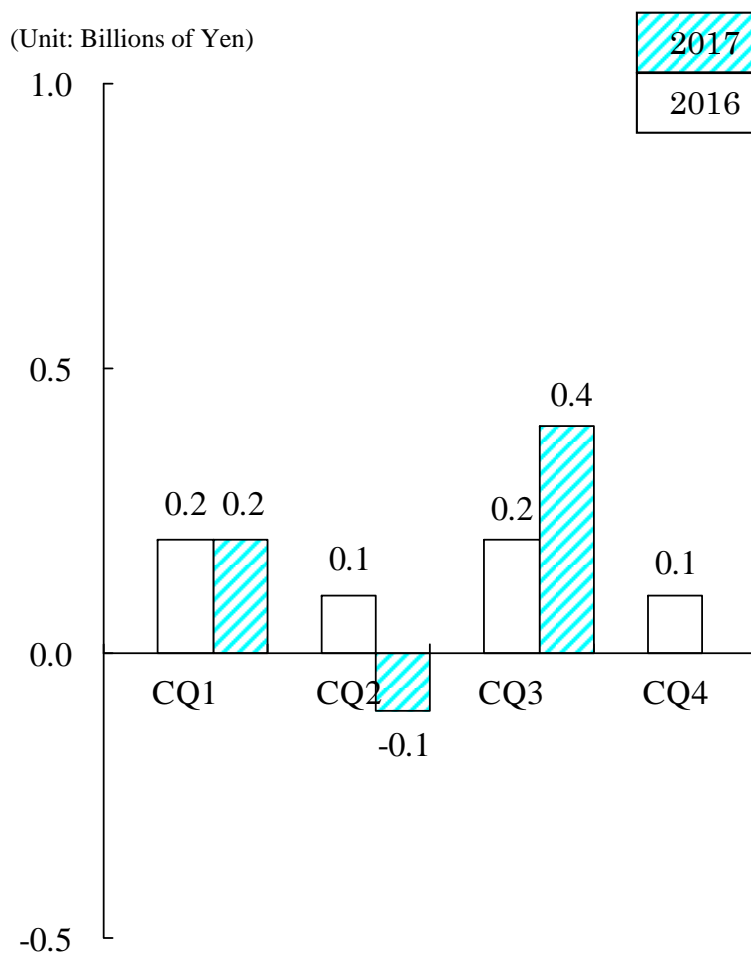
《Aluminum》

(Unit: Billions of Yen)



《Others》

(Unit: Billions of Yen)



(note) From 2017 SDK changes the segmentation (LIB materials is transferred from "Others" to "Electronics"). Figures of 2016 are based on the new segmentation.

Topics

[General]

● Incorporated into ESG indexes for investment

In July 2017, SDK was incorporated into three ESG indexes for investment: “FTSE Blossom Japan Index” provided by FTSE International Limited and Frank Russel Company (FTSE Russell, a member of London Stock Exchange Group); and “MSCI Japan ESG Select Leaders Index” and “MSCI Japan Empowering Women Index” provided by MSCI Incorporated (MSCI). FTSE Russell and MSCI are world-famous index providers, and ESG stands for “environmental, social and governance.” Government Pension Investment Fund (GPIF) of Japan has adopted these three ESG indexes as benchmarks to conduct full-scale ESG conscious investment. 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 environmental, 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 (SRI) Index,” which is provided by Morningstar Japan K.K., for four consecutive years and the “SNAM Sustainability Index,” which is provided by Sompo Japan Nipponkoa Asset Management Co., Ltd., for six consecutive years.

Topics

[Chemicals segment]

- Established a subsidiary to sell high-purity gases for electronics in the U.S.

In July 2017, SDK established a wholly-owned subsidiary, “Showa Chemicals of America Inc.” (SCA), in Austin, Texas, aiming to strengthen its sale of high-purity gases for electronics in the U.S. American semiconductor manufacturers have 15-percent share of the global semiconductor production capacity. SDK established SCA in order to further expand its high-purity gas business in the U.S., strengthen relationship between SDK and major semiconductor manufacturers in the U.S., and gather information about state-of-the-art semiconductor-processing technologies. SCA will start sale of high-purity gases in 2018. SDK sells various high-purity gas products in many areas where manufacturers of semiconductors and display panels are located. SCA will function as the Showa Denko Group’s base in the U.S. to promote marketing, sale and distribution of high-purity gas products.

- Decided to found new liquefied CO₂ gas plant in Oita Petrochemical Complex

In August 2017, Showa Denko Gas Products Co., Ltd. (SGP), a consolidated subsidiary of SDK, decided to found a new plant to produce liquefied carbon dioxide (CO₂) gas in SDK’s Oita Petrochemical Complex. SDK and SGP plan to make the new plant utilize stable CO₂ gas sources in the chemical plant of the Complex. The new plant is scheduled to start operation in August 2018, and will have annual production capacity of 15,000 tons. The supply-demand situation for liquefied CO₂ gas and dry ice is expected to be even tighter in the future. To cope with this problem and maintain stable supply of liquefied CO₂ gas and dry ice to our customers in Kyusyu, Chugoku, and Shikoku regions, SDK and SGP decided to found the new plant.

[Chemicals segment]

● Established fourth bulk molding compound plant in Asia

In September 2017, Showa Denko New Material (Zhuhai) Co., Ltd. (SDNZ), a consolidated subsidiary of SDK, had a ceremony for the completion of its new plant to produce thermosetting bulk molding compound (BMC) in Zhuhai, Guangdong Province, China. The Showa Denko Group formerly had BMC production bases at three locations, namely, in Japan, Shanghai and Thailand. The production base in Shanghai has been supplying BMC to customers mainly in East China, and has been operating at full capacity because sales of BMC in China have been rapidly increasing centering on the application for automobiles and home electrical appliances. The new plant of SDNZ will supply BMC to customers mainly in South China. SDK Group will make its BMC production system, which comprises four production bases located in Japan, Shanghai, Zhuhai and Thailand, ready to be operated at full capacity as soon as possible, and aggressively expand its functional chemicals business especially in China and ASEAN region where rapid growth of the market is expected.

● Started to supply hydrogen made from used plastics to a hydrogen station

In July 2017, SDK started to supply “low-carbon” hydrogen gas made from used plastics (low-carbon hydrogen) at its Kawasaki Plant to TOMOE SHOKAI Co., Ltd.’s Shinsuna Hydrogen Station located in Koto-ku, Tokyo. SDK’s “Demonstration Project to Promote Local Consumption of Locally Produced Low-carbon Hydrogen Gas Made from Used Plastics” had been accredited as an official project under the framework of “FY 2015 Regional Cooperation and Low-carbon Hydrogen Technology Demonstration Project” commissioned by the Ministry of Environment. SDK has been promoting this demonstration project in cooperation with Kawasaki City since July 2015, aiming to realize low-carbon hydrogen based society. In this project, SDK plans to 1) refine hydrogen suitable for use in fuel cell (FC) and fuel cell vehicle (FCV), 2) supply hydrogen gas to a coastal zone (Tonomachi) through a pipeline, and 3) build a regional supply chain model of low-carbon hydrogen through demonstrational use of hydrogen in FCs and FCVs. This time, in cooperation with TOMOE SHOKAI, SDK supplies hydrogen gas to Shinsuna Hydrogen Station owned and operated by TOMOE SHOKAI, and fills the tanks of FCVs with hydrogen. SDK will continue contributing to creation of sustainable society through development of environment-friendly products and production processes.

Topics

[Electronics segment]

● Started shipment of 2.5-inch 1 TB HD media, best in class

In September 2017, SDK started shipment of 2.5-inch HD media with storage capacity of 1 terabyte (TB) per disk, which feature the world's highest storage capacity for this size available on the market at that time*.

SDK's 2.5-inch

1 TB HD media have been adopted into Toshiba Electronic Devices & Storage Corporation's hard disk drive (HDD), "MQ04ABF100," for client. SDK started supplying its 2.5-inch HD media for this application, using the ninth-generation perpendicular magnetic recording (PMR) technology. In 2005, SDK had become the world's first to manufacture and sell PMR-technology-based HD media. As the world's largest independent HD media supplier with a market share of about 25%, SDK will continue to strengthen its HD media business in accordance with the company's motto of "Best in Class."

*As of September 25, 2017, according to our research.

[Electronics segment]

● Expanded lineup of infrared LEDs for high-output uses

In August 2017, SDK expanded its product lineup of infrared LED chips (IR-LEDs), which are mainly used as parts of photo-couplers for gate drivers in power semiconductor modules and parts of sensors for IoT-related devices. SDK's product lineup of IR-LEDs has three categories, namely, conventional LEDs made with Liquid Phase Epitaxy (LPE) method*¹, transparent type LEDs and reflection type LEDs made with Metal Organic Chemical Vapor Deposition (MOCVD) method*². This time, SDK upgraded its technology to manufacture reflection type LEDs, and successfully added "Double Junction Reflection Type LED" and "P-up Reflection Type LED*³" to its product lineup of IR-LEDs. Double Junction Reflection Type LED realizes output nearly twice as much as that of conventional reflection type LED. It is suitable for uses that require high output LEDs such as biometric sensors, surveillance or security cameras, virtual reality, and sensors for automotive equipment. P-up Reflection Type LED is a product which realizes the P-up polarity structure in Reflection Type LED, where N-up structure manufactured through LPE method is the main stream. SDK developed this P-up Reflection Type LED in order to respond to the requests from customers who desire to develop high-power modules which are compatible with circuit designs for conventional P-up non-reflection type LEDs, which are manufactured through LPE method. The market for IR-LEDs is expected to expand concurrently with the expansion of IoT-related device market. SDK will continue to expand its lineup of LED products, and respond to the needs of the market.

*1 LPE method: Liquid Phase Epitaxy method. Under this crystal growth method, solid phase crystal crystalizes and grows on a substrate dipped into the solution of the target material. Due to the rapid growth of crystal, this method easily realizes thick film.

*2 MOCVD method: Metal Organic Chemical Vapor Deposition method. Under this crystal growth method, an organometallic compound is vaporized, and crystal of the target material grows on a substrate in the gas. Through proper control of the flow of the gas containing vaporized organometallic compound, you can form homogenous thin crystal efficiently.

*3 P-up: An LED chip consists of P-side electrode and N-side electrode. "P-up" indicates an LED chip with P-side electrode on the top.

Topics

[Inorganics segment]

- Completed acquisition of all shares in SGL GE, a graphite electrode production company

By late September 2017, SDK obtained approval from all required competition authorities for its acquisition of all shares in SGL GE Holding GmbH (SGL GE), a graphite electrode production company, from its parent company, SGL Carbon GmbH, which is a wholly owned subsidiary of SGL Carbon SE, a world carbon and graphite product manufacturer based in Germany. Effective on October 2, 2017, SDK completed acquisition of all shares in SGL GE and made it a wholly owned subsidiary of SDK. The acquired company's name was changed to "SHOWA DENKO CARBON Holding GmbH" as of the same date. Through acquisition of full ownership of former SGL GE, SDK now has graphite electrode production bases in Europe and Southeast Asia, in addition to its existing bases in Japan, the U.S. and China, and becomes the leading supplier in the global graphite electrode industry. SDK will strive to generate synergy as early as possible, pursue more cost effectiveness, enhance business durability, and achieve further growth in a highly competitive market. On the other hand, effective on November 7, 2017, SDK completed transfer of former SGL GE's graphite electrode business in the U.S. to Tokai Carbon Co., Ltd. as SDK previously decided in its board meeting held on September 27, 2017. This transfer was implemented in order to make the acquisition of former SGL GE in line with the condition given by the U.S. competition authorities as a prerequisite to give approval to the acquisition.

Topics

[Aluminum segment]

● New aluminum can JV has a foundation stone-laying ceremony in Thailand

SDK, Showa Aluminum Can Corporation (SAC), which is a consolidated subsidiary of SDK, and Carabao Group Public Company Limited (CBG), which is a leading beverage maker headquartered in Bangkok, Thailand, established a joint corporation “Asia Pacific Can Company Limited” (APC) to manufacture and sell aluminum cans in June 2017, and had a foundation stone-laying ceremony for its factory in July, 2017. After the start-up of operations of the factory which is scheduled for October 2018, APC will mainly manufacture aluminum cans for CBG’s beverages for export from Thailand. CBG aims to expand its overseas sales, centering on Southeast Asian countries, China and the United Kingdom. APC will support CBG’s overseas operations through stable supply of high-quality aluminum cans manufactured by leading-edge technologies and quality management system built up by SAC over many years. APC will be the Showa Denko Group’s second overseas can production base following Hanacans Joint Stock Company of Vietnam. The Showa Denko Group has been promoting aluminum can business expansion strategy that targets Southeast Asia, and will utilize APC’s business development for the formation of its best marketing mix in Southeast Asia.

[Others segment]

● Decided to expand capacity for producing high-grade SiC epitaxial wafers

In September 2017, SDK decided to expand 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). SDK will expand its facilities to produce HGE to increase their production capacity from current 3,000 wafers per month to 5,000 wafers per month*¹. In HGE developed by SDK, the number of surface defects and basal plane dislocation (BPD)*², which is typical crystal defect, is controlled to be within 0.1/cm². Since the launch in October 2015, HGE has been acclaimed by many device manufacturers at home and abroad, and adopted as a key component to produce SiC-MOSFET for practical use. SDK decided to expand its capacity to produce HGE because SDK’s facilities to produce HGE are operating at full capacity these days and we expect that the market for SiC-MOSFET will start to take-off in and after 2018. The size of the market for SiC epitaxial wafers for power devices is expected to reach ¥20 billion in 2020*³ as the early use of SiC power devices in vehicles is under consideration. SDK will continue meeting the need of the market for high-quality SiC epitaxial wafers, aiming to contribute to the improvement in energy efficiency of power devices.

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

*2 Basal plane dislocation: Dislocation that occurs on a basal plane of a single crystal SiC.

*3 Estimated by SDK.

Topics

[Others segment]

- Decided to acquire assets concerning SiC for power devices from Nippon Steel & Sumitomo Metal Group

SDK has decided to acquire assets concerning Sublimation-recrystallization Method to manufacture silicon carbide (SiC) wafers from Nippon Steel & Sumitomo Metal Corporation and Nippon Steel & Sumikin Materials Co., Ltd. by around the end of January 2018. Development of full-SiC-based power modules including MOSFET requires SiC wafers with fewer crystal defects and further cost reduction. This time, SDK aims to improve the quality of its SiC epitaxial wafers through the acquisition of SiC-wafer-related assets currently owned by Nippon Steel & Sumitomo Metal Group.