

August 12, 2022

Financial Results Material – FY 23/03 Q1



Microwave **Chemical**

**Make Wave,
Make World.**

世界が知らない世界をつくれ

Executive Summary

1

Sales grew on y-o-y basis, on path to achieving FY target

- FY 23/03 Q1, **Sales 157million yen.**
- Sales grew at a rate of **131.2% y-o-y**, thanks to the contribution of projects that have advanced from the R&D stage.
- 13.9 % progress for FY 23/03 (1,133 million yen). Expected to achieve the FY target as our business book sales in the second half of the FY.
- **Progress rate on contract basis is 61.3% (694 million yen)**

2

Steady progress made in two KPI

- ① New Contracts
- ② Total Contracts

- Acquired 7 new contracts, FY 23/03 target 25 **28.0% progress**
- 158 new inquiries, 14.5 % increase compared to FY21 Q1 driven by requirement for carbon neutrality.
- 31 contracts signed, 12 delivered. FY23/03 target 52 contracts, **59.6% progress.**
- Expect to achieve annual target by acquisition of new contracts.

3

Advancement in Technology Standardization & Green Market

- Scaling business through standardization of technology – chemical decomposition (“PlaWave™”)
 - Chemical recycling - Direct decomposition of waste plastic to basic chemicals (Partner: Showa Denko)
 - Chemical Recycling of Polyurethane foam (Partner : Mitsui Chemicals)
- Establishment of eco-friendly Carbon Fiber Manufacturing Process (Partner : Mitsui Chemicals)



Agenda

1. Company overview
2. Financial Results and KPI Highlights
3. Topics
4. Appendix



【Mission】

Make Wave, Make World

【Vision】

**Innovate the chemical industry, unchanged for more than a century
revolutionize the world of manufacturing**

-Making the microwave process a global standard-



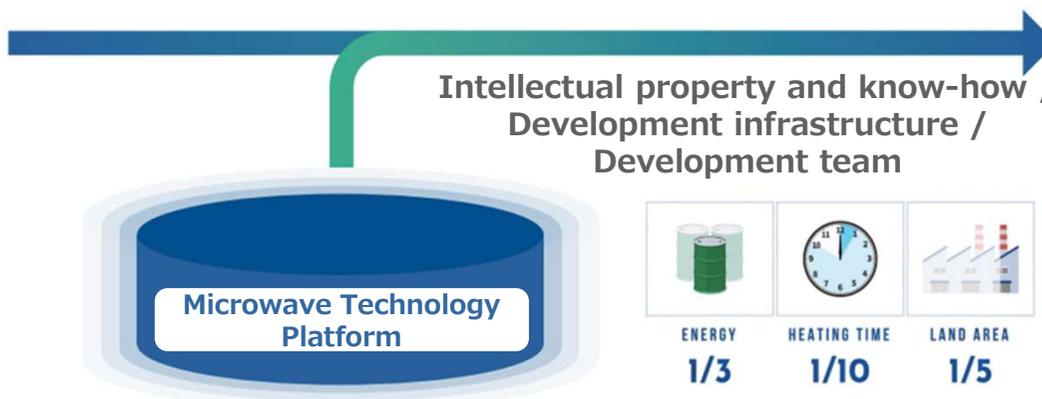
Company Overview

Industrialized microwave chemical process for the first time in the world. Utilizing the microwave technology platform, we promote joint development and commercialization with various partners in a wide range of fields.



Current manufacturing technology using fossil fuels, etc

Microwave : New energy source



History



Fatty acid ester
3,200 t/y



Sugar ester
1,000 t/y

太陽化学株式会社
TAYO KAGAKU



Peptide drug
(GMP, PeptiStar)

PeptiStar



PMMA recycling
(Mitsubishi Chemical)



ASR·SMC recycling
(Mitsui Chemicals)

Mitsui Chemicals



Rare metal refining
(QST)

QST



Hydrogen production
(Sumitomo chemical)
SUMITOMO CHEMICAL



Carbon Fiber
(Mitsui Chemicals)

Mitsui Chemicals

Industrialized

Under Development



Benefit of Microwave Process (1/2)

Legacy System



Source : BASF Corporate History
1900



Current

Innovation



Benefits

Process



Reduce Energy consumption
by 1/3*¹

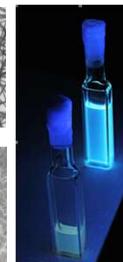
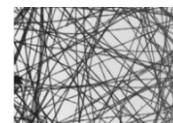


Highly efficient and reduces
tact time by 1/10*¹

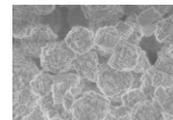


Small Footprint 1/5*¹

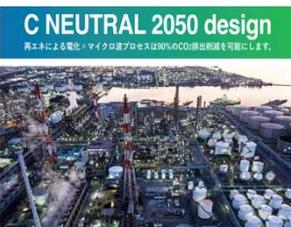
Product



Development of
new materials and
high- quality materials



Decarbonation

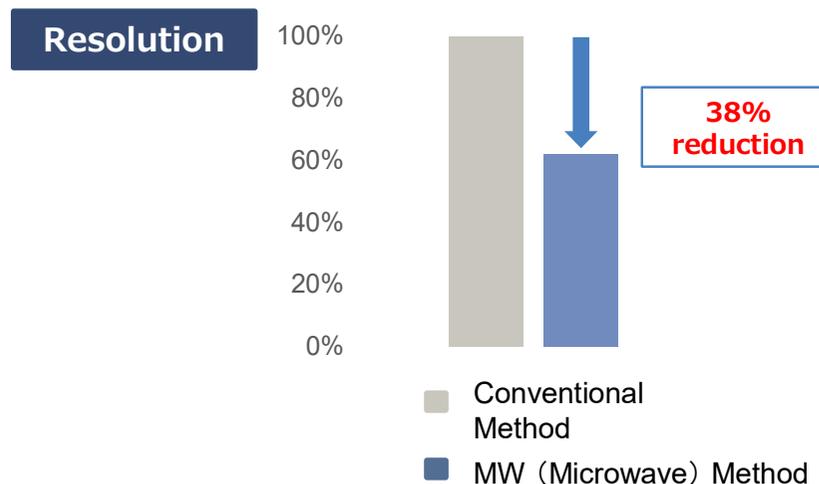
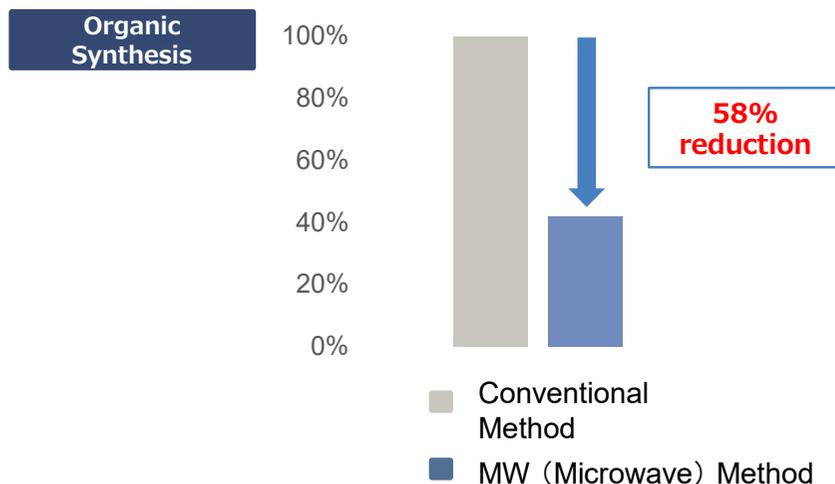


90%*¹ reduction of CO₂
emissions with electrification
using renewable energy

*1 : The figures are estimated from our plant of fatty acid esters
operated in Osaka

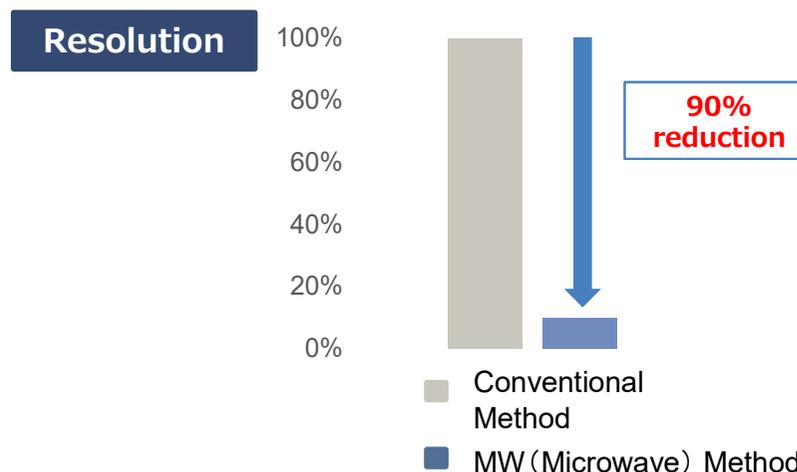
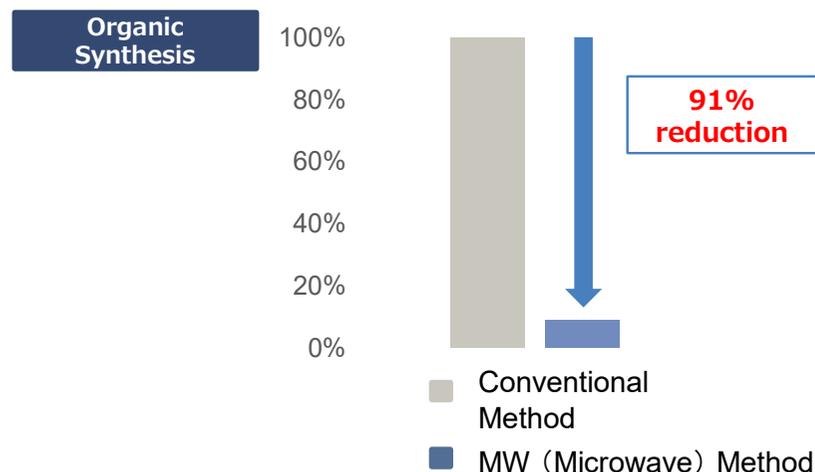
Benefit of Microwave Process (2/2)

Energy consumption: 1. Energy saving with microwave systems



CO₂ emissions:

1. CO₂ emission cuts = 1. Microwave-assisted energy efficiency × 2. CO₂ emission intensity by energy source



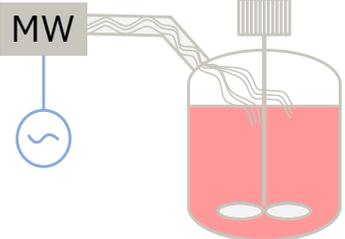
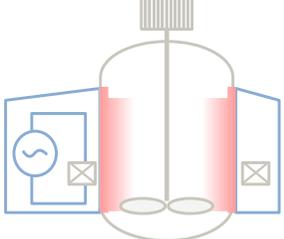
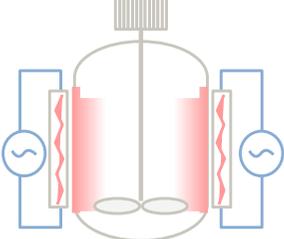
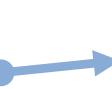
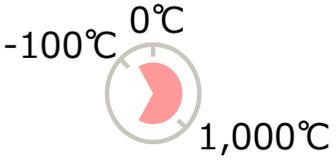
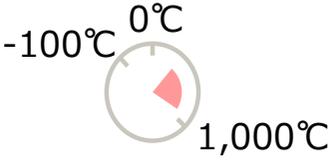
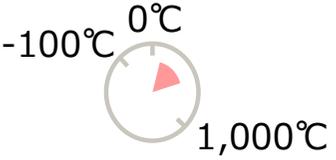
CO₂ emission cuts are calculated by multiplying 1. energy consumption by 2. energy sources used. Use of microwaves reduces energy consumption in many chemical reaction processes. There is a trend that chemical manufactures across the world are laying out their roadmaps, assuming that they significantly reduce the use of conventional fossil fuels to shift to natural energies, which will diminish the intensity of CO₂ emission from energy sources.

* MW Method assumes the use of photovoltaic electricity, CO₂ emission reductions and energy equivalent reductions are our estimates. Conventional method data is our trial calculation, and MW method data is based on our demonstration machine at commercial level



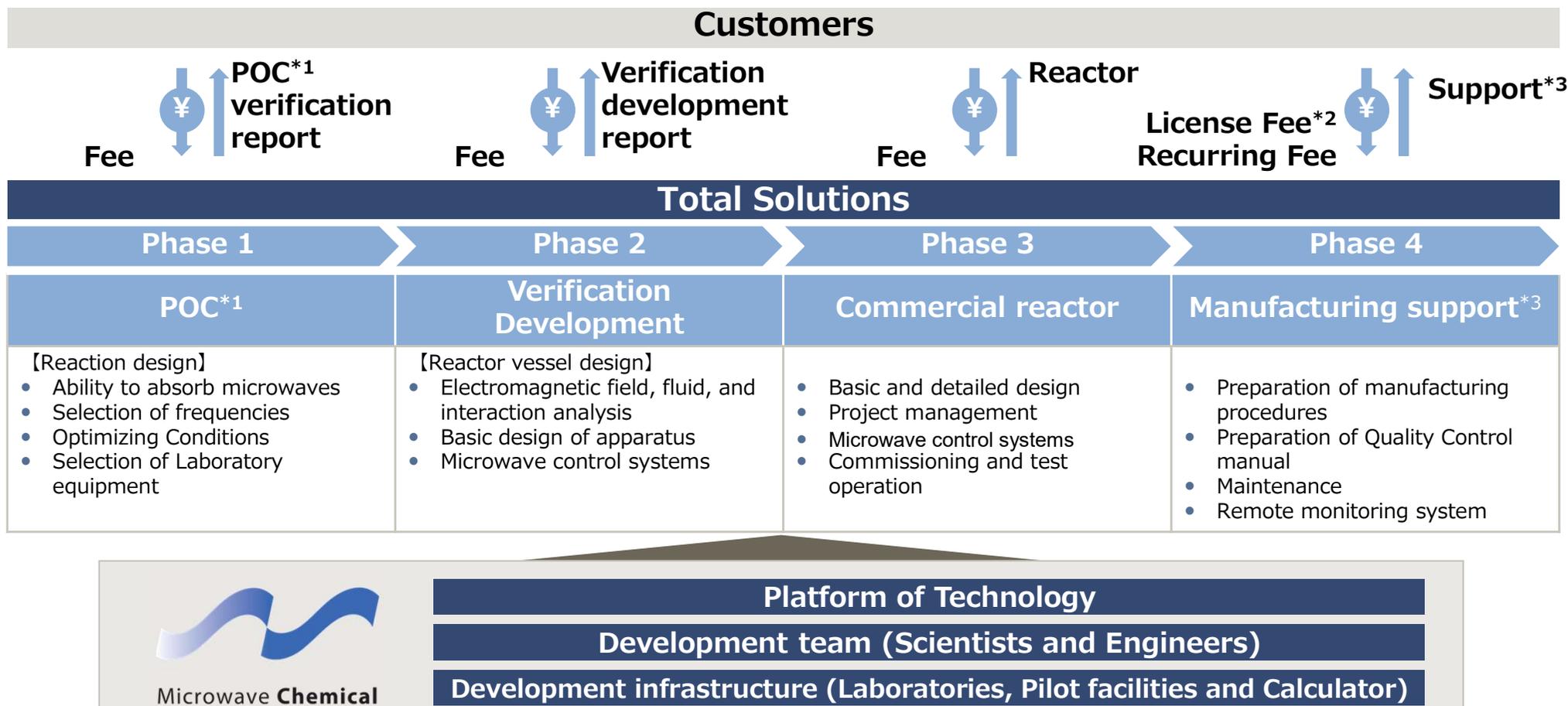
Comparison – Electrification technology

Microwave process is the only process that transfers energy directly, which provides advantage, such as scaling up, energy efficiency, and temperature range.

	Microwave Heating	Induction Heating	Electric heater Heating
			
Energy Transfer	Direct	Indirect	Indirect
Scaling Up	 Easy	 Restricted	 Restricted
Energy Efficiency	 High	 Medium	 Low
Temperature Range			

Business Model

- (1) Total solutions from R&D to engineering
- (2) Profit on each phase. License fee when commercialized by client.



*1: POC: Proof of Concept. The process of testing the feasibility and effectiveness of new concept or idea before actual development

*2: License: Share the customer value earned by introduction of microwave process as license fees. Specifically, receive as upfront payment and recurring royalties

*3: Manufacturing support and maintenance: Support customers who have installed microwave reactors in their manufacturing process. In addition, provide maintenance of microwave reactors and other facilities



Growth Driver

Business Model



Market Focus

Projects

1. New Contract Acquisition

Through new and existing customers, strategic alliances, oversea customers



Unit Price

2. A Virtuous Circle Strengthening the Technology Platform

Each project will strengthen our technology platform which in turn increases our ability to provide solutions.



Plants in Commercial Production



Packaged Solution

3. Standardization

Scaling business by providing packaged solution to multiple clients.

4. Focus on growth areas

Green

Healthcare
(Includes food)

Electronics



Carbon Neutral – Our vision

We will expand our business long-term by committing to carbon neutrality of various industry.

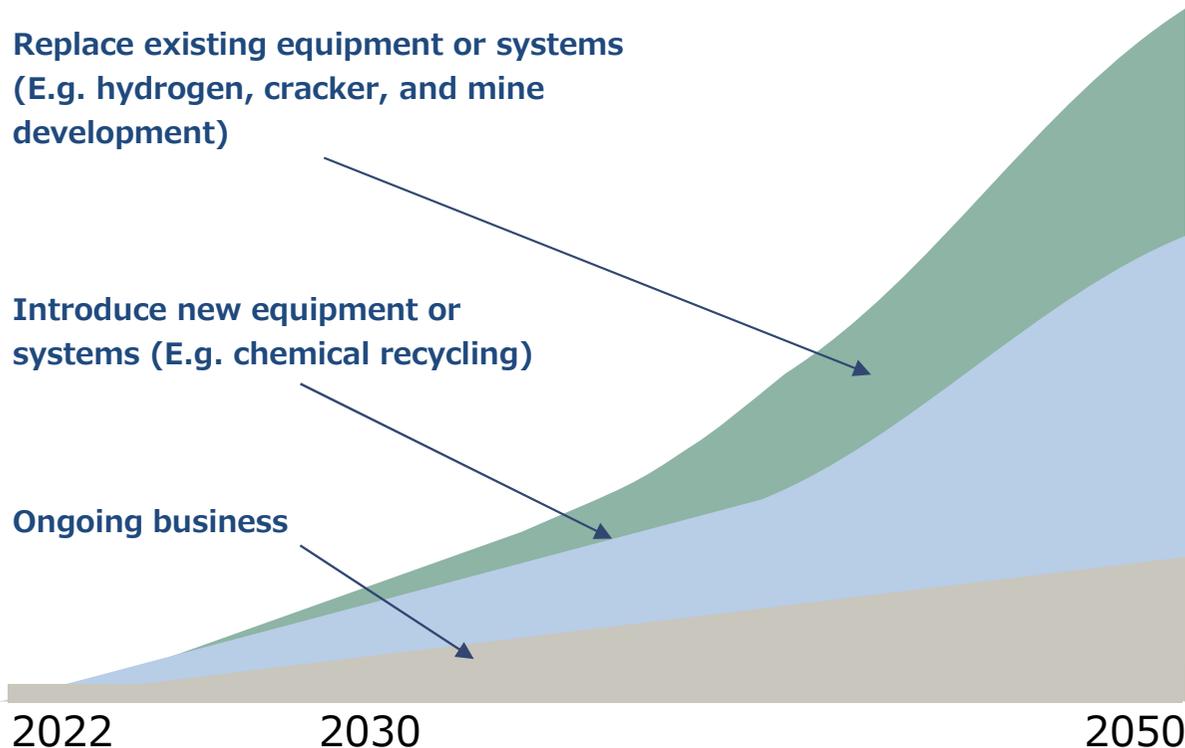
MWCC's Growth Image

- ▶ For heavy industry, average lifetimes of emissions-intensive assets is around 40 years, and around 30% of existing assets are expected to require major investment to improve facilities within the next 10 years.*1
- ▶ In order to achieve carbon neutral, new innovative technologies must be ready for implementation. Generally, it takes about 10 years for new technologies to become commercially viable, so we need to start developing new solutions "now".

Replace existing equipment or systems
(E.g. hydrogen, cracker, and mine development)

Introduce new equipment or systems
(E.g. chemical recycling)

Ongoing business



MWCC's Active Solutions for Decarbonization

C NEUTRAL 2050 design
再生による電化・ハイドロジェンプロセスは90%のCO2排出削減を可能にします。

- Electrification of the chemical industry
 - Electrification of crackers
 - All other processes
- Contributions to other industries through new processes and materials
 - ▶ Energy, steel and petrochemical industries
 - Turquoise hydrogen
 - Ammonia
 - CO2 as a raw material
 - ▶ Mobility (automobile, etc.) electronics industries
 - Battery-related material (Cathode materials, etc.)
 - Carbon Fiber
 - Post-consumer recycled materials (chemical recycling)
 - Lithium and rare earth (mine development)



Cathode materials



Lithium

*1: Net Zero by 2050 A Road Map for the Global Energy Sector IEA May 2021



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FY23/03 Full-year budget

Planned net sales of 1,133 million yen and operating income of 67 million yen

(Unit : million Yen)

	FY 22/03 Full-year (result)	FY 23/03 Full-year (budget)	Difference	
Net sales	860	1,133	+272	+31.7%
Phase 1	309	686	+377	+121.5%
Phase 2	320	381	+61	+19.0%
Phase 3	30	35	+5	+16.7%
Phase 4	200	-	▲200	▲100.0%
Others	-	30	+30	-
Operating profit	▲87	67	+155	-
Ordinary profit	▲98	30	+128	-
Profit	▲110	45	+155	-



Financial results for FY23/03 Q1

Sales increased by 89 million Yen(+131.2%) YoY due to strong growth in sales from Phase 2 onward

(Unit : million Yen)

	FY 22/03 Q1 (result)	FY 23/03 Q1 (result)	Difference	
Net sales	68	157	+89	+131.2%
Phase 1	41	34	▲6	▲15.5%
Phase 2	26	87	+61	+225.3%
Phase 3	–	35	+35	–
Phase 4	0	–	▲0	▲100.0%
Others	–	–	–	–
Operating profit	▲117	▲36	+81	–
Ordinary profit	▲121	▲65	+55	–
Profit	▲122	▲66	+56	–



Seasonal Fluctuations / Revenue Recognition

<Seasonal Fluctuations>

Our major customers, chemical companies, finalize budgets by March, just before the start of the new fiscal year, so project work with MWCC often begins in the first or second quarter. As a result, the completion of the contract, in which **our company's revenues are recorded, tends to be skewed toward the second half of the year.** There is also an impact from the completion timing of large-scale projects. In addition, since the majority of selling, general and administrative expenses are fixed costs, the proportion of profits also tends to be weighted toward the second half of the year, which may affect investors' decisions.

FY22/03 Net sales for each quarterly accounting period(Thousand Yen)

Q1	Q2	Q3	Q4	Total
68,053	61,451	548,149	182,855	860,510

<Revenue Recognition>

The following is a description of the main performance obligations in the Company's main business related to revenues arising from contracts with customers and the usual time at which such performance obligations are met. Payment is made generally within one month after obligation is fulfilled and does not include financial component.

① Joint development agreement(JDA)

The Company submits reports, samples, etc. stipulated in the JDA and receives payment. Under such agreements, **revenue is booked upon acceptance of the report, samples, etc. by the customer.**

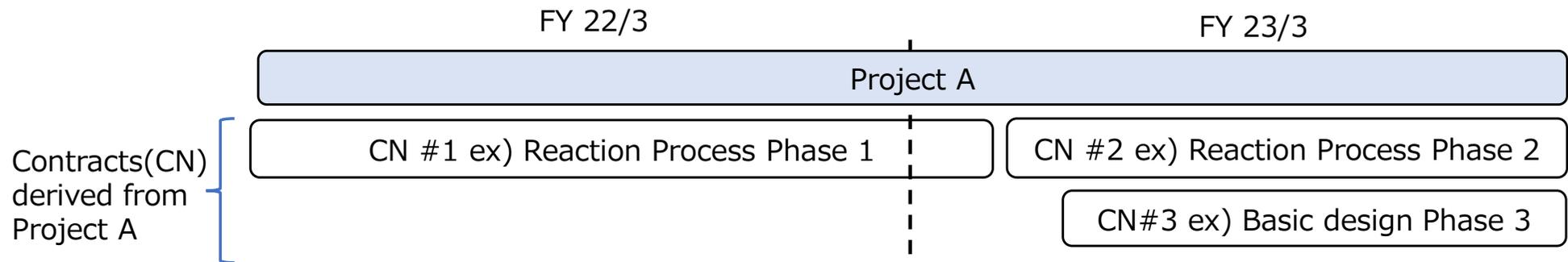
② License agreement

Under license agreements, the Company licenses its intellectual property to customers and receives upfront payments and running royalties as compensation. The upfront payment is booked as revenue at the time the intellectual property is licensed. Running royalties are based on the sales revenue of the licensee company, and revenue is recognized when the product is sold by the licensee company.



KPI(Key Performance Indicator)

1. **Important KPI** for our business are ①**Total Number of newly acquired Contracts** and ②**Total Number of Contracts**.
2. Contracts are signed with clients based on solutions we provide which will defer per phase and service we provide. Multiple contracts could be signed with one project as indicated below.



【Related information】

- a. Total Number of Projects** : Project consist of a team with task to provide total solution package to clients. Project is also referred as a pipeline and categorized in three types.
 - Revenue generating project: A project that provide solution to a client
 - Non-revenue generating project :
 - R&D project: A project which we invest our own resources.
 - Funded projects: A project funded by government and other public entity.
- b. Sales per Phase** : To understand the progress of the project by sales per each phase(1~4).

FY23/03 Q1 KPI Highlights

1 New Contracts - total number of newly acquired contracts

- Acquired 7 contracts out of 25 annual projection
- New inquiry strong, increased compared to FY22/03 Q1.

2 Total Contracts - total number of contracts

- 31 Contracts already signed, 12 delivered. FY 23/03 target 52 contracts.
- Compared to FY 22/03 Q1, number of Phase 2 increased.

3 Projects - total number of projects

- 35 projects in progress(28 solution project) , FY 23/03 target 52 projects.
- Expect to achieve annual target by acquisition of new contracts

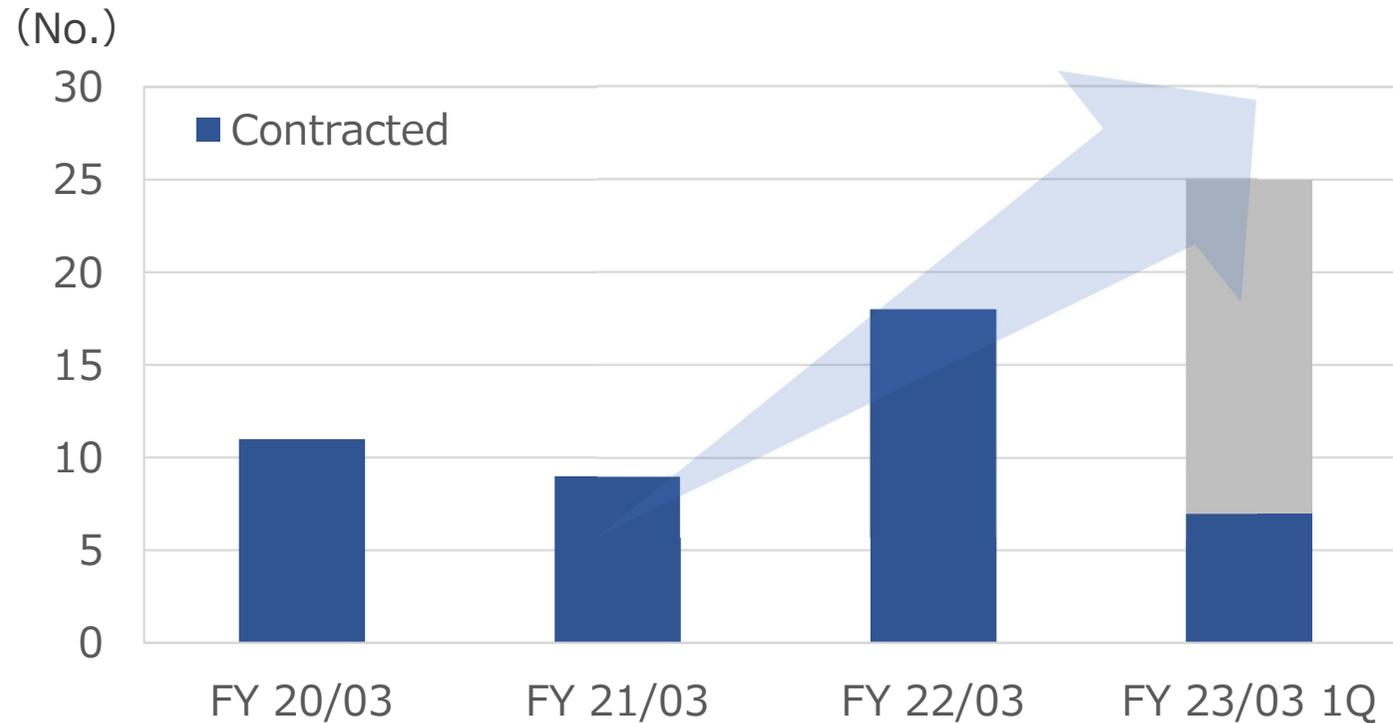
4 Sales per Phase

- Steady progress made in each phase of the project. 694 million yen (61.3%) achieved on a contract basis compared to FY23/03 budget of 1,133 million yen.

KPI① Total number of newly acquired contracts

Acquired 7 contracts in Q1. (Target: 25 contracts in FY ending Mar 2023)

New business inquiries are on an increasing trend YoY (see next section), so we expect to progress as planned.



No. of acquired contracts	11	9	18	7(3)*
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*A number in parentheses indicates the number of contracts already delivered.

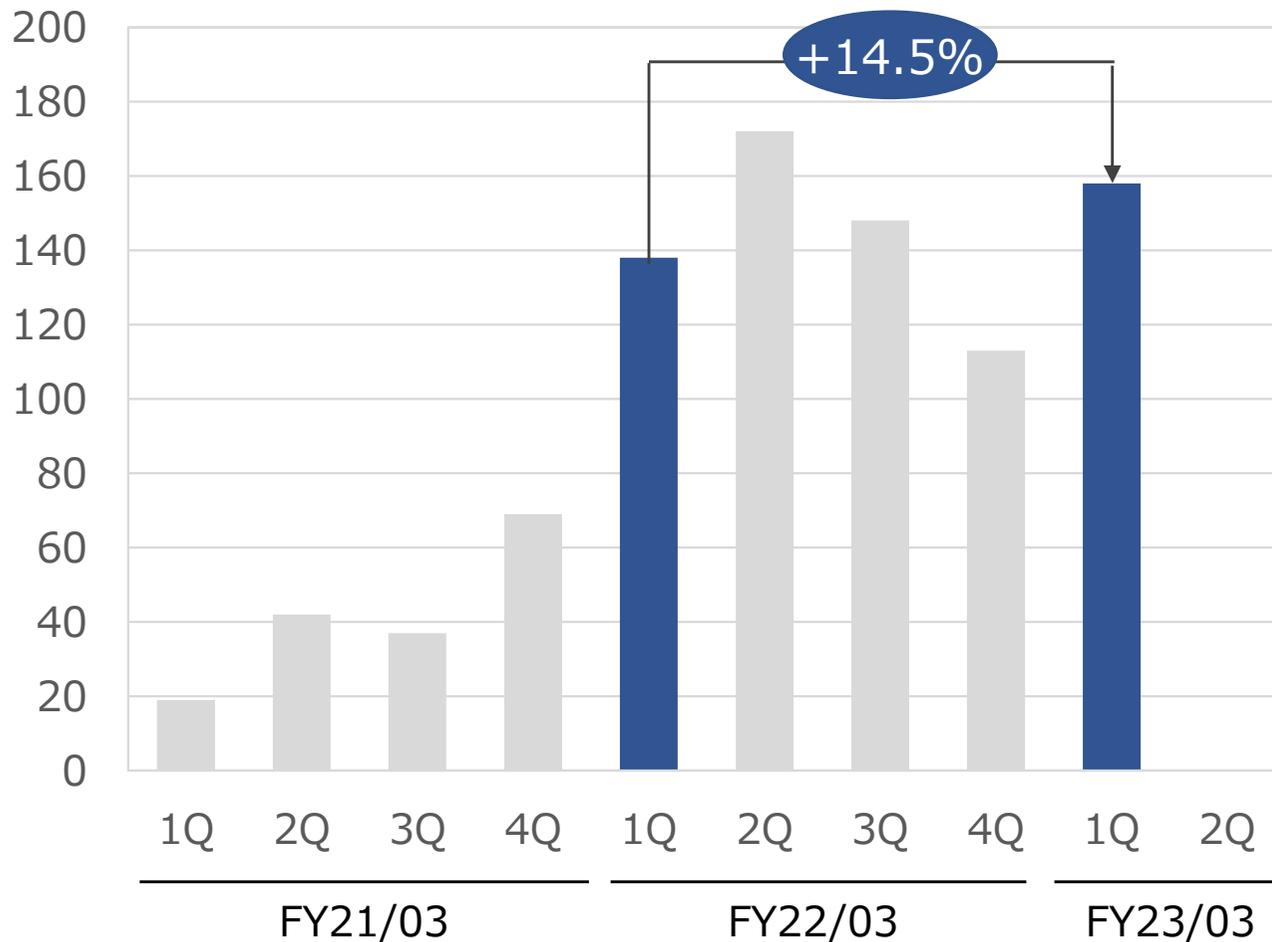


New business inquiries trend

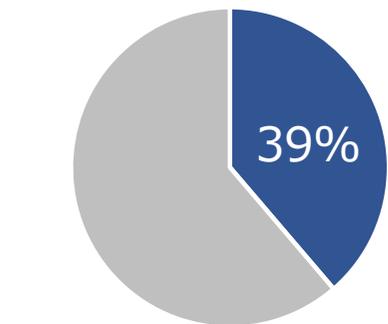
New business inquiries increased by 14.5% YoY. The overall trend was an increase in carbon neutral (CN)-related projects.

Transition of New business inquiries

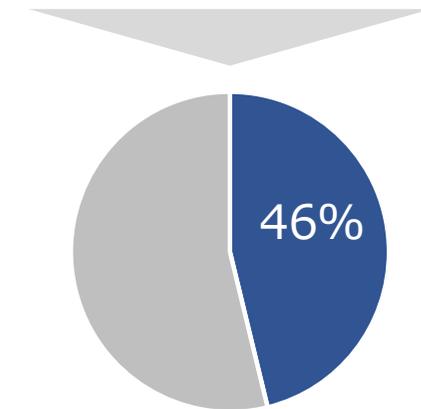
(Unit : No.)



Percentage of CN-related projects



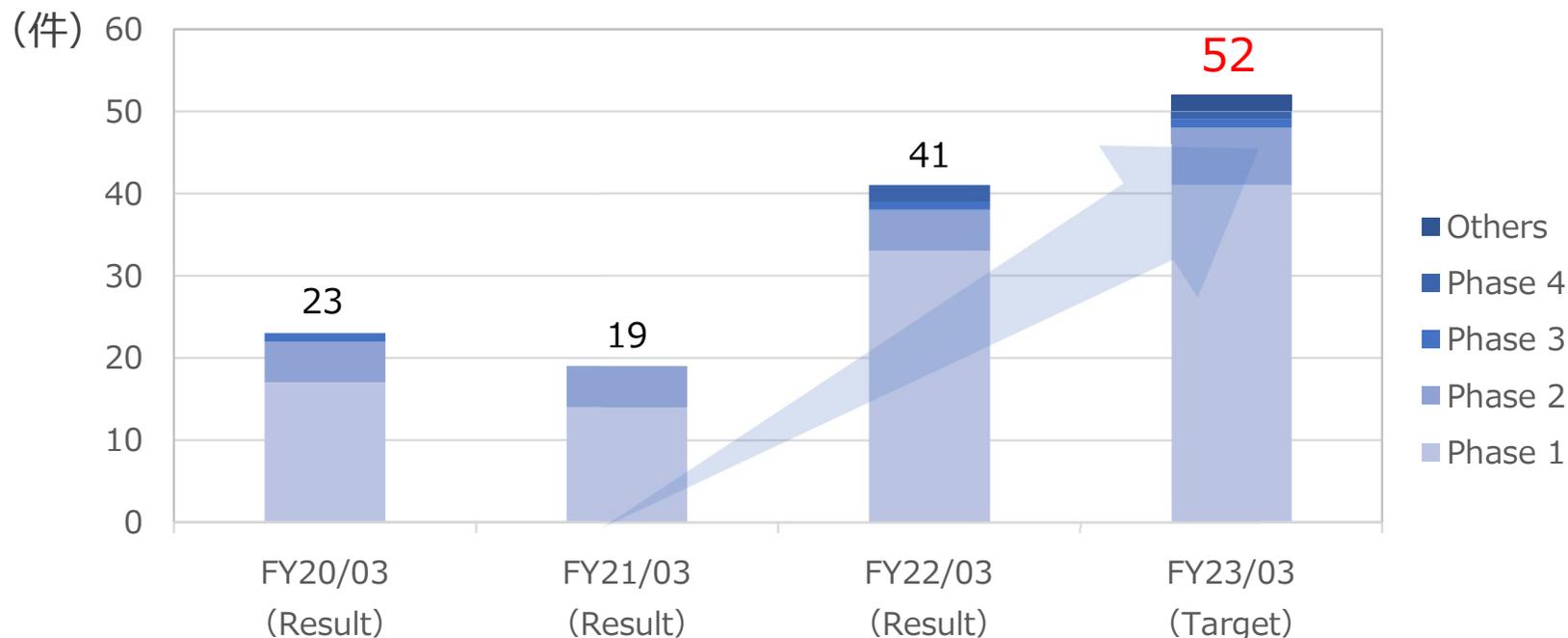
FY22/03
Full - Year



FY23/03
1Q

KPI② Total number of contracts

Growth achieved with acquisition of new projects and stage-up of existing projects



Phase 1	17	14	33	41
Phase 2	5	5	5	7
Phase 3	1	—	1	1
Phase 4 ^{*1}	—	—	2	1
Others	—	—	—	2
Total	23	19	41	52

*1 One of the Phase 4 projects in FY22/03 and FY23/03, respectively, does not provide a technology platform as a solution, but is related to a project with TMT Corporation, a joint venture established by Microwave Chemical and TAIYO CHEMICAL for the production of sucrose esters. Microwave Chemical and TMT have entered into a patent and know-how license agreement, but the Company does not expect to recognize any revenue based on this agreement in FY23/03. One of the Phase 4 projects recorded in FY22/03 is revenue related to spot maintenance work, but since there is no ongoing contractual relationship with the company for this project, no ongoing revenue is expected in FY23/03.

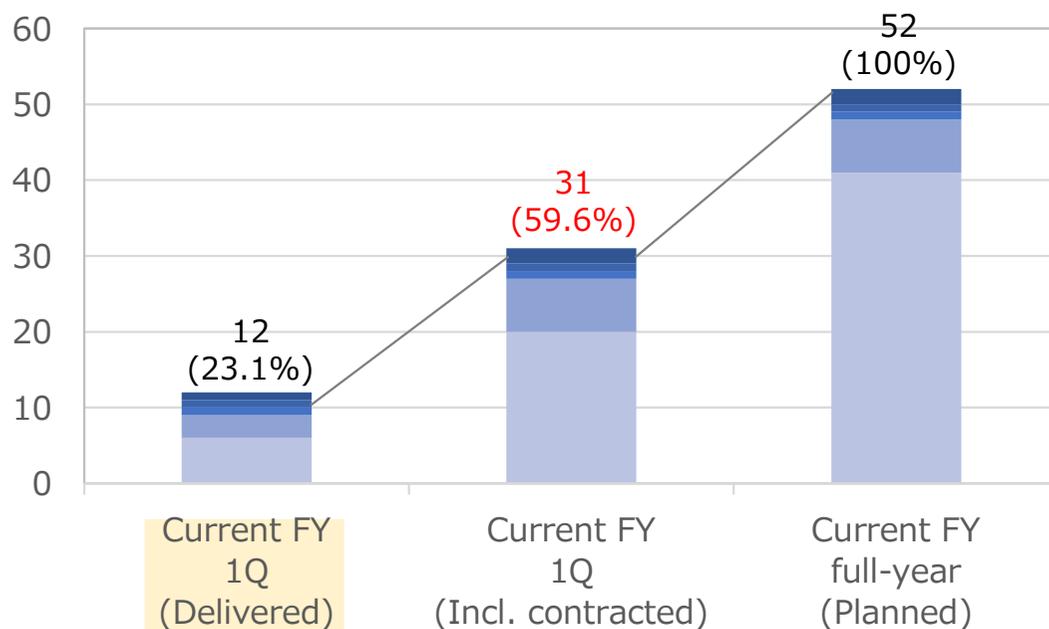


KPI② Total number of contracts

59.6 progress percentage on a contract basis, compared to FY23/03 target.
Phase 2 & 3 of FY23/03 Q1 delivered basis increased compared to FY22/03 Q1.

Progress vs. full-year plan

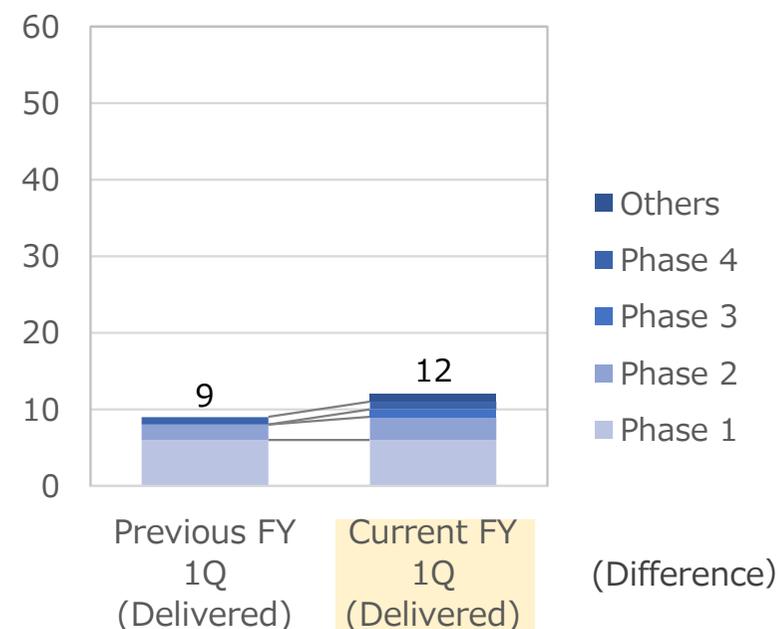
(Unit: No.)



Phase 1	6	20	41
Phase 2	3	7	7
Phase 3	1	1	1
Phase 4	1	1	1
Others	1	2	2
Total	12	31	52

YoY comparison

(Unit: No.)

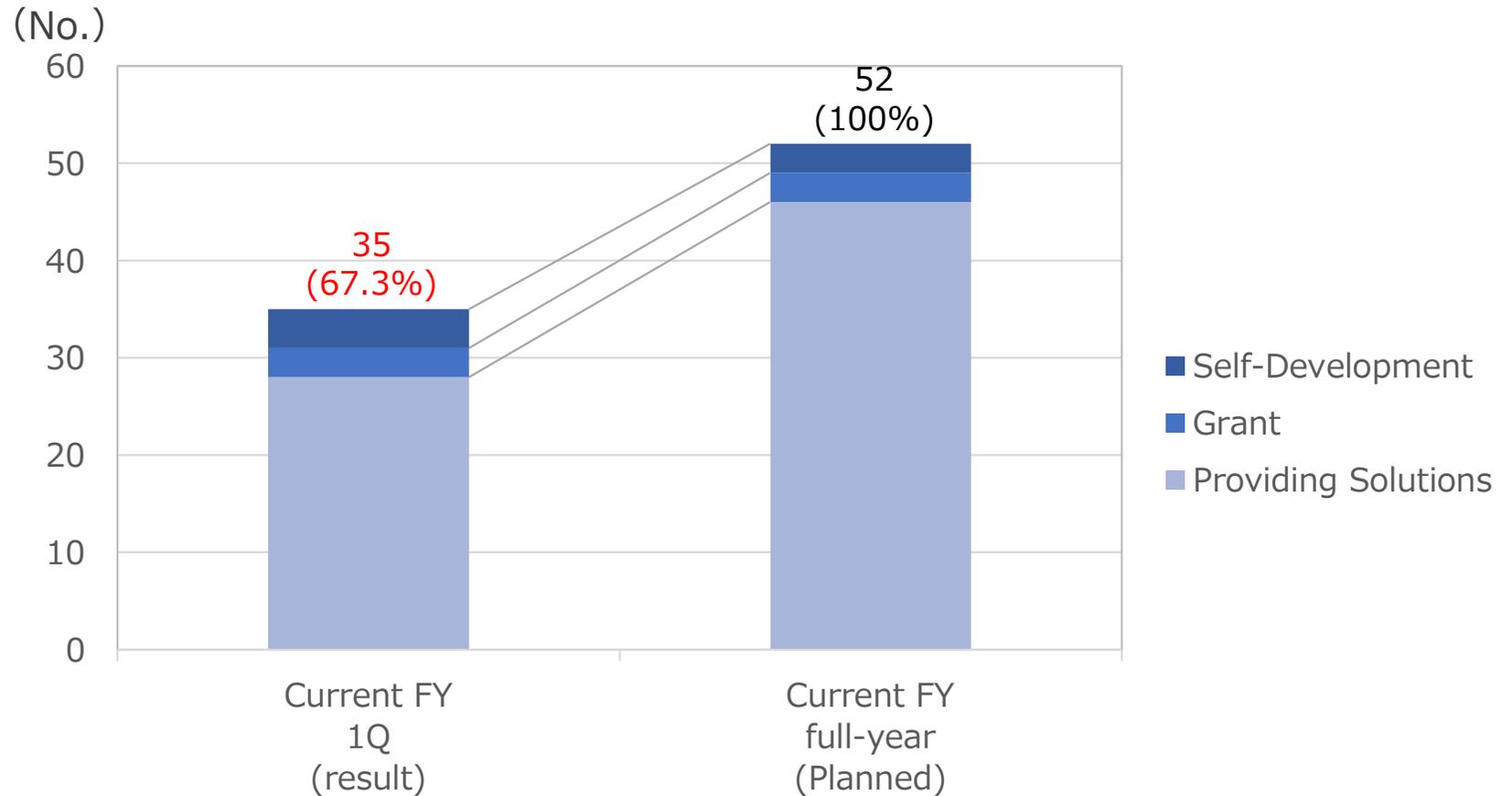


Phase 1	6	6	0
Phase 2	2	3	+1
Phase 3	0	1	+1
Phase 4	1	1	0
Others	0	1	+1
Total	9	12	+3



Total number of projects

67.3% progress vs. the full-year plan. Expect to achieve this year's plan by acquiring new projects.

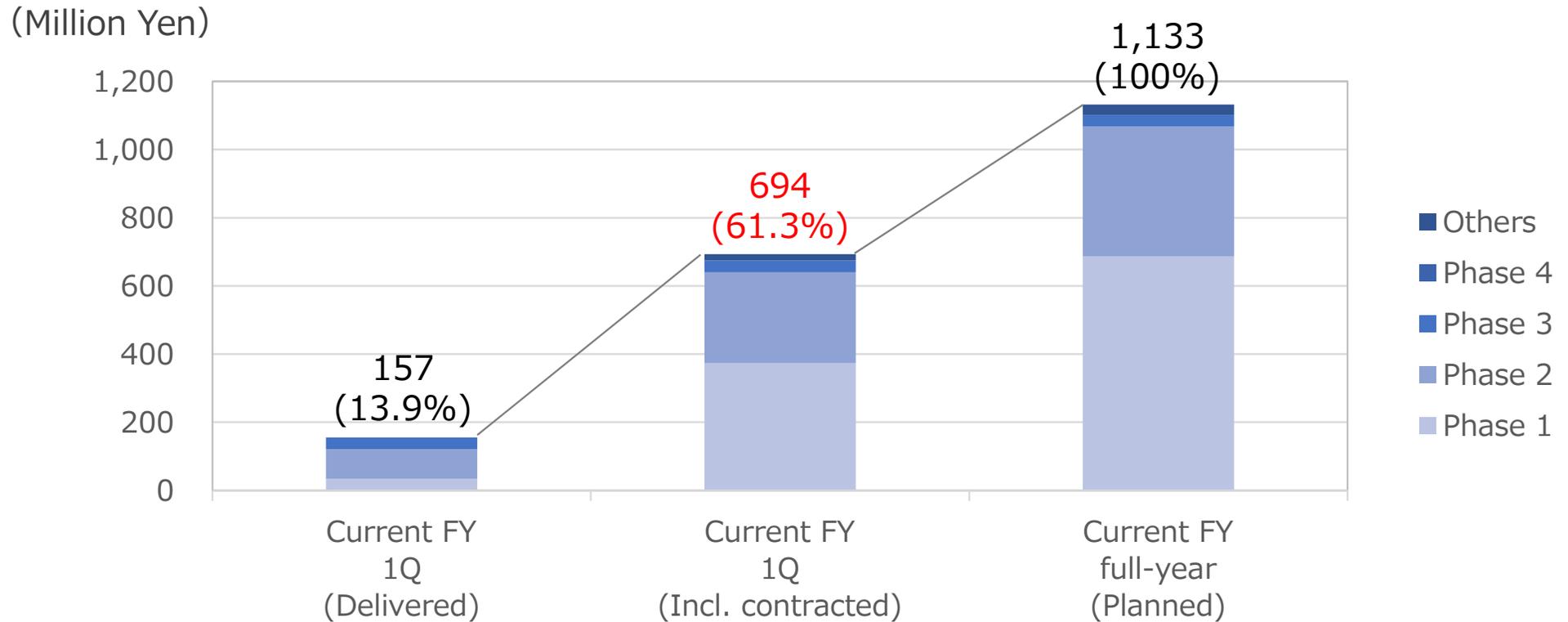


Providing Solutions	28	46
Grant	3	3
Self-Development	4	3
Total	35	52



Sales per phase

On a contract basis, each phase is progressing vs. the full-year plan.



Phase 1	34	373	686
Phase 2	87	267	381
Phase 3	35	35	35
Phase 4	-	-	-
Others	0	18	30
Total	157	694	1,133



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Mitsui Chemicals/Carbon Fiber(CF) Process

Established a novel Eco-Friendly CF manufacturing process using microwave.

- ✓ By applying this technology in the oxidation process – the most energy-intensive part of CF production – and the subsequent carbonization process, we expect to **reduce energy consumption by approximately 50 percent**, as well as the process time and footprint.
- ✓ To further advance the technology, we are jointly **studying pilot project**.



Image produced by MWCC,
does not represent actual business

PAN-based Carbon Fiber Production Process

Conventional Process

- Longer Processing Time
- Larger Equipment
- Higher Energy Consumption

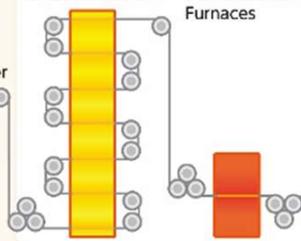
High Temperature

Conventional Process

200-300°C Oxidation Ovens

1000-2000°C Carbonization Furnaces

PAN Fiber



Microwave Process

- Shorter Processing Time
- Smaller Equipment
- Lower Energy Consumption

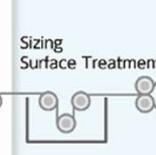
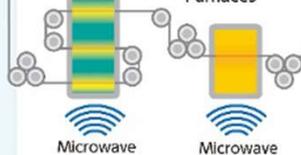
Low Temperature

Microwave Process

Oxidation Ovens

Carbonization Furnaces

PAN Fiber



Mitsui Chemicals / Chemical recycling of polyurethane

Launched a new initiative to commercialize chemical recycling of polyurethane foam used in mattresses and automobile for direct decomposition.

- ✓ Has **never been commercialized in Japan.**
- ✓ By utilizing “PlaWave™”, expected to achieve **reduction of energy and increase decomposition speed by twofold.**
- ✓ Pilot project in 2023, **commercialize target in 2025.**

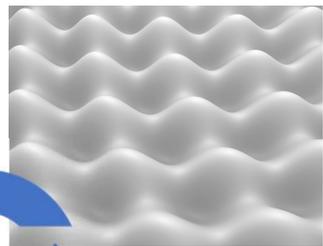
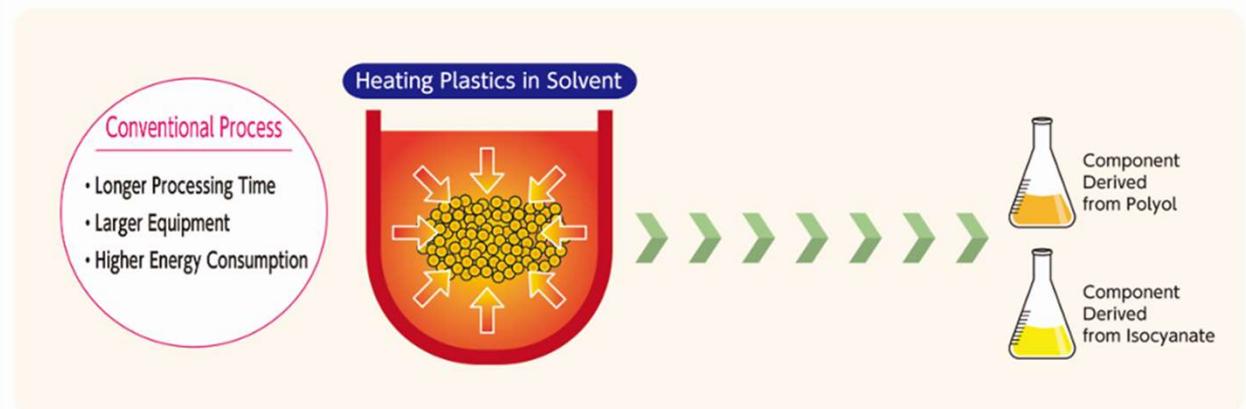
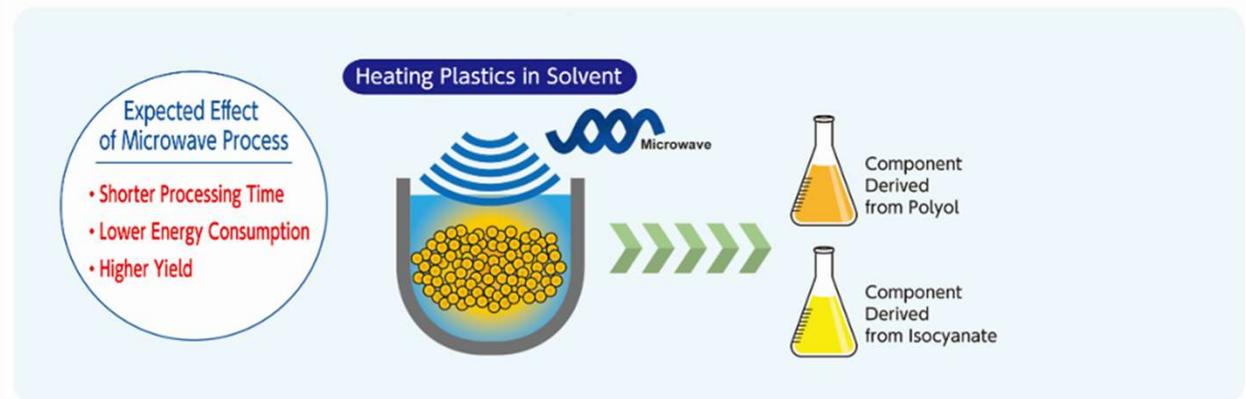


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Showa Denko / Chemical Recycling of waste plastic

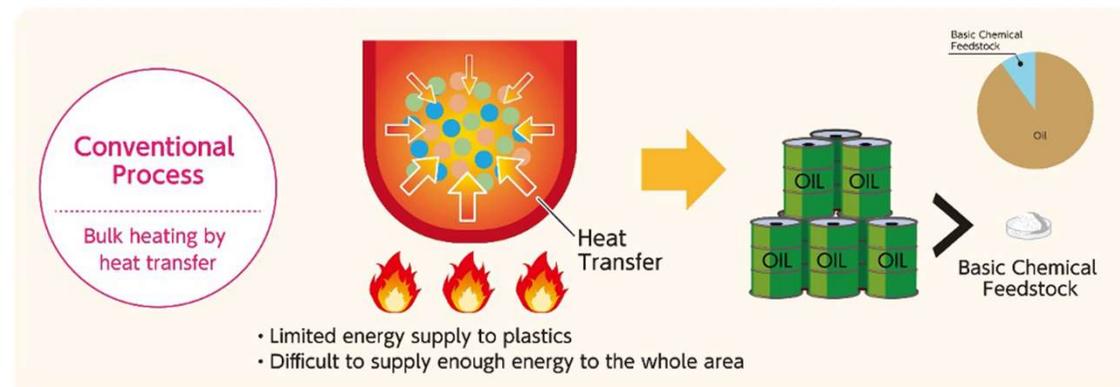
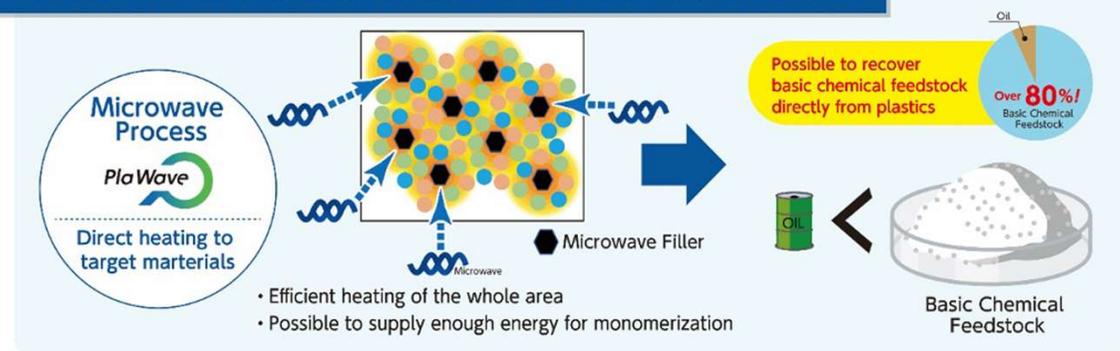
Joint development of microwave-based chemical recycling technology to directly decompose used plastic into basic chemicals such as ethylene and propylene.

- ✓ **Direct decomposition of waste plastic to basic chemical is difficult.**
- ✓ MWCC will utilize microwave based plastic decomposition platform “PlaWave™” to deal with **various waste derived from containers and packaging goods.**
- ✓ SDK has been engaged in chemical recycling operations since 2003 at Kawasaki Plant, producing clean hydrogen and ammonia through thermal decomposition.



Image produced by MWCC,
does not represent actual business

Direct Transformation to Basic Chemical Feedstock



Awards and Recognition

Two awards in recognition of initiatives aimed at realizing a sustainable society.

1

Won Grand Prize of
MUFG ICJ ESG
accelerator program
(May 2022) *1

- MUFG ICJ ESG accelerator is an accelerator program jointly managed by MUFG and ICJ, aimed at technologies for carbon neutral and circular economy.
- MWCC won **grand prize** for category A "carbon neutral / circular economy" out of 98 applicants.
- "The electrification of manufacturing is a key component in achieving carbon neutrality. MWCC is receiving various inquiries and **has a track record for implementation. We hope they will deploy this technology globally**". - comment by a judge.

2

Selected by "Alliance
to End Plastic Waste
Program"
(June 2022) *2

- Plug and Play Japan K.K. and the non-profit Alliance to End Plastic Waste have launched a new program to achieve the international goal of "eliminating plastic waste and creating a circular economy"
- The first phase of the program, which will begin on June 23, will focus on the following areas: (1) collection, management, and sorting of plastic waste; **(2) technologies related to the recycling process**; and (3) value creation after plastic recycling.
- MWCC was selected as one of the startups to be supported by the program.

*1) https://www.bk.mufg.jp/info/pdf/20220510_icj_esg_accelerator.pdf

*2) <https://japan.plugandplaytechcenter.com/press/aepw-plug-and-play-japan-batch1>



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QST/Energy-saving rare metal refining technology

Summary

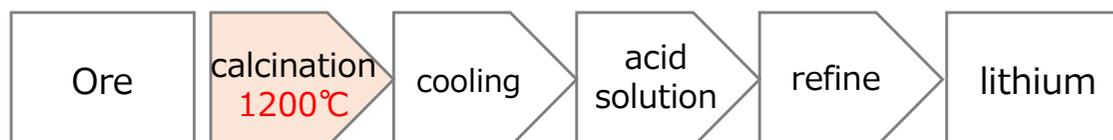
- QST and MWCC to enter into a joint R&D/demonstration agreement to **refine rare metals including lithium** by combining chemical treatment and microwave heating.
- During the demonstration, **scalability and adaptability to various metals and minerals** will be examined.
- We expect to contribute to SDGs by deploying this technology to various industries.

QST: National Institutes for Quantum Science and Technology



Process case Study

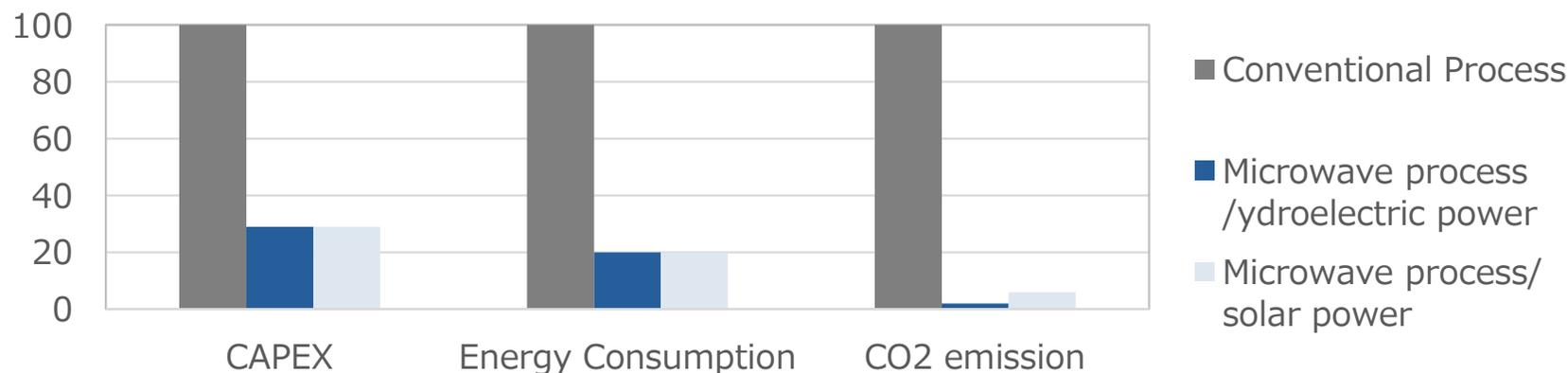
[Conventional Process]... Energy intensive calcination process



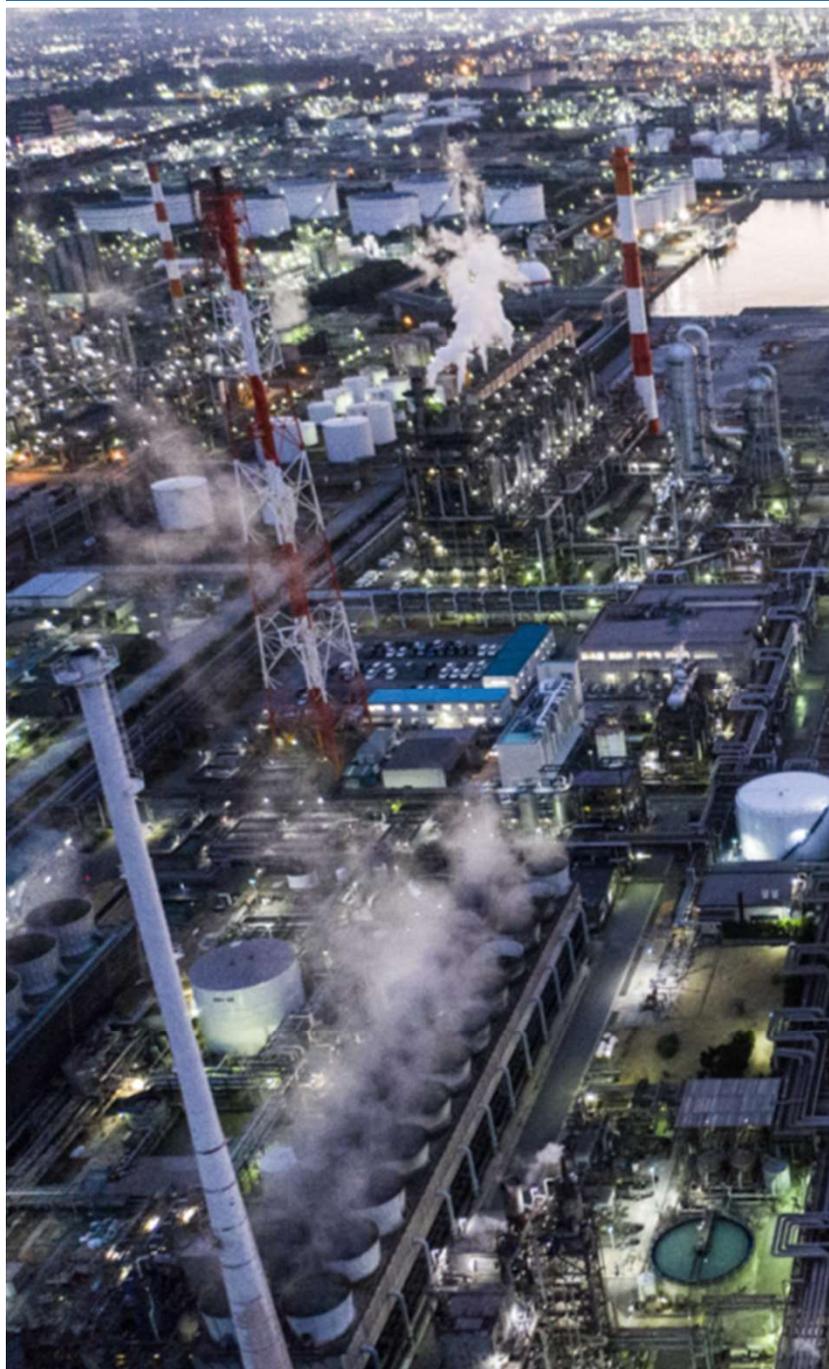
[Microwave Process]... Reduce process temperature from 1,200°C→220



Cost Case Study



Company Overview



Name

Microwave Chemical Co., Ltd.

Founded

August 15, 2007

Representative

CEO Iwao Yoshino

Capital

2,772.09 million yen

No. of employees

60 (including 16 PhDs)

Head office

Photonics Center 5F, 2-1 Yamadaoka, Suita,
565-087 Osaka

Major businesses

Provide solutions for from R&D to engineering
processes, making the most use of our
microwave technology platform

Major shareholders

Management team, The University of
Tokyo Edge Capital Partners Co., Ltd.,
JAFCO Group Co., Ltd., INCJ, Ltd., Mitsui
Chemicals, Inc. etc.

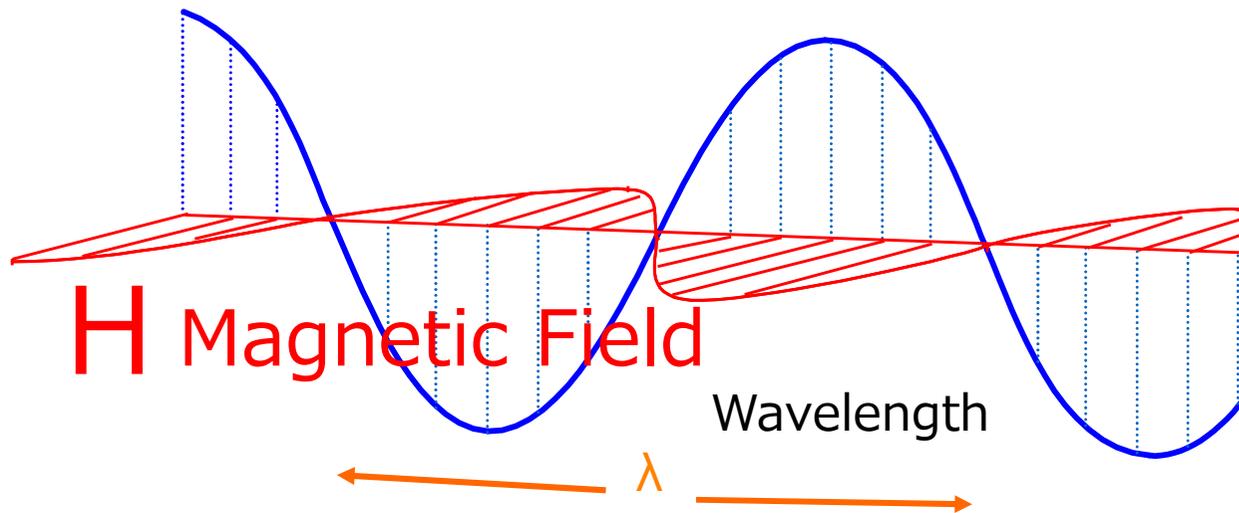
Note: Capital as of end June 2022 , number of employees as of end March 2022



What is Microwave ?

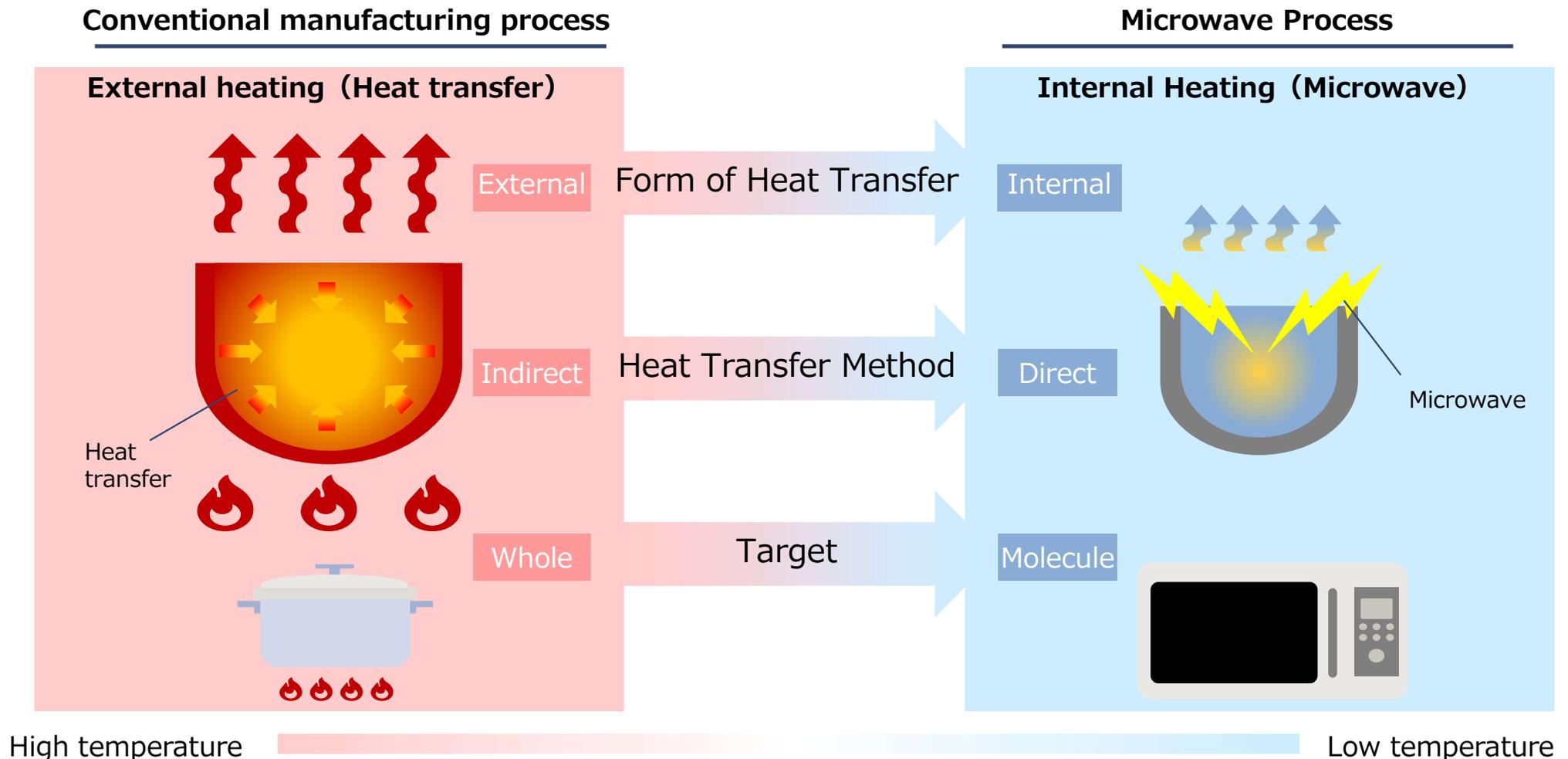
Microwave is an electromagnetic wave used in applications such as wireless base stations, radar-communication systems, and microwave ovens.

E Electric Field



Feature of Microwave Process

We will dramatically change the manufacturing process utilizing microwave technology.

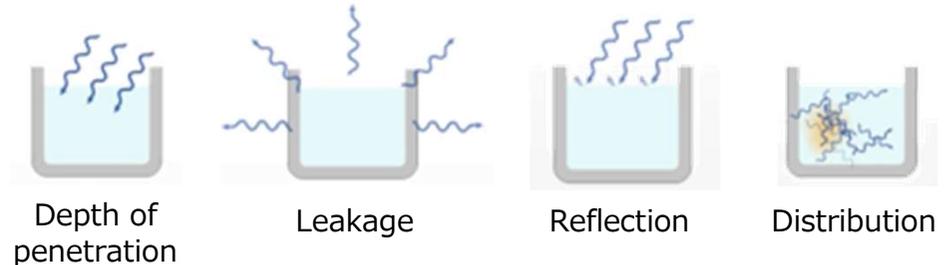


*In the Conventional heat transfer process, energy is transferred to the whole object indirectly through external material. On the other hand, microwaves process transfers energy to the target molecule directly from inside. **Totally opposite approach.**

Success in Scaling Microwave Process to Industrial Level

Challenges for Industrial Applications of Microwaves

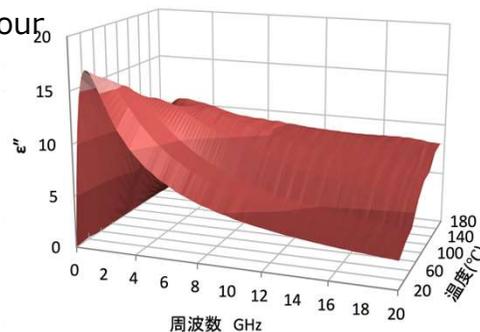
In the chemical industry, many useful experimental results using microwaves have been reported in papers since the 1980s. However, because microwaves are "waves," it is extremely difficult to control. Therefore, industry norm was that the microwave technology cannot be used in industrial setting and only in the lab.



Solved by Our Unique Approach

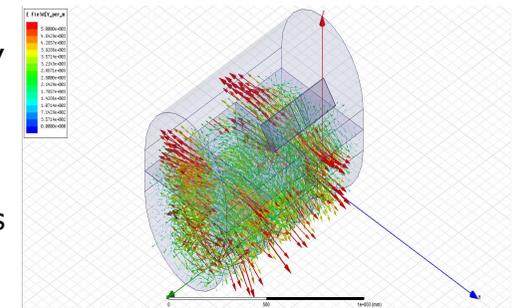
【Reaction System Design】

Developed data base of absorption rate of each molecule through our proprietary measurement technology. Design reaction utilizing the database by recognizing the pattern.



【Reactor Vessel Design】

Develop simulation technologies, couple electromagnetic field and thermic fluid analyses to increase the granularity in simulating the state, and introduce supercomputers, so as to apply to large-sized and complex reactor vessels



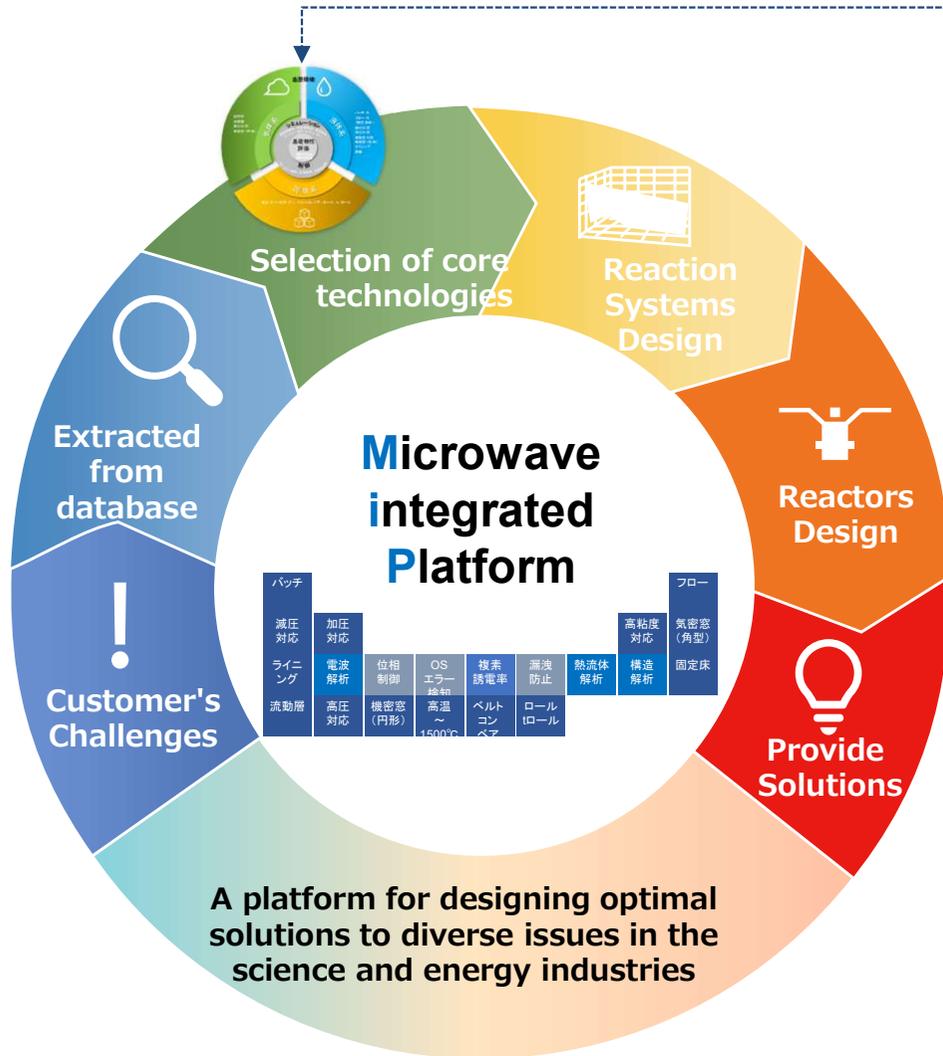
Realizing Industrial Applications of Microwaves

Completed large-scale chemical plant using microwave chemical process in Osaka in 2014 and started commercial operation complying with various laws and regulations such as the Fire Service Act.

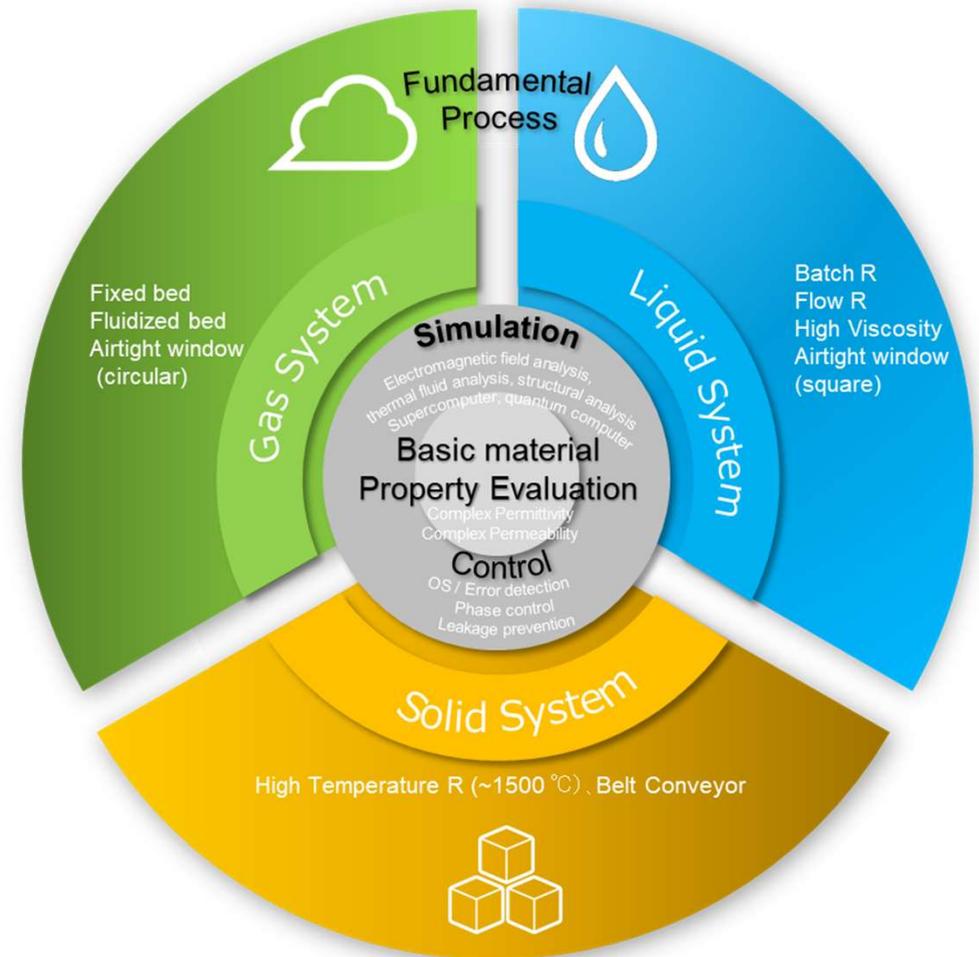


Technology Platform and Core Technologies

Our Technology Platform

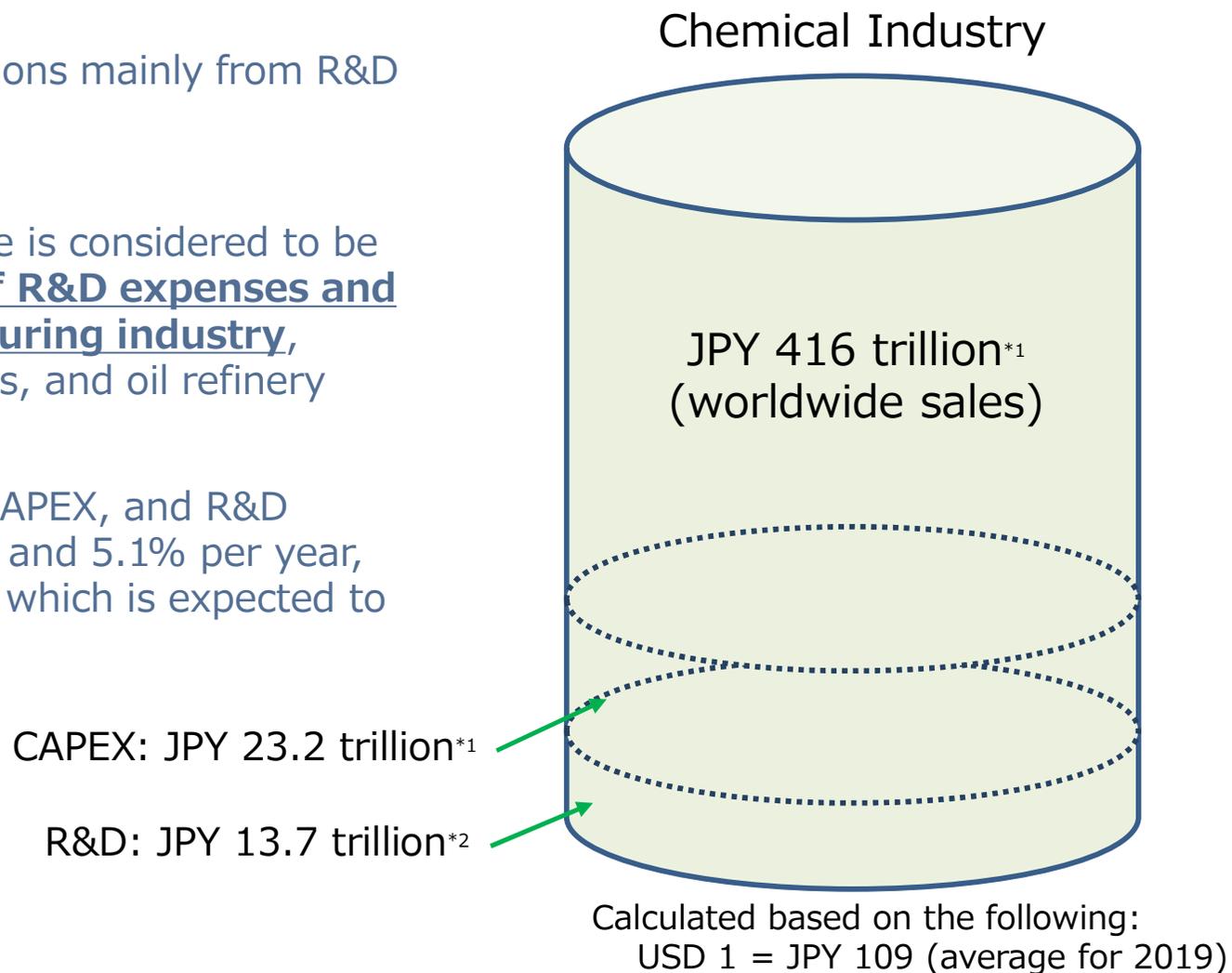


Our Core Technologies



Potential Market

- Customers pay fees for our solutions mainly from R&D expenses and CAPEX
- As such, the potential market size is considered to be **the part of the total amount of R&D expenses and CAPEX in the overall manufacturing industry,** including chemical, medical, foods, and oil refinery
- In the chemical industry, sales, CAPEX, and R&D expenses increased 3.9%, 4.6%, and 5.1% per year, respectively, from 2010 to 2020, which is expected to continue



*1 Guide to the Business of Chemistry 2021 American Chemical Council, August 2021

*2 Forecast on global annual chemical industry capital expenditures 2019-2023

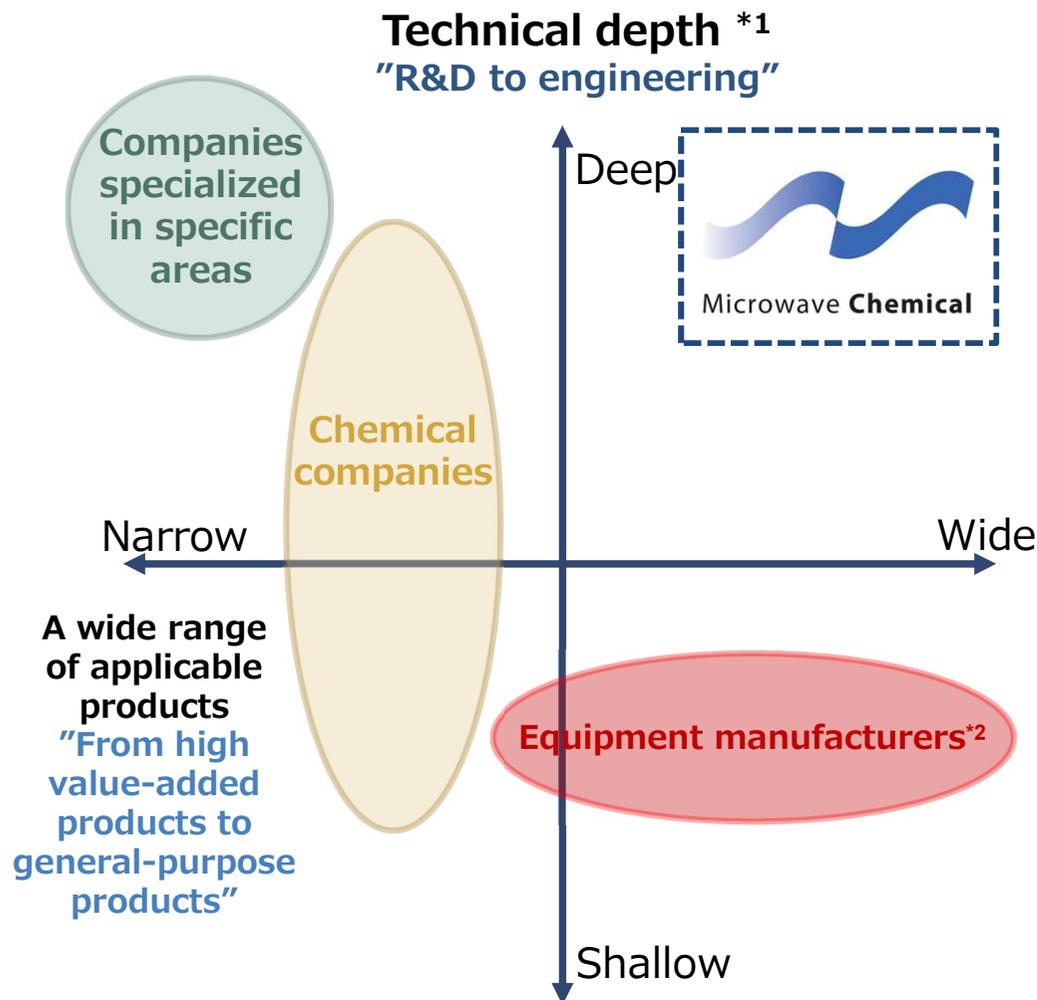
*3 Research spending continues on an upward trajectory) <https://cen.acs.org/business/investment/Research-spending-continues-upward-trajectory/97/i23>

2022 Facts And Figures Of The European Chemical Industry) <https://cefic.org/a-pillar-of-the-european-economy/facts-and-figures-of-the-european-chemical-industry/>

Competitive Landscape

Current Competitive Environment

Multi-layered Entry Barrier



- **Technology platform**

- ✓ Design capabilities and core technology groups for reaction systems and reactors
- ✓ Patents and know-how supporting the platform

- **Development team and infrastructure**

- ✓ Cross-sectorial team, such as physics, chemistry, engineering, and simulation
- ✓ The large microwave-focused labs and demonstration development infrastructure

- **Customer base accumulation**

- ✓ Deeply understanding issues and requests identified through constant relationships including horizontal connection
- ✓ Production technology and compliance with laws and regulations accumulated through experience in the start-up and operation of large-scale commercial plants

*1 Depth of solutions we provide for customers' R&D and engineering challenges, which are backed by our scientific capabilities. Generally, either only R&D or only equipment is provided

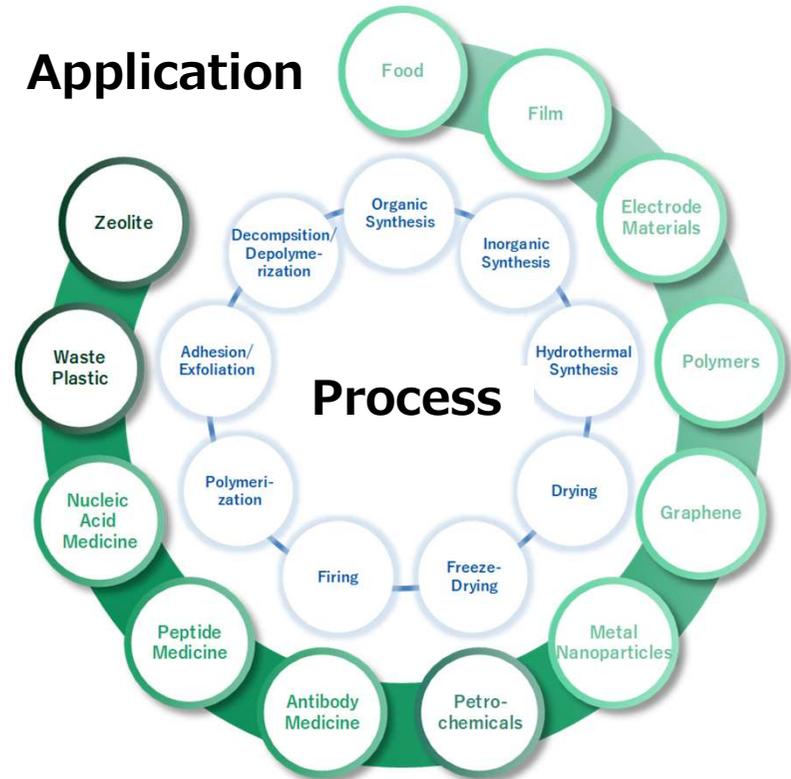
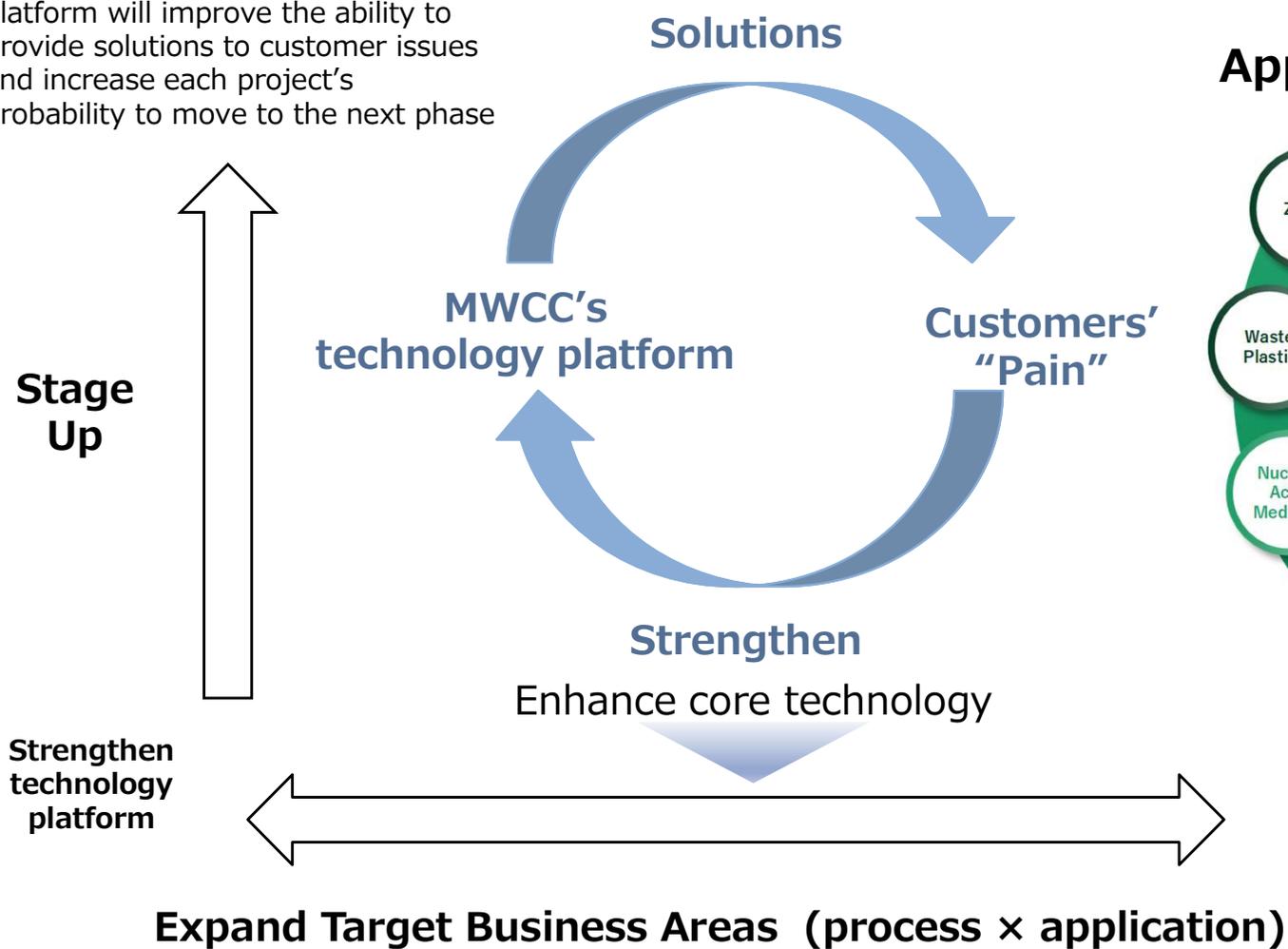
*2 Mostly machine manufacturers

Note: This graph is an image of our own analysis of the positioning of each company in the industry



Virtuous Cycle Drives Growth

Strengthening of our technology platform will improve the ability to provide solutions to customer issues and increase each project's probability to move to the next phase



Enhanced core technology will increase the number of processes (manufacturing methods) and applications (products) for which microwave technology platform can be used



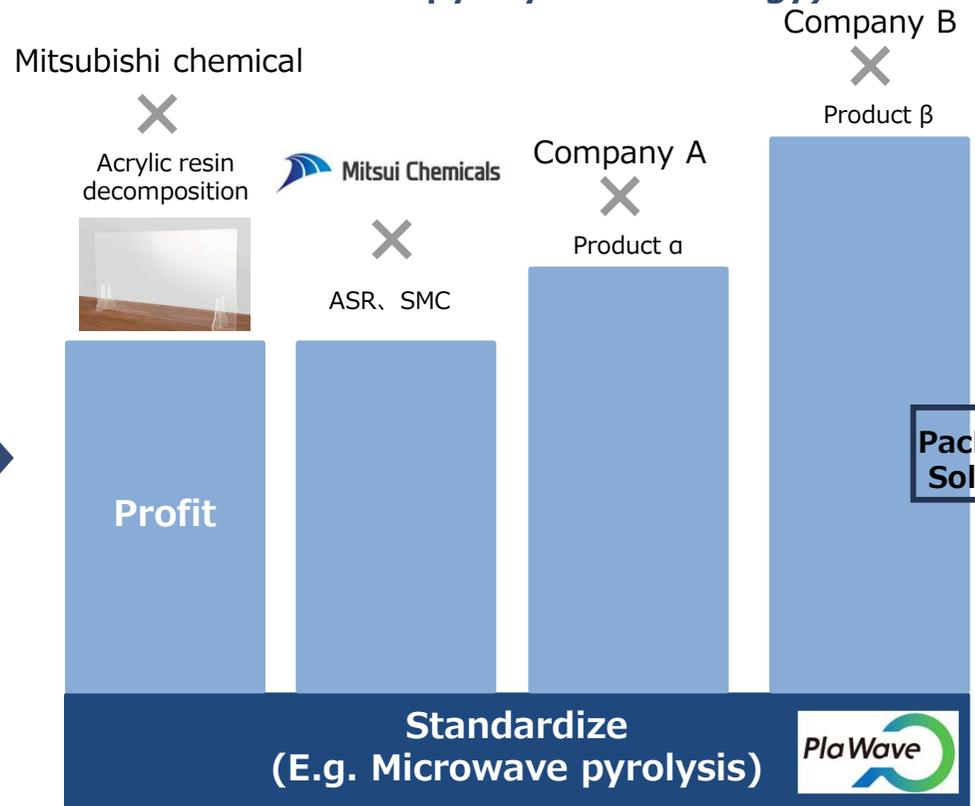
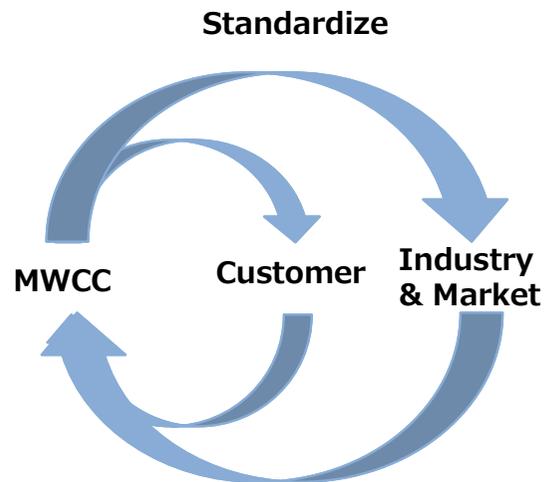
Standardization Drives Growth

We scale our business by “standardizing” our technology platform and providing solutions to “pains” which is common to industries and markets. For example, we have conducted chemical recycling business using microwave pyrolysis technology, pharmaceutical-related and food-related business using microwave freeze-drying technology.

Solutions for each customer

Standardized solutions for each industry and application (E.g. Chemical recycling business by standardized microwave pyrolysis technology)

Examples: chemical recycling, freeze-dry, etc.



Microwave Technology Platform



End of Document



Microwave **Chemical**

**Make Wave,
Make World.**

世界が知らない世界をつくれ