PROJECT 2020+

Evolving unique chemical company

Third Quarter, 2016 Financial Results
- Consolidated -

SHOWA DENKO K.K.

November 1, 2016

Saburo Muto, CFO
Director & Managing 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.

Consolidated Companies

- Consolidated subsidiaries: 49

  2 companies newly consolidated and 1 company excluded, compared with the end of 2015
  Newly consolidated: Shoko Highpolymer Co., Ltd., SunAllomer Ltd.
  Excluded: Japan Ethyl Acetate Co., Ltd. (Completion of liquidation)

  1 company newly consolidated after the end of June
  SunAllomer Ltd.

- Equity method applied: 12

  1 company excluded compared with the end of 2015, after the end of June
  SunAllomer Ltd.

Selected Data

(Average)

	2015		2016		Increase/decrease	
	Jan.-Sept.	Jul.-Sept.	Jan.-Sept.	Jul.-Sept.	Jan.-Sept.	Jul.-Sept.
■Exchange rate: ¥/US$	120.9	122.2	108.7	102.4	Yen appreciated by ¥12.2/$	Yen appreciated by ¥19.8/$
■Domestic naphtha price: ¥/KL	47,700	47,200	32,400	31,300	-15,300	-15,900
■Aluminum						
LME price: US$/T	1,741	1,618	1,577	1,633	-164	15
Domestic market*: K¥/T	286	250	223	215	-63	-35

Exchange rate at the end of December, 2015 ¥120.6/US$, at the end of September, 2016 ¥101.1/US$
⇒Yen appreciated by ¥19.5/US$

*Domestic market: data from Nikkei

Summary

Jan. 1 – Sept. 30, 2015 vs. Jan. 1 – Sept. 30, 2016

(Unit: Billions of Yen)

	Jan.-Sept. 2015	Jan.-Sept. 2016	Increase/ decrease
Net Sales	594.1	488.9	-105.2
Operating Income	25.5	25.4	-0.1
Non-operating income and expenses, net	0.5	-4.8	-5.3
Interest/Dividends income and expenses	-1.5	-1.3	0.1
Equity in earnings of affiliates	2.2	4.1	2.0
Foreign exchange gains or losses	0.0	-5.4	-5.4
Other	-0.2	-2.2	-2.0
Ordinary Income	26.0	20.6	-5.3
Extraordinary Profit	2.1	1.2	-0.9
Extraordinary Loss	-18.9	-7.9	11.0
Income before income taxes	9.1	13.9	4.8
Income taxes	-12.1	-1.4	10.7
Profit	-2.9	12.5	15.4
Profit attributable to non-controlling interests	7.1	-1.0	-8.1
Profit attributable to owners of parent	4.2	11.5	7.3

Extraordinary Profit/Loss

(Unit: Billions of Yen)

	Jan.-Sept. 2015	Jan.-Sept. 2016	Increase/ decrease
■Extraordinary Profit	2.1	1.2	-0.9
●Gain from sales of fixed assets	0.2	0.3	0.1
●Gain on sales of investment securities	1.7	0.1	-1.7
●Gain on bargain purchase	—	0.7	0.7
●Other	0.2	0.1	-0.1
■Extraordinary Loss	-18.9	-7.9	11.0
●Loss on sales and retirement of noncurrent assets	-2.4	-2.6	-0.2
●Impairment loss	-0.5	-1.8	-1.3
●Provision of allowance for doubtful accounts	-12.9	—	12.9
●Other	-3.1	-3.5	-0.4
■Extraordinary Profit/Loss, Net	-16.8	-6.7	10.1

Consolidated Sales by Segment

(Unit: Billions of Yen)

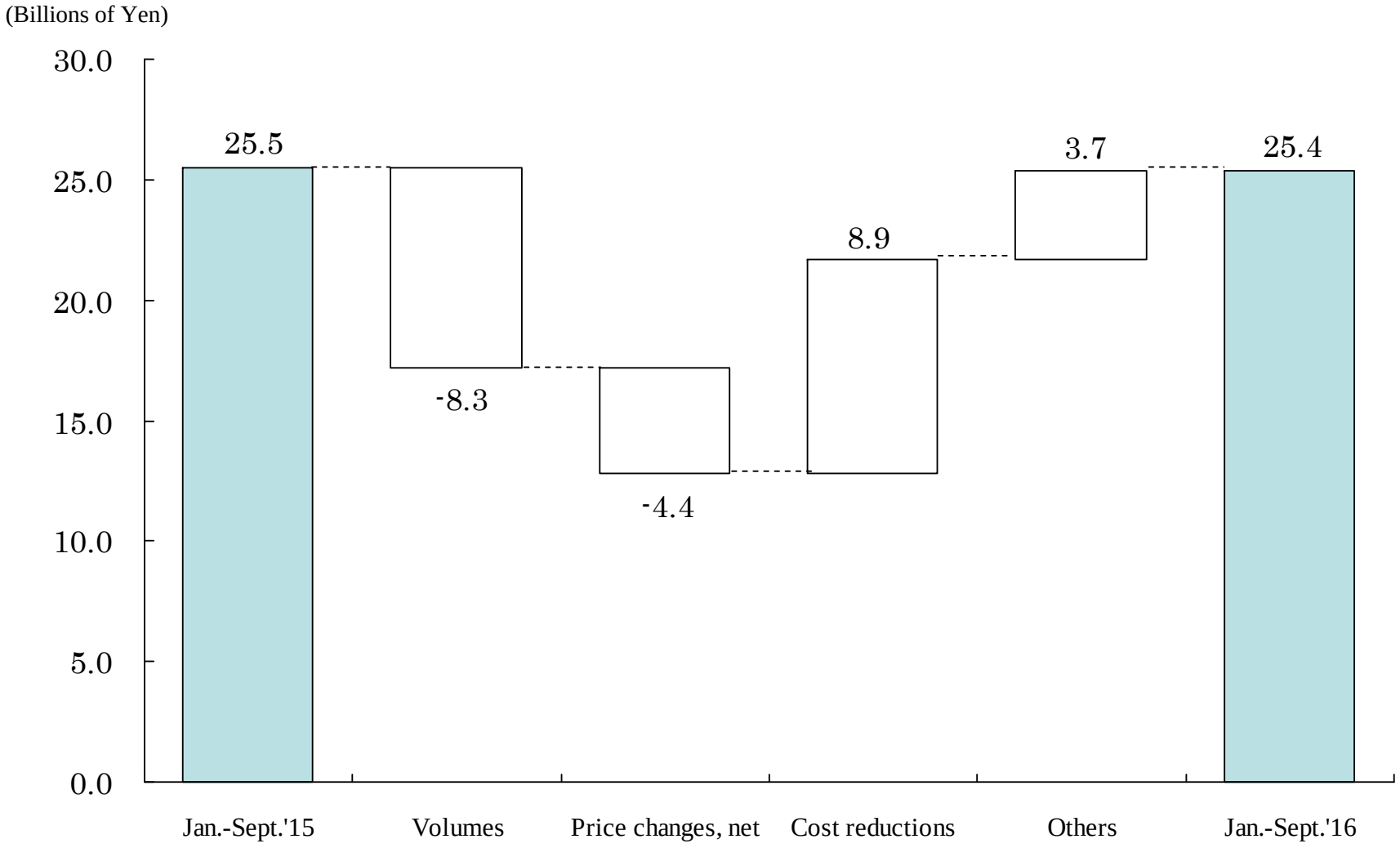
	Jan.-Sept. 2015	Jan.-Sept. 2016	Increase/ decrease	
Petrochemicals	178.6	130.1	-48.5	【Olefins】sales decreased (naphtha price down, shipment volumes slightly down due to shutdown maintenance of derivative plants) 【Organic chemicals】sales decreased (vinyl acetate, ethyl acetate: price down)
Chemicals	106.7	98.8	-7.9	【Basic chemicals】sales decreased (AN: market price down) 【Electronic chemicals】sales slightly decreased (steady but yen appreciated) 【Functional chemicals】sales decreased (transferred phenolic resin business) 【Industrial gases】sales slightly increased
Electronics	98.5	74.1	-24.4	【HDs】sales decreased (shipment volumes down, yen appreciated) 【Compound semiconductors】【Rare earths】sales decreased
Inorganics	49.3	37.5	-11.8	【Ceramics】sales decreased (shipment volumes of alumina down) 【Graphite electrodes】sales decreased (market price down, shipment volumes maintained at the year-before period level)
Aluminum	75.9	72.5	-3.4	【High-purity foil for capacitors】sales increased (shipment volumes of Showa Denko Aluminum (Nantong) Co., Ltd. up) 【Aluminum specialty components】sales decreased (shipment volumes for automotive applications down) 【Aluminum cans】sales increased (Hanacans Joint Stock Company: shipment volumes up)
Others	115.7	107.6	-8.2	【LIB materials】sales increased (shipment volumes up for smartphone and automotive applications) 【SHOKO Co., Ltd.】sales decreased
Adjustments	-30.6	-31.7	-1.1	
Total	594.1	488.9	-105.2	

Consolidated Operating Income by Segment

(Unit: Billions of Yen)

	Jan.-Sept. 2015	Jan.-Sept. 2016	Increase/ decrease	
Petrochemicals	8.6	13.4	4.7	【Olefins】profit increased (continued high operation, raw naphtha price down) 【Organic chemicals】profit increased (vinyl acetate, ethyl acetate: prices of raw materials down)
Chemicals	7.6	9.7	2.2	【Basic chemicals】profit increased (ammonia: shipment volumes up, raw materials prices down, the ratio of recycled plastics among raw materials increased) 【Electronic chemicals】profit decreased 【Functional chemicals】profit increased 【Industrial gases】profit increased (liquefied carbon dioxide, dry ice shipments steady) 【Power generating business】profit increased
Electronics	12.1	8.3	-3.7	【HDs】profit decreased (shipment volumes down) 【Compound semiconductors】profit decreased (shipment volumes down) 【Rare earths】profit increased (loss on reduction in the book value of inventories decreased)
Inorganics	0.7	-5.0	-5.7	【Ceramics】profit decreased (shipment volumes of alumina down) 【Graphite electrodes】profit decreased (market price down, renovation of the hydropower facilities)
Aluminum	2.5	2.8	0.3	【High-purity foil for capacitors】profit increased (shipment volumes up) 【Aluminum specialty components】profit decreased (shipment volumes for automotive applications down) 【Aluminum cans】profit increased (Hanacans Joint Stock Company: shipment volumes up)
Others	0.0	1.4	1.4	【LIB materials】profit increased (shipment volumes up)
Adjustments	-5.9	-5.2	0.7	
Total	25.5	25.4	-0.1	

Operating Income Breakdown by Factor



Summary

CQ3 (Jul.1 – Sept.30), 2015 vs. CQ3 (Jul.1 – Sept.30), 2016

(Unit: Billions of Yen)

	Jul.-Sept. 2015	Jul.-Sept. 2016	Increase/ decrease
Net Sales	197.1	167.3	-29.8
Operating Income	9.4	13.9	4.5
Non-operating income and expenses, net	1.1	-0.3	-1.3
Interest/Dividends income and expenses	-0.7	-0.4	0.3
Equity in earnings of affiliates	1.1	2.3	1.2
Foreign exchange gains or losses	1.0	-1.4	-2.4
Other	-0.3	-0.7	-0.4
Ordinary Income	10.5	13.6	3.2
Extraordinary Profit	0.2	0.7	0.5
Extraordinary Loss	-1.4	-1.8	-0.4
Income before income taxes	9.3	12.5	3.2
Income taxes	-6.8	-2.1	4.7
Profit	2.5	10.4	7.9
Profit attributable to non-controlling interests	0.5	-0.5	-0.9
Profit attributable to owners of parent	2.9	9.9	7.0

Consolidated Sales by Segment

CQ3 (Jul.1 – Sept.30), 2015 v s. CQ3 (Jul.1 – Sept.30), 2016

(Unit: Billions of Yen)

	Jul.-Sept. 2015	Jul.-Sept. 2016	Increase/ decrease	
Petrochemicals	57.4	44.1	-13.3	【Olefins】sales decreased (raw naphtha price down) 【Organic chemicals】sales maintained at the year-earlier level (vinyl acetate: sales up (shipment volumes up), ethyl acetate: sales down (market price down)
Chemicals	36.4	33.9	-2.6	【Basic chemicals】sales decreased (AN, etc.) 【Electronic chemicals】sales slightly decreased (yen appreciated) 【Functional chemicals】sales decreased (transferred phenolic resin business) 【Industrial gases】sales maintained at the year-before period level
Electronics	33.5	27.2	-6.3	【HDs】sales decreased (shipment volumes maintained at the year-before period level, yen appreciated) 【Compound semiconductors】sales decreased (shipment volumes down) 【Rare earths】sales maintained at the year-before period level
Inorganics	16.2	12.6	-3.6	【Ceramics】sales decreased (shipment volumes of alumina down) 【Graphite electrodes】sales decreased (market price down)
Aluminum	25.9	24.7	-1.2	【High-purity foil for capacitors】sales maintained at the year-before period level 【Aluminum specialty components】sales decreased (shipment volumes down) 【Aluminum cans】sales slightly increased (shipment volumes up)
Others	36.3	34.7	-1.6	【LIB materials】sales decreased 【SHOKO Co., Ltd.】sales decreased (synthetic resin, etc.)
Adjustments	-8.6	-9.9	-1.3	
Total	197.1	167.3	-29.8	

Consolidated Operating Income by Segment

CQ3 (Jul.1 – Sept.30), 2015 v s. CQ3 (Jul.1 – Sept.30), 2016

(Unit: Billions of Yen)

	Jul.-Sept. 2015	Jul.-Sept. 2016	Increase/ decrease	
Petrochemicals	2.7	6.0	3.3	【Olefins】profit increased (market price steady, raw naphtha price down) 【Organic chemicals】profit increased (vinyl acetate: shipment volumes up, ethyl acetate: price of raw materials down)
Chemicals	3.3	4.3	1.0	【Basic chemicals】profit increased (ammonia: shipment volumes up, raw materials prices down, the ratio of recycled plastics among raw materials increased) 【Electronic chemicals】profit decreased 【Functional chemicals】profit increased 【Industrial gases】profit increased (shipment volumes of carbon dioxide, dry ice up) 【Power generating business】profit maintained at the year-before period level
Electronics	4.0	4.3	0.2	【HDs】profit increased (streamlined production capacity, cost reduction) 【Compound semiconductors】profit decreased (shipment volumes down) 【Rare earths】profit maintained at the year-before period level
Inorganics	0.7	-0.7	-1.4	【Ceramics】profit decreased (shipment volumes of alumina down) 【Graphite electrodes】profit decreased (market price down)
Aluminum	1.1	1.3	0.2	【High-purity foil for capacitors】profit increased (shipment volumes up) 【Aluminum specialty components】【Aluminum cans】profit maintained the year-before period level
Others	-0.2	0.4	0.6	【LIB materials】profit slightly decreased 【SHOKO Co., Ltd.】profit increased
Adjustments	-2.1	-1.7	0.5	
Total	9.4	13.9	4.5	

Consolidated Balance Sheet

(Unit: Billions of Yen)

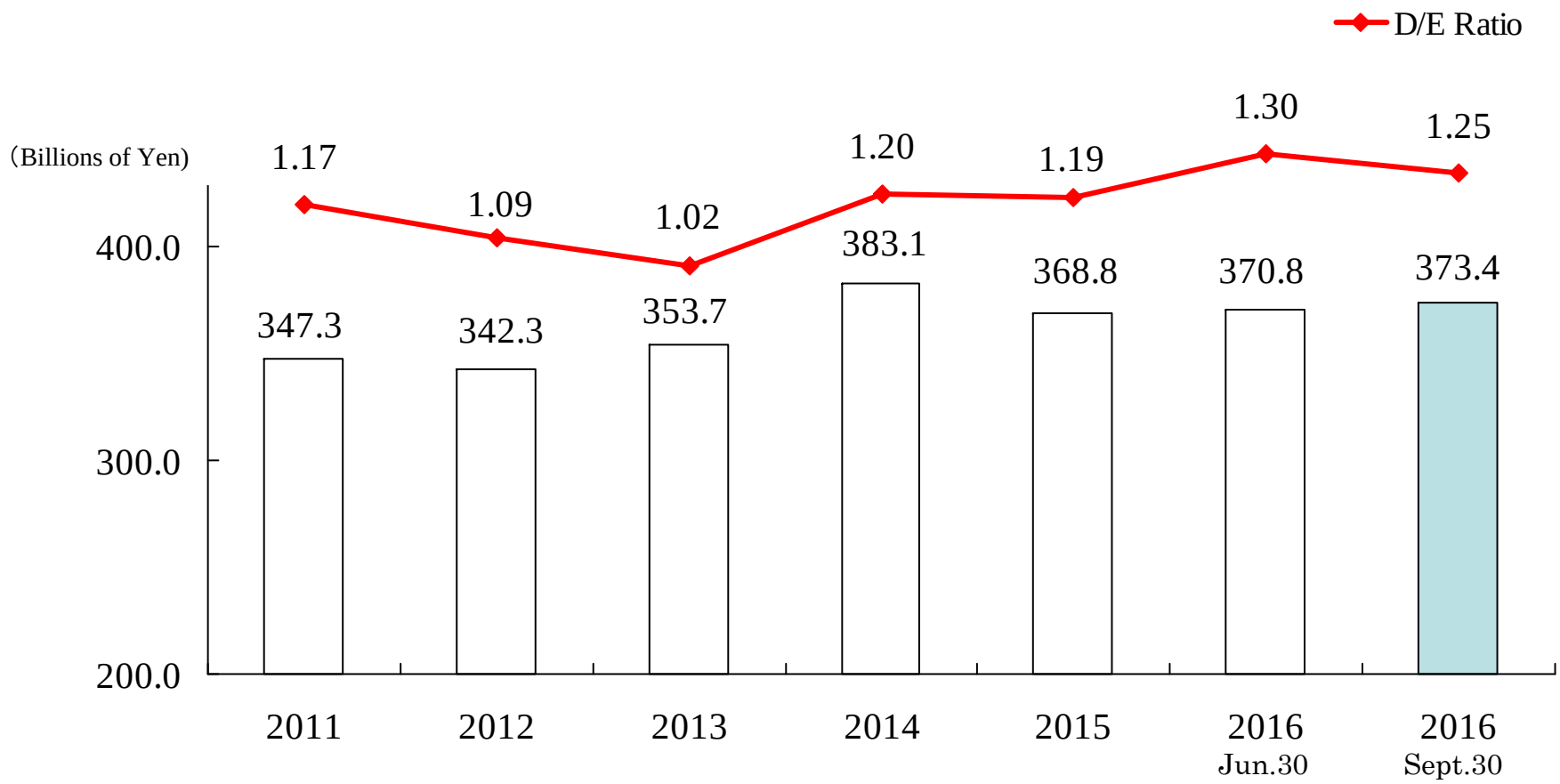
Assets	Dec.31, 2015	Sept. 30, 2016	Increase/ decrease	Liabilities and Net Assets	Dec.31, 2015	Sept. 30, 2016	Increase/ decrease
Cash and deposits	64.1	57.5	-6.5	Notes and accounts payable	103.9	88.9	-15.0
Notes and accounts receivable	136.6	124.8	-11.8	Interest-bearing debt	368.8	373.4	4.5
Inventories	105.9	96.4	-9.5	Net defined benefit liability	15.2	12.2	-3.0
Other current assets	26.5	28.4	2.0	Other liabilities	143.6	125.3	-18.3
Total Current Assets	333.1	307.1	-25.9	Total Liabilities	631.5	599.8	-31.7
Buildings and structures	81.5	78.1	-3.4	Capital stock	140.6	140.6	0.0
Machinery and equipment	112.9	111.2	-1.8	Capital surplus	62.2	62.0	-0.2
Land	251.9	251.5	-0.3	Retained earnings	55.8	63.2	7.4
Other tangible fixed assets	55.0	49.1	-5.9	Treasury stock	-10.2	-10.5	-0.3
Total Tangible Fixed Assets	501.3	489.9	-11.4	Total Shareholders' equity	248.4	255.3	6.9
Intangible Fixed Assets	12.5	11.4	-1.1	Valuation difference on available-for-sale securities	3.9	1.2	-2.8
Investments and other assets	94.4	89.3	-5.1	Deferred gains or losses on hedges	-0.3	-1.3	-1.0
incl. investment securities	76.6	68.3	-8.3	Foreign currency translation adjustment	18.6	-0.3	-19.0
				Revaluation reserve for land	31.3	32.9	1.6
				Remeasurements of defined benefit plans	-4.8	-3.9	1.0
				Total accumulated other comprehensive income	48.7	28.5	-20.1
				Non-controlling interests	12.6	14.1	1.5
Total fixed assets	608.2	590.6	-17.6	Total net assets	309.8	298.0	-11.8
Total Assets	**941.3**	**897.8**	**-43.5**	**Total Liabilities and Net Assets**	**941.3**	**897.8**	**-43.5**

Total Assets
Interest-bearing Debt and D/E ratio

(Billions of Yen)

	Dec.31, 2015	Sept.30, 2016	Increase/ decrease
● **Total assets**	941.3	897.8	-43.5
● **Interest-bearing debt**	368.8	373.4	4.5
● **Debt/Equity ratio**	1.19 times	1.25 times	0.06p
● **Stockholders' Equity ratio**	31.6%	31.6%	—

Interest-bearing Debt



Equity ratio	26.8%	29.2%	30.6%	29.7%	31.6%	30.6%	31.6%

(Reference) Summary

CQ2 (Apr.1 – Jun.30), 2016 vs. CQ3 (Jul.1 – Sept.30), 2016

(Unit: Billions of Yen)

	Apr.-Jun. 2016	Jul.-Sept. 2016	Increase/ decrease
Net Sales	164.1	167.3	3.1
Operating Income	8.7	13.9	5.2
Non-operating income and expenses, net	-3.1	-0.3	2.8
Interest/Dividends income and expenses	-0.4	-0.4	0.0
Equity in earnings of affiliates	0.6	2.3	1.7
Foreign exchange gains or losses	-2.2	-1.4	0.7
Other	-1.1	-0.7	0.4
Ordinary Income	5.6	13.6	8.0
Extraordinary Profit	0.5	0.7	0.2
Extraordinary Loss	-4.5	-1.8	2.7
Income before income taxes	1.6	12.5	10.9
Income taxes	-0.4	-2.1	-1.8
Profit	1.2	10.4	9.2
Profit attributable to non-controlling interests	-0.2	-0.5	-0.2
Profit attributable to owners of parent	0.9	9.9	9.0

(Reference) Consolidated Sales by Segment

CQ2 (Apr.1 – Jun.30), 2016 vs. CQ3 (Jul.1 – Sept.30), 2016

(Unit: Billions of Yen)

	Apr.-Jun. 2016	Jul.-Sept. 2016	Increase/ Decrease	
Petrochemicals	43.1	44.1	1.0	【Olefins】sales maintained at the CQ2 level 【Organic chemicals】sales increased (shipment volume of vinyl acetate, ethyl acetate up)
Chemicals	32.8	33.9	1.1	【Basic chemicals】sales decreased (shipment volumes of ammonia down) 【Electronic chemicals】sales slightly increased (shipment volumes up) 【Functional chemicals】sales maintained at the CQ2 level 【Industrial gases】sales increased (seasonal) 【Power generating business】sales increased (conducted shutdown maintenance in CQ2)
Electronics	24.7	27.2	2.6	【HDs】sales increased (shipment volumes up) 【Compound semiconductors】sales maintained at the CQ2 level 【Rare earths】sales slightly decreased
Inorganics	12.5	12.6	0.1	【Ceramics】sales decreased 【Graphite electrodes】sales increased (shipment volumes up)
Aluminum	25.8	24.7	-1.1	【High-purity foil for capacitors】sales decreased (shipment volumes down, seasonal) 【Aluminum specialty components】【Aluminum cans】sales maintained at the CQ2 level)
Others	36.7	34.7	-2.0	【LIB materials】sales slightly decreased 【SHOKO Co., Ltd.】sales decreased (synthetic resin, etc.)
Adjustments	-11.4	-9.9	1.5	
Total	164.1	167.3	3.1	

(Reference) Consolidated Operating Income by Segment

CQ2 (Apr.1 – Jun.30), 2016 vs. CQ3 (Jul.1 – Sept.30), 2016

(Unit: Billions of Yen)

	Apr.-Jun. 2016	Jul.-Sept. 2016	Increase/ Decrease	
Petrochemicals	5.9	6.0	0.1	【Olefins】profit maintained at the CQ2 level 【Organic chemicals】profit slightly increased
Chemicals	2.9	4.3	1.3	【Basic chemicals】【Electronic chemicals】profit maintained at the CQ2 level 【Functional chemicals】profit increased (shipment volumes up, seasonal) 【Industrial gases】profit increased (shipment volumes up, seasonal) 【Power generating business】profit increased (conducted shutdown maintenance in CQ2)
Electronics	2.4	4.3	1.9	【HDs】profit increased (shipment volumes up, streamlined production capacity, cost reduction measures implemented) 【Compound semiconductors】【Rare earths】profit maintained at the CQ2 level
Inorganics	-2.4	-0.7	1.7	【Ceramics】profit slightly increased 【Graphite electrodes】profit increased (shipment volumes up, progress in renovation of the hydropower facilities)
Aluminum	1.2	1.3	0.1	【High-purity foil for capacitors】【Aluminum specialty components】profit maintained at the CQ2 level 【Aluminum cans】profit increased
Others	0.5	0.4	-0.1	【LIB materials】profit slightly decreased 【SHOKO Co., Ltd.】profit slightly decreased
Adjustments	-1.8	-1.7	0.2	
Total	8.7	13.9	5.2	

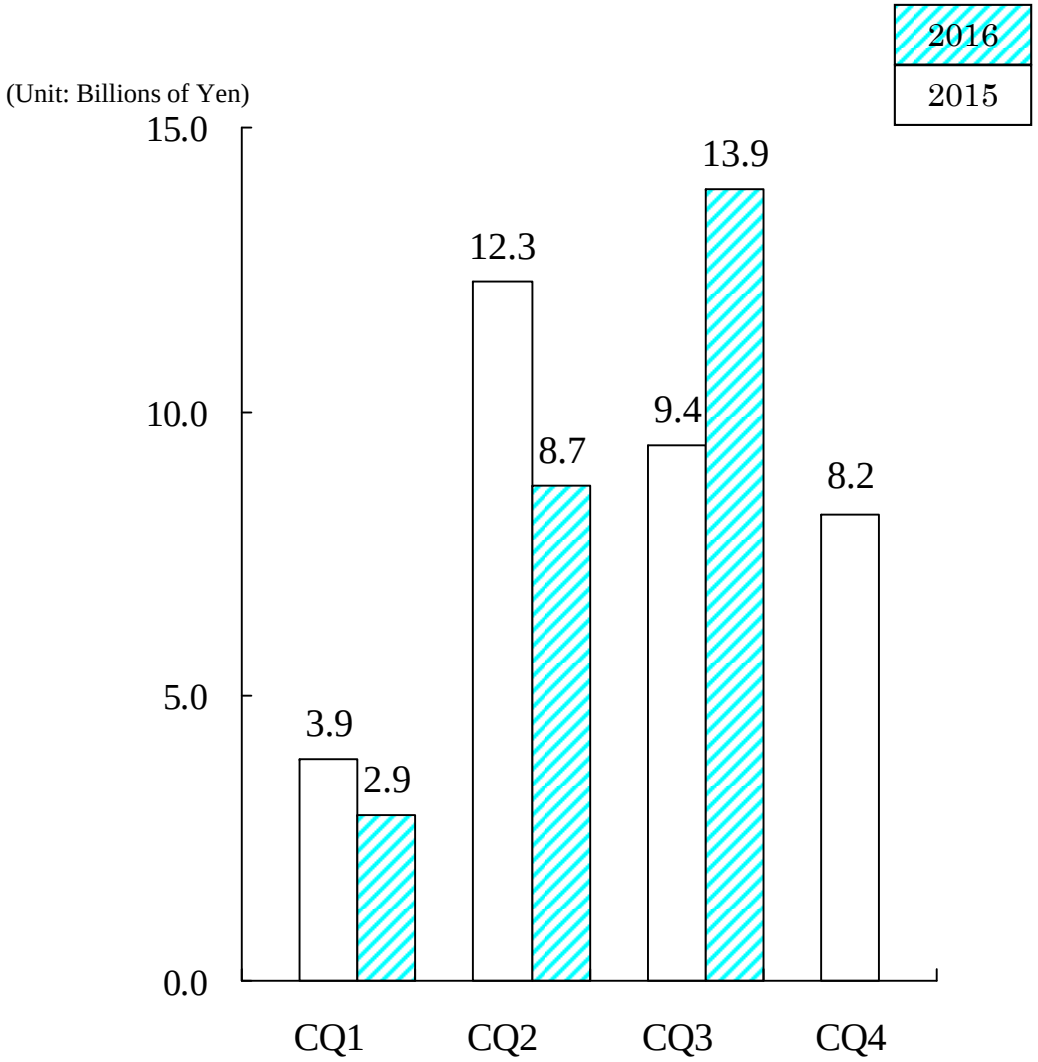
(Reference) Quarterly Summary 2016

(Unit: Billions of Yen)

	Jan. - Mar. 2016	Apr. - Jun. 2016	Jul. - Sept. 2016	Jan. - Sept. 2016	2016 Forecast *
Net Sales	157.4	164.1	167.3	488.9	670.0
Operating Income	2.9	8.7	13.9	25.4	30.0
Profit attributable to owners of parent	0.7	0.9	9.9	11.5	9.0

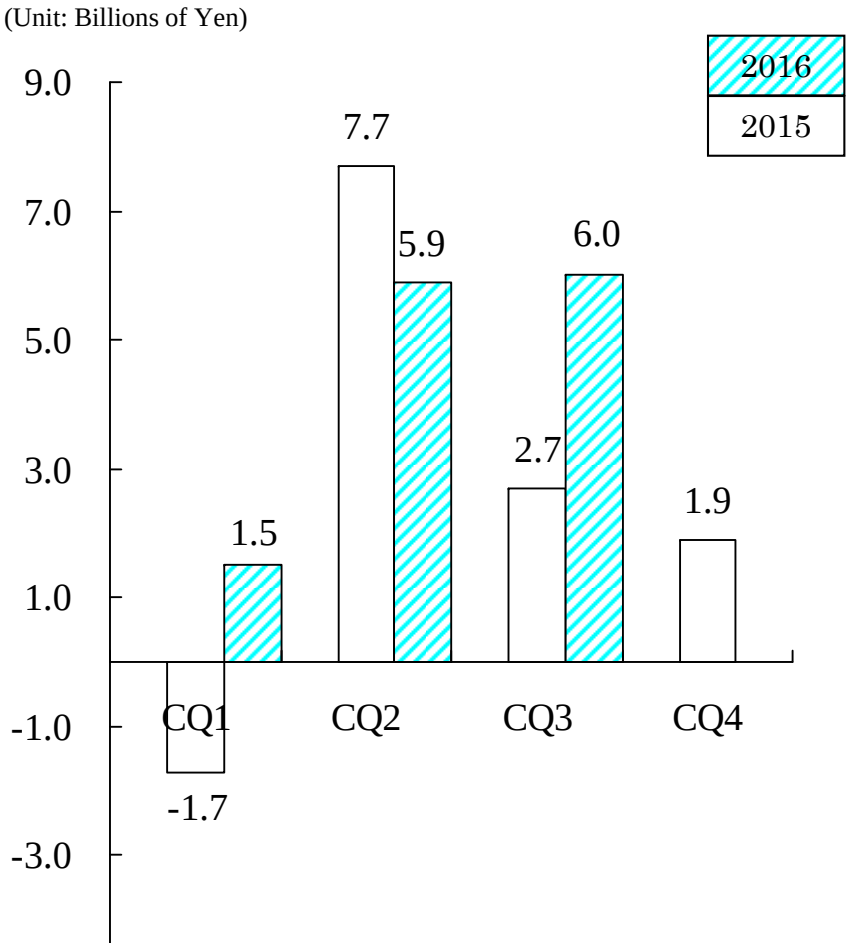
*Forecast was revised on Aug. 9, 2016.

(Reference)　Quarterly Operating Income

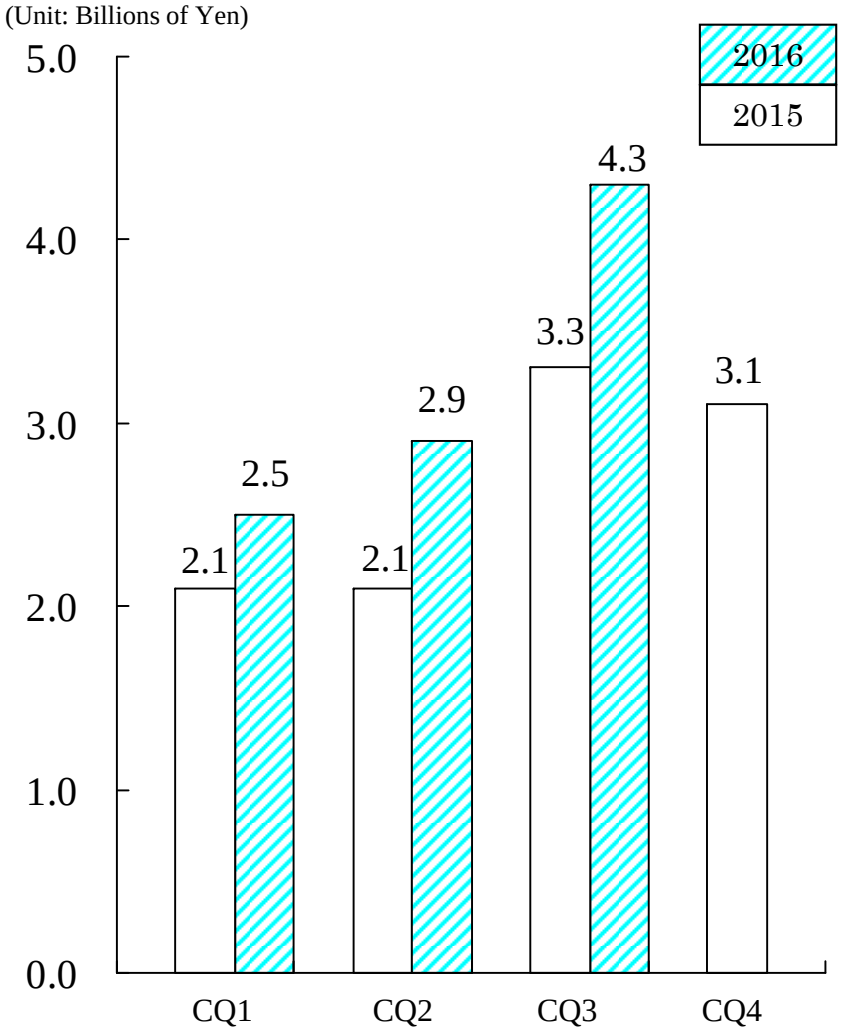


(Reference) Quarterly Operating Income by Segment

《Petrochemicals》



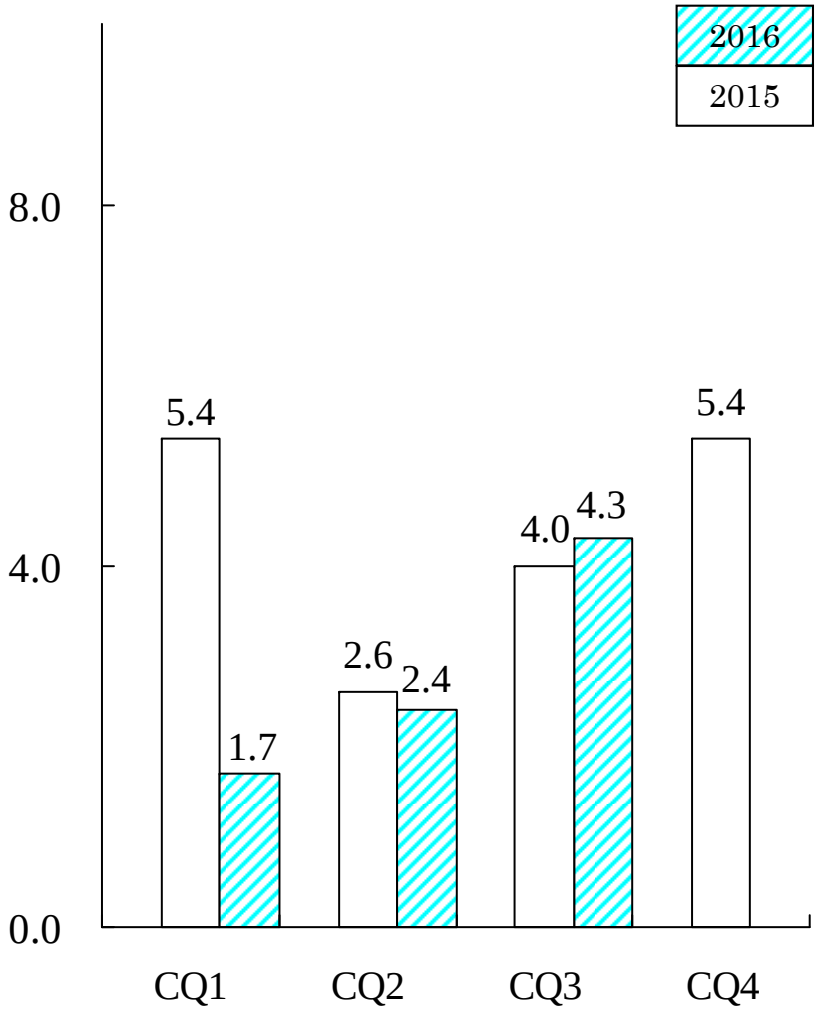
《Chemicals》



(Reference) Quarterly Operating Income by Segment

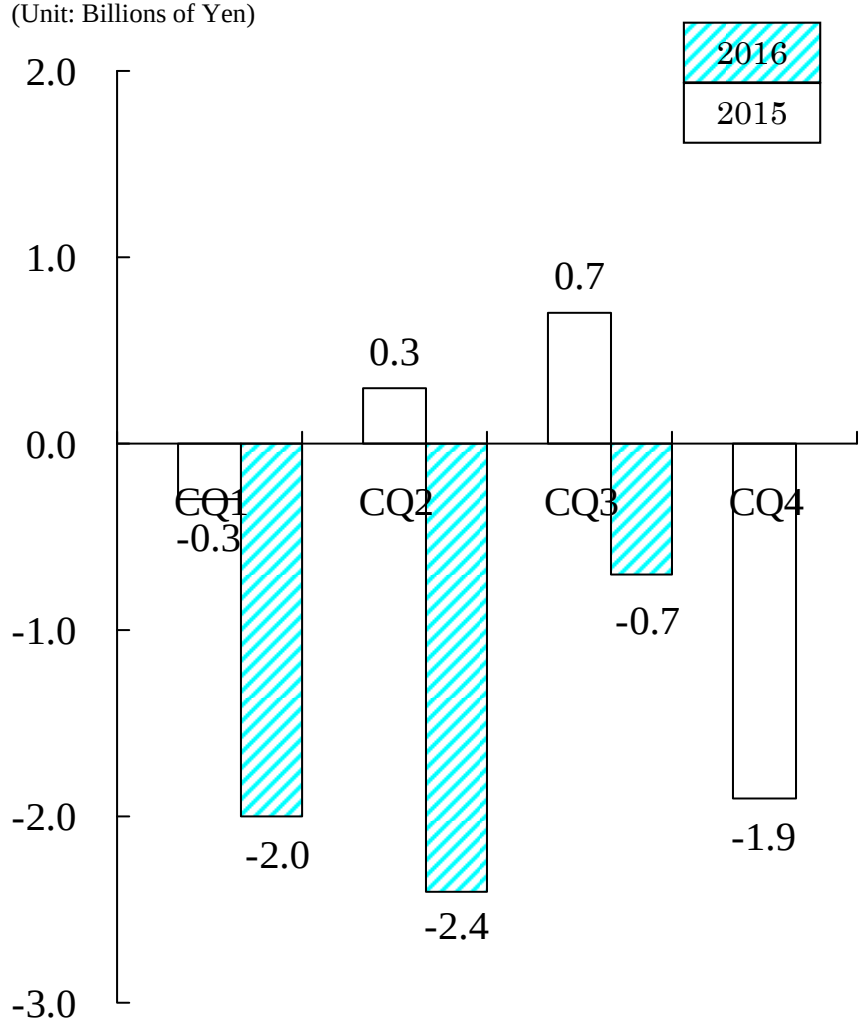
《Electronics》

(Unit: Billions of Yen)



《Inorganics》

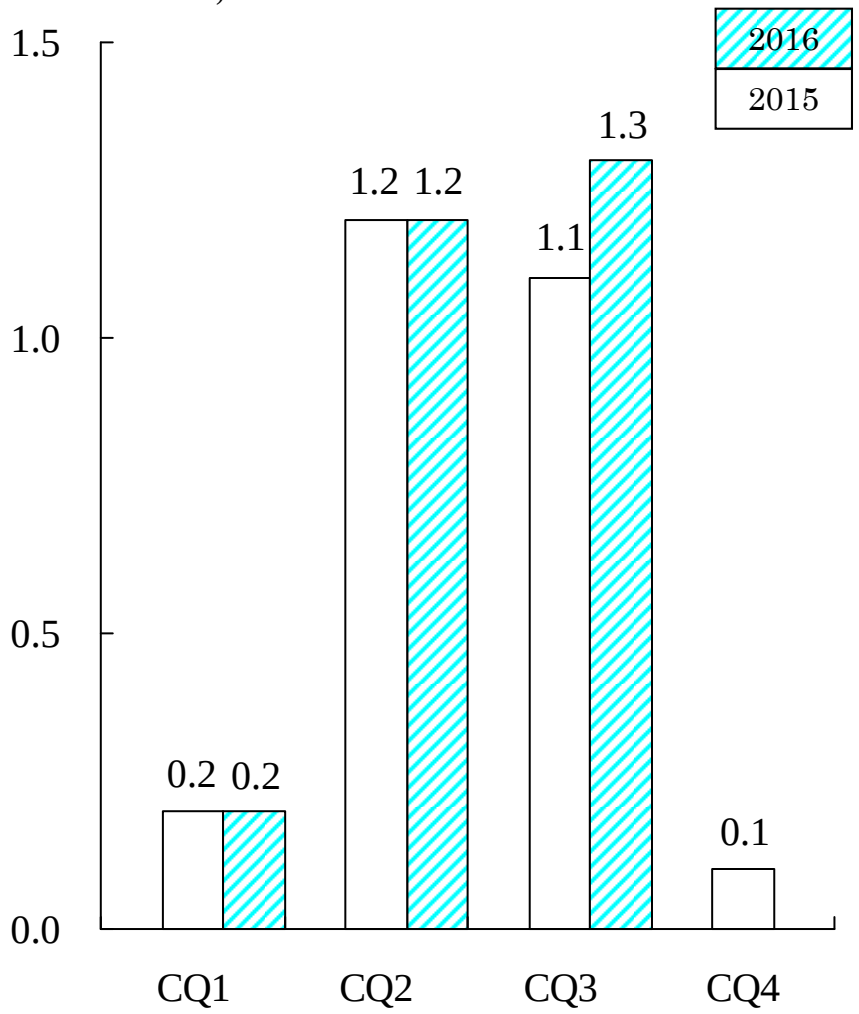
(Unit: Billions of Yen)



(Reference) Quarterly Operating Income by Segment

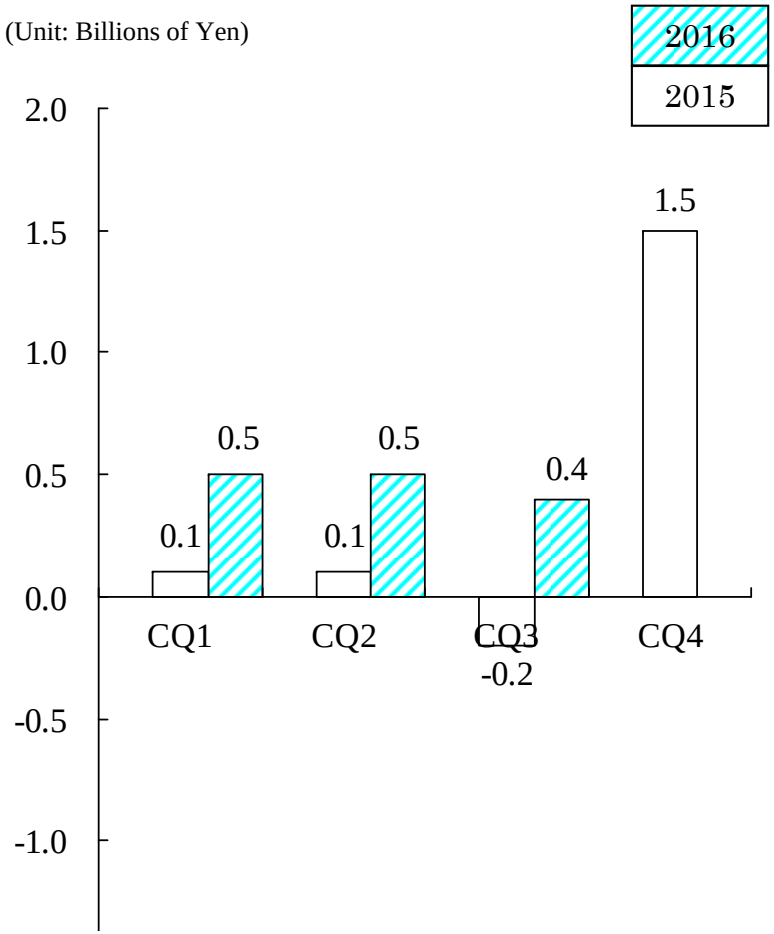
《Aluminum》

(Unit: Billions of Yen)



《Others》

(Unit: Billions of Yen)



Topics

[Petrochemicals segment]

- **Acquisition of additional shares in polypropylene JV SunAllomer**

  In August 2016, SDK, JX Nippon Oil & Energy Corporation (JX), and LyondellBasell Group (LYB) reached agreement concerning the sale/purchase of LYB's shares in SunAllomer Ltd., a joint venture company among the three parties for production and sale of polypropylene, and an investment joint venture between SDK and JX purchased LYB's 50% stake in SunAllomer. For SDK, the propylene business constitutes a key element in its olefin chain. Taking this opportunity of acquiring additional shares, SDK will further strengthen cooperation with SunAllomer, thereby enhancing the competitive power of its propylene business.

Topics

[Chemicals segment]

- **Succeeding in experimental production of hydrogen for fuel cell vehicles from ammonia**

In July 2016, SDK announced that it succeeded in development of technology to produce high-purity hydrogen for fuel cell vehicles*1 from ammonia as a result of a joint research with Hiroshima University, National Institute of Advanced Industrial Science and Technology, Toyota Industries Corporation and Taiyo Nippon Sanso Corporation. This joint research has been sponsored by the Council for Science, Technology and Innovation which is organized under the supervision of the Cabinet Office, Government of Japan, and has been implemented as a contract research program to develop "core technologies for ammonia-based hydrogen station" as a part of strategic innovation program to explore "energy carriers*2." For the promotion of fuel cell vehicles which use hydrogen, development of efficient and practical measures to store and transport hydrogen is a problem to be solved as soon as possible because hydrogen exists as a gaseous body under normal temperature. Ammonia, a molecule of which contains three hydrogen atoms, is expected to be a candidate for an energy carrier to realize hydrogen stations because it can be easily liquefied. This time, SDK developed a one-tenth scale model of demonstration equipment to decompose ammonia and remove residual ammonia from hydrogen gas by utilizing material to remove ammonia which was discovered by Hiroshima University. The demonstration experiment with this equipment was the first successful case in the world to decompose ammonia, extract hydrogen and remove residual ammonia with a model equipment of this scale. Thus the joint research team contributed to the realization of considerable progress in the technology to use ammonia as an energy carrier to provide fuel cell vehicles with hydrogen.

*1 Fuel cell vehicle: A vehicle which is driven by electric motors powered by electricity generated through reaction between hydrogen loaded as fuel and atmospheric oxygen in on-board solid polymer fuel cells.

*2 Energy carrier: Liquid hydrogen or other materials rich in hydrogen, such as ammonia. Energy carrier is synthesized at energy producing area, stored and transported as chemically stable liquid. At energy consuming area, user extracts hydrogen to be used as fuel from it, or directly converts it into energy.

Topics

[Chemicals segment]

- **Developing normal-temperature-curing non-styrene vinylester resin aqueous emulsion**

  SDK developed vinylester resin aqueous emulsion that does not use styrene as reactive monomer, and cures after drying of water at normal temperature. SDK started shipment of its samples in October 2016. Making the most of SDK's original resin-design and emulsification technologies, this new resin has high corrosion resistance and curability at normal temperature equivalent to conventional vinylester resins. Moreover, when applied to a repair work of underground cesspits, this new resin does not require measures to prevent fire and poisoning and is good for the safety of workers because it does not contain styrene. Making the most of this new product, SDK proposes a method of lining with superior work environment, less odor, and easy handling of resins. SDK will continue contributing to infrastructure construction and maintenance, the demand for which is expected to grow bot at home and abroad.

[Electronics segment]

- **Streamlining of HD media production capacity**

  In its HD media business, SDK completed integration of processes to produce substrates and media for HDDs, as a part of its effort to promote "Best in Class Strategy." In the second quarter of 2016, SDK also streamlined its capacity to produce HD media in order to make it in line with the movement in the HDD manufacturing industry to reduce its production capacity. Specifically, SDK concentrated production of HD media into production lines of high productivity, reduced its monthly production capacity from 30 million plateaus to 20 million plateaus, and significantly strengthened the Company's cost competitiveness. Through promotion of development and mass production of leading-edge HD media, SDK will secure its technical advantages in the HD media market, and make the foundation of its HD media business more solid.

Topics

[Inorganics segment]

- Agreeing on acquisition of SGL GE Holding, a graphite electrode manufacturer

In October 2016, SDK agreed with SGL Carbon SE, a carbon and graphite product manufacturer headquartered in Germany, that SDK will acquire the whole shares of SGL GE Holding GmbH (SGL GE), which engages in the graphite electrode business, from SGL Carbon GmbH, a wholly owned subsidiary of SGL Carbon SE, and make SGL GE a subsidiary of SDK. Graphite electrodes are used in the processes to manufacture electric furnace steel. SDK considers its graphite electrode business a “Base-shaping” business in its medium-term business plan “Project 2020+” and aims to increase its durability to market fluctuation and to generate stable profit and cash flow. SGL GE has production bases in Europe, the U.S., and Southeast Asia, and is highly cost-competitive. By making SGL GE its subsidiary, SDK will enhance the durability of its graphite electrode business, and pursue a higher level of growth in the highly competitive graphite electrode market. The graphite electrode business is expected to maintain a certain market size in the future. With the acquisition of SGL GE, SDK can cover all areas around the world and establish its position as the global leading supplier of graphite electrodes. Based on the new platform, SDK will revitalize its graphite electrode business as the Company’s major profit source. SDK’s acquisition of the shares of SGL GE is subject to the approval of the relevant authorities under the applicable competition laws of the relevant countries including the U.S. and Germany, and other preconditions.

Topics

[Aluminum segment]

- **Our aluminum cooling device technology contributes to development of next-generation power devices**

  In July 2016, a project team led by Professor Katsuaki Suganuma, Osaka University, in which SDK participates, successfully developed a hybrid circuit board structure for SiC based power devices which can stably operate even under high-temperature condition of 300°C. This project was organized as university-industry research collaboration with the object of developing circuit board and packaging technologies to integrate heat-resistant SiC power devices. SDK has been providing the team with technologies to develop a composite of aluminum boards with insulating ceramics layer and cooling devices, technologies to solder these materials, and heat radiation design for the composite circuit board and the whole package. Taking advantage of its technologies, SDK will develop new parts and materials for power modules, establish technologies to evaluate performance of power modules equipped with these parts and materials, and offer solutions to realize downsized high-output power modules.

Topics

[Others segment]

- Decision to expand *VGCF*™ production capacity for use in LIBs

In August 2016, SDK decided to expand the capacity of facilities in Kawasaki Plant to produce *VGCF*™ carbon nanofiber, which is used as an additive for cathodes and anodes of lithium ion batteries (LIBs) to improve electrical conductivity, from 200t/y at present to 300t/y by the end of 2017. The demand for LIB materials has been growing rapidly due to the increase in demand not only for small LIBs but also for large LIBs including those for automotive applications. In particular, the electric vehicle (EV) market in China is expanding substantially, while new EVs are launched in Europe at an accelerated pace due to tighter control on CO_2 emissions. Thus the LIB market is expected to continue its steady growth. *VGCF*™ is used as electrically-conductive additive in LIB cathodes and anodes, and extends the life of LIBs. Compared with grain-type additives, fibriform *VGCF*™ gives larger capacity and longer life to LIBs with less amount of addition. Moreover, *VGCF*™ has high thermal conductivity, thereby promoting heat dissipation from electrodes and enhancing the safety of LIBs. In addition to *VGCF*™, SDK offers various LIB materials including *SCMG*™ anode material, and *SPALF*™ aluminum laminated film for packaging. SDK's LIB materials are acclaimed highly by LIB manufacturers because our products add their LIBs such values as "high capacity, low resistance, and long life."