



Financial Results

for 1st half of the Fiscal Year ending March 2022

日本発条株式会社(東証1部 5991)
NHK Spring Co., Ltd.(5991/TSE1)

NHK
NHK SPRING CO.,LTD.

Greeting from CEO

President & CEO Representative
Member of the Board

Takashi Kayamoto

~Aiming for sustainable growth ~
~ Straight up, freely and broadly ~

(1) Further promotion of CSR activities

- Strengthen further relationship of mutual trust with stakeholders
- Sincerely strive to environmental and social issues
- Thoroughly implement quality-first manufacturing

(2) Accelerate response to drastically changing business environment

- Strengthen correspondence for electrification and autonomous of automobiles
- Creation of next-generation core businesses

(3) Secure "profit" for sustainable growth

- Develop attractive product
- Total cost reduction

Carbon Neutral

Announcement date : 8th September 2021

2 0 3 0 (Interim target) 50% decrease from FY2013

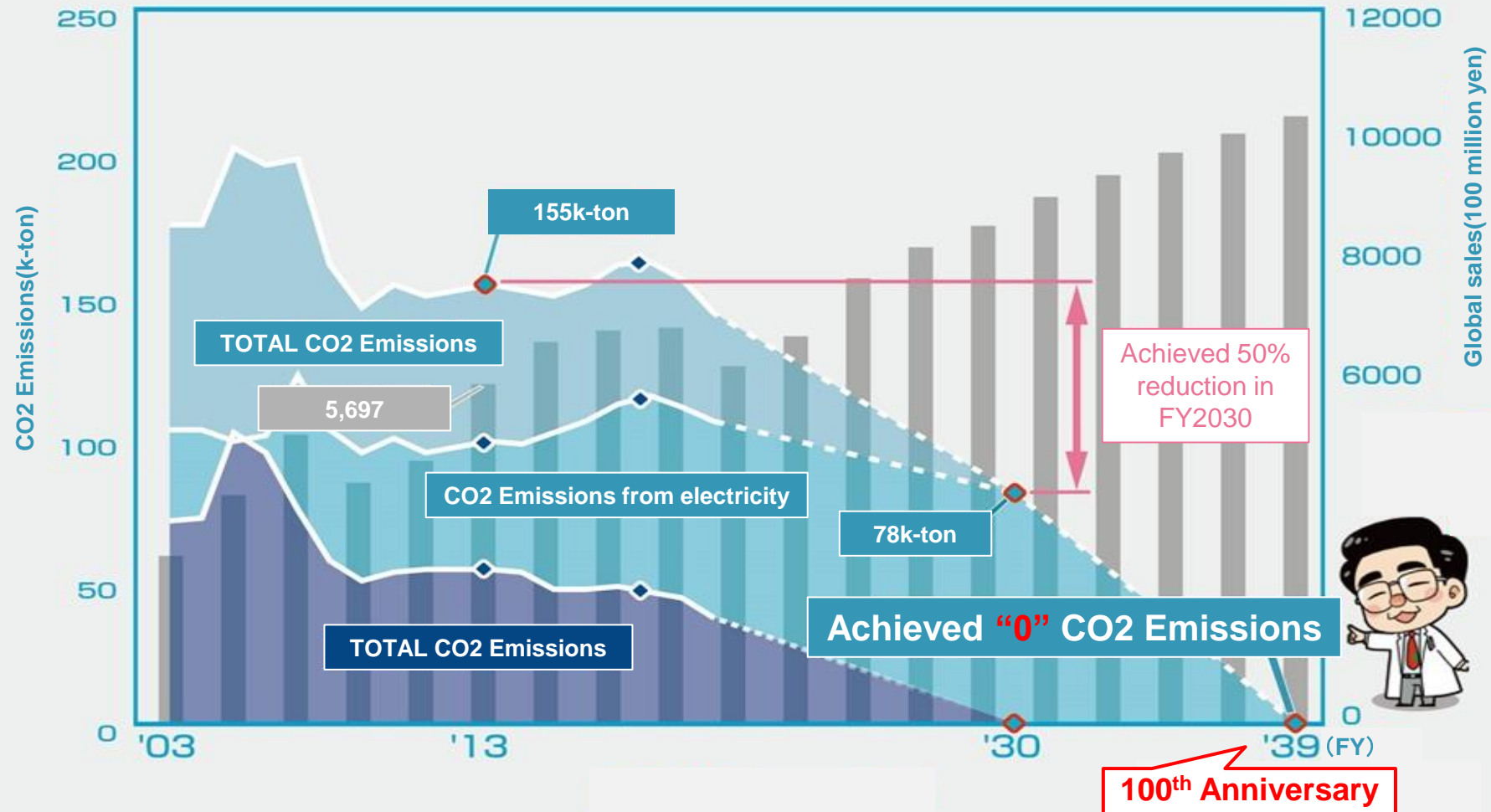
2 0 3 9 (Centennial of NHK's foundation) : Achieved neutral CO² emissions

Aiming for industrial waste "0"

NHK Spring itself has been working waste reduce since 1993 and is continuing to "0".
Group target including overseas: Until FY2030, 95% decrease from the volume of FY2013.

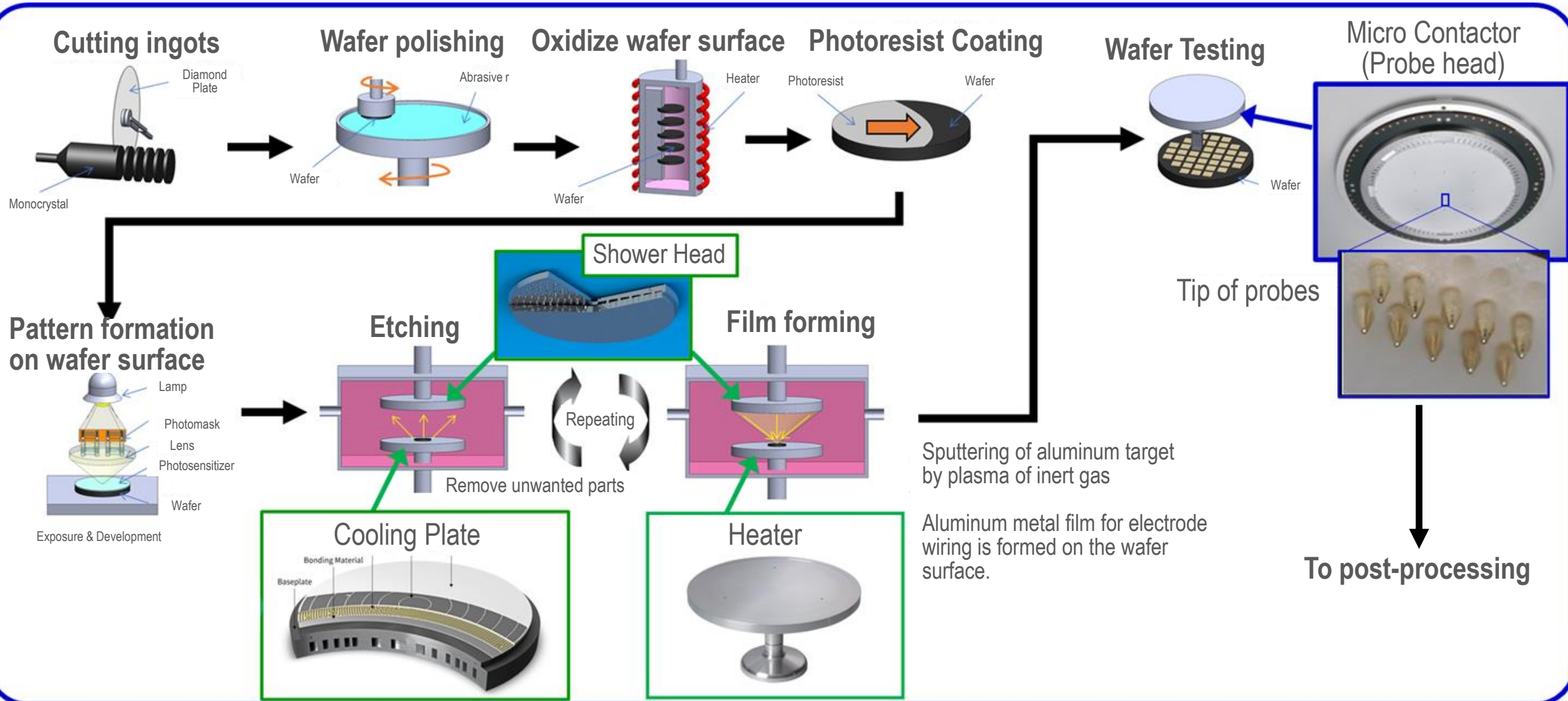
Carbon Neutral

NHK Group CO2 Emission target

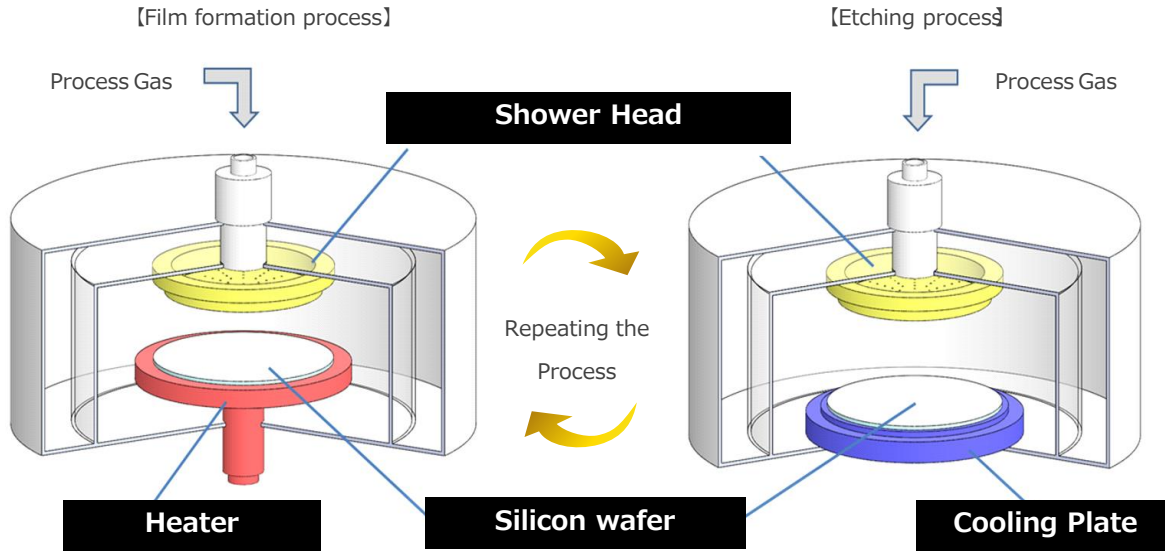


The CO² emissions above are the total of NHK Spring itself and domestic group companies. Overseas affiliates conduct activities in line with those in Japan.

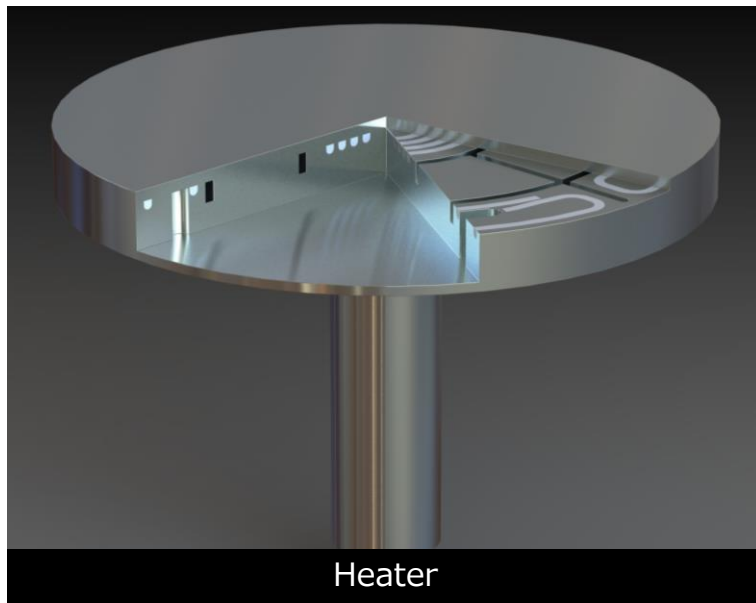
Semiconductor Process Components



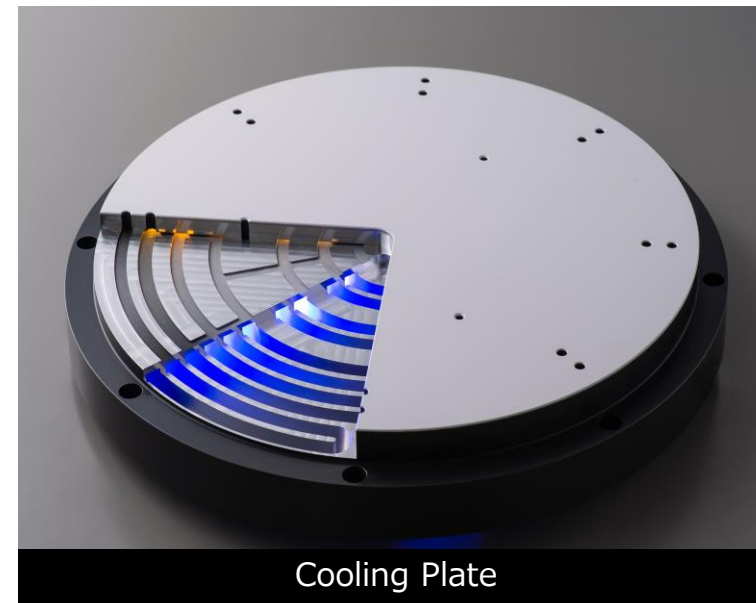
Semiconductor Process Components



Distributes the gases required for semiconductor manufacturing processes, evenly to wafers

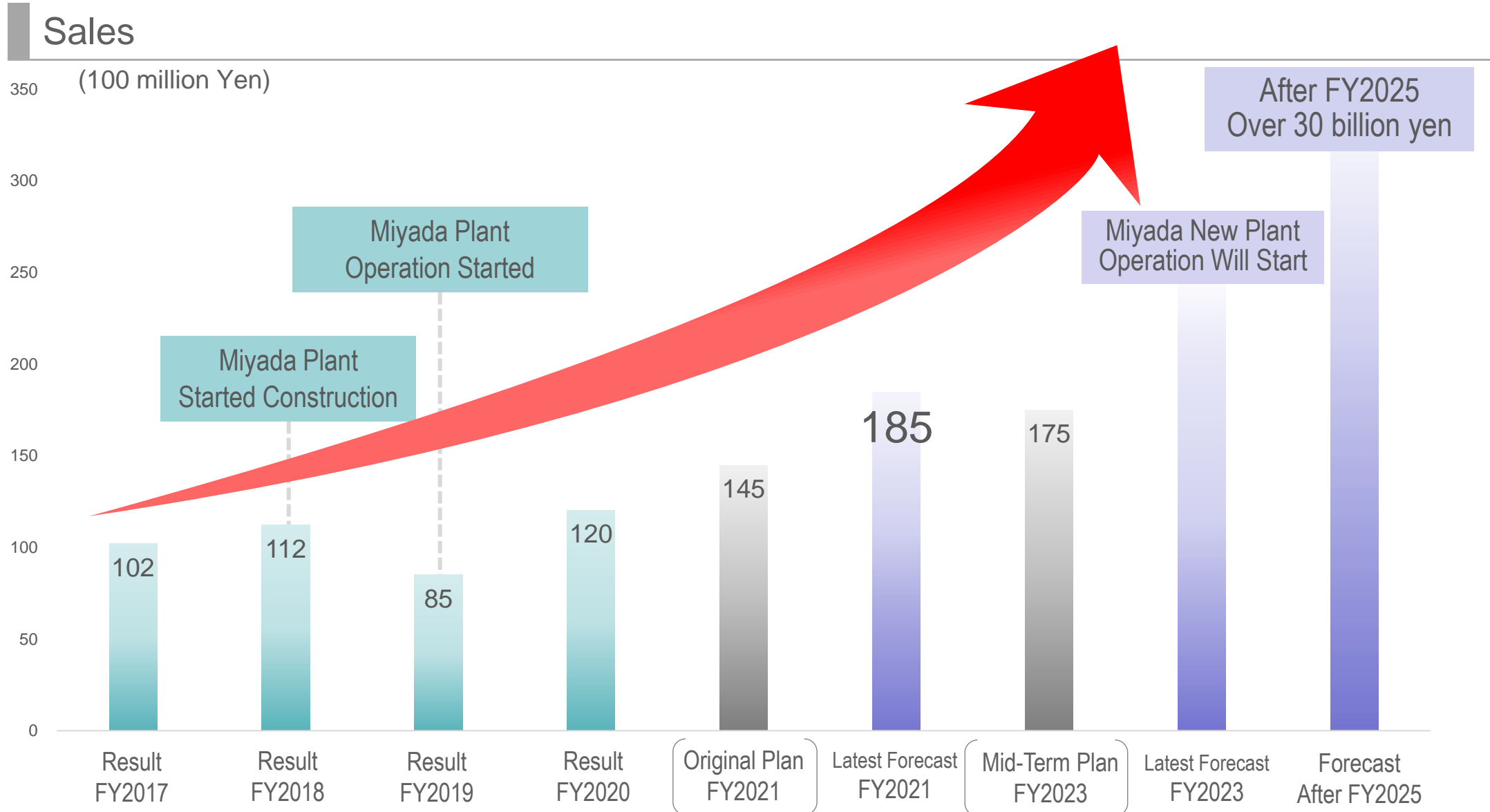


Mainly used in the film formation process, enabling high-precision wafer temperature control



Mainly used for etching equipment, enabling high precision wafer temperature control

Semiconductor Process Components Sales Result & Forecast

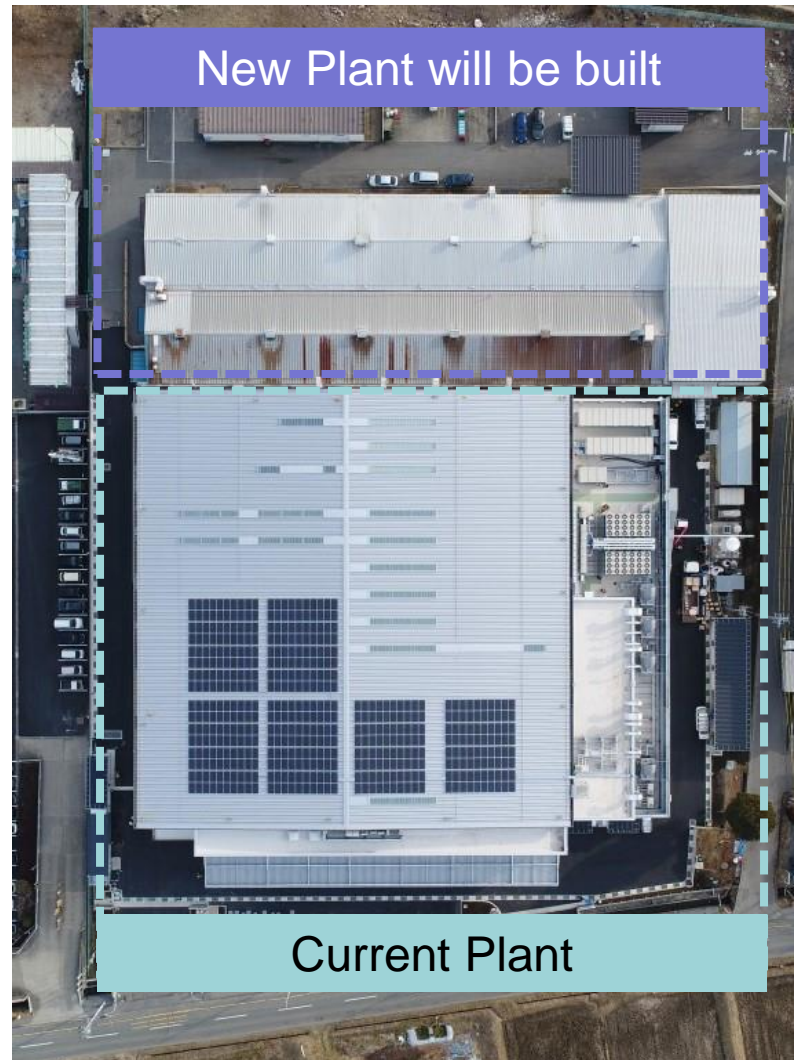


Miyada Factory manufacturing Semiconductor Process Components



Built on 2019

Miyada Factory manufacturing Semiconductor Process Components



- April 2018 Factory construction started
(Investment of 8 billion yen)
- April 2019 Factory operation started
- July 2022 Expanded production capacity
Equipment will start operations
(Investment of 0.4 billion yen)
- October 2022 Expanded production capacity
Equipment will start operations
(Investment of 0.9 billion yen)
- March 2024 New Plant will start operations
(Investment of 8 billion yen)

Overview of the Financial Results for 1st half of the year ending March 2022

Executive Vice President & CFO and
Representative Member of the Board

Toru Sugiyama

Results for 1st half of the year ending March 2022

(100 million yen)

	FY2020 1H	Initial Forecast	Previous Forecast	FY2021 1H Results	Vs. FY2020 1H	Vs. Initial Forecast	Vs. Previous Forecast		
		as of 5/2021	as of 8/2021						
Net Sales	2,362	2,700	2,850	2,789	426	89	-60		
Operating Income	-88	60	110	102	191	42	-7		
Ratio	-3.7%	2.2%	3.9%	3.7%	–	1.5%	-0.2%		
Ordinary Income	-97	70	130	135	232	65	5		
Ratio	-4.1%	2.6%	4.6%	4.9%	–	2.3%	0.3%		
Exchange gains/losses	-16	8	11	16	32	8	5		
Profit Attribute to Owners of Parent	-79	45	85	84	163	39	-0		
Extraordinary profits/losses	–	–	–	-2	-2	-2	-2		
Average Rate	US\$	106.7	105.0	108.0	110.2	3.5	5.2	2.2	
	Thai Baht	3.4	3.3	3.4	3.5	0.0	0.2	0.1	
Current Rate	US\$	this year	105.8	105.0	108.0	111.9	6.1	6.9	3.9
		previous year	108.8	110.7	110.7	110.7	1.9	–	–
	Thai Baht	this year	3.5	3.3	3.4	3.4	-0.1	0.1	0.0
		previous year	3.6	3.4	3.4	3.4	-0.2	–	–

Forecast for the year ending March 2022

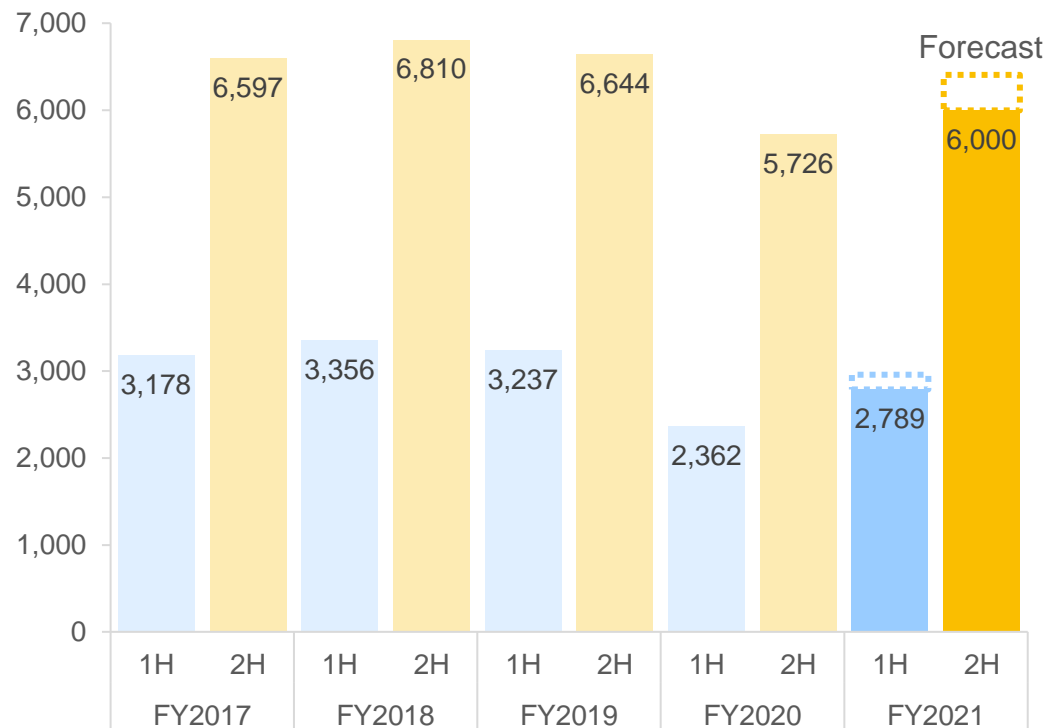
(100 million yen)

	FY2020 Results	Initial Forecast	Previous Forecast	FY2021 Forecast	Vs. FY2020	Vs. Initial Forecast	Vs. Previous Forecast		
		as of 5/2021	as of 8/2021						
Net Sales	5,726	6,000	6,000	6,000	273	—	—		
Operating Income	104	250	250	250	145	—	—		
Ratio	1.8%	4.2%	4.2%	4.2%	2.3%	—	—		
Ordinary Income	145	270	270	270	124	—	—		
Ratio	2.5%	4.5%	4.5%	4.5%	2.0%	—	—		
Exchange gains/losses	12	8	12	4	-8	-4	-8		
Profit Attribute to Owners of Parent	93	180	180	180	86	—	—		
Extraordinary profits/losses	2	—	—	-2	-5	-2	-2		
Average Rate	US\$	106.2	105.0	108.0	110.0	3.8	5.0	2.0	
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Result Trends

Net Sales

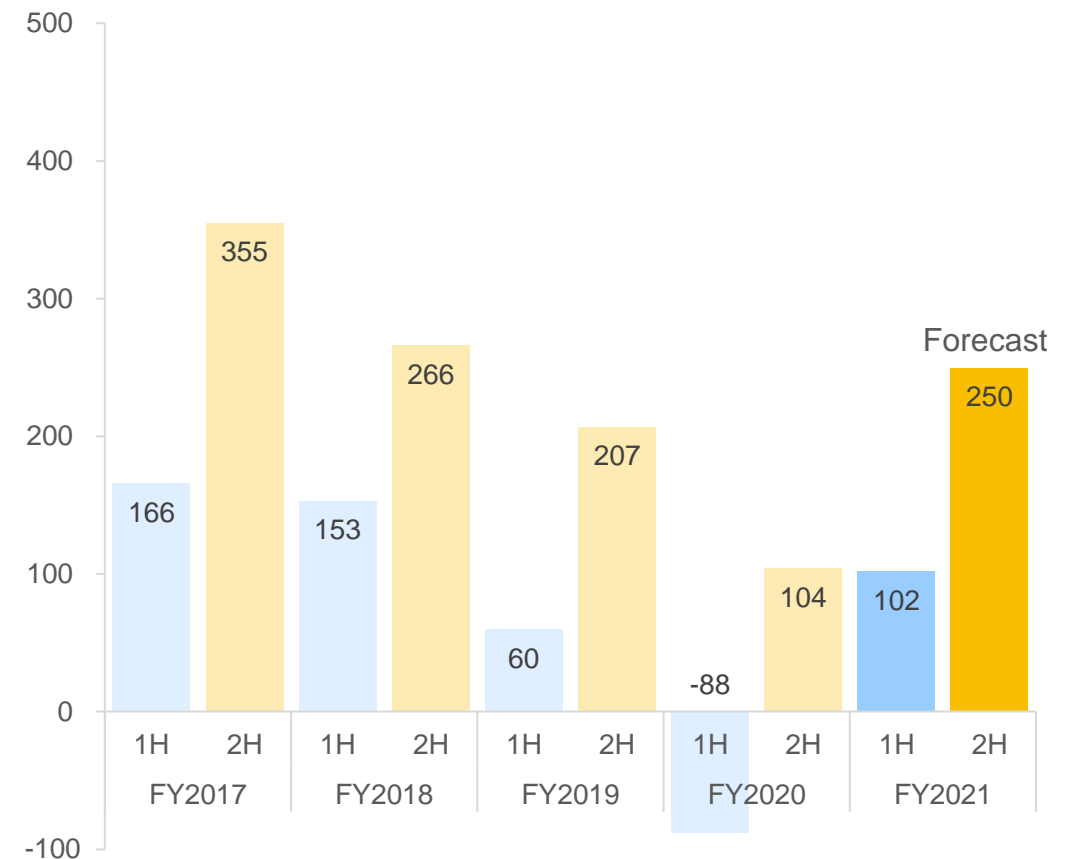
(100 million Yen)



As a result of the adoption of the "Accounting Standard for Revenue Recognition (Revised ASBJ Statement No.29)", the amount paid by customers, which was previously recorded as net sales, is offset against the cost of sales from the fiscal year ending March 31, 2022.

Operating Income

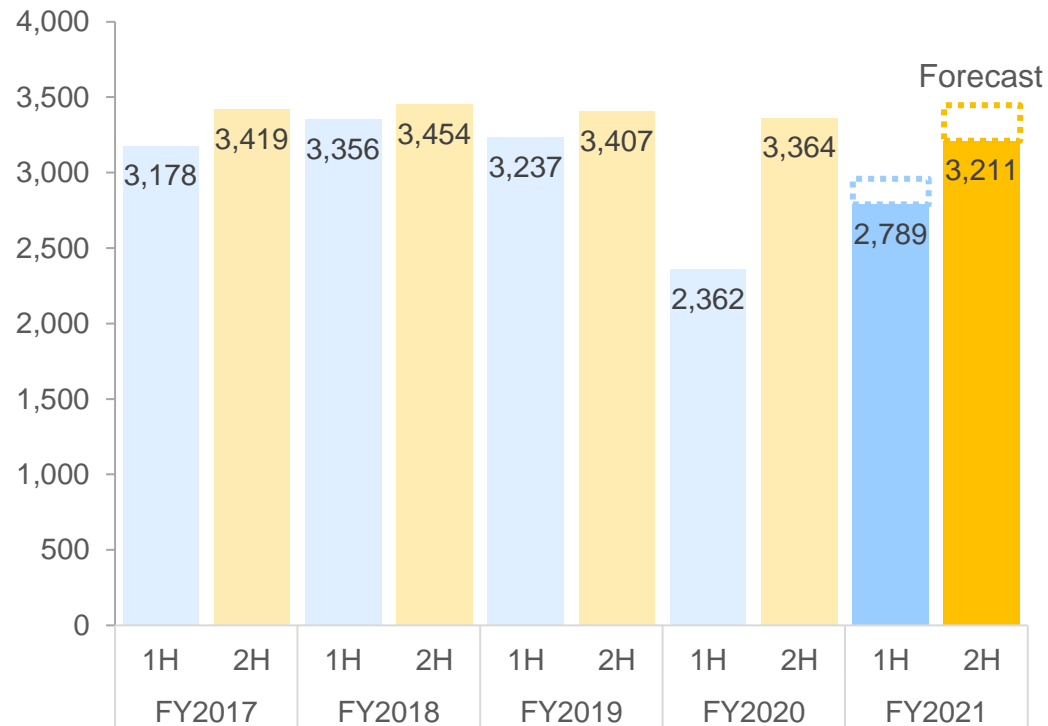
(100 million Yen)



Result Trends in each half-year period

Net Sales

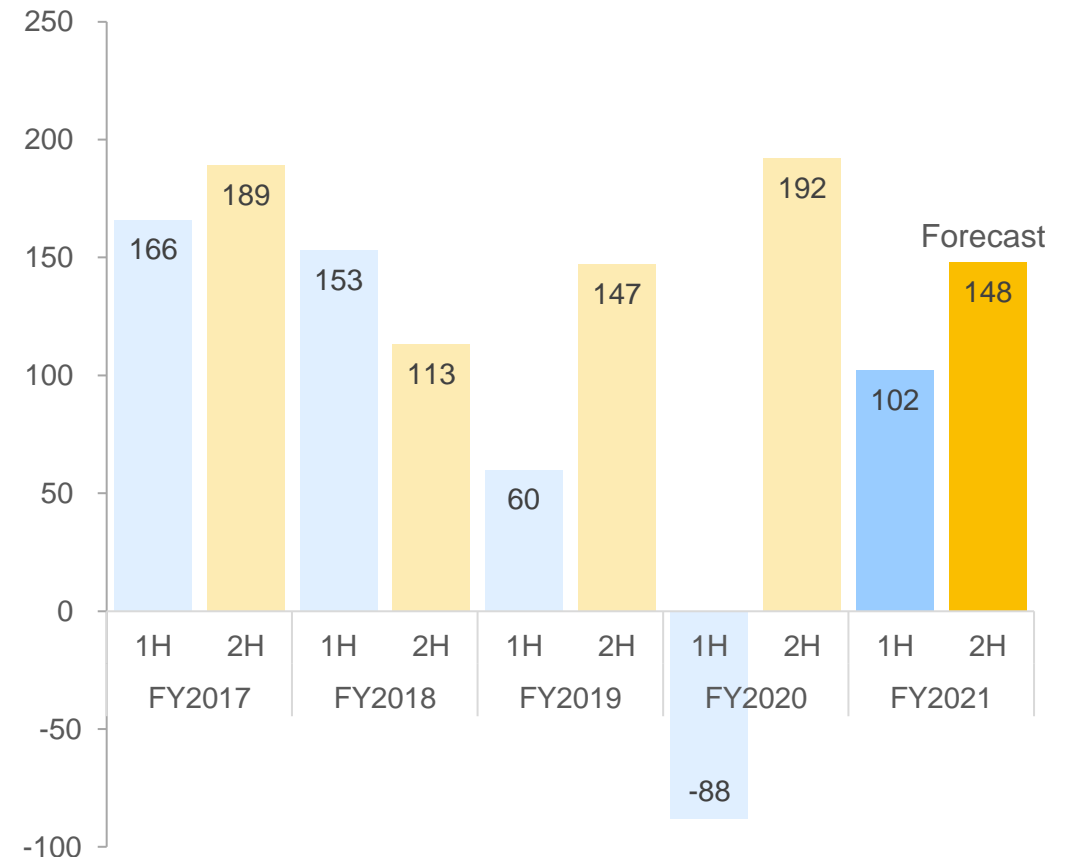
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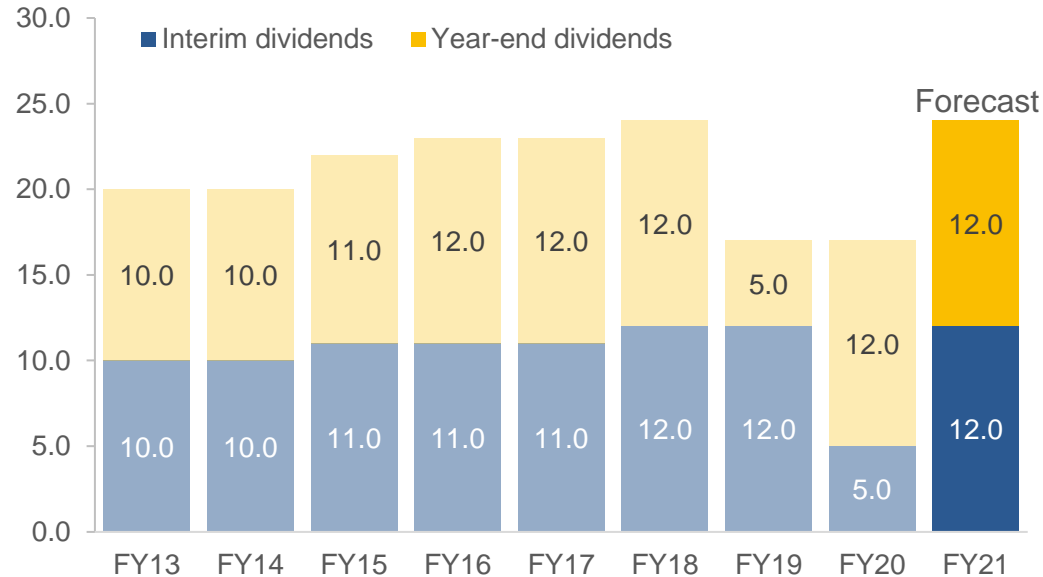
Operating Income

(100 million Yen)

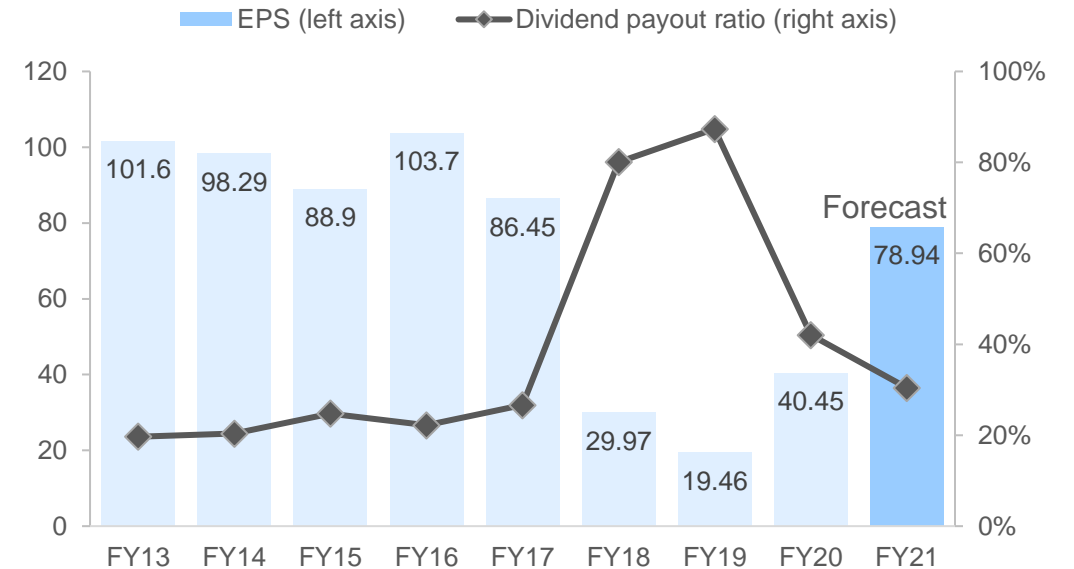


Dividends

Dividend Per Share (DPS)



Earnings Per Share (EPS)



	End of Q2	Year end	Total	Dividend payout ratio
Result for the year ended Mar.2021	5.0 yen	12.0 yen	17.0 yen	42.0%
Forecast for the year ending Mar.2022	12.0 yen	12.0 yen	24.0 yen	30.4%

Details of the Financial Results
for 1st half of the Year Ending March 2022

Details of the Financial Forecast
for the Year Ending March 2022

Corporate Officer
Director, Accounting & Financing Dept.

Osamu Ikejiri

Details of the Financial Results
for 1st half of the Year Ending March 2022

Results for 1st half of the year ending March 2022

(100 million yen)

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Ratio	-3.7%	2.2%	3.9%	3.7%	–	1.5%	-0.2%		
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	Thai Baht	this year	3.5	3.3	3.4	3.4	-0.1	0.1	0.0
		previous year	3.6	3.4	3.4	3.4	-0.2	–	–

Net Sales / Operating Income by Business Segment

(100 million yen)

		FY2020 1st half	FY2021		1st half	Vs. FY2020 1H Variance
			Q1	Q2		
A utomotive Suspension Spring	Net Sales	422	285	258	543	120
	Operating Income	-61	4	-19	-15	45
	Ratio	-14.6%	1.4%	-7.6%	-2.9%	11.7%
A utomotive Seating	Net Sales	977	523	460	983	6
	Operating Income	-29	-1	-17	-18	10
	Ratio	-3.0%	-0.2%	-3.9%	-1.9%	1.1%
P recision Springs & Components	Net Sales	569	368	404	773	203
	Operating Income	-2	33	53	86	89
	Ratio	-0.5%	9.0%	13.3%	11.2%	11.7%
I ndustrial Machinery & Others	Net Sales	392	239	249	488	95
	Operating Income	5	25	25	50	44
	Ratio	1.5%	10.7%	10.0%	10.4%	8.9%
Total	Net Sales	2,362	1,416	1,372	2,789	426
	Operating Income	-88	61	41	102	191
	Ratio	-3.7%	4.4%	3.0%	3.7%	7.4%

Automotive Suspension Springs

Sales and profits increased due to volume recovery from the impact of the spread of the COVID-19 infection.

Automotive Seating

Although we are recovering from the effects of the spread of the COVID-19 infection, some locations were strongly affected by the shortage of semiconductors.

Precision Springs & Components

Sales of automotive-related parts are recovering from the impact of the spread of the COVID-19 infection, and orders for HDD-related parts continue to be strong. As a result, sales and profits increased.

Industrial Machinery & Others

Sales and profits increased mainly due to strong sales of semiconductor process components.

Net Sales / Operating Income by Region

(100 million yen)

	FY2020 1st half	FY2021			Vs. FY2020 1H Variance	
		Q1	Q2	1st half		
Japan	Net Sales	1,371	797	803	1,600	229
	Operating Income	-65	43	42	86	151
	Ratio	-4.8%	5.5%	5.3%	5.4%	10.2%
Asia	Net Sales	634	429	409	838	203
	Operating Income	12	35	25	61	49
	Ratio	1.9%	8.4%	6.2%	7.3%	5.4%
America & Europe & Others	Net Sales	356	190	159	349	-6
	Operating Income	-35	-17	-26	-44	-9
	Ratio	-9.9%	-9.4%	-16.9%	-12.8%	-3.0%
Total	Net Sales	2,362	1,416	1,372	2,789	426
	Operating Income	-88	61	41	102	191
	Ratio	-3.7%	4.4%	3.0%	3.7%	7.4%

Japan

Sales of automotive-related parts recovered from the impact of the spread of the COVID-19 infection, and sales of HDD-related parts and semiconductor process components were strong. Overall, sales and profits increased.

Asia

Sales and profits increased due to a recovery in volume from the impact of the spread of the COVID-19 infection and the support of a weaker JPY.

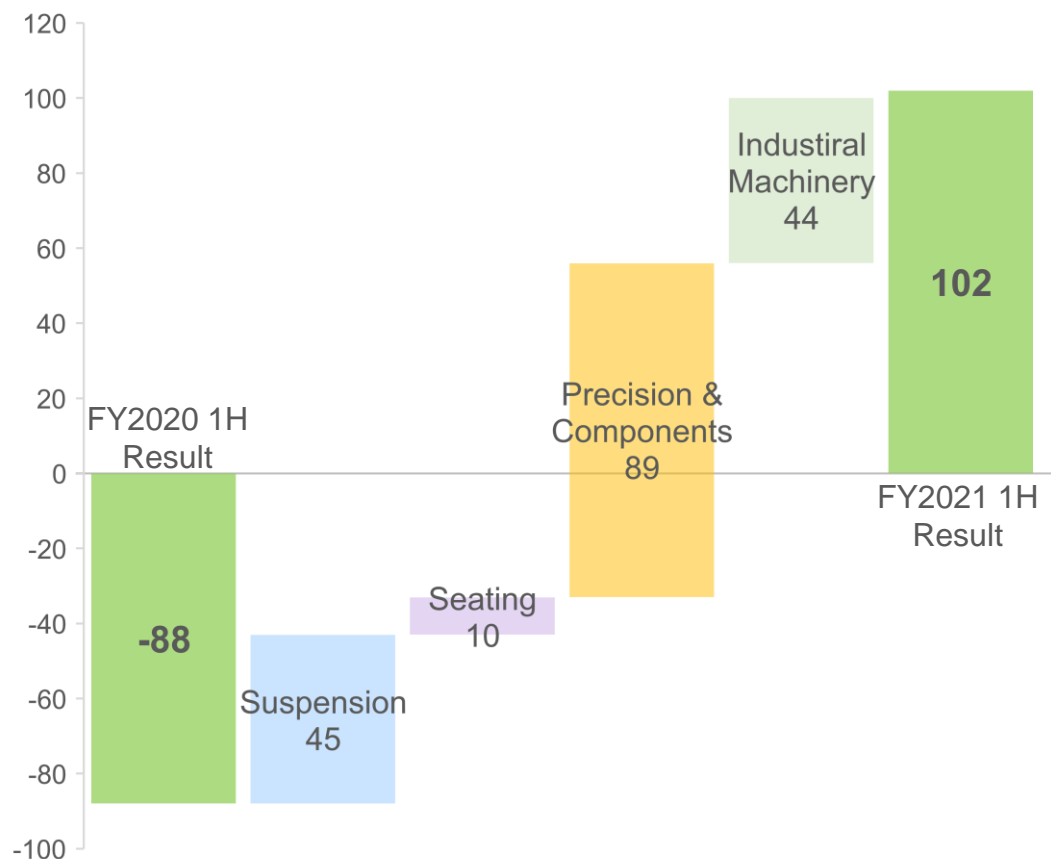
America, Europe & Others

Sales and profits of automotive parts decreased due to the significant impact of the semiconductor shortage and the sharp rise in material prices.

Operating Income Trends by Segment

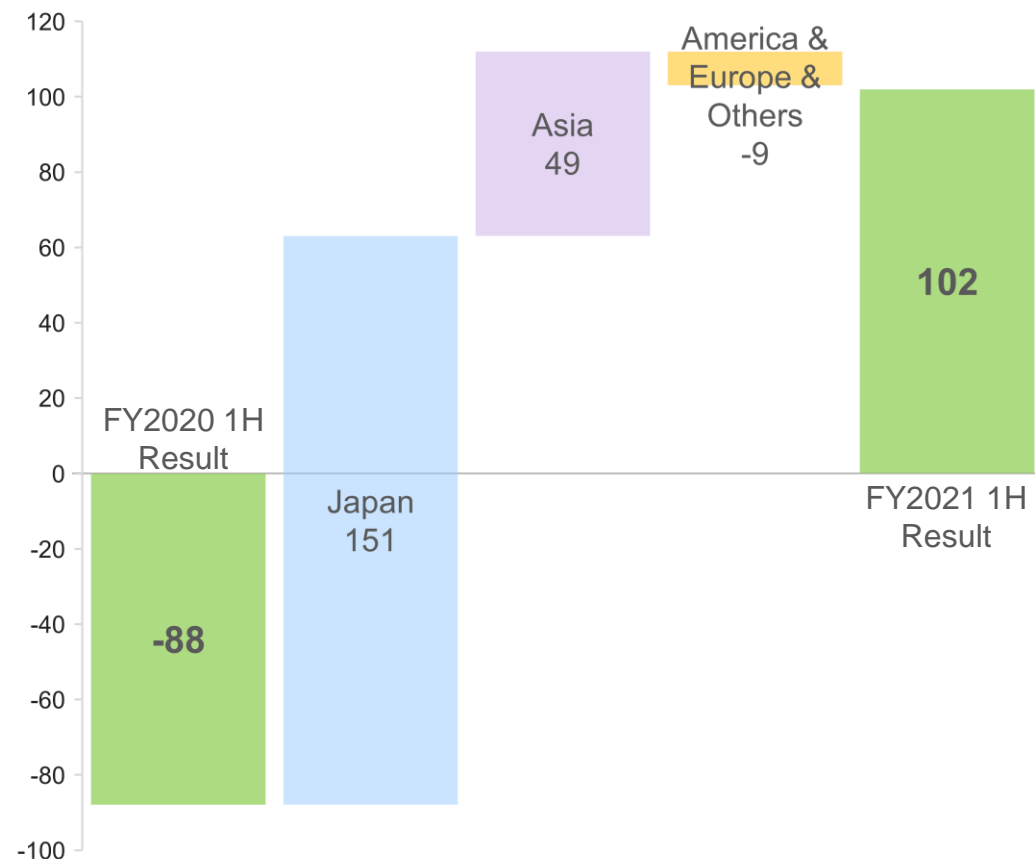
By Business Segment

(100 million Yen)



By Region

(100 million Yen)



Automotive Suspension Spring

(100 Million Yen)

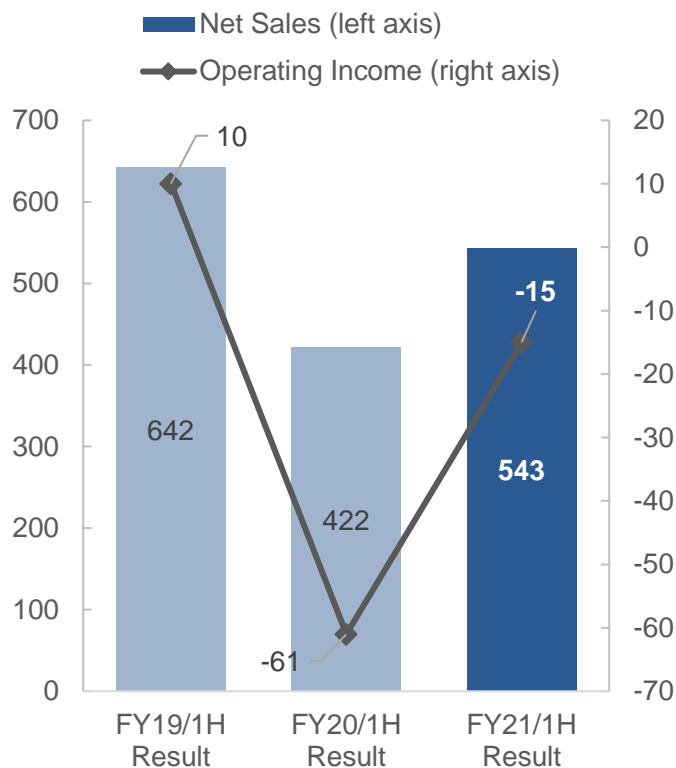
	FY2020 1st half	FY2021		1st half	Vs. FY2020 1H Variance
		Q1	Q2		
Net Sales	422	285	258	543	120
Operating Income	-61	4	-19	-15	45
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vs. FY2020 1st half

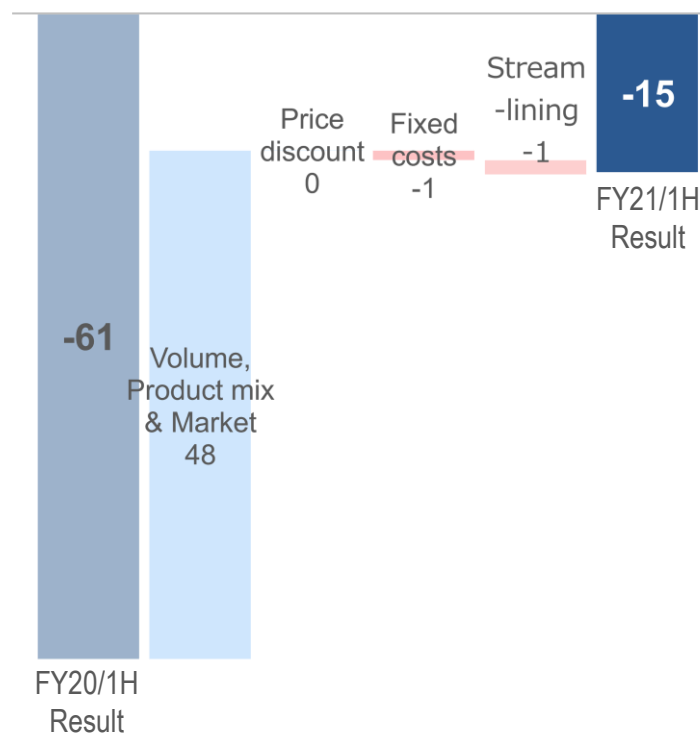
In the previous fiscal year, sales declined significantly due to the impact of the spread of the COVID-19 infection.

In the current fiscal year, both sales and profits increased due to the recovery in volume from the previous fiscal year, despite the impact of the semiconductor shortage.

Results Trends



Variable Factor Analysis for Operating Income



Automotive Seating

(100 Million Yen)

	FY2020 1st half	FY2021		1st half	Vs. FY2020 1H Variance
		Q1	Q2		
Net Sales	977	523	460	983	6
Operating Income	-29	-1	-17	-18	10
Ratio	-3.0%	-0.2%	-3.9%	-1.9%	1.1%

vs. FY2020 1st half

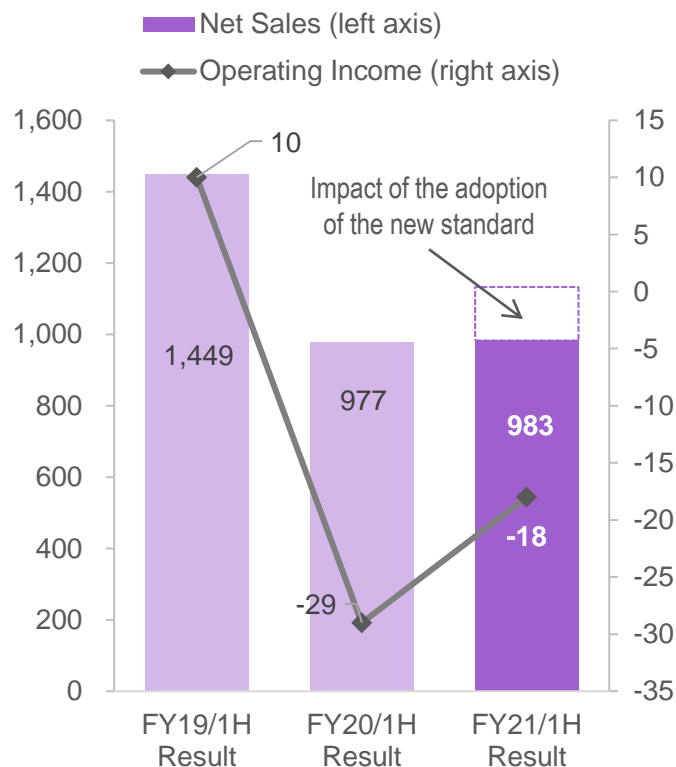
In the previous fiscal year, sales declined significantly in each region due to the impact of the spread of the COVID-19 infection. In the current fiscal year, sales and profits increased in Japan and Thailand due to a recovery in volume from the previous fiscal year.

On the other hand, sales and profits decreased in the U.S. due to the significant impact of production cutbacks by customers due to semiconductor shortages.

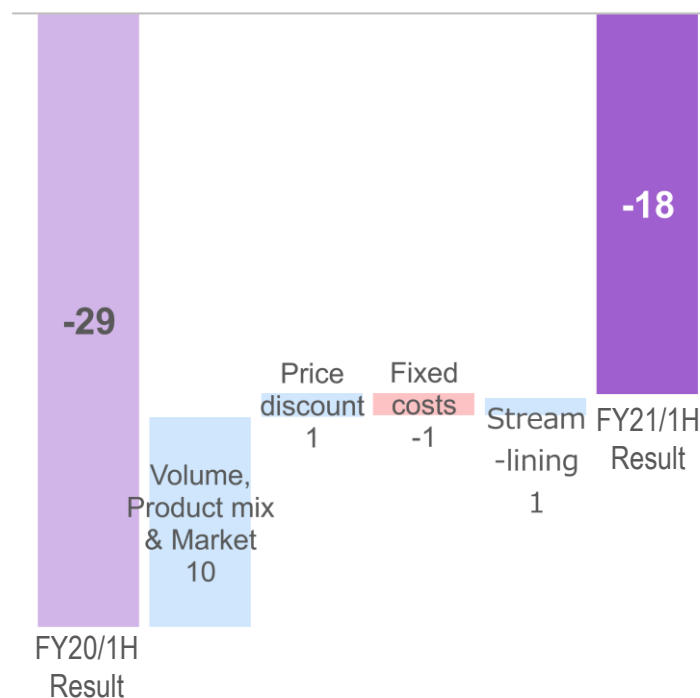
In China, sales decreased due to a decrease in the volume of orders received.

The decrease in sales includes the impact of the application of revenue recognition standards.

Results Trends



Variable Factor Analysis for Operating Income



Precision Springs & Components

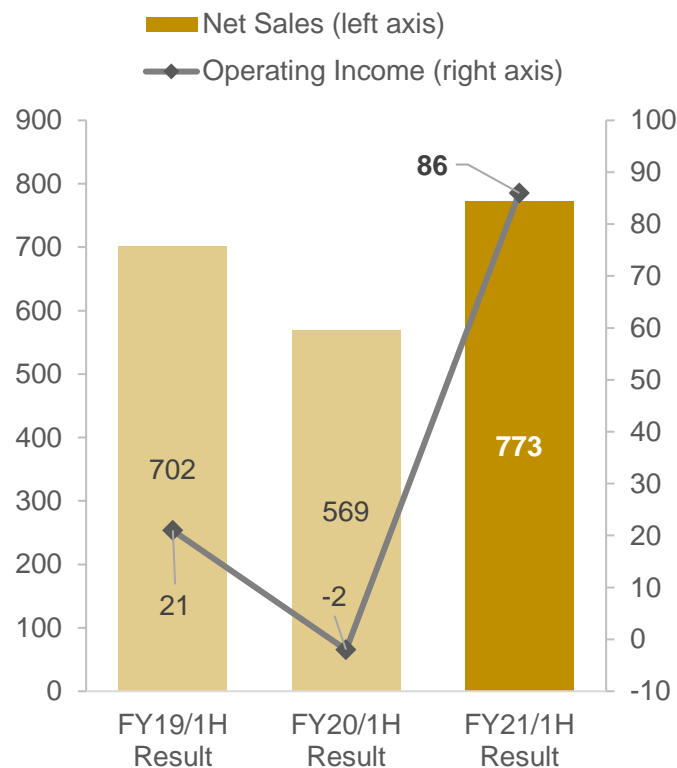
(100 Million Yen)

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		Q1	Q2		
Net Sales	569	368	404	773	203
Operating Income	-2	33	53	86	89
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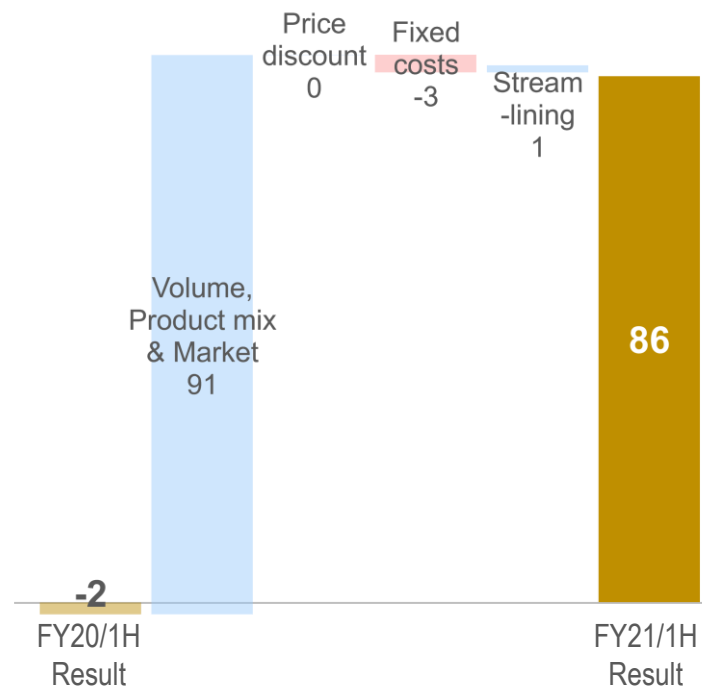
vs. FY2020 1st half

Although the automotive-related parts were affected by shortages in the supply of semiconductors and other factors, the information-and-communication-related business saw continued strong demand for HDD-related parts, resulting in increased sales and profits.

Results Trends



Variable Factor Analysis for Operating Income



Results for 1st half of the year ending March 2022: Analysis by Business Segment

Industrial Machinery & Others

(100 Million Yen)

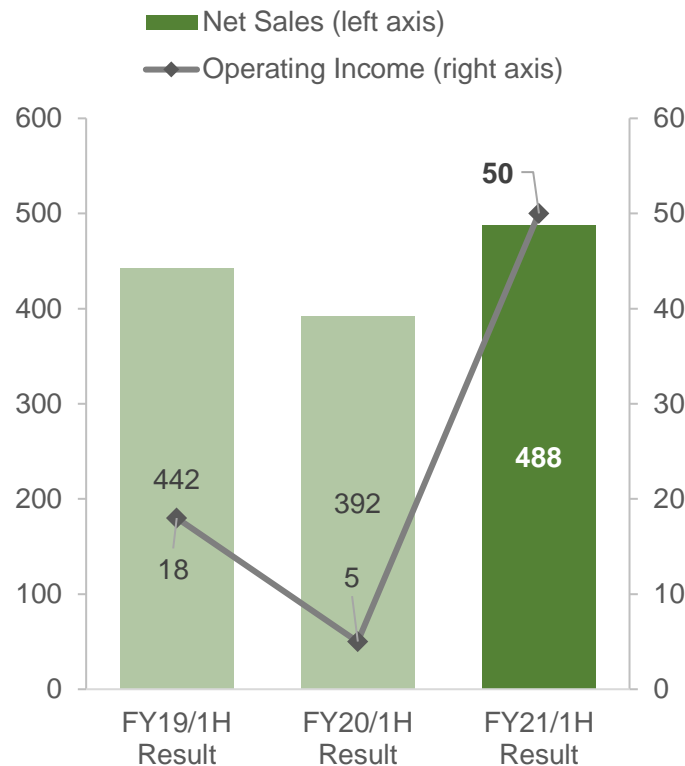
	FY2020 1st half	FY2021		Vs. FY2020 1H Variance	
		Q1	Q2		1st half
Net Sales	392	239	249	488	95
Operating Income	5	25	25	50	44
Ratio	1.5%	10.7%	10.0%	10.4%	8.9%

vs. FY2020 1st half

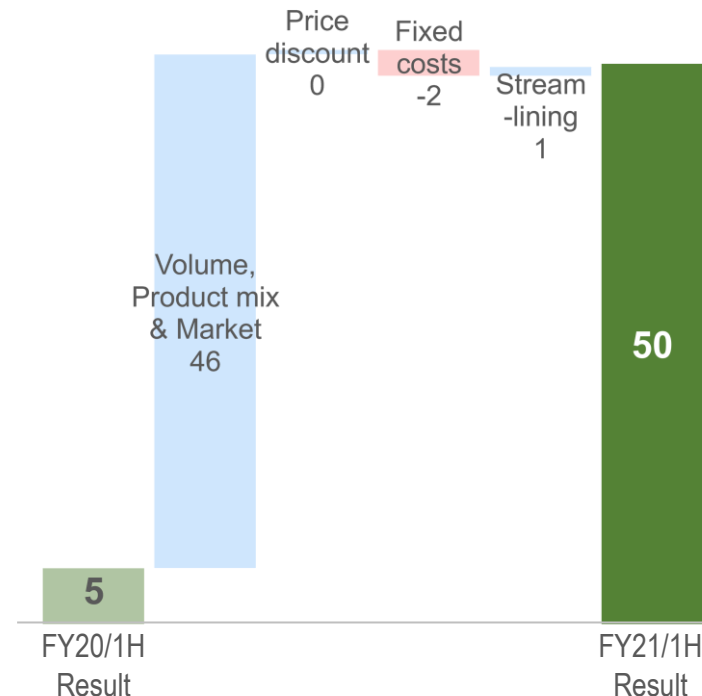
Sales of semiconductor process components were strong in the previous fiscal year, as the impact of the spread of the COVID-19 infection was minimal. Orders continued to be strong during the current fiscal year.

In addition, the automotive business is recovering from the impact of the spread of the COVID-19 infection. In addition, there was an increase in demand for golf shafts, maritime-related products, etc., resulting in an overall increase in both sales and profits.

Results Trends



Variable Factor Analysis for Operating Income



Assets Status

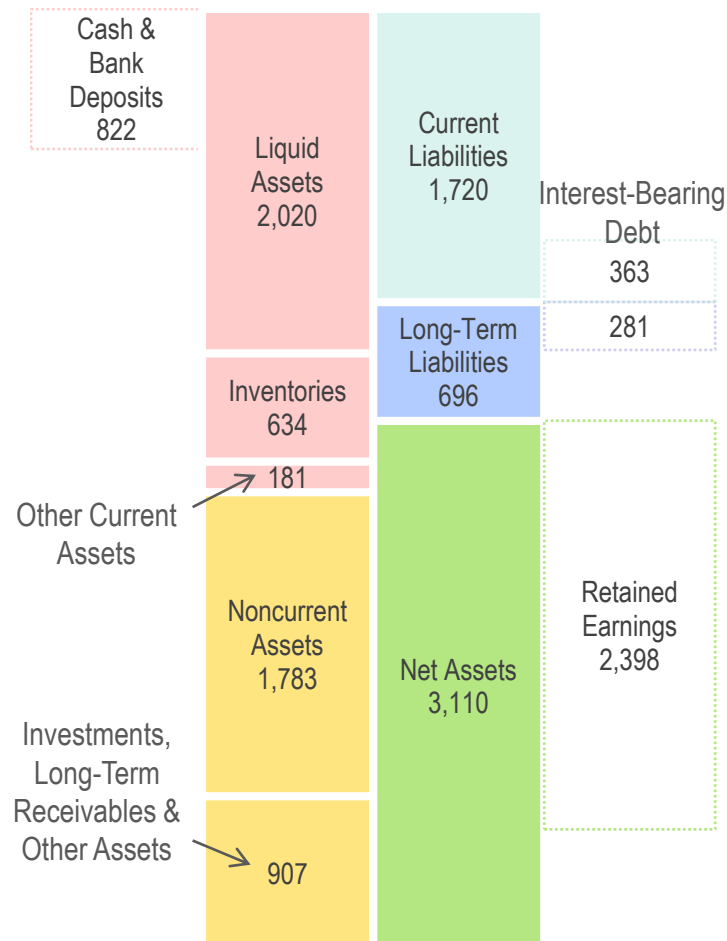
(100 million yen)

	FY2017	FY2018	FY2019	FY2020	FY2021 1st half	Increase /Decrease
Total Assets	5,683	5,731	5,326	5,607	5,526	-81
Stockholder's Equity	2,928	2,811	2,709	2,839	2,952	112
Stockholder's Equity to Total Assets Ratio	51.5%	49.0%	50.9%	50.6%	53.4%	2.8%
Cash and Bank Deposits	952	985	745	793	822	29
Interest Bearing Debt	532	682	575	692	644	-48
Net Cash	419	303	170	100	178	77

Balance Sheet Status

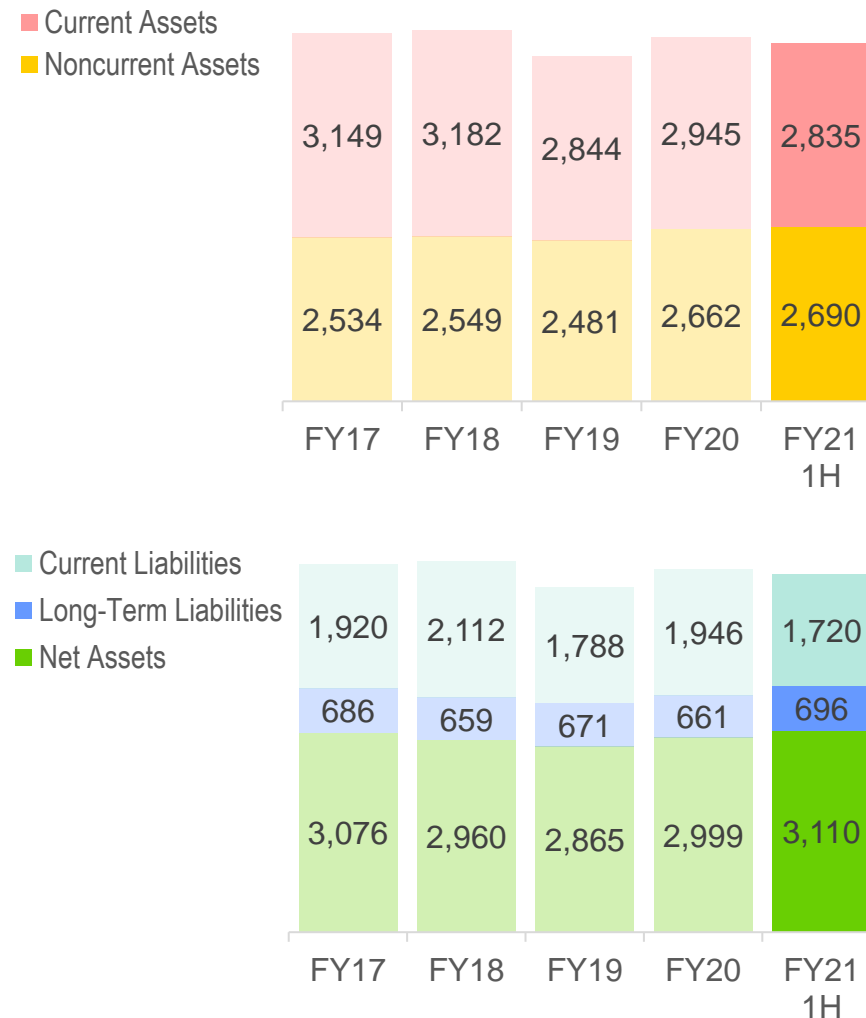
Balance Sheet as of 9/2021

(100 million yen)



Balance Sheet Trends

(100 million yen)



Assets

Operating transactions decreased due to the impact of the spread of the COVID-19 infection and the semiconductor shortage, resulting in a decrease in operating receivables.

Liabilities

In addition to the repayment of loans, operating debt decreased due to a decrease in operating transactions.

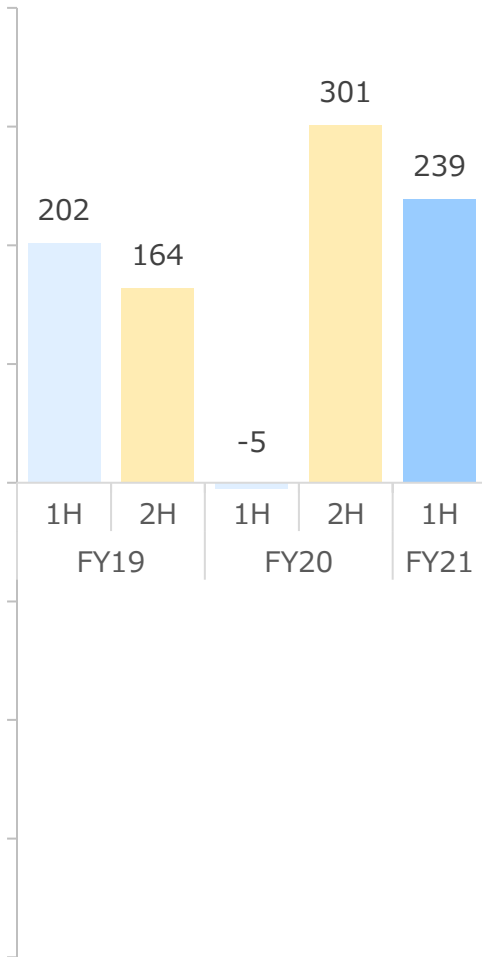
Fixed liabilities increased due to the issuance of bonds.

Net Assets

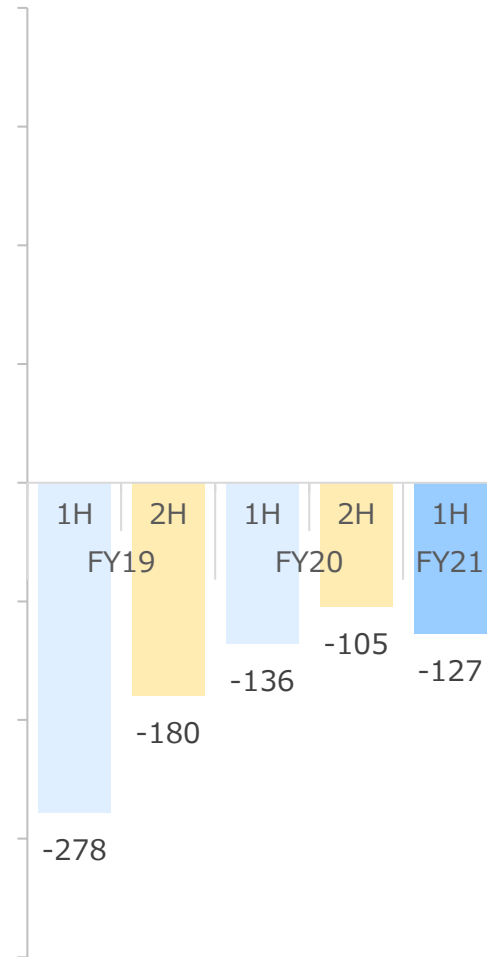
Foreign currency translation adjustments increased. Retained earnings increased due to net income for the current fiscal year.

Cash Flow Status in each half-year period

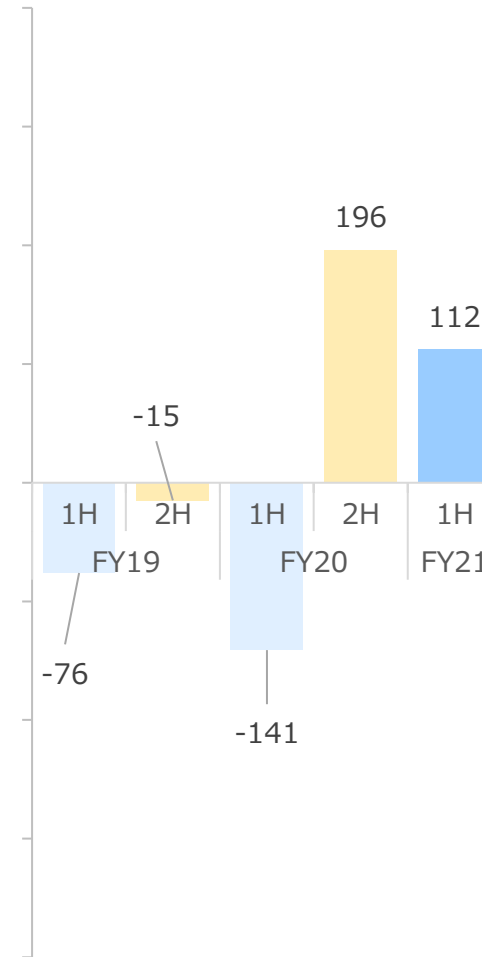
Operating CF



Investment CF

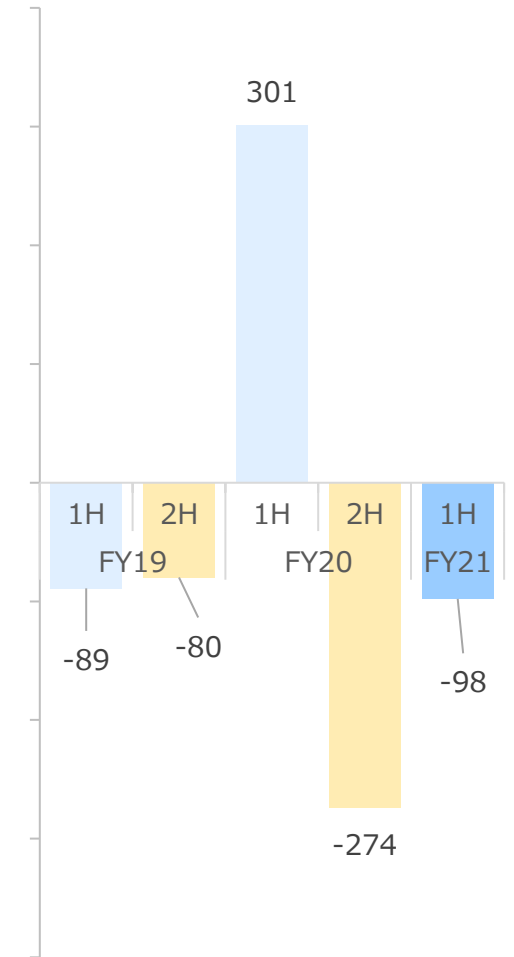


Free CF



Financial CF

(100 million Yen)



Details of the Financial Forecast
for the Year Ending March 2022

Forecast for the year ending March 2022

(100 million yen)

	FY2020 Results	Initial Forecast	Previous Forecast	FY2021 Forecast	Vs. FY2020	Vs. Initial Forecast	Vs. Previous Forecast		
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Profit Attribute to Owners of Parent	93	180	180	180	86	—	—		
Extraordinary profits/losses	2	—	—	-2	-5	-2	-2		
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	Thai Baht	this year	3.4	3.3	3.4	3.3	-0.1	—	-0.1
		previous year	3.6	3.4	3.4	3.4	-0.2	—	—

Net Sales / Operating Income by Business Segment

(100 million yen)

	FY2020 Results	FY2021		Vs. FY2020 Results	Vs. Initial Forecast
		Initial Forecast	Latest Forecast		
A utomotive Suspension Spring	Net Sales	1,020	1,180	159	—
	Operating Income	-46	11	16	-41
	Ratio	-4.6%	0.9%	2.0%	-3.5%
A utomotive Seating	Net Sales	2,425	2,290	-235	-100
	Operating Income	19	66	0	-46
	Ratio	0.8%	2.9%	0.1%	-2.0%
P recision Springs & Components	Net Sales	1,385	1,560	244	70
	Operating Income	68	103	96	62
	Ratio	4.9%	6.6%	5.2%	3.5%
I ndustrial Machinery & Others	Net Sales	895	970	104	30
	Operating Income	63	70	31	25
	Ratio	7.1%	7.2%	2.4%	2.3%
Total	Net Sales	5,726	6,000	273	—
	Operating Income	104	250	145	—
	Ratio	1.8%	4.2%	2.3%	—

Automotive Suspension Springs & Automotive Seating

Sales and profits are expected to decrease due to the impact of lower automotive production caused by the semiconductor shortage, as well as the impact of higher raw material prices and logistics costs.

Precision Springs & Components

Although automotive-related parts are expected to be affected by the shortage of semiconductors and the sharp rise in raw material prices, orders for HDD-related parts are expected to remain strong, so overall sales and profits are expected to increase.

Industrial Machinery & Others

Sales and profits are expected to increase due to strong orders in non-automotive-related businesses such as semiconductor process components and golf shafts.

Net Sales / Operating Income by Region

(100 million yen)

	FY2020 Results	FY2021		Vs. FY2020 Results	Vs. Initial Forecast
		Initial Forecast	Latest Forecast		
Japan	Net Sales	3,431	3,720	18	-270
	Operating Income	100	155	87	33
	Ratio	2.9%	4.2%	2.5%	1.3%
Asia	Net Sales	1,489	1,460	209	239
	Operating Income	64	98	52	19
	Ratio	4.3%	6.7%	2.6%	0.2%
America & Europe & Others	Net Sales	805	820	45	31
	Operating Income	-59	-3	4	-52
	Ratio	-7.4%	-0.4%	1.0%	-6.1%
Total	Net Sales	5,726	6,000	273	—
	Operating Income	104	250	145	—
	Ratio	1.8%	4.2%	2.3%	—

Japan

Although the automotive business will be affected by the shortage of semiconductors as well as soaring raw material prices and logistics costs, HDD-related parts and semiconductor process components are expected to perform well, so overall sales are expected to decrease but profits are expected to increase.

Asia

Both sales and profits are expected to increase as orders for HDD-related parts are expected to be strong in Thailand and China.

America, Europe & Others

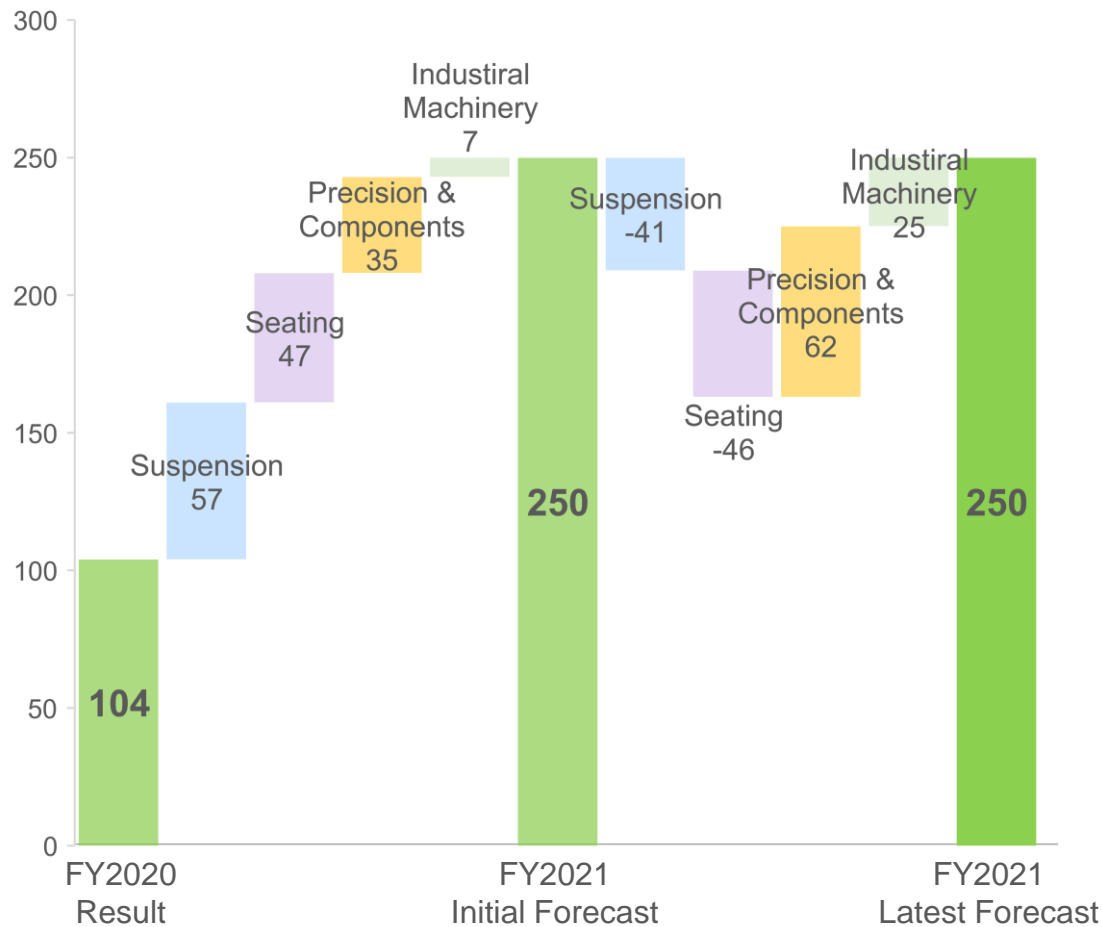
Although the timing of the resolution of the semiconductor shortage is uncertain, sales are expected to increase due to an expected recovery in automotive production to a certain extent in the second half.

On the other hand, profits are expected to decrease due to the expected impact of soaring raw material prices and logistics costs.

Variable Factor Analysis for Operating Income

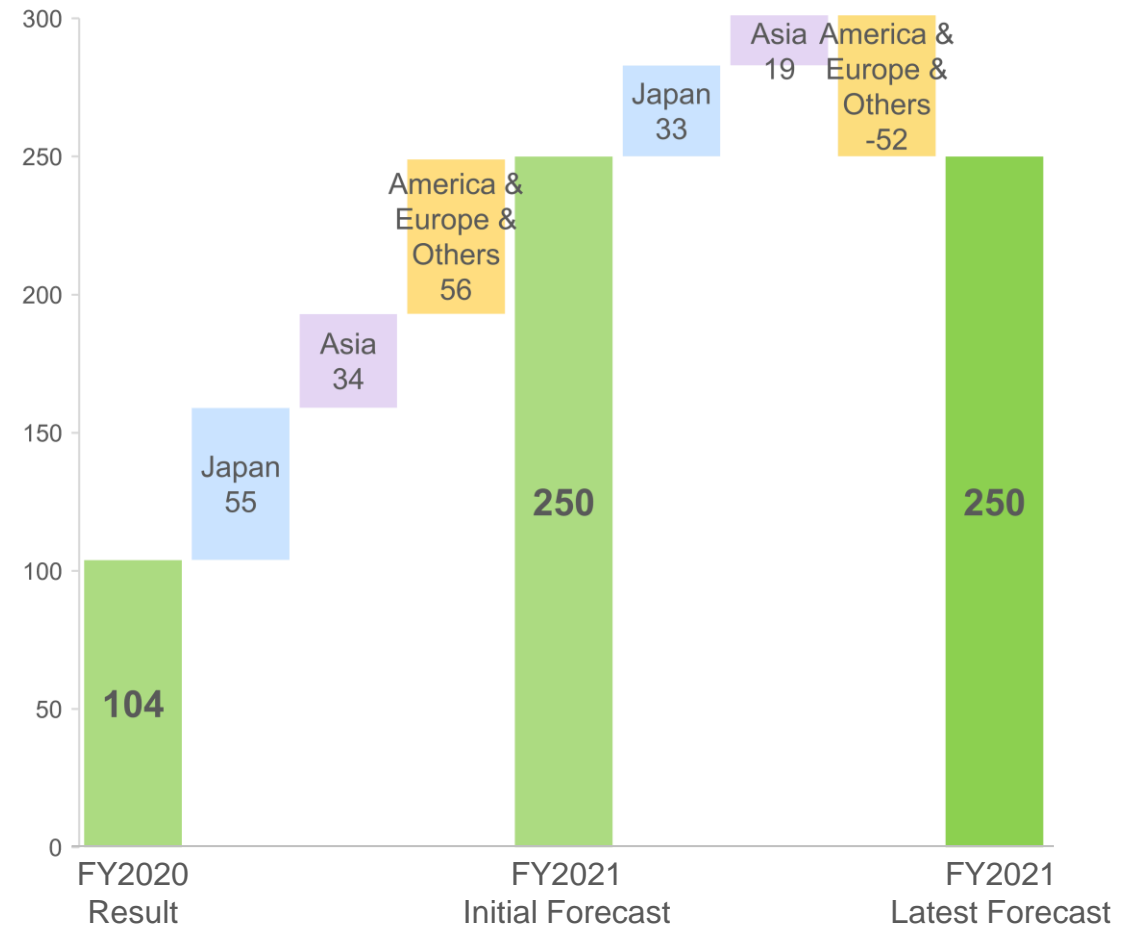
By Business Segment

(100 million Yen)



By Region

(100 million Yen)



Automotive Suspension Spring

(100 Million Yen)

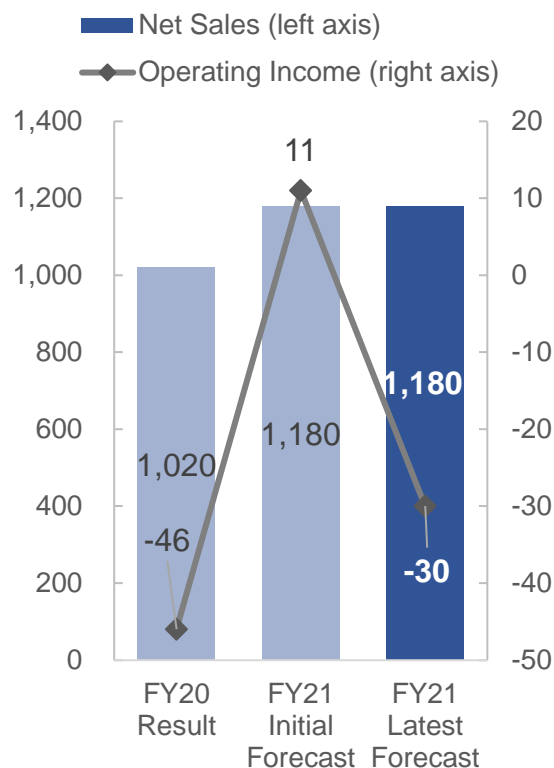
	FY2020	FY2021		Vs. FY2020 Result	Vs. Initial Forecast
	Result	Initial Forecast	Latest Forecast		
Net Sales	1,020	1,180	1,180	159	—
Operating Income	-46	11	-30	16	-41
Ratio	-4.6%	0.9%	-2.5%	2.0%	-3.5%

vs. Initial Forecast as of 5/2021

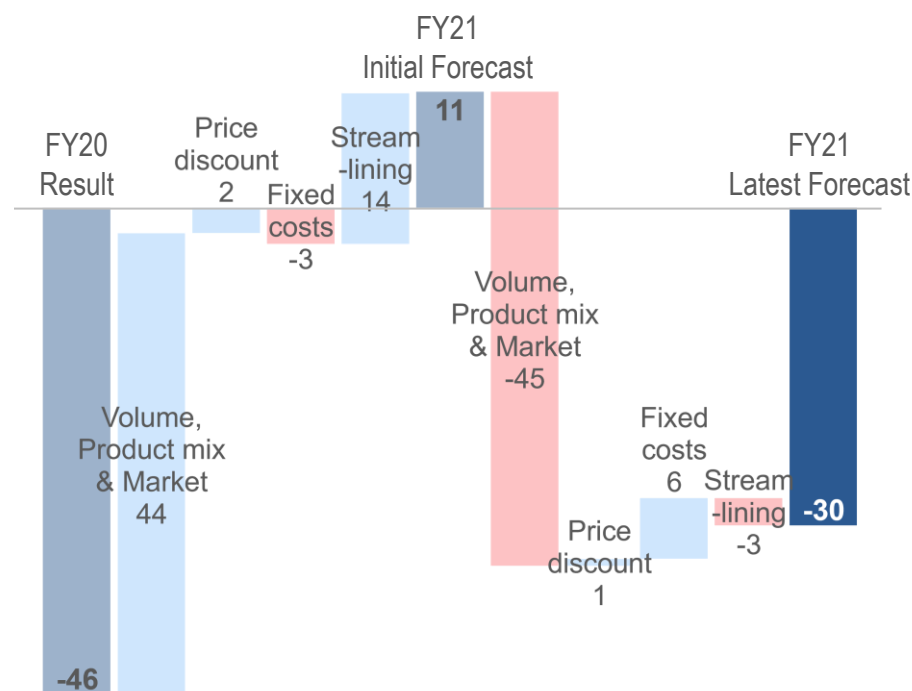
Although the timing of the resolution of the semiconductor supply shortage and the impact of automotive manufacturers' production cutbacks due to the spread of the COVID-19 infection in Southeast Asian countries and other regions is uncertain, we expect a certain level of recovery in sales volume in the second half, mainly in Asia, the U.S., Europe, and other regions, and full-year sales are expected to be in line with the plan.

On the other hand, operating income is expected to decrease due to the expected impact of soaring raw material prices and logistics costs.

Results Comparison



Variable Factor Analysis for Operating Income



Automotive Seating

(100 Million Yen)

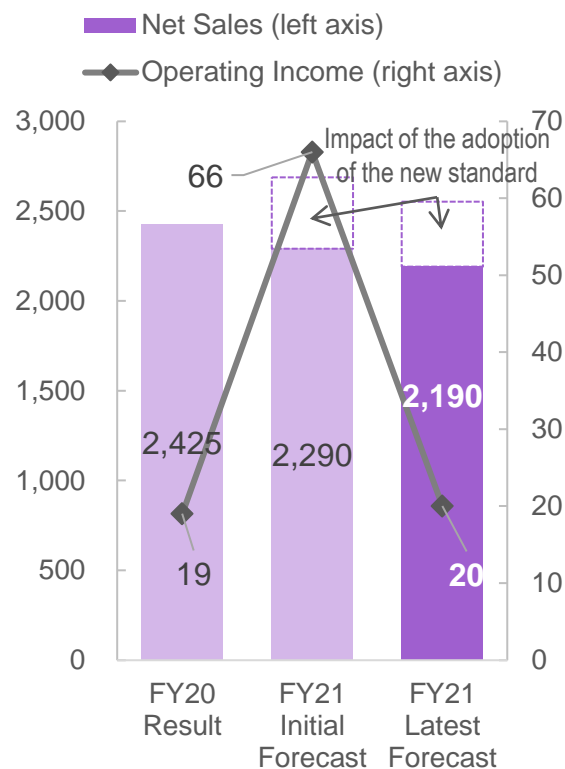
	FY2020 Result	FY2021		Vs. FY2020 Result	Vs. Initial Forecast
		Initial Forecast	Latest Forecast		
Net Sales	2,425	2,290	2,190	-235	-100
Operating Income	19	66	20	-	-46
Ratio	0.8%	2.9%	0.9%	0.1%	-2.0%

vs. Initial Forecast as of 5/2021

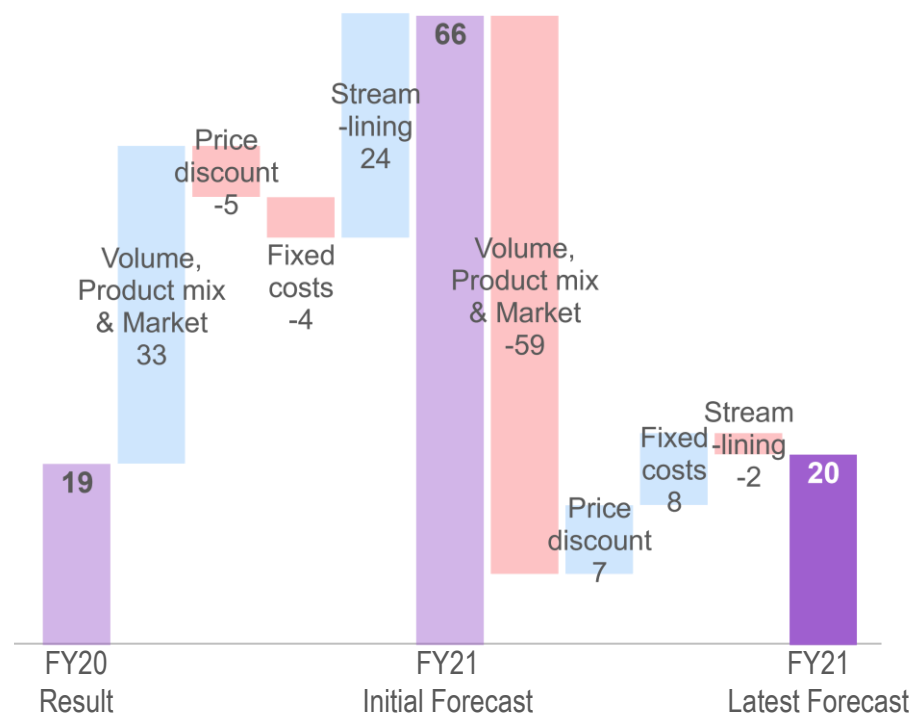
Although the timing of the resolution of the semiconductor supply shortage and the impact of automakers' production cutbacks due to the spread of the COVID-19 infection in Southeast Asian countries and other regions is uncertain, a certain level of recovery in sales volume is expected in the second half, mainly in Asia and the U.S..

However, sales and profits are expected to decrease due to the impact of production cutbacks in Japan caused by semiconductor supply shortages, which are larger than expected, as well as the impact of soaring raw material prices and logistics costs.

Results Comparison



Variable Factor Analysis for Operating Income



Precision Springs & Components

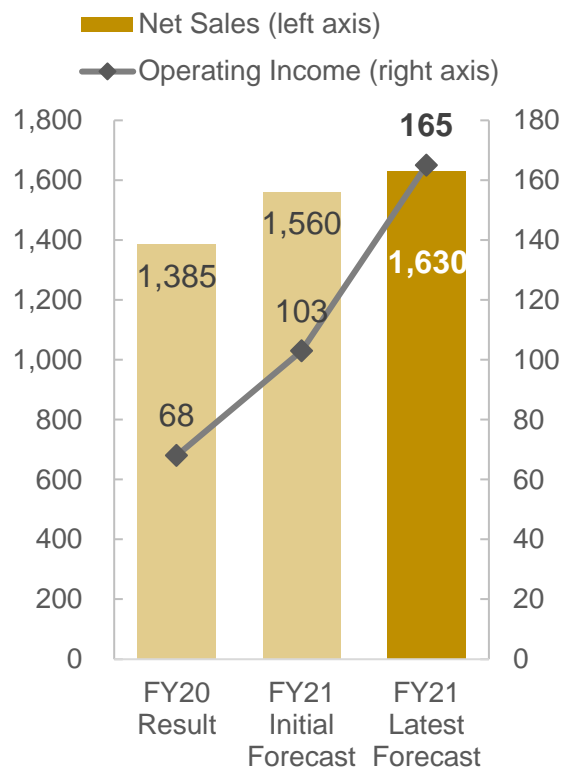
(100 Million Yen)

	FY2020	FY2021		Vs. FY2020 Result	Vs. Initial Forecast
	Result	Initial Forecast	Latest Forecast		
Net Sales	1,385	1,560	1,630	244	70
Operating Income	68	103	165	96	62
Ratio	4.9%	6.6%	10.1%	5.2%	3.5%

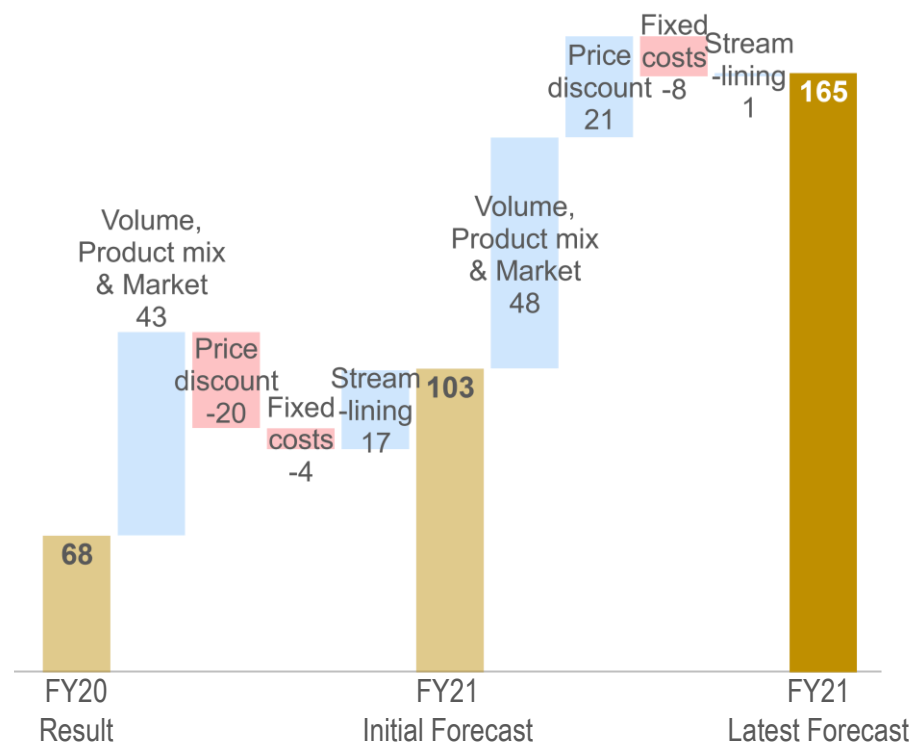
vs. Initial Forecast as of 5/2021

Automotive-related parts will be affected by soaring raw material prices and logistics costs in addition to the impact of semiconductor supply shortages, but orders for information-and-communication-related products such as HDD-related parts are expected to remain strong on a global basis, so overall sales and profits are expected to increase.

Results Comparison



Variable Factor Analysis for Operating Income



Forecast for the year ending March 2022: Analysis by Business Segment

Industrial Machinery & Others

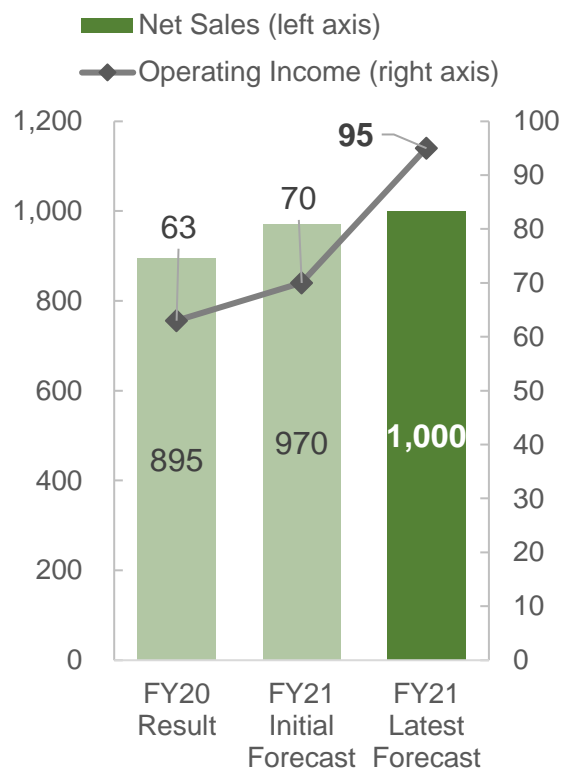
(100 Million Yen)

	FY2020	FY2021		Vs. FY2020 Result	Vs. Initial Forecast
	Result	Initial Forecast	Latest Forecast		
Net Sales	895	970	1,000	104	30
Operating Income	63	70	95	31	25
Ratio	7.1%	7.2%	9.5%	2.4%	2.3%

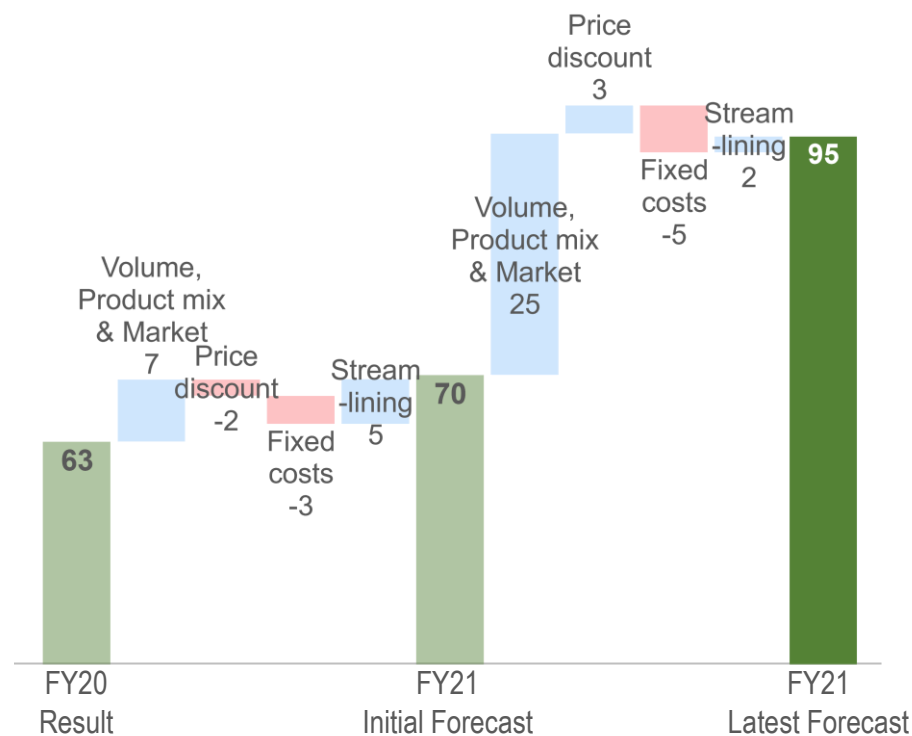
vs. Initial Forecast as of 5/2021

In addition to strong orders for semiconductor process components, demand for IMS (Integrated Metal Substrate), golf shafts, and maritime-related products is also expected to increase, resulting in higher sales and profits.

Results Comparison



Variable Factor Analysis for Operating Income



Capital Investment / Depreciation & Amortization

(100 million Yen)

by Business Segment

		FY2019 Results	FY2020 Results	FY2021		
				Initial Forecast	Latest Forecast	Variance
Capital Investments	Automotive Suspension Springs	151	49	57	49	-7
	Automotive Seating	55	62	57	49	-8
	Precision Springs & Components	144	105	126	144	17
	Industrial Machinery & Others	29	24	38	36	-1
	Company-wide sharing	17	7	13	11	-1
	Total	398	249	293	292	-0
	Vs. Previous year	-11.4%	-37.3%	17.4%	17.1%	
Depreciation & Amortization	Automotive Suspension Springs	62	59	71	68	-2
	Automotive Seating	54	51	50	52	2
	Precision Springs & Components	98	109	114	114	0
	Industrial Machinery & Others	31	37	39	37	-1
	Company-wide sharing	17	16	11	14	2
	Total	264	274	287	287	-0
	Vs. Previous year	5.6%	4.1%	4.6%	4.5%	

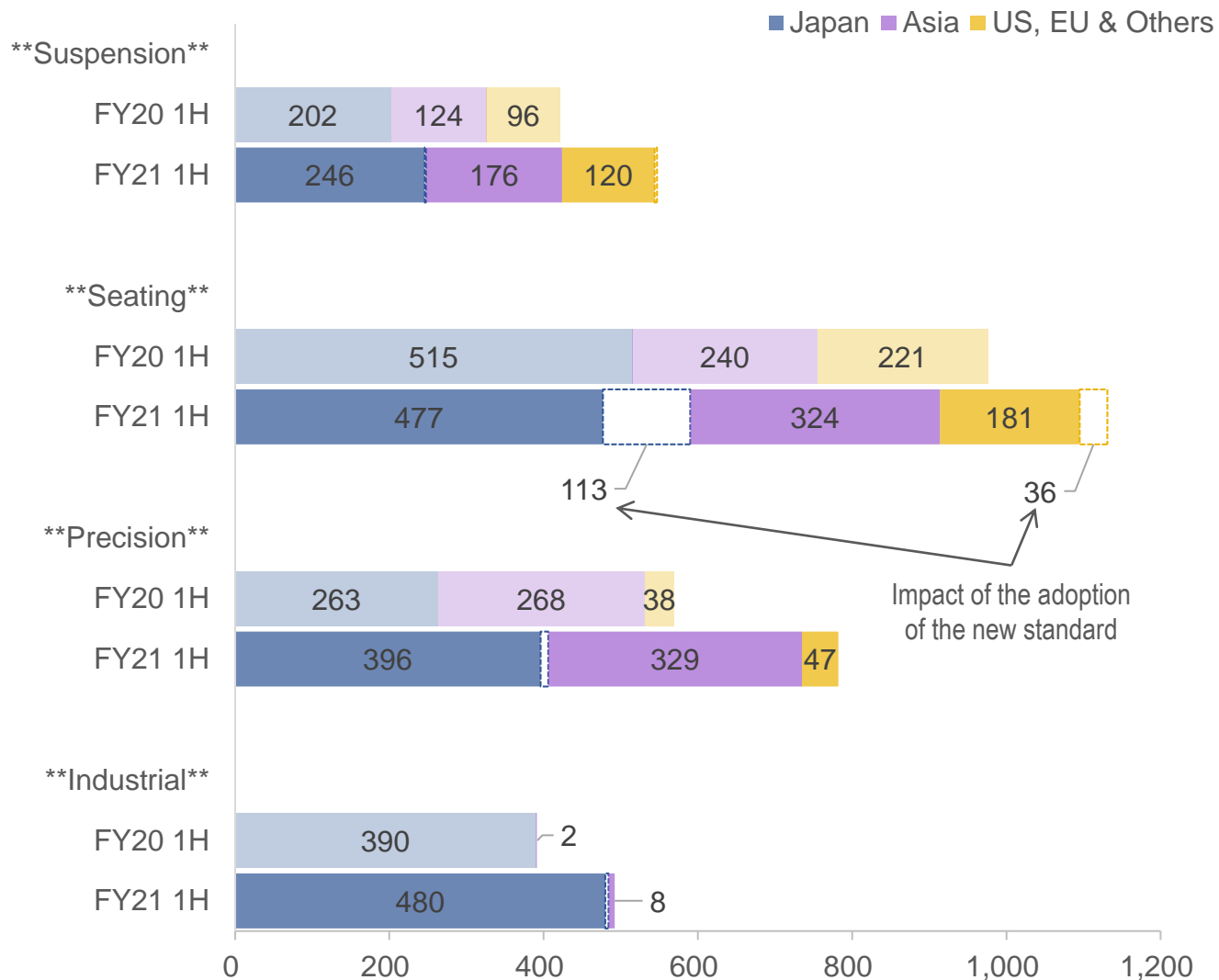
Capital Investment / Depreciation & Amortization Cont'd**by Region**

(100 million Yen)

		FY2019 Results	FY2020 Results	FY2021		
				Initial Forecast	Latest Forecast	Variance
Capital Investments	Japan	188	138	168	167	-1
	Asia	100	63	85	92	7
	America, Europe & Others	109	48	38	32	-6
	Overseas total	209	111	124	125	0
	Total	398	249	293	292	-0
Depreciation & Amortization	Japan	154	164	172	168	-3
	Asia	62	71	71	74	3
	America, Europe & Others	47	39	43	44	0
	Overseas total	109	110	115	119	3
	Total	264	274	287	287	-0

Supplementary Materials

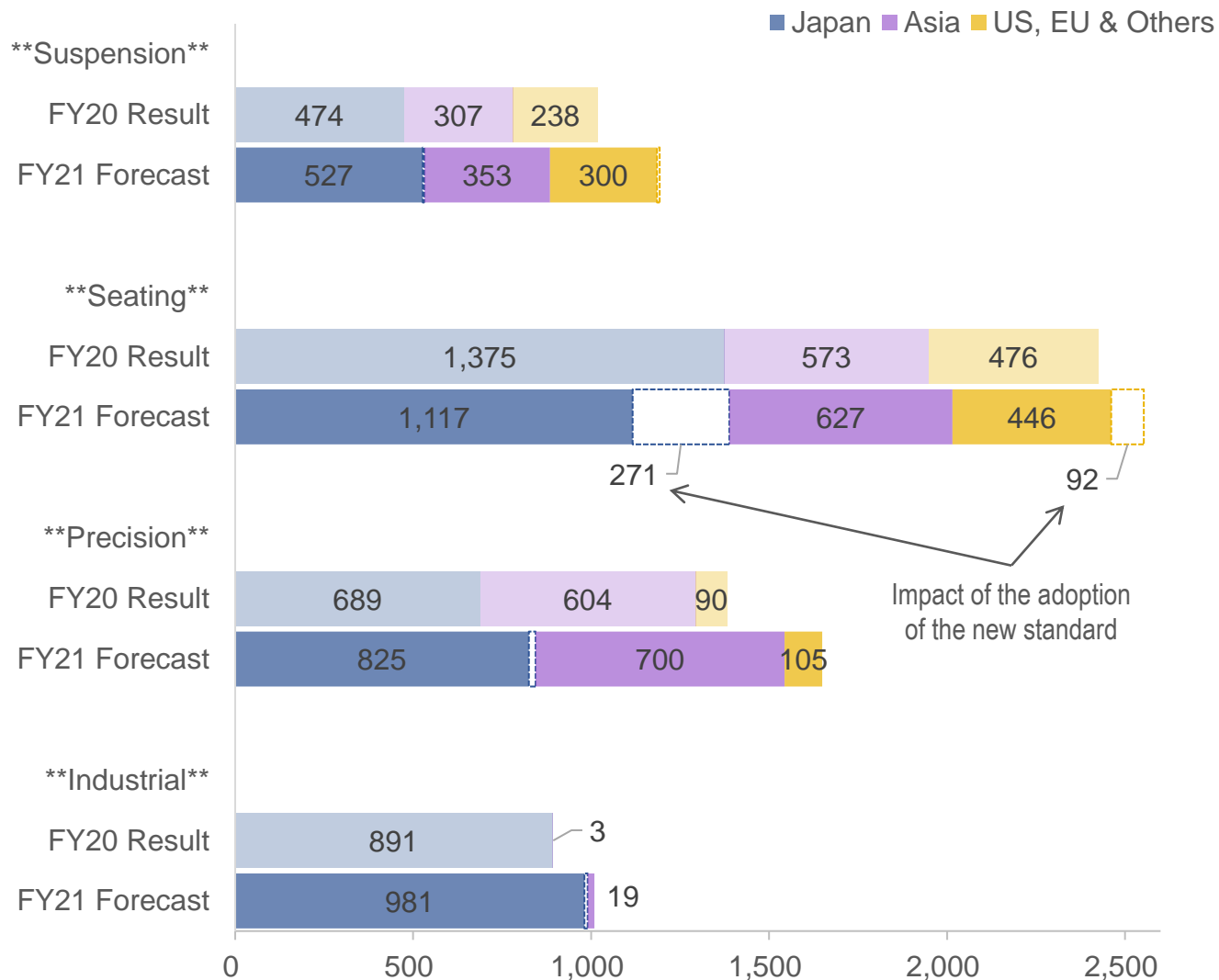
Details of Net Sales (half-year)



(100 million Yen)

		Japan	Asia	America & Europe & Others	Total
Automotive Suspension Springs	FY20 1H	202	124	96	422
	FY21 1H	246	176	120	543
Automotive Seating	FY20 1H	515	240	221	977
	FY21 1H	477	324	181	983
Precision Springs & Components	FY20 1H	263	268	38	569
	FY21 1H	396	329	47	773
Industrial Machinery & Others	FY20 1H	390	2	-	392
	FY21 1H	480	8	-	488
Total	FY20 1H	1,371	634	356	2,362
	FY21 1H	1,600	838	349	2,789

Details of Net Sales (full-year)

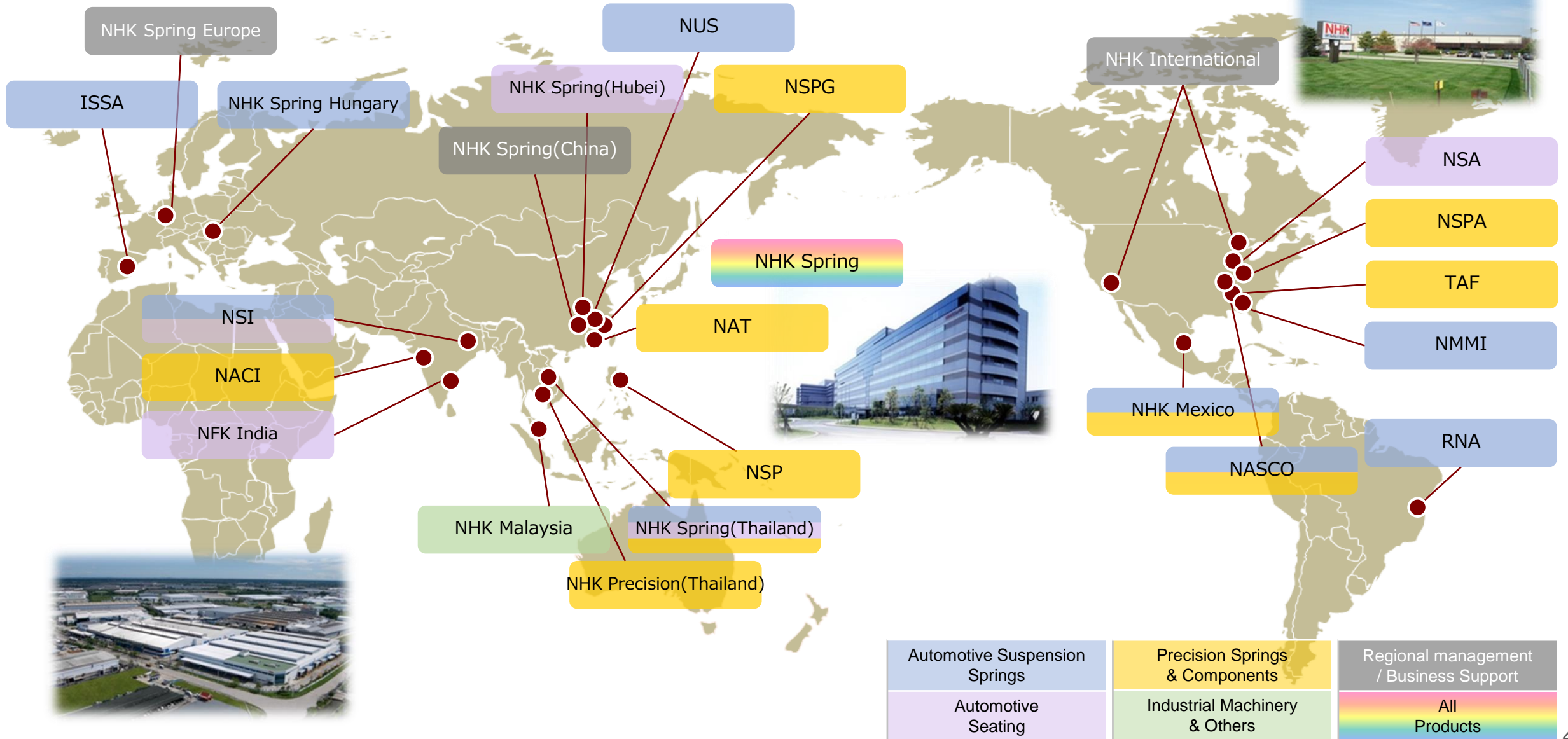


(100 million Yen)

		Japan	Asia	America & Europe & Others	Total
Automotive Suspension Springs	FY20 Result	474	307	238	1,020
	FY21 Forecast	527	353	300	1,180
Automotive Seating	FY20 Result	1,375	573	476	2,425
	FY21 Forecast	1,117	627	446	2,190
Precision Springs & Components	FY20 Result	689	604	90	1,385
	FY21 Forecast	825	700	105	1,630
Industrial Machinery & Others	FY20 Result	891	3	-	895
	FY21 Forecast	981	19	-	1,000
Total	FY20 Result	3,431	1,489	805	5,726
	FY21 Forecast	3,450	1,699	851	6,000

Supplementary Materials: Overseas Expansion

Major Overseas Operations



Answers to Frequently Asked Questions

Question

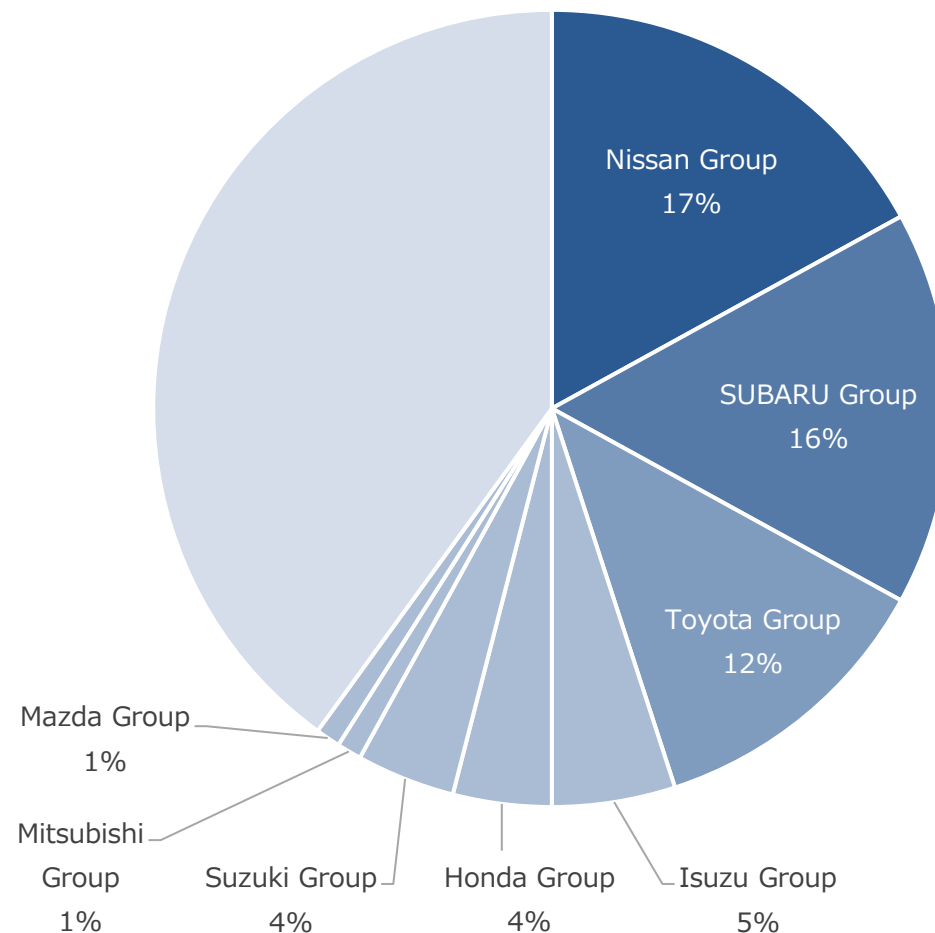
: What is your sales breakdown to each of the major car makers?

Answer

: Our results for the year ended March 2021 are shown in the table below.

Major car makers	FY2019	FY2020
Nissan Group	19%	17%
SUBARU Group	17%	16%
Toyota Group	12%	12%
Isuzu Group	5%	5%
Honda Group	4%	4%
Suzuki Group	4%	4%
Mitsubishi Group	2%	1%
Mazda Group	1%	1%
Top 3 Companies	48%	45%

(Note) The percentages show share versus total net sales.



Motor Core

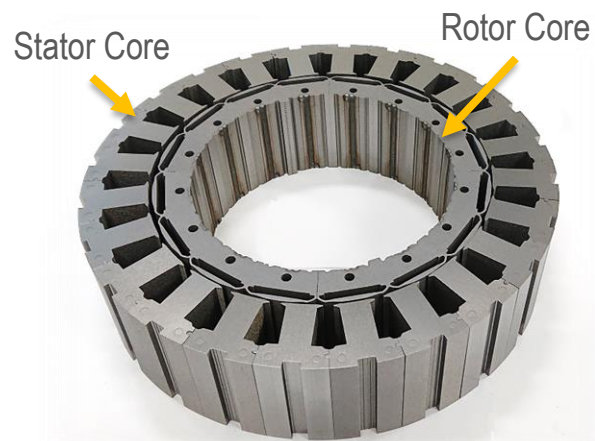
NHK produce Motor Cores, which are laminated iron cores used in the motors -- drive motors and/or power generators-- for EV and HV vehicles. They are made by some hundred layers of 0.25-0.35 mm thickness electromagnetic steel sheets which are stamped out one by one, and are fastened together by caulking or welding.

The motor core consists of the Rotor Core, which has a magnet inserted and serves as the rotating part of the motor, and the Stator Core, which is the fixed winding part. Electric power from battery is supplied to the motors through inverters, and Rotor Cores --which contains magnets-- are pulled and repelled by rotating magnetic field generated in the Stator Cores-- which are wound with coils--, causing Rotor Cores high speed rotation. Thin plate laminated iron cores can easily pass through magnetic field lines, and have ability to generate stronger magnetic force.

NHK Motor Cores are diameter of around 200mm and height of around 150mm, which is a relatively large size for the precision stamped products that NHK produce; but NHK has built up an ability over the many years, to produce dimensional accuracy as micron level, through our production of automotive parts and HDD (hard disk drive) parts, to be able to produce this kind of large, ultra-high precision stamped products.

The press dies --which is the key to the production of Motor Core-- are manufactured in-house, from designing, production to maintenance. In addition to our Atsugi Plant in Japan, NHK is able to produce the same quality motor cores, at our global operations in Mexico and China.

Motor Core



Suspension for HDD (Hard Disk Drive) Read-Write Head



Suspensions for HDD are unique spring products, holding read-write head in Hard Disk Drive devices.

In these days, there are much more HDDs in the Data Center in the companies ,who operates SNS and/or Video sharing sites --rather than used in Personal computers--; In these Data Centers, Ultra-large capacity HDDs line up with unit of hundreds of thousands.

A lot of CLA type suspensions (Refer Note 1. :hereinafter CLA) are used in these kind of HDDs; for example, in the picture (left), 18 pieces of CLA are used in 1 HDD equipment. The CLA is an Ultra-small actuator, built into the tip of the suspension, which moves read-write head. The CLA types can make finer movement at higher speed, rather than DSA type suspensions (Refer Note 2. :hereinafter DSA), a conventional product with a small actuator built into the center.

If you compare it to a human part, DSAs use up to the wrist, and CLAs use up to the fingertips; It has become an indispensable product for ultra-large capacity HDDs, by improving positioning accuracy and speed, with speedy & fine movements.

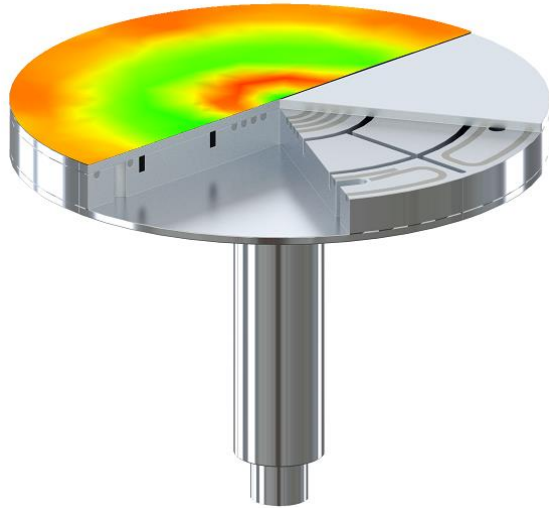
NHK Spring had started CLA mass-production from January 2016 --first in the world-- and have top share of the world.

*Note 1 : CLA stands for "Co-Located Actuators"

*Note 2 : DSA stands for "Dual Stage Actuators"



Stage heater with multi-zone temperature distribution control function for film deposition equipment



Ceramics spray-coated cooling plate for etching equipment



In semiconductors, conductors and insulators are drawn in a fine and complicated pattern on a silicon substrate to form a circuit.

Our stage heaters, which are mainly made of metal such as aluminum alloy and stainless steel, are broadly adopted in film deposition processes such as CVD and ALD*, and they make it possible to realize a complicated internal structure by the advanced bonding technology that we have cultivated over many years.

*CVD stands for Chemical Vapor Deposition

*ALD stands for Atomic Layer Deposition

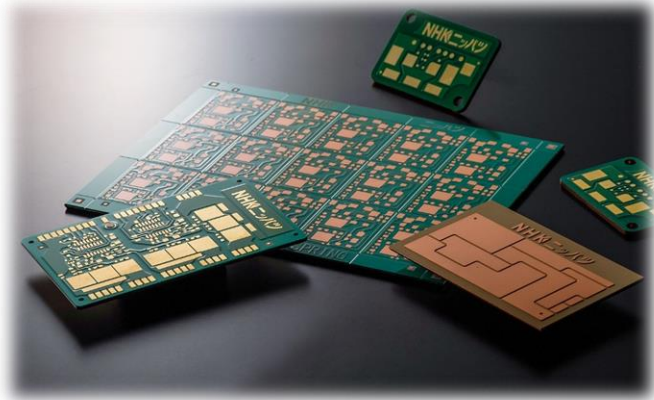
In making full use of our own heater element design technology and analysis technology for simulation, it is possible to arrange multiple heater elements, refrigerant channels, and heat insulating space, which enables to realize not only equalize temperature distribution, but also active temperature distribution control, that partially generates a difference in the range of several tens of degrees.

Regarding to etching equipment, we are manufacturing important stage parts called cooling plates, on which silicon wafers are loaded during process. Most of them are made from aluminum alloy ; NHK have the strength of integrated production --from material procurement to precision processing and ceramic spray coating--, and applying our advanced bonding technology, common to the heater manufacturing.

In these years, in addition to the parts at the bottom of the chamber -- heater and cooling plate which support work in process wafers--, we have also focused on developing the parts of the upper side of the chamber -- called shower heads, for the purpose of supplying required gas in the process --, and this sales are also increasing.

IMS (Integrated Metal Substrate)

IMS with high heat dissipation and high reliability insulation layer



Integrated Metal Substrates (IMS) are circuit plates, circuits are formed via an insulating layer on metal base, such as aluminum or copper, and their excellent heat dissipation are characteristic of IMS. Taking advantage of this heat-radiating performance, IMS is used in the fields of automotive, industrial, and consumer applications, to efficiently dissipate the heat generated by semiconductor components mounted on IMS.

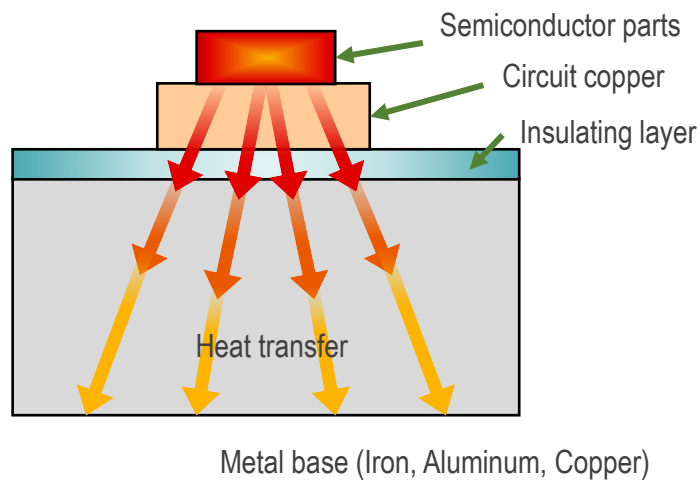
In the automotive field, our products are increasingly used in DC-DC converters and charger modules for electric and hybrid vehicles, and we are aiming to use them in drive inverter circuits in their future. In industrial applications, in addition to general-purpose inverters and inverter circuits for air conditioners, our IMS are widely used as power modules inside power conditioners for renewable energy.

Our IMS is specialized in the development and manufacturing of high heat radiation and highly reliable insulating layers.

Our IMS is characterized by our strength in integrated production, from the development of high heat-dissipating and highly reliable insulating layers, to manufacturing and finishing into IMS.

We have been developing IMS since 1980s, and have been leading the industry by introducing high heat dissipation insulating materials to the market successively.

Cross-sectional structure of IMS





NHK SPRING CO.,LTD.

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