

# **MEC Company Ltd. (4971 JP) – Sponsored Research**

TECHNOLOGY THAT SUPPORTS FUNCTIONALITY OF MOTHER BOARDS

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NIPPON INVESTMENT BESPOKE RESEARCH UK LTD

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## Summary – Key Ingredient for Faster Communication

MEC was founded exactly 50 years ago by Kosaku Maeda with his vision to integrate machinery (M), electronics (E) and chemistry (C). Its main business is to develop, manufacture and sell specialised industrial chemicals for package substrates. The firm operates a comprehensive global value chain, ranging from R&D to sales.

MEC is a global leader in copper surface treatment chemicals thanks to its prowess in the following three technologies:

1. Adhesion Enhancement Technology: This technology improves the bonding of organic resin to metal (copper) by roughening the copper surface with micron precision.
2. Fine Wiring Formation Technology for micro patterning: The main use is for COF (chip-on-film) for flat panel displays (FPDs)
3. Surface Etching Technology: This provides the ability to etch only copper with no impact on any other co-existing metals

MEC's chemical solutions are designed to enhance the functionality and production yield of electronic substrates. The firm has spent circa 10% of sales in R&D to meet the demand from an ever-expanding range of industries such as IoT, electrification of automobiles and 5G.

FY19 Q1 earnings results released on 10 May reported declines in both sales (¥2,328mil (-12.5% YoY)) and operating profit (¥205mil (-60.5% YoY)) mainly due to weak sales of the CZ Series – adhesion enhancement chemicals. The electronics industry has seen a slowdown in areas such as smartphones and servers used for cryptocurrency. Furthermore, tension rising between US and China keeps Japanese manufacturers erring on the side of caution regarding business conditions over the near term. Although MEC is guiding for a weak H1 (sales ¥5,600mil (+1.8% YoY) / OP ¥850mil (-18.2% YoY)), the firm is expecting a rebound in the H2 (sales ¥6,200mil (+6.4% YoY / +10.7% HoH) / OP ¥1,200mil (+1.4% YoY / +41.2% HoH)) as investments for 5G, such as base stations and servers – equipment that requires large volumes of CPUs and therefore demand for MEC's copper roughening chemicals – start to come through.

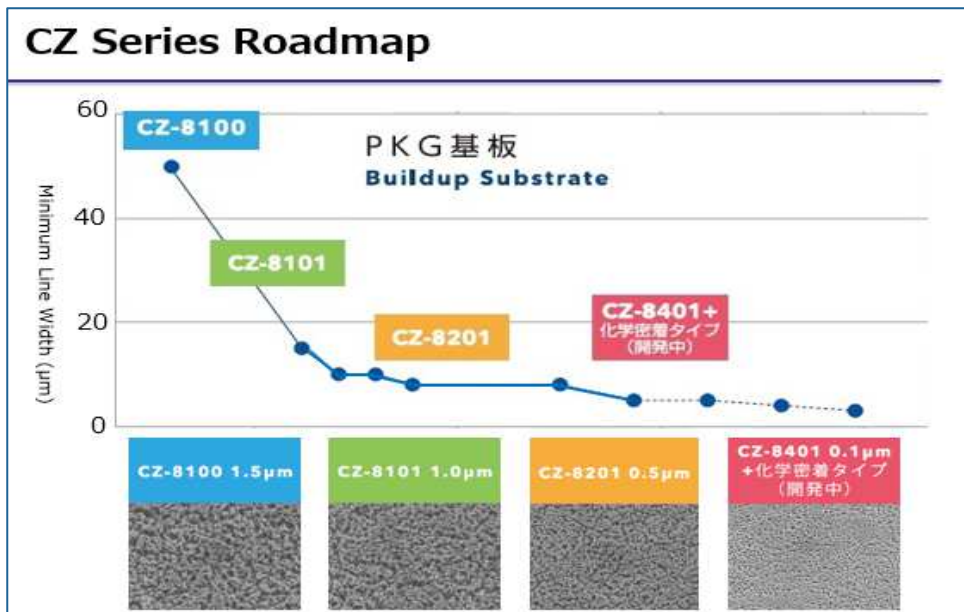
Another application that MEC views as an opportunity for growth is in automotive applications. Automakers are all working on electric vehicles (EVs) and ADAS – advanced driver assisted systems – which means connected mobility will require large volumes of semiconductors.

## MEC's Core Technologies

### Adhesion Enhancement Technology – The CZ Series

Adhesion enhancement is MEC's core technology and it is used in IC packaging. The firm has a wide variety of etching solutions under the CZ Series brand. CZ stands for “copper zarazara” – zarazara is Japanese for rough to the touch– and as the name suggests, its core technology is to roughen copper surfaces to improve the adhesiveness between organic resins and copper surfaces.

Copper roughening technology took the limelight in 1995, when PWB (printed wiring board) materials changed from ceramic to organic resin. While there was no need for an adhesive agent when using ceramic substrates, etching two different materials, such as copper and resin surfaces, required a more advanced adhesive method to ensure the substrate quality would not hamper the functionality of the CPU. MEC came up with a solution to dissolve / modify copper surfaces to create the kind of topography which enhances adhesiveness between different types of materials on a substrate. Its first such agent, CZ-8100, was adopted by Intel's Pentium in 1995. In the copper treatment chemical market for CPUs used in PCs, MEC has 100% global market share. The CZ Series earns circa 50% of the firm's total revenues.



Source: MEC Company Ltd.

During recent years, semiconductors such as CPUs (central processing units) and APs (application processors) have not only become faster but they also have greater functionality. As the width of lines and spaces (L/S) got thinner and finer with each passing year, MEC responded with the launch of an upgraded version of the CZ Series. For example, the original CZ-8100 – used as a pre-treatment for build-up resin lamination, dry film lamination or solder mask application – has 1.5µm coarse surface but the current most popular series CZ-8101 has much finer 1µm coarseness to meet thinner L/S packages used in various applications including smartphones and tablets. Circa 35% of MEC's sales are associated to smartphones and tablets.

Currently, MEC is promoting the most advanced CZ Series with 0.1 µm roughness, the CZ-8401. The CZ Series of products is not only available for package substrates but are also used across a wide range of electronic substrates that require high levels of adhesion. The CZ-8401 is now confirmed to be used in AiP (antenna in package) for 5G smartphones. Such high-spectrum phones are likely to use much larger volumes of ICs per phone compared to existing models.

Outside of the traditional electronics industry, the automotive industry has also provided a new lease of life for some of MEC's products. While sales of the last version of the CZ-8100 initially suffered a decline with the launch of the new version – the CZ-8101 – the older CZ-8100 is now in demand from the auto industry. The CZ-8100 is used in ADAS-use PWBs which are included in components associated with car safety, such as millimetre wave radar, sensors and cameras for data processing. CZ-8101 and the V-Bond series (pre-lamination treatment) are also used for the electrification of automobiles. Currently, circa 20% of MEC's total sales comes from automotive applications.

According to MEC, the gross profit margin of the CZ Series is a healthy 65% and the profitability does not differ by application.

#### [FlatBOND – Adhesion Enhancement for High-Frequency Substrates – Targeting 5G Applications](#)

MEC has also developed FlatBOND. As the name suggests, it is a chemical agent does not roughen the surface but enables flat adhesion without jeopardising adhesion quality. The firm believes that FlatBOND is a solution for high-frequent substrates required for 5G, because the smooth etching created by this agent does not cause delays in the flow of signal transmission.

### ***Fine Wiring Formation Technology – The EXE Series***

Fine wiring technology is a proven technology employed in the COF (chip on film) and is widely used in flat panel TVs and flat panel displays (FPDs). The firm's fine wiring formation technology has become de facto standard for TVs. Here, MEC's EXE Series – anisotropic etching – is widely adopted for wire patterning of COF substrates. The technology can also be applied to other applications such as flexible circuit boards and mother boards.

Since 2018, the EXE Series has been used in mobile device displays. MEC remains positive on the outlook for this product as each new generation of displays requires finer etching. Moreover, as battery capacity requirements for smartphones and tablets continue to expand, the need to develop smaller electronic components increases as the real estate within the devices is taken by the larger battery. Therefore, mother boards need to have finer and thinner wire patterning, so without precise etching capabilities, there is the risk that there will be defects in the mother board. Such technological complications can be solved by the semi-additive process (SAP) which is based on plating. However, SAP is not suitable for devices like smartphones and tablets as it is expensive and inefficient due to the difficulty in production process. The EXE Series solves this issue.

The EXE Series generates a fat GPM of 80% (vs the 59% GPM for the company as of FY19 Q1). For now, EXE Series sales are largely correlated with production volumes of flat panel TVs. Circa 10% of MEC's sales is generated from TVs but the increase in demand for large-sized and 4K TVs has supported segment sales.

### ***Surface Treatment Technology***

4 Surface treatment (SF) technology is historically used for pre-treatment processes of copper used in electronics substrates. Developed over 20 years ago, SF was generating revenues of just ¥20mil per annum. However, the technology is now used in touch panel sensors for mobile devices, which has boosted revenues to circa ¥1,000mill/annum. The GPM of surface treatment is circa 50%. ST technology is further divided to segments: selective etching and direct resin-to-metal bonding without solution.

#### **1: Selective Etching**

A selective etching solution is a chemical that dissolves only copper, for example, while not having any effect on other co-existing metals – such as nickel and aluminium – for etching. The solution was first used for display and touch panel sensors for the Apple (AAPL US) iPhone and iPad.

#### **2: Direct Resin-to-Metal Bonding (AMALPHA)**

Direct resin-to-metal bonding is a technology to bond two materials without adhesive. Direct bonding at the interface level offers advantages such as high reliability, better durability (without deterioration of adhesion) and is environmentally friendly as no solution is used.

## Customers, Competitors, Market Share and Competitive Advantage

MEC's direct customers are IC package makers such as Ibiden (4062 JP) and Shinko Electric (6967 JP), and PCB maker CMK Corporation (6958 JP) and Meiko (6787 JP) in Japan. It also supplies to Nanya (2408 TT) in Taiwan, and Samsung Electronics (005930 KS) and LG Electronics (066570 KS) in Korea. Those customers have business with chipmakers like Intel (INTC US) and AMD (AMD US). Therefore, MEC's earnings have a high correlation to the semiconductor trend. Competitors include Mitsubishi Gas Chemical (4182 JP), Hitachi Chemical (4217 JP), Atotech (Germany), and MacDermid Group (US) which was acquired by Element Solutions (ESI US). There are local manufacturers in China and Korea, but they tend to focus on the lower end of the market. However, these competitors only develop and manufacture copper surface treatment chemicals for pre-laminating process and etching agents, but they do not develop or manufacture copper roughening agents – this is MEC's core speciality.

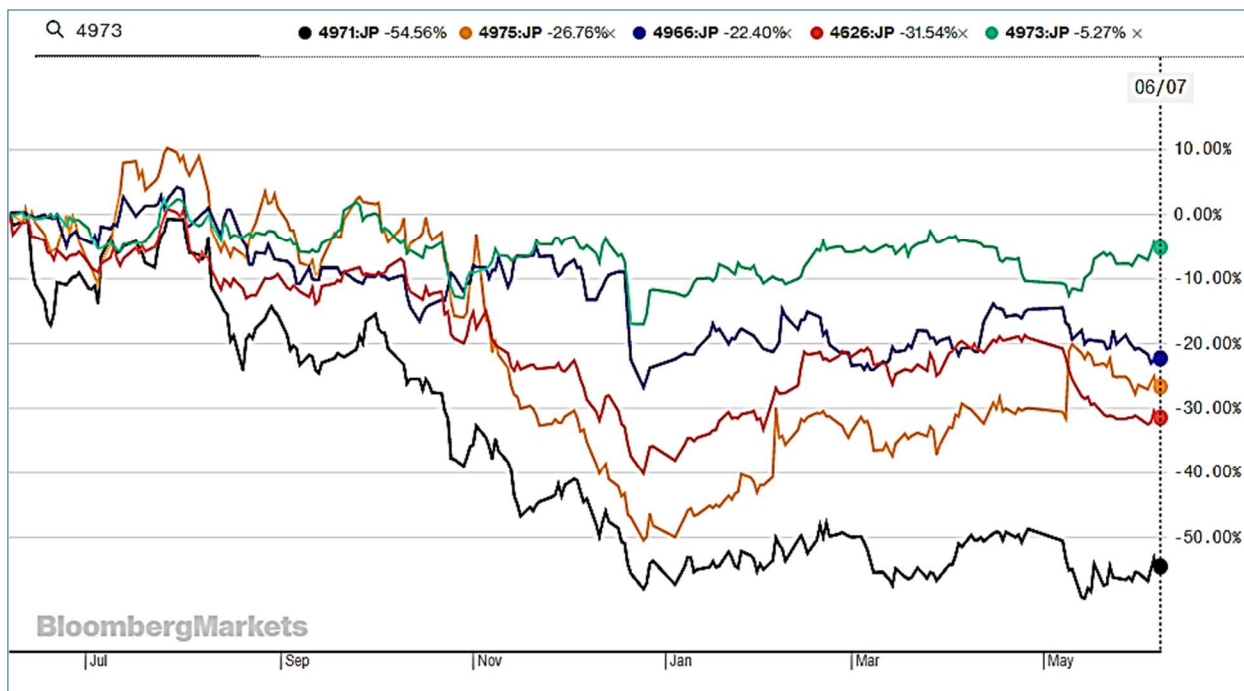
In terms of the overall business, peer group comparisons with the likes of Mitsubishi Gas Chemical and Hitachi Chemical are not straight forward as they have a more diversified business model while MEC's business is almost entirely based on with copper surface treatment technology. Companies such as C Uyemura (4966 JP), JCU Corp (4975 JP) and Japan Pure Chemical (4973 JP) compete with MEC in the manufacture of metal surfacing and Taiyo Holdings (4626 JP) supplies resist ink for PWBs. These companies are often compared to MEC when looking at valuation and stock price performance, however, we would note that none of them competes with MEC in copper surface treatments.

<b>MEC (4971 JP): The Peer Group Comparison</b>					
(¥million)	MEC (4971JP)	JCU (4975JP)	Uyemura (4966JP)	JPC (4973JP)	Taiyo HDS (4626JP)
Fiscal Year	FY12/19CE	FY03/20 CE	FY03/20CE	FY03/20CE	FY03/20CE
Sales	11,800	24,500	53,300	10,800	69,500
YoY (%)	4.16	-1.47	2.54	4.05	17.0
OP	2,050	6,500	8,800	1,250	10,500
YoY (%)	-7.74	-8.09	7.16	23.4	29.6
OP Margin (%)	17.4	26.5	16.5	11.6	15.1
RP	2,100	6,500	9,000	1,350	10,300
NP	1,500	4,550	5,650	940	7,100
EPS (¥)	74.73	163.4	627.6	162.9	249
Dividend (¥)	26	45	150	80	140
Dividend Pay-out ratio (%)	34.8	27.5	23.9	49.1	56.2
Stock Price (¥, 29/05/2019)	1,000	1,973	6,430	2,284	3,310
Market Cap	20,000	54,900	63,500	14,400	95,600
Forward ROE (%)	9.9	18.9	9.1	9.4	9.1
Forward PER (X)	13.4	12.1	10.2	14.0	13.3
PBR (X)	1.25	2.2	0.94	1.3	1.33

Source: Toyo Keizai, Nippon-IBR. CE=Company Estimate

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## Peer Group Share Price Performance vs MEC



Source: Bloomberg

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MEC’s strength lies in its R&D capability. The firm spends around 10% of its revenue on R&D to keep pace with the ever-growing technological challenges. Some 90~95% of its COGS is spent on procuring chemical substances such as sulfuric acid, hydrochloric acid, hydrogen peroxide, and water. The remaining 5% is for surfactants. The company’s R&D focus is on discovering what serves as the optimal blending ratio of those ingredients to create optimal solutions.

MEC mainly hires new graduates with chemistry or pharmacology degrees, all of whom are first allocated R&D tasks before being directed to a specific division of the firm. Management believes that having employees with specialist knowledge is a great differentiation factor that MEC has over its competitors.

### Overseas Operations

MEC has production subsidiaries in Taiwan, China and Europe. Each company has a fully autonomous management structure, from production to sales. The overseas sales ratio in the Q1 was 54.9% YoY, down 0.7ppts YoY. In Japan, Taiwan and China, the slowdown of smartphone shipment volume also affected sales, however in Europe, the negative impact of weak smartphone shipments was somewhat offset by demand from general industry and for automotive applications. MEC’s new production base in Thailand will commence operations from July 2019. The facility will serve electronic substrate makers operating in the region that supply the automotive and electronics device sectors.

#### Sales breakdown by region

(¥million)	FY2017				FY2018				FY2019		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	QoQ (%)	YoY (%)
Japan	1,104	1,225	1,383	1,479	1,239	1,332	1,384	1,410	1,077	-23.6	-13.1
Asia	1,104	1,195	1,294	1,354	1,240	1,330	1,399	1,355	1,079	-20.4	-13.0
Europe	165	164	133	144	181	175	148	130	171	31.5	-5.5
% Overseas sales ratio (%)	57.0	54.5	52.5	52.0	55.6	53.1	54.2	53.6	54.9		

Source: MEC FY12/19 Q1 Result Presentation

## Earnings Trend

### FY12/19 Q1 Results

Q1 FY12/19 earnings result was announced on 10 May. Sales and OP were ¥2328mil (-12.5% YoY) and ¥205mil (-60.5%YoY) respectively. Sales of total Chemicals fell -13.2% YoY and -20.4% QoQ. Particularly weak were Adhesive Enhancer sales (-14.9% YoY / -20.4% QoQ), including the CZ Series, on the back of a slowdown in smartphone shipment volume, which affected the electronics components market overall. The entire value chain suffered from rapid inventory adjustment followed by production controls.

For companies such as MEC with high marginal profits, low utilisation rates directly hit profitability. While Q1 CZ-8100 sales fell -8.3% QoQ and -14.1% YoY to ¥232mil, CZ-8101 sales – which are heavily exposed to the smartphone market – reported sharp declines of -24.3% QoQ and -25.3% YoY to ¥540mil. The marginal profitability of the Chemicals segment is estimated at circa 70%. With the slump in sales and low utilisation rate, the OP margin for Chemicals plummeted from 19.9% in FY18 Q1 to just to 8.8% this year.

### Sales Breakdown by Segment

(¥million)	FY2017				FY2018				FY2019
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Chemicals	2,301	2,518	2,769	2,945	2,612	2,773	2,898	2,847	2,266
Machinery	27	39	7	8	9	17	10	15	40
Materials	36	26	28	23	21	46	19	3	15
Others	8	1	5	2	16	1	4	1	6

Source: MEC FY12/19 Q1 Result Presentation

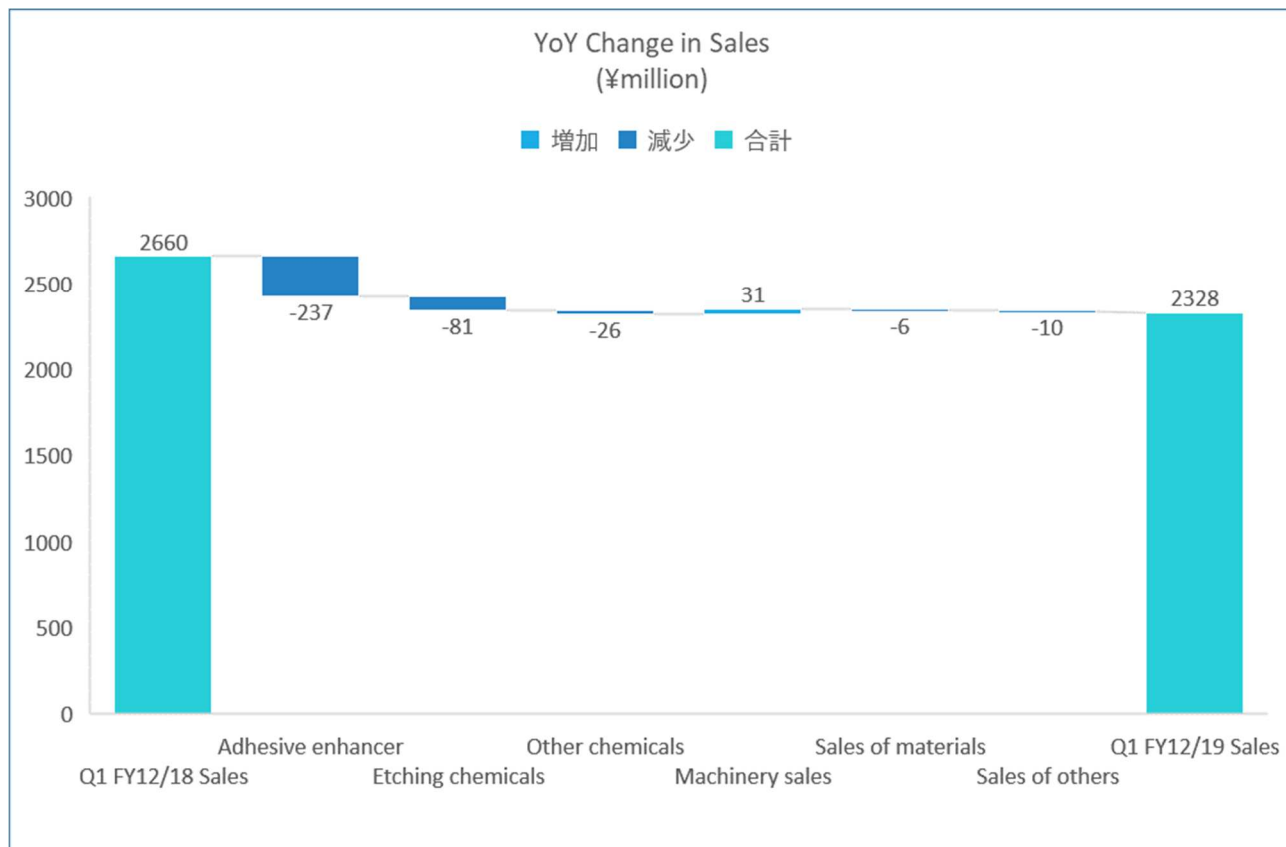
### Chemical Sales by Products

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(¥million)	FY2017				FY2018				FY2019		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	QoQ (%)	YoY (%)
Copper surface treatment chemicals	2,128	2,331	2,557	2,697	2,454	2,617	2,716	2,685	2,134	-20.5	-13.0
Adhesive enhancer	1,376	1,434	1,577	1,642	1,598	1,641	1,640	1,577	1,360	-13.8	-14.9
CZ-8100	249	269	260	270	270	279	272	253	232	-8.3	-14.1
CZ-8101	628	634	704	709	723	733	725	713	540	-24.3	-25.3
Etching chemicals	752	897	980	1,055	855	975	1,076	1,108	773	-30.2	-9.6
Other surface treatment chemicals	172	186	212	247	158	156	181	162	132	-18.5	-16.5
Ungluing agent	81	103	139	165	73	87	105	96	59	-38.5	-19.2
Flux agent	49	46	42	45	47	45	42	37	39	5.4	-17.0
Anti-corrosive agent	27	24	22	23	29	20	24	22	25	13.6	-13.8
Others	14	12	7	12	9	3	8	5	8	60.0	-11.1
Chemical Sales Total	2,301	2,518	2,769	2,935	2,612	2,773	2,898	2,847	2,266	-20.4	-13.2

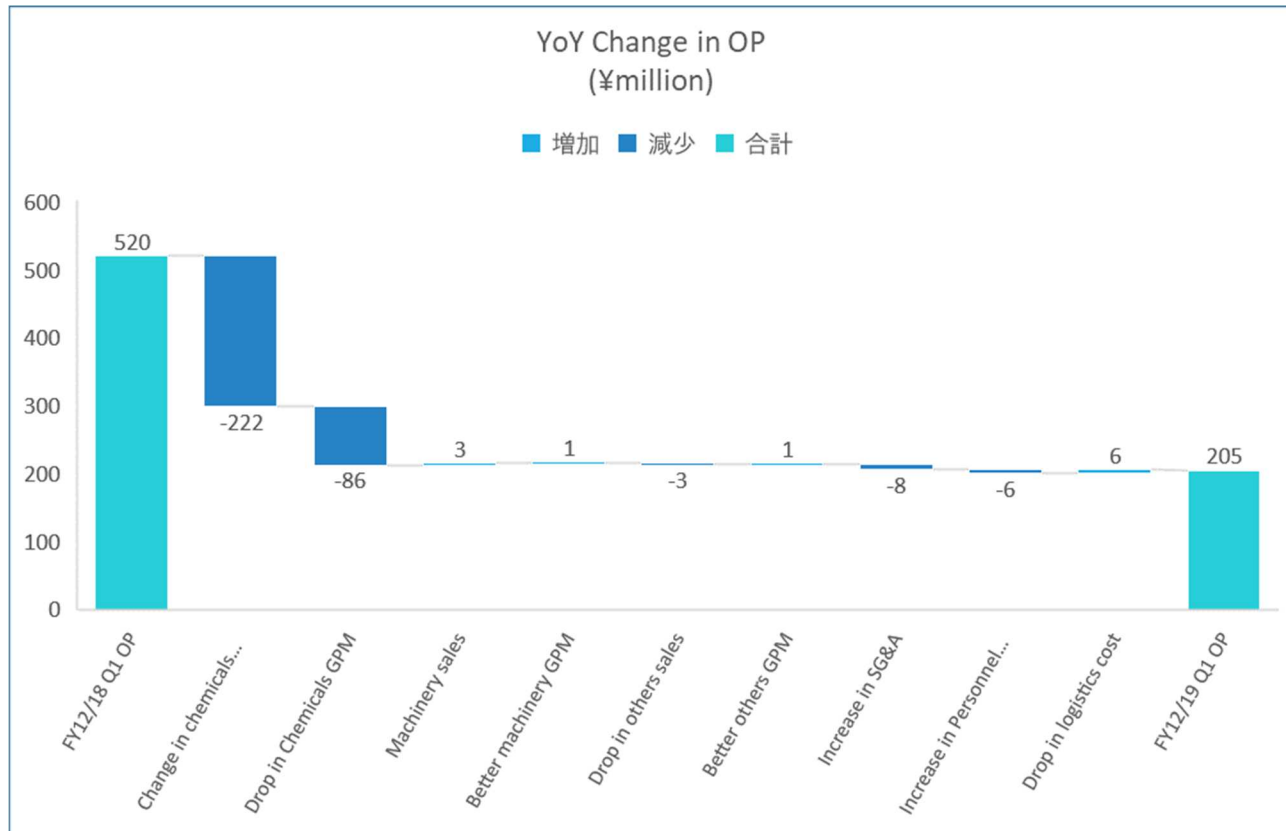
Source: MEC FY12/19 Q1 Result Presentation





Source: FY12/19 Q1 presentation material

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Source: MEC's FY12/19 Q1 presentation material

### Outlook for FY12/19

MEC's is guiding for FY19 sales to rise +4.7% YoY but anticipates OP to decline -7.8% YoY due to higher costs for logistics (+¥70mil), depreciation (+¥80mil / +24.1% YoY to ¥735mil) and personnel / overseas (Thailand) subsidiaries (+¥110mil). The firm plans to spend ¥1,957mil on CAPEX (+3.2x YoY) in FY12/19 which includes investment in Thailand and the R&D premises in Japan. However, the firm is looking for a recovery in the H2 as 5G investment kicks in. In Korea, 5G is already available and Japan's 5G service is expected to start in 2020. However, not all high-end smartphones will be 5G compatible by 2020, though most are expected to be ready by 2021. For Apple's 5G models, the AiP will be loaded with substrates adhered by MEC's CZ-8401.

It is common consensus that 5G infrastructure investment should start in later 2019. According to research on 5G by IHS Markit®, the full range of planned 5G capabilities will not be available during the initial launch but will likely be implemented in a phased approach over the next few years. With 5G, there will be greater need for numbers of base stations due to differences in propagation – a measure of how far a signal at a given frequency can travel and how well it can penetrate solid objects. Under 5G, the higher the frequency band, the smaller the area that each base station is able to cover, therefore will require great numbers of base stations which will require more semiconductors to enable much speedier and higher volume data communication. The chemical that will likely be used for 5G base station CPU substrates is FlatBOND.

The firm also assumes that demand from automotive customers for the older CZ Series – the CZ-8100 – will grow as more EVs are produced. The increase in safety features, such as millimetre wave radars, and safety cameras, which require smaller and finer copper circuits, is a positive for MEC. Reliable functionality that comes from the bonding between copper and resin is the most important property that both the CZ-8101 and the new CZ-8401 are able to provide. Although automotive makers place strict criteria on their suppliers, MEC's proven track record of no fault over the past 20 years within the electronics substrate market has helped the firm gain access to the automotive business.

MEC has not announced medium-term management plan for its earnings visibility is low due to the nature of semiconductor associated business.

### Shareholder Return Policy

MEC aims to pay out 30% of net profit as dividend as well as paying a stable cash dividend. In FY12/19, the firm plans to pay ¥26/share (flat YoY), which gives a pay-out ratio 32.9%. In 12/18, it completed share repurchased programme announced in Oct 2018, after having purchased 200,000 shares (¥265mil). Those shares will be used to pay remuneration to the Board members.

As of the end of Q1, it has retained earnings as high as ¥14.6bil. MEC reckons that the best use of this cash is for future growth opportunities. For example, the firm is currently considering setting up a new factory in China (potential costs between ¥3~4bil vs. its spending on the new Thai factory ¥0.8billion). It would also consider M&A if there were suitable candidates.

### **MEC (4971 JP): ROE based on Simplified DuPont Equation**

	FY3/16	FY3/17	FY12/17	FY12/18
Net Profit Margin (%)	16.7	17.7	0.16	15.7
Asset Turnover (x)	0.60	0.55	n/a	0.59
Financial Leverage (x)	1.25	1.33	n/a	1.28
ROE (%)	12.5	12.9	n/a	12.0

Source: Nippon-IBR

## Corporate Governance Issues

MEC has seven Board members of which four, including one external auditor, are external independent directors. The ratio of external independent director is 57%, more than 1/3 recommended by the Corporate Governance Code. Furthermore, its ESG Committee is formed by external independent directors and chaired by Mr. Maeda, MEC's President.

Instead of ESG, MEC aims to support ESGH – the H = Human – as the firm thinks that its human resources are an important asset for its business. It is rare to see that 100% of female employees come back to work after maternity leave in Japan but this has been the case at MEC. The firm was selected as one of the “Nadeshiko Stocks” – named after the Japan's female football team – which is a list of companies that are praised for fair treatment of female staff.

## Financial Summary

### MEC (4971 JP): Financial Summary

(¥million)	FY3/2015	FY3/2016	FY3/2017	FY12/17	FY12/18	FY12/19
Sales	9,057	9,078	9,259	9,641	11,328	11,800
Operating Profit	2,008	2,185	1,887	1,993	2,222	2,050
Recurring Profit	2,129	2,207	1,888	2,063	2,236	2,100
Net Profit	1,344	1,514	1,642	1,567	1,778	1,500
EPS (¥)	66.98	76.26	84.86	81.77	92.85	74.73
Adjusted EPS (¥)	-	-	-	-	-	-
Cash flow from operation (CFO)	1,489	1,796	1,633	1,591	1,928	-
Cash flow from investment (CFI)	-399	-1,372	-2,461	-832	-706	-
Cash flow from finance (CFF)	-220	-912	1,128	-885	-1,228	-
Cash and cash equivalent	3,997	3,422	3,723	3,664	3,599	-
Free cash flow (FCF)	1,090	424	-828	759	1,222	-
CFO per share (¥)	74.19	90.42	84.37	110.65	100.67	-
FCF per share (¥)	54.31	21.35	-42.78	52.79	63.80	-
Total asset	14,646	15,715	17,993	19,247	18,897	-
Liabilities	2,606	3,465	4,883	4,660	3,731	-
Net asset	12,039	12,250	13,110	14,587	15,166	-
Capital	594	594	594	594	594	-
Shareholders' equity	12,039	12,250	13,110	14,587	15,166	-
BPS (¥)	599.85	632.41	683.86	760.92	799.46	-
OPM (%)	22.17	24.07	20.38	20.67	19.62	17.37
ROE (%)	12.05	12.47	12.95	15.09	11.95	-
ROA (%)	14.87	14.68	11.34	14.43	11.78	-
Shareholder equity ratio (%)	82.20	77.95	72.86	75.79	80.26	-
D/E ratio (%)	21.65	28.29	37.25	31.95	24.60	-
Total asset turnover (X)	0.66	0.60	0.55	0.69	0.59	-
Interest coverage (x)	408.60	556.00	318.00	335.00	373.33	-
Current ratio (%)	465.02	293.52	279.82	290.46	321.00	-
Interest-bearing debt	0	0	1,750	1,250	750	-
EBIT	2,134	2,211	1,894	2,069	2,242	-
EBIT Margin (%)	23.56	24.36	20.46	21.46	19.79	-
EBITDA	2,470	2,571	2,262	2,541	2,851	-
EBITDA margin (%)	27.27	28.32	24.43	26.36	25.17	-
Dividend (¥)	14.00	18.00	20.00	22.00	26.00	26.00
Dividend pay-out ratio (%)	20.90	23.60	23.60	26.90	28.00	34.79
Shares outstanding (shares)	20,071,093	20,071,093	20,071,093	20,071,093	20,071,093	20,071,093
Treasury (shares)	34	700,089	900,089	900,089	1,100,232	1,100,232

Source: Nikkei Value Search

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