August 8th 2023

Financial Results Q1 FY 24/03

Microwave Chemical

Make Wave,
Make World.

世界が知らない世界をつくれ

Executive Summary

1

24/03 Q1 result

On path to achieving FY target

- FY 24/03 Q1, **Sales 102 million yen（▲34.8% YTY)**
- 5.6 % progress rate for FY 24/03 (1,846 million yen), but our **revenue recognition skewed toward SH, expect to achieve FY target.**
- **Progress rate on contract basis is 78.5% (1,448 million yen).**

2

Steady progress made in KPI

①New Contracts
②Total Contracts
③Sales per Phase

- Acquired 10 new contracts. FY 24/03 target 28, **35.7% progress.**
- 31 contracts signed. FY24/03 target 61 contracts, **47.7% progress.**
- **Sales for Phase 2 contract exceeded 1,000million yen**, progress rate on contract basis is 78.5% (1,448 million yen)

3

Advancement in Technology Standardization & Green Market

- Pilot project to directly convert waste polyamide 66(PA66) to raw materials.(Partner: **Asahi Kasei Corporation**)
- Granted continued funding for distributed chemical recycling sytem (Partner: **Osaka Pref. & Seven-Eleven Japan**)
- JDA for Lithium Ore Refining technology(Partner: **Mitsui & Co., Ltd**.)

Award

- Selected as **“Japan Startup Award 2023(MEXT Award)”**

Agenda

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

【Mission】

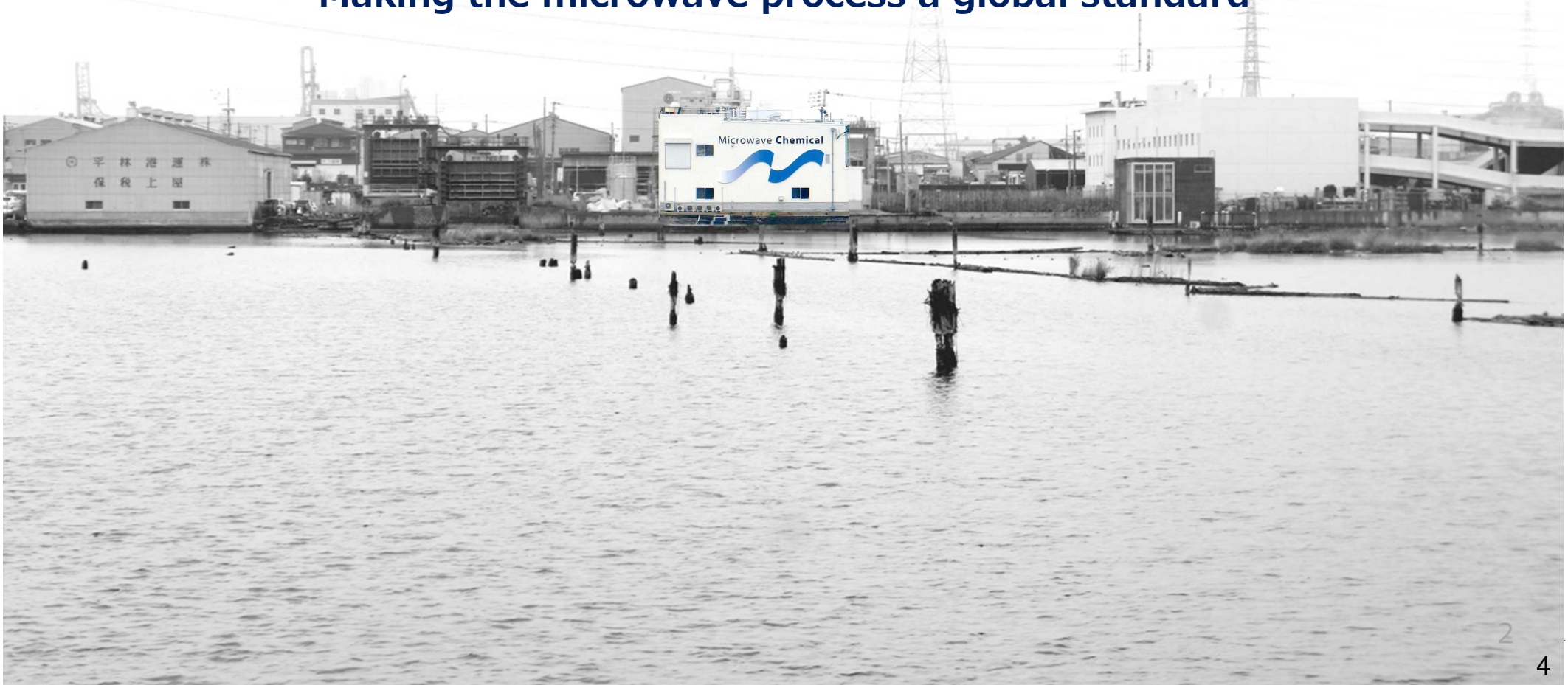
Make Wave, Make World

【Vision】

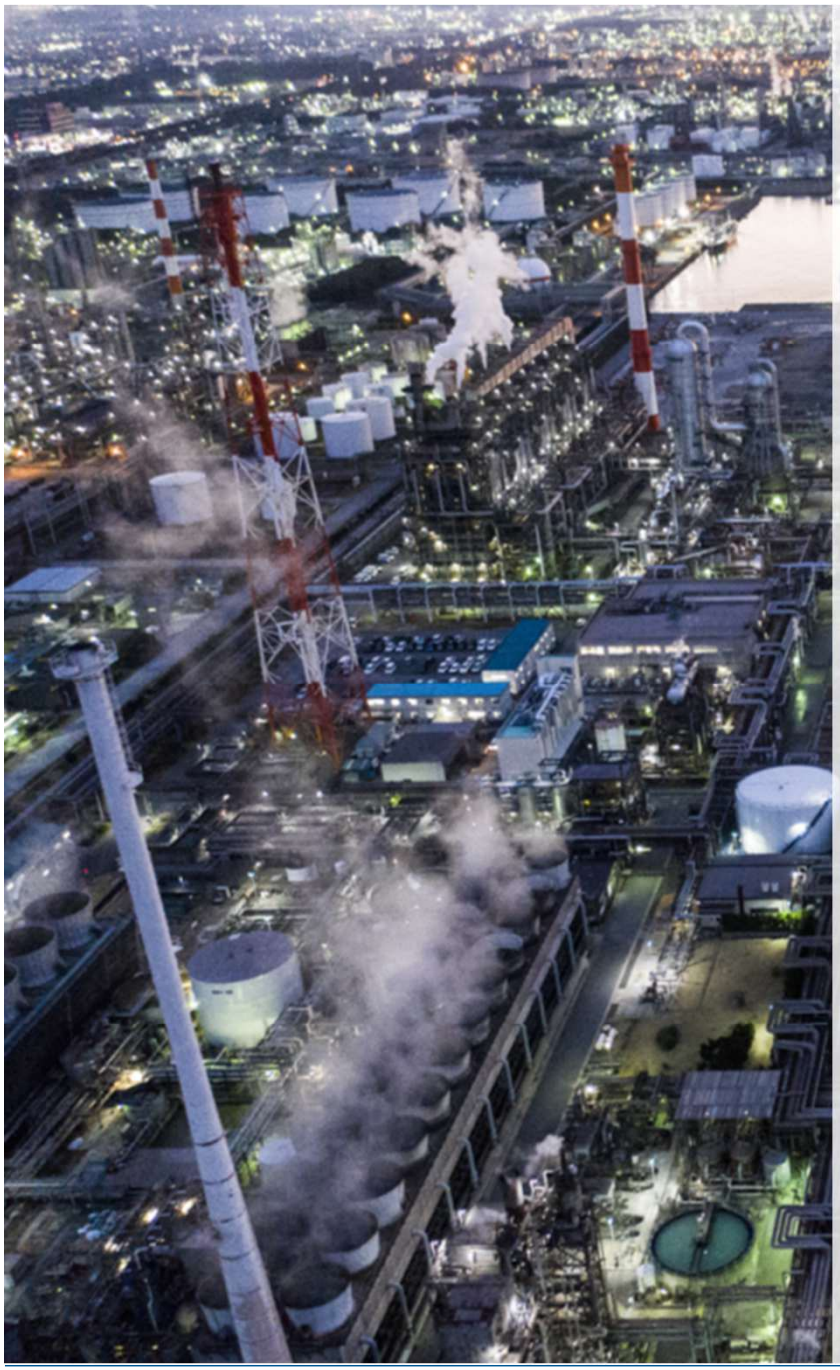
Innovate the chemical industry, unchanged for more than a century

revolutionize the world of manufacturing

-Making the microwave process a global standard-



Company Overview



Name	Microwave Chemical Co., Ltd.
Founded	August 15, 2007
Representative	CEO Iwao Yoshino
No. of employees	64 (including 13 Ph.D)
Head office	Photonics Center 5F, 2-1 Yamadaoka, Suita, 565-0871 Osaka
Major businesses	Provide solutions for from R&D to engineering processes, making the most use of our microwave technology platform

Note: Number of employees as of the end of March 2023

History

2014: Complete the construction of a large-scale microwave plant in Suminoe-ku, Osaka and begin shipping products for TOYO INK CO., LTD.

2017: Complete construction of a joint sucrose ester plant with Taiyo Kagaku Co., Ltd.

2019: Deliver a microwave facility complying with GMP to PeptiStar Inc. for its manufacture of peptide medicine

2022: Announce the establishment of technology for the production of carbon fibers with low environmental impact with Mitsui Chemicals, Inc.

2022: IPO TSE Growth Market

2021: Announce the start of development of turquoise hydrogen production with Sumitomo Chemical Co.

2021: Announce the start of a direct monomerization initiative for waste plastics with Mitsui Chemicals, Inc.

2021: Announce the construction of a joint demonstration facility for acrylic resin decomposition with Mitsubishi Chemical Corporation

2017: Enter into strategic partnerships with Mitsui Chemicals, Inc., Mitsui Mining & Smelting Co., Ltd., Futamura Chemical Co., Ltd. and Iwatani Corporation, respectively

2014: Sign a joint development with BASF (Germany) in the field of polymer engineering

100

10

Image of an increment in the cumulative number of pipelines*

Inception

Establish technologies | **Build track record towards commercialization** | **Roll out our technology platform** | **Grow business**

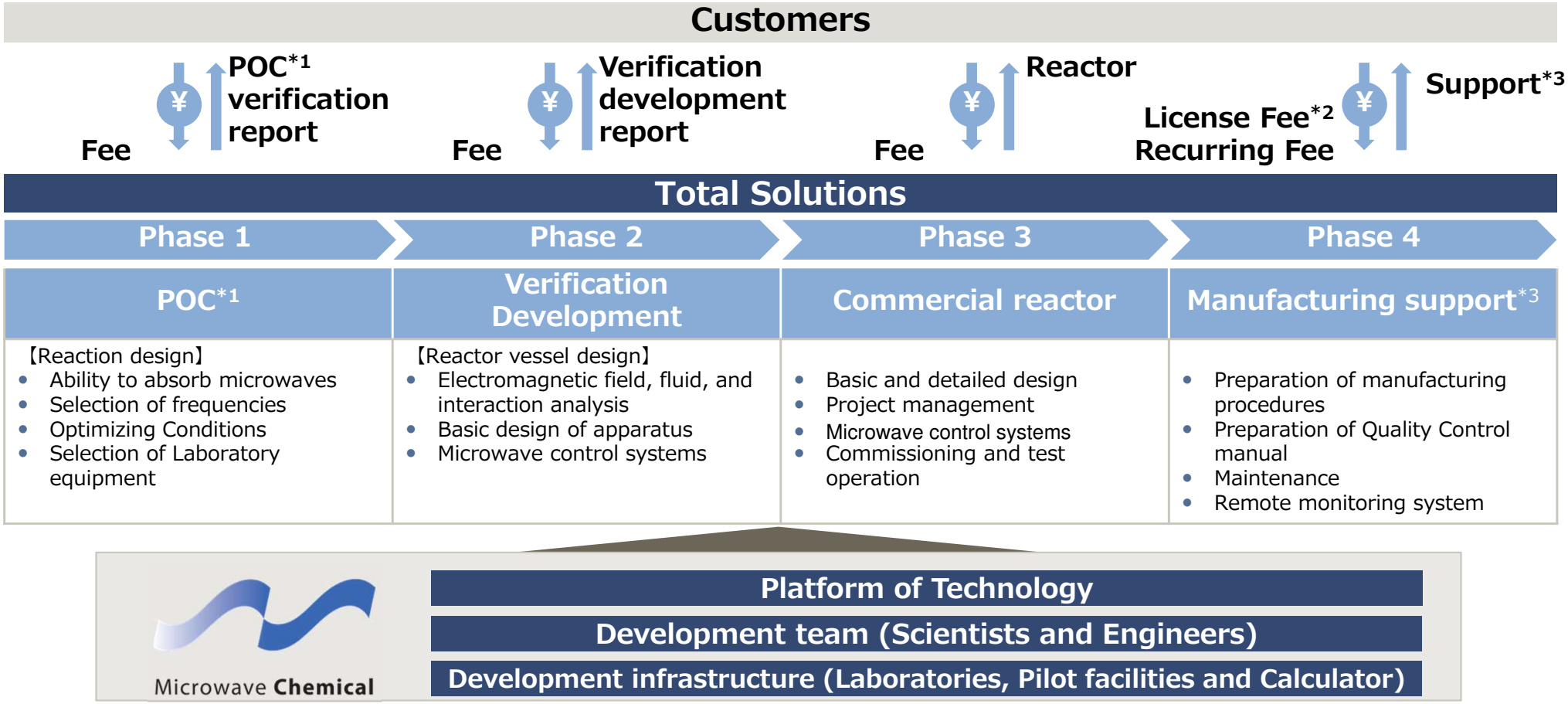
2007 2014 2019 2021

Shift from a manufacturer and distributor to demonstrate its technologies to a solution provider using its technology platform

* The Pipelines refer to development projects in Phase 1 (lab development), Phase 2 (demonstration development), Phase 3 (commercial reactor introduction), or Phase 4 (manufacturing support)

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 Strategy

Focus and forward-looking investments for 2025 and beyond.

Business Model × **Market Focus**

Projects × Unit Price × Plants in Commercial Production × Packaged Solution

1. New Contract Acquisition

of new contract acquisitions will be comparable to that of the previous FY. Rather than simply pursuing quantity, will **focus on high-quality inquiry that leads to large-scale projects.**

2. A Virtuous Circle Strengthening the Technology Platform

Improvement of efficiency and profitability through strengthening of **technology platforms with focus** on areas with technological superiority and market demand.

3. Standardization

Promotion of existing standardization businesses (chemical recycling, freeze-drying) and launch of new standardization businesses

2. A Virtuous Circle Strengthening the Technology Platform

4. Focus on growth areas

Green

Form projects with focus on green domain. Accelerate growth opportunities by **active investments in the carbon-neutral field.**

R&D Capacity (Personnel + Infrastructure)

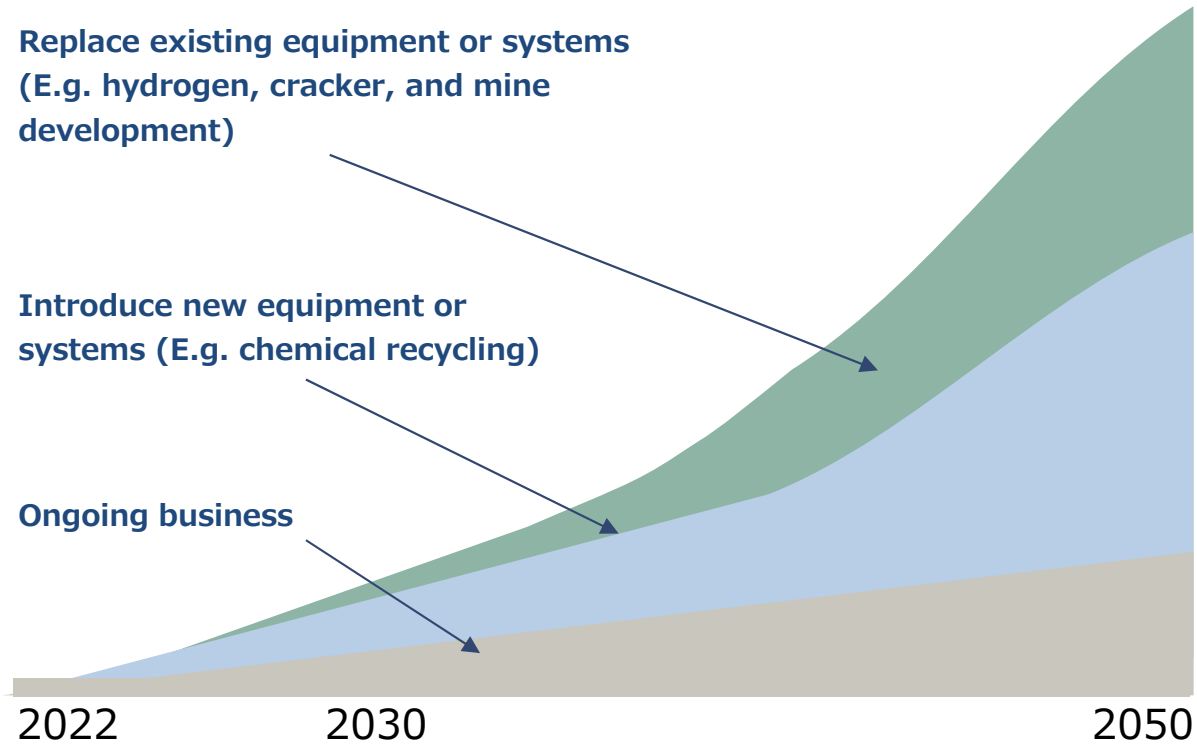
To accommodate the expected increase in stage-up contracts after FY25/3, we will gradually strengthen ① personnel and ② R&D infrastructure (labs + pilot facilities).

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".**



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

MWCC's Active Solutions for Decarbonization

C NEUTRAL 2050 design

- Electrification of the chemical industry
  - Electrification of crackers
  - All other processes

- Energy
  - Turquoise hydrogen
  - Ammonia
  - Nuclear Fusion

- Raw materials
  - Chemical recycling
  - Biomass

- Carbon Fixation
  - CCUS

- Mobility
  - Battery-related material(Cathode etc.)
  - Carbon Fiber/CFRP
  - Lithium and rare earth (mining process)

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FY 24/03 Budget & 23/03 Result

Net sales target 1,846million yen, Operating profit 40million yes.

(Unit : million Yen)

	FY 23/03 Full-year (result)	FY 24/03 Full-year (budget)	year-to-year comparison	
Net sales	1,215	1,846	+631	+51.9%
Phase 1	567	559	▲8	▲1.4%
Phase 2	593	1,284	+690	+116.3%
Phase 3	35	–	▲35	▲100.0%
Phase 4	–	–	–	-
Others	19	3	▲16	▲84.4%
Operating profit	59	40	▲19	▲32.0%
Ordinary profit	26	33	+7	+27.8%
Net Profit	75	89	+14	+18.9%

*The estimated amount of corporate tax adjustment is zero yen.

Financial results for FY24/03 Q1

YTY Sales comparison ▲34.8%.

(Unit : million Yen)

	FY 23/03 Q1	FY 24/03 Q1	year-to-year comparison	
Net sales	157	102	▲54	▲34.8%
Phase 1	34	69	+34	+100.0%
Phase 2	87	33	▲54	▲62.0%
Phase 3	35	–	▲35	▲100.0%
Phase 4	–	–	–	-
Others	0	–	▲0	▲100.0%
Operating profit	▲36	▲169	▲133	-
Ordinary profit	▲65	▲170	▲104	-
Net Profit	▲66	▲184	▲117	-

Seasonal Fluctuations / Revenue Recognition

<Seasonal Fluctuations>

Our major customers, chemical companies, finalizes budgets by March, just before the start of the new fiscal year, so project 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.

(Net sales for each quarterly accounting period)

(Unit : 1 Million Yen)

	Q1	Q2	Q3	Q4	Total
FY 22/3	68	61	548	182	860
FY 23/3	157	185	252	620	1,215

<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 dose not include financial component.

① Joint development agreement(JDA)

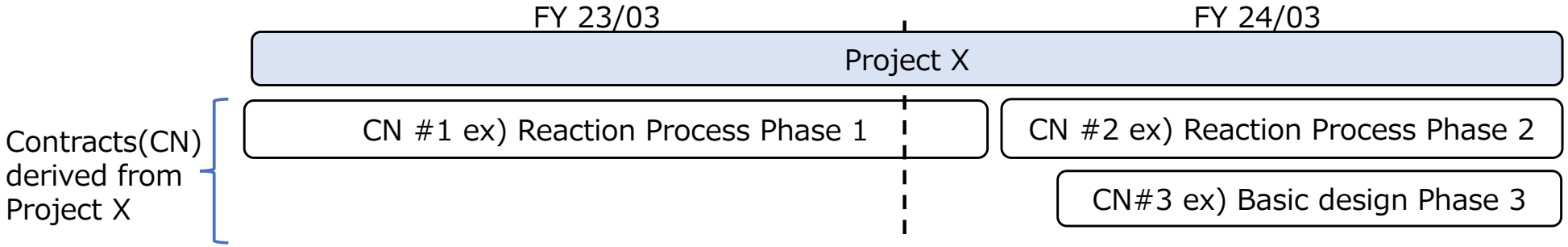
The Company submits reports, samples, etc. stipulated in the JDA and receives payment. Under such agreements, revenue is booked upon acceptance of the report, samples, etc. by the customer.

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.
3. ③**Sales per Phase :** To understand the progress of the contract by sales per each phase(1～4).
4. Contracts is basis of our revenue. We disclose only the Contracts that is expected to complete and book sales within this FY as KPI.



【Related information】

a. **Total Number of Projects**：Project consist of a team with task to provide “total solution” to clients. It is also referred as a pipeline and categorized in two types.
   - Revenue generating project: Solution Providing Project to a client
   - Non-revenue generating project : R&D Project which we invest our own resources.

FY24/03 Q1 KPI Highlights

1 New Contracts - total number of newly acquired contracts

- Acquired 10 contracts out of 28 annual projection

2 Total Contracts - total number of contracts

- 31 Contracts signed, 10 delivered. FY 24/03 target 65 contracts.

3 Sales per Phase Projects

- 1,448mil yen(78.5%) achieved on contract basis. FY24/03 target 1,846mil yen.

4 Projects – total number of projects

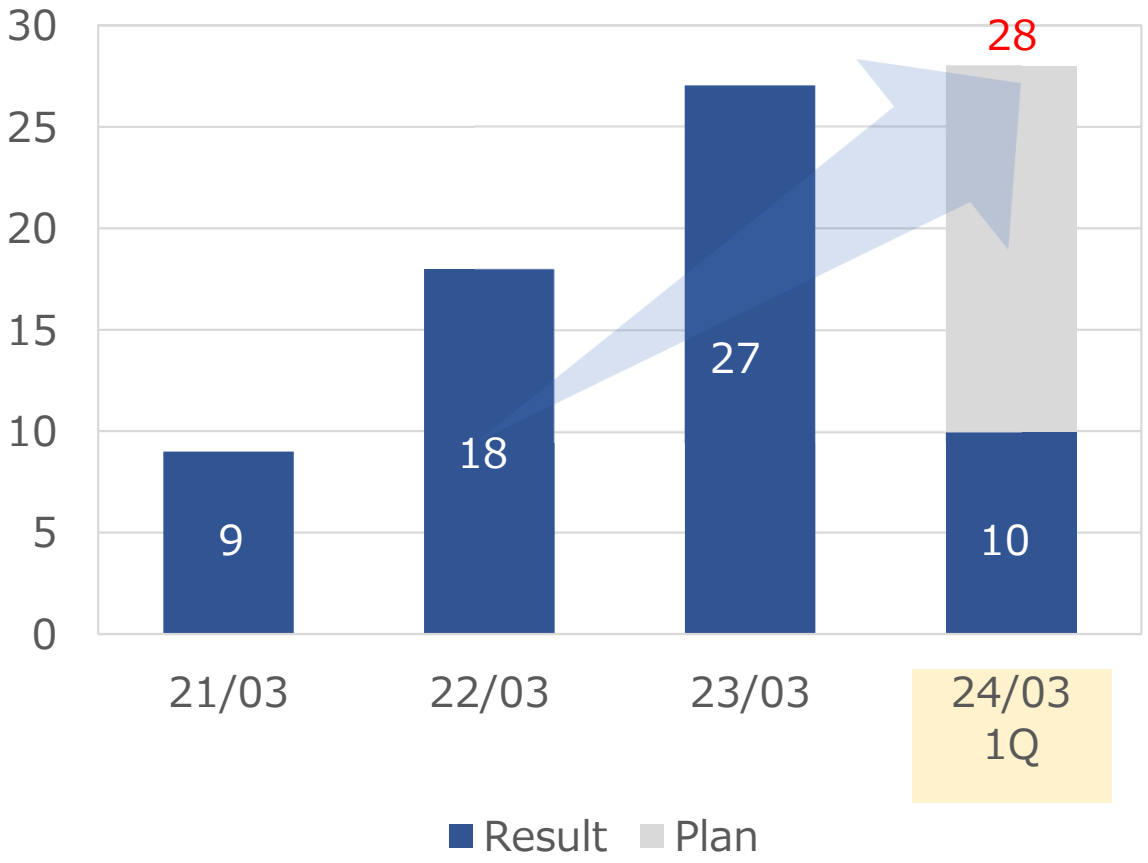
- 30 Solution Providing Projects, 3 R&D Projects ongoing.

KPI① Total number of newly acquired contracts

Acquired 10 contracts in Q1. FY 24/03 target 28 contracts.

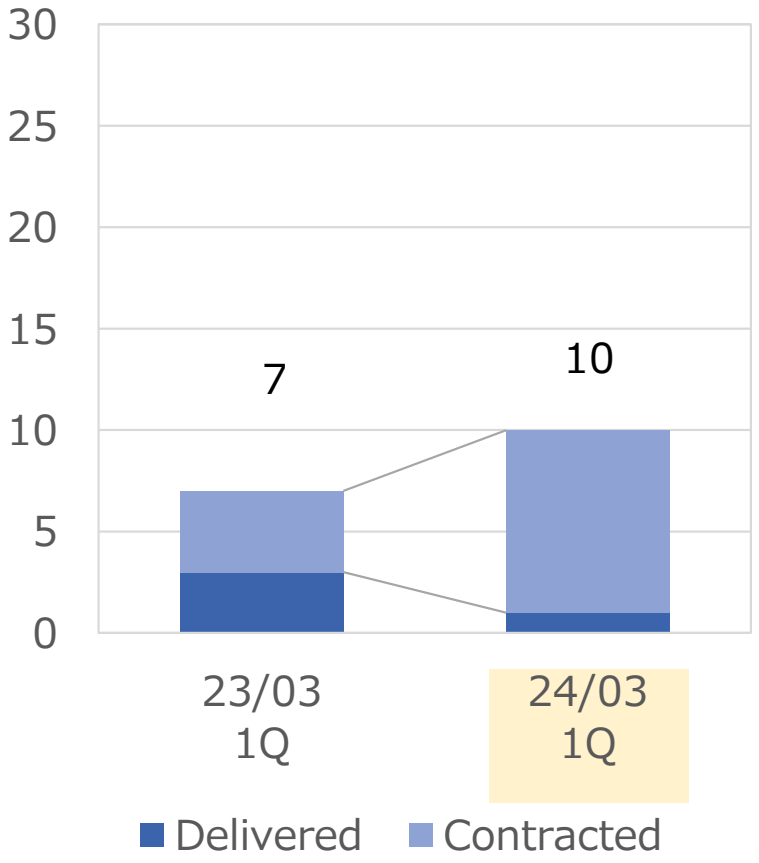
Newly acquired contracts : Trend

(Unit : # of Contracts)



YTY Comparison

(Unit : # of Contracts)

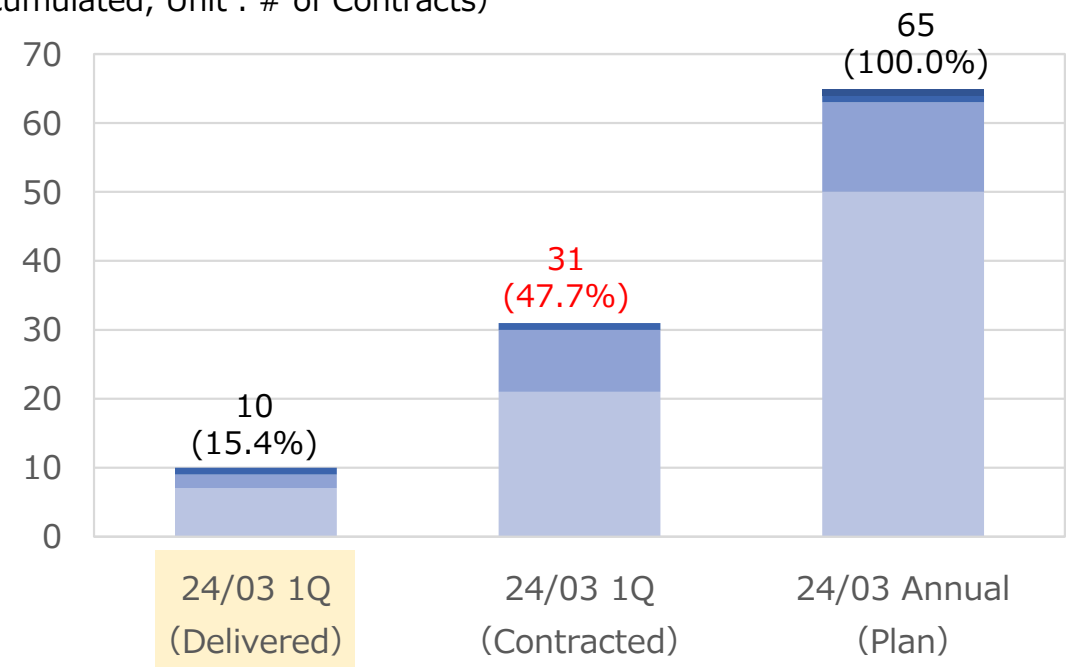


KPI② Total number of contracts

47.7 % progress compared to FY24/03 target.

Progress vs. full-year plan

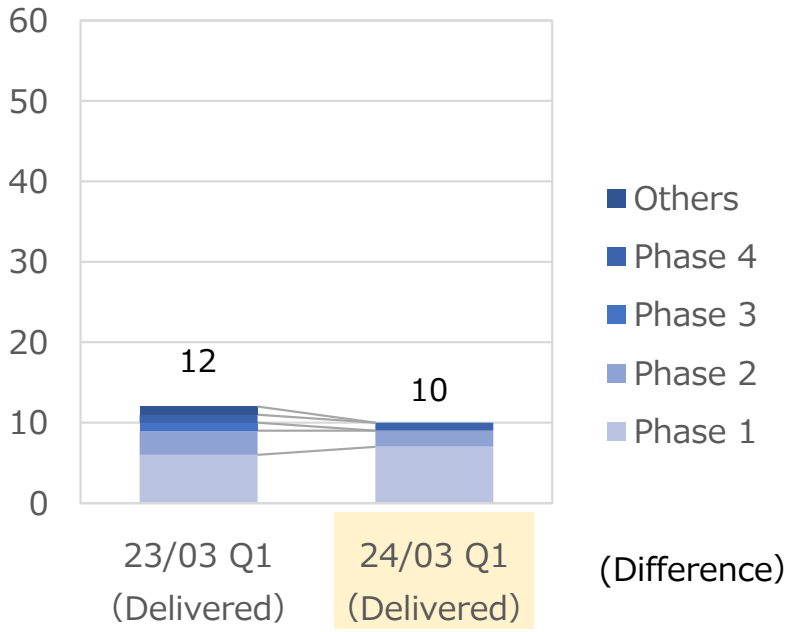
(Accumulated, Unit : # of Contracts)



	24/03 1Q (Delivered)	24/03 1Q (Contracted)	24/03 Annual (Plan)
Phase 1	7	21	50
Phase 2	2	9	13
Phase 3	0	0	0
Phase 4	1	1	1
Others	0	0	1
Total	10	31	65

YtY Comparison

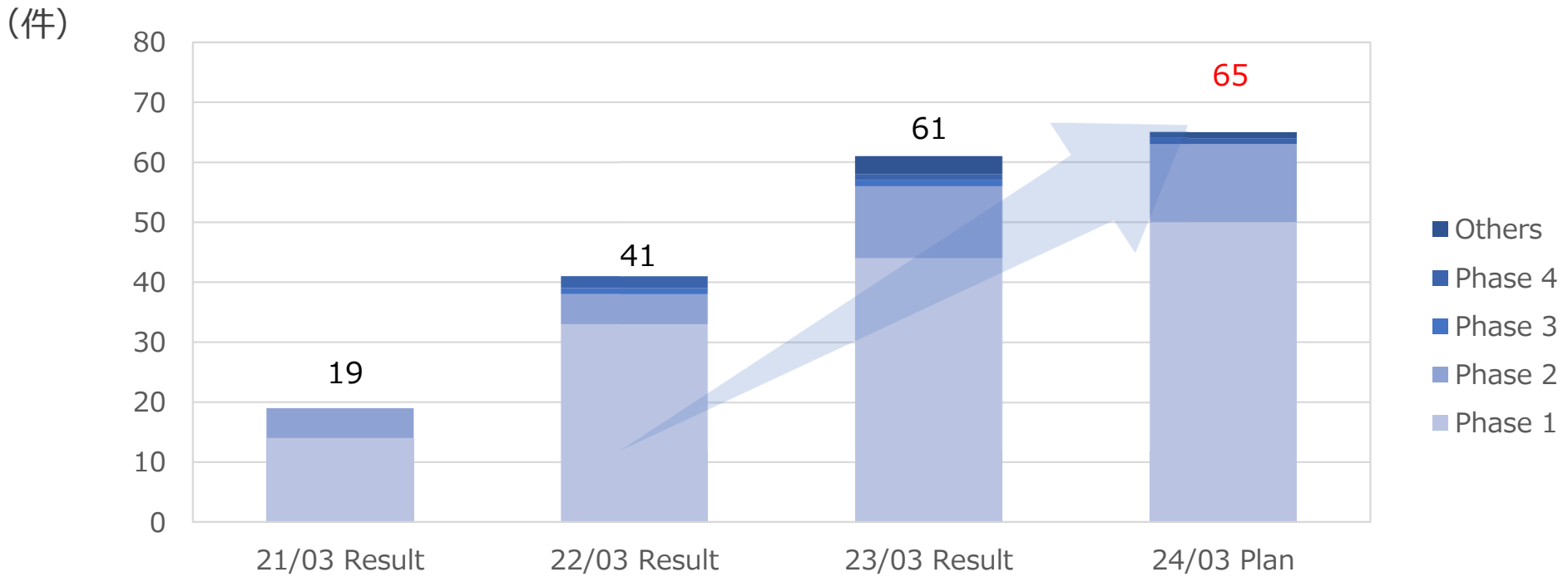
(Accumulated, Unit : # of Contracts)



23/03 Q1 (Delivered)	24/03 Q1 (Delivered)	(Difference)
6	7	+1
3	2	▲1
1	0	▲1
1	1	–
1	0	▲1
12	10	▲2

Ref: Total number of contracts / Past Figures & FY24/03 Forecast

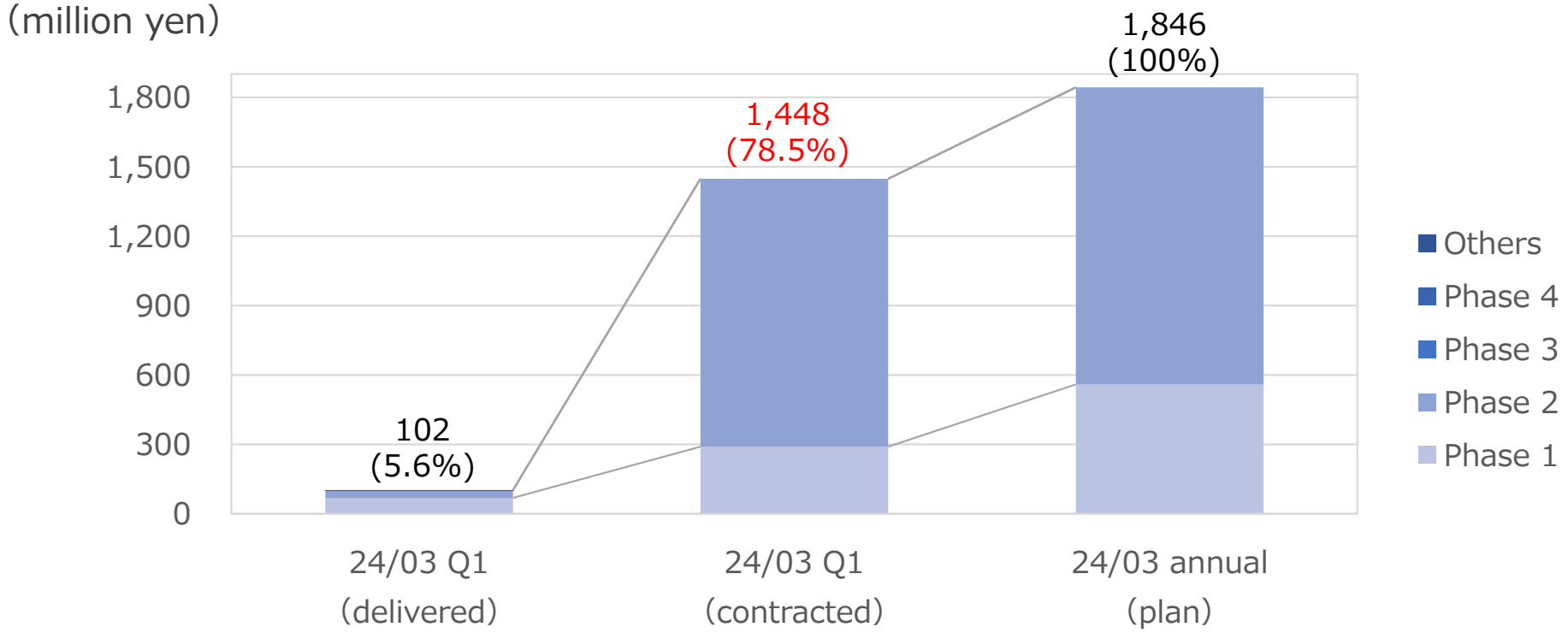
Similar number or contracts expected for 24/03 compared to 23/03



Phase 1	14	33	44	50
Phase 2	5	5	12	13
Phase 3	0	1	1	0
Phase 4	0	2	1	1
Others	0	0	3	1
Total	19	41	61	65

KPI③ Sales per phase

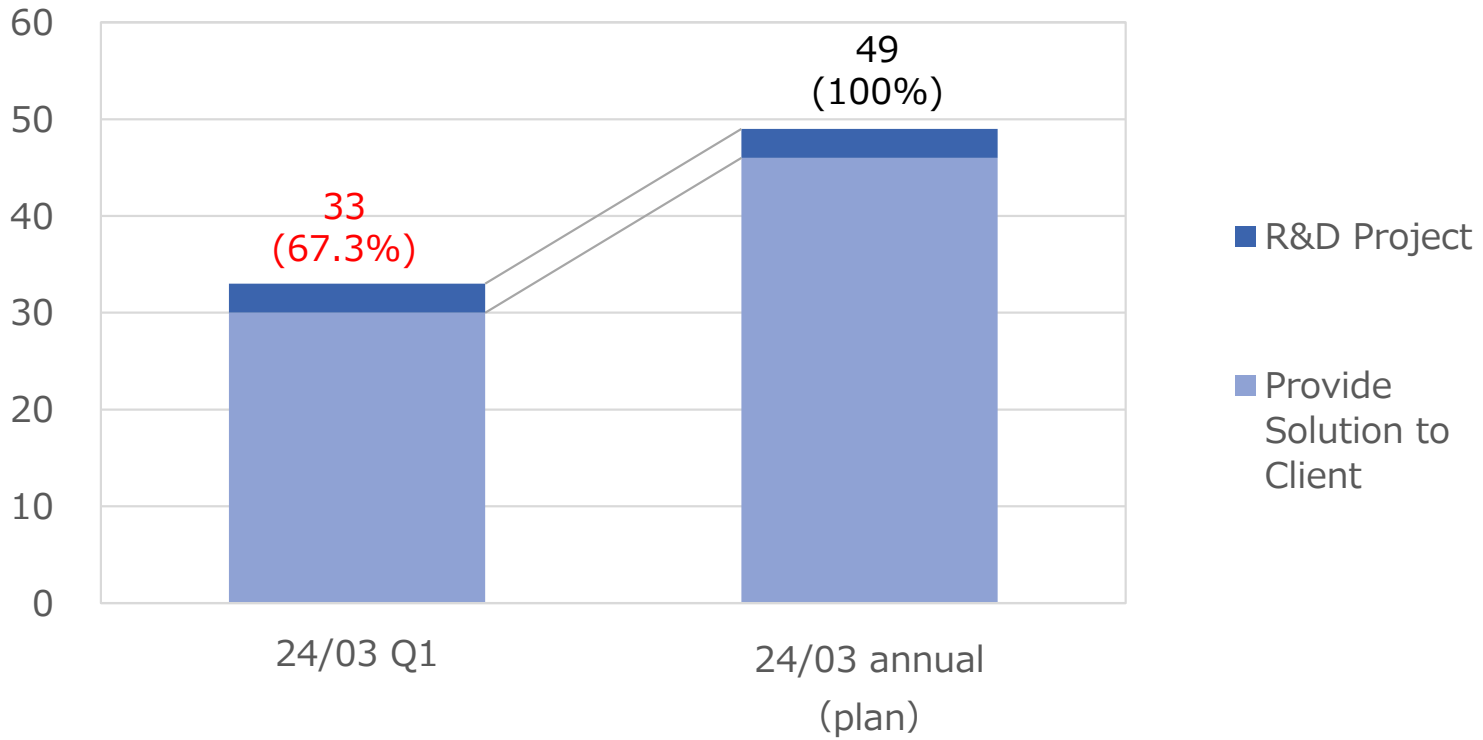
Steady progress made on each phase per contract basis.



Phase 1	69	290	559
Phase 2	33	1,158	1,284
Phase 3	-	-	-
Phase 4	-	-	-
Others	-	-	3
Total	102	1,448	1,846

Ref: Total Number of Projects

67.3% progress vs. full-year plan.



R&D	3	3
Provide solution	30	46
Total	33	49

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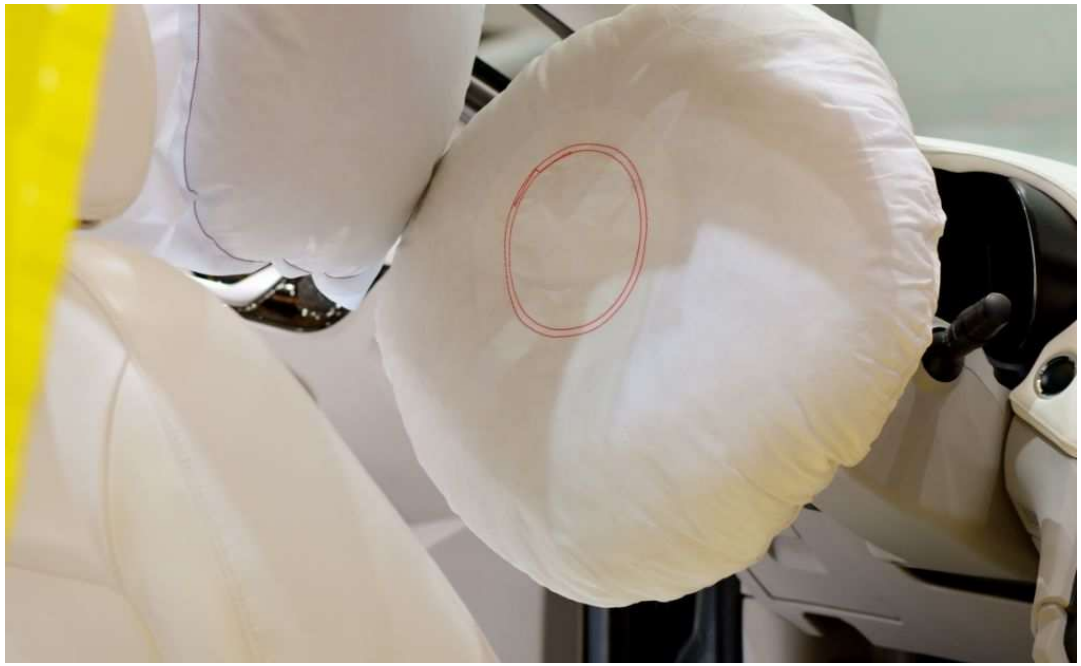
Topics: 24/03 Q1 BUSINESS HIGHLIGHT

Scaling through Standardization / Chemical Recycling	• Commenced a joint pilot project to **directly convert waste polyamide 66, used in automotive airbags and components, directly to raw materials.**（パートナー：**Asahi Kasei Corporation**） • Granted continued funding of “Carbon Neutral Technology Development and Demonstration Program” for distributed recycling system. (Partner: **Osaka Pref. & Seven-Eleven Japan**)
Progress in Green Domain / Mining Process	• **To electrify lithium refining technology** utilizing novel microwave process to reduce carbon footprint for roasting process, which is the primary source of CO2 emissions.(Partner : **Mitsui &Co. Ltd.**)
Others / Award	• “Japan Startup Award 2023”. The award was aimed to recognize **impactful new business** that serve as a **role model** for entrepreneurs and promote entrepreneurship in Japanese society.

Pilot project with **Asahi Kasei Corporation**

Commenced a joint chemical recycling pilot project to **directly convert waste polyamide 66, used in automotive airbags and components, directly to raw materials.**

- ✓ In FY2023, we will build bench-scale reactor within our Osaka facility. Subsequently, in FY2024, we will conduct small-scale pilot test, **by the end of FY2025, we will assess potential commercialization.**
- ✓ While conducting small-scale pilot tests, we will **simultaneously develop business model involving the entire value chain.**



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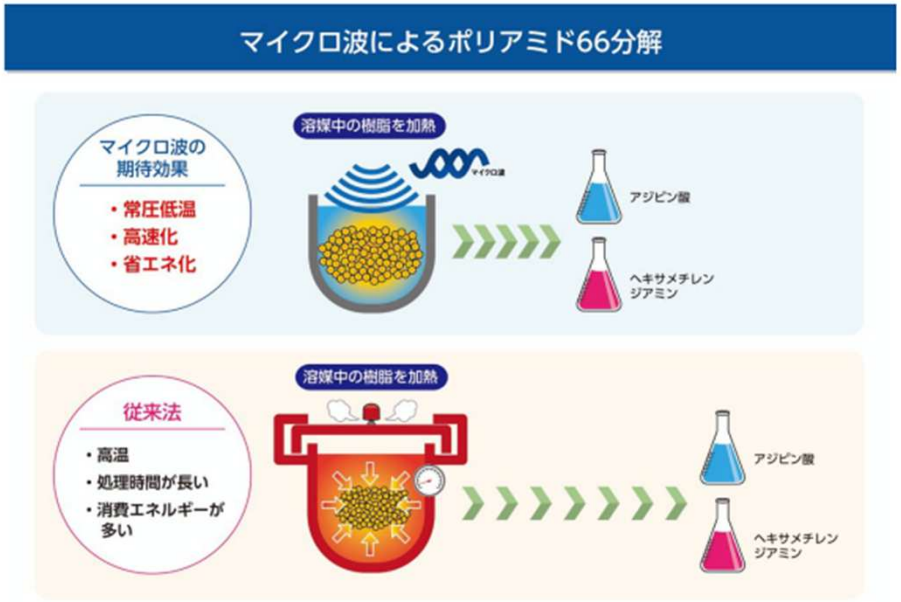


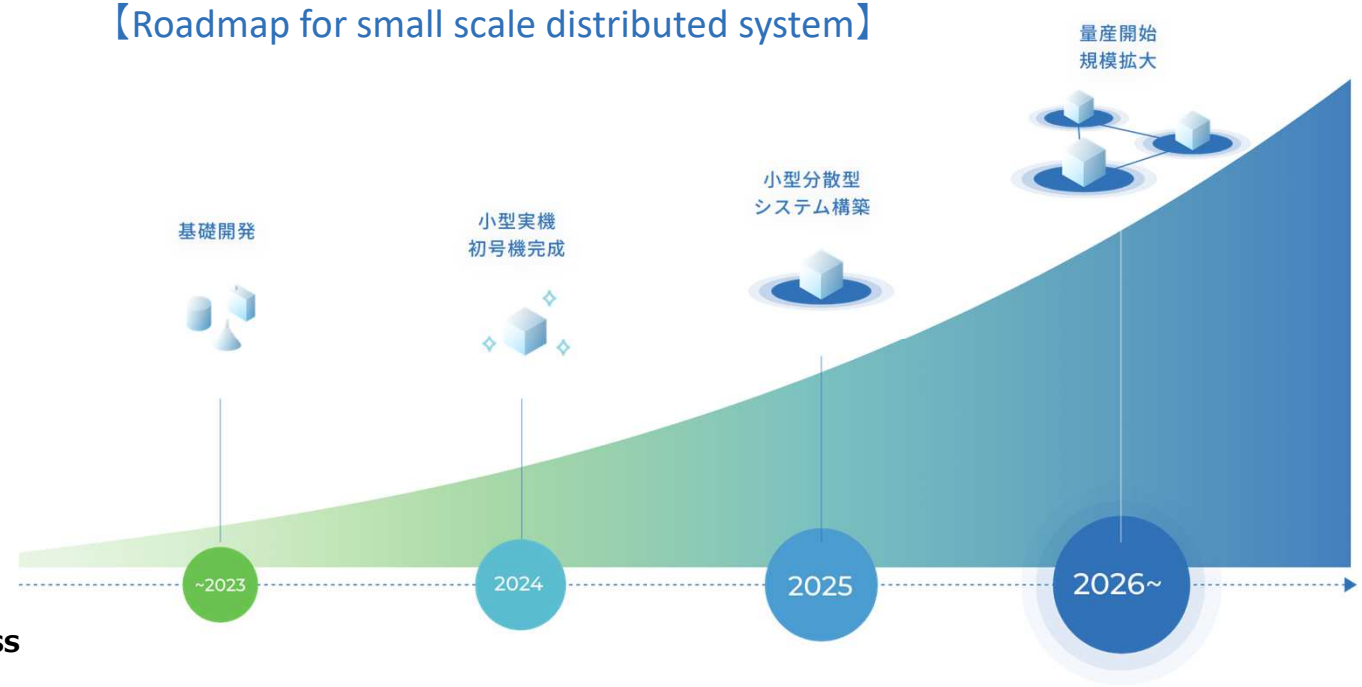
Chemical Recycling with **Seven-Eleven Japan**

Granted continued funding from Osaka Prefecture “Carbon Neutral Technology Development and Demonstration Program” together with Seven-Eleven Japan for distributed recycling system.

- ✓ In this project, Our aim is to develop and demonstrate **"small-scale distributed”** chemical recycling system to improve efficiency of the system including transportation cost, cut emissions through the use of renewable energy, and lower recycling costs.
- ✓ **At the 2025 Osaka-Kansai Expo**, we plan to showcase plastic products made from recycled plastics collected from our partner Seven-Eleven stores..
- ✓ **We plan to optimize recycling** system by introducing two models. Namely, the "large-scale centralized" approach and the "small-scale decentralized" approach.

Image / do not represent actual business

【Roadmap for small scale distributed system】



JDA with **Mitsui & Co., Ltd. for** Lithium Ore Refining tech.

To electrify lithium refining technology utilizing novel microwave process to reduce carbon footprint for roasting process, which is the primary source of CO2 emissions.

- ✓ We developed a microwave technology platform called **"Green Mining-MX"** for mining processes. We are collaborating with the National Institutes for Quantum and Radiological Science and Technology (QST) to develop energy-efficient and CO2-reducing refining methods using microwave heating. This technology will be applied to the refining of lithium ore.
- ✓ **Commercialization target 2026.**
- ✓ As electrification accelerates for mobility(EV), securing a stable supply chain for lithium used in batteries becomes crucial due to its designation as a critical mineral in many countries, impacting **economic security.**

Image / do not represent actual business

“Japan Startup Award 2023” Awarded

The award was aimed to recognize **impactful new business** that serve as a **role model** for entrepreneurs and promote entrepreneurship in Japanese society.

- ✓ Out of 337 entries, selected as the **Minister of Education, Culture, Sports, Science, and Technology（ MEXT） Award.**
- ✓ Our efforts to bring innovation to the world of chemical industries and manufacturing, which has remained unchanged for over 100 years, have been **recognized and appreciated.**
- ✓ The ceremony was held at the Prime Minister’s Official Residence on the June 9th, where the presentation was made to **PM Kishida and Minister Nagaoka of MEXT.**

Photos： Nikkan Kogyo Shimbunsha

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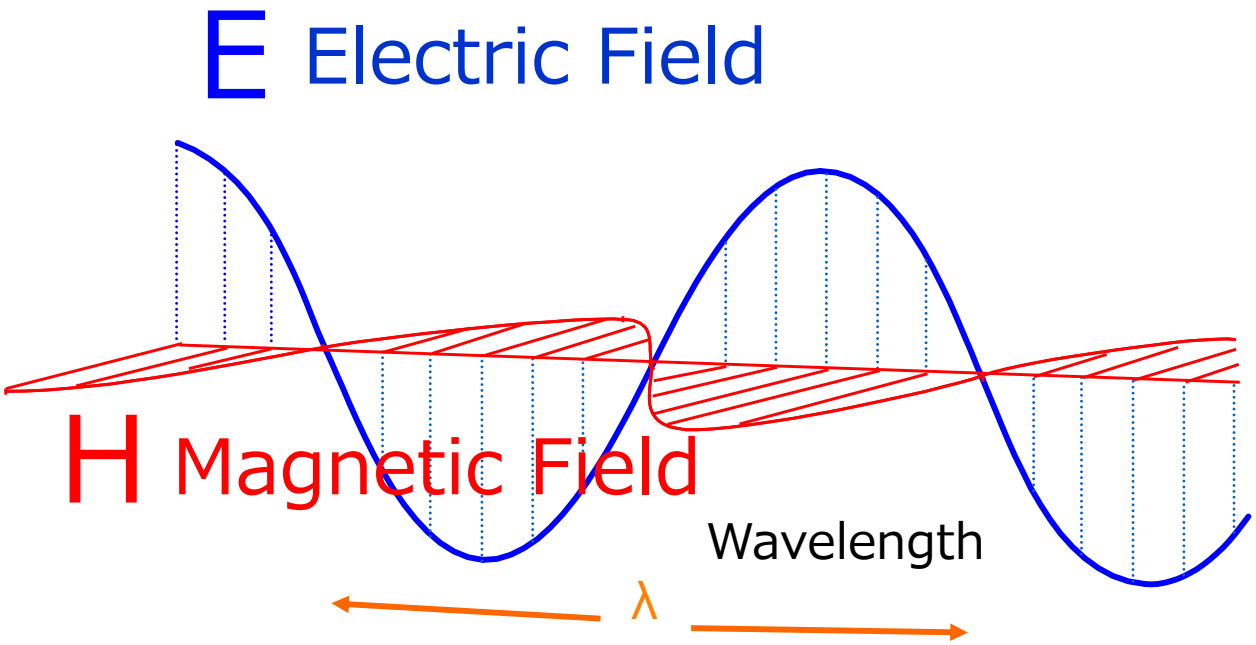
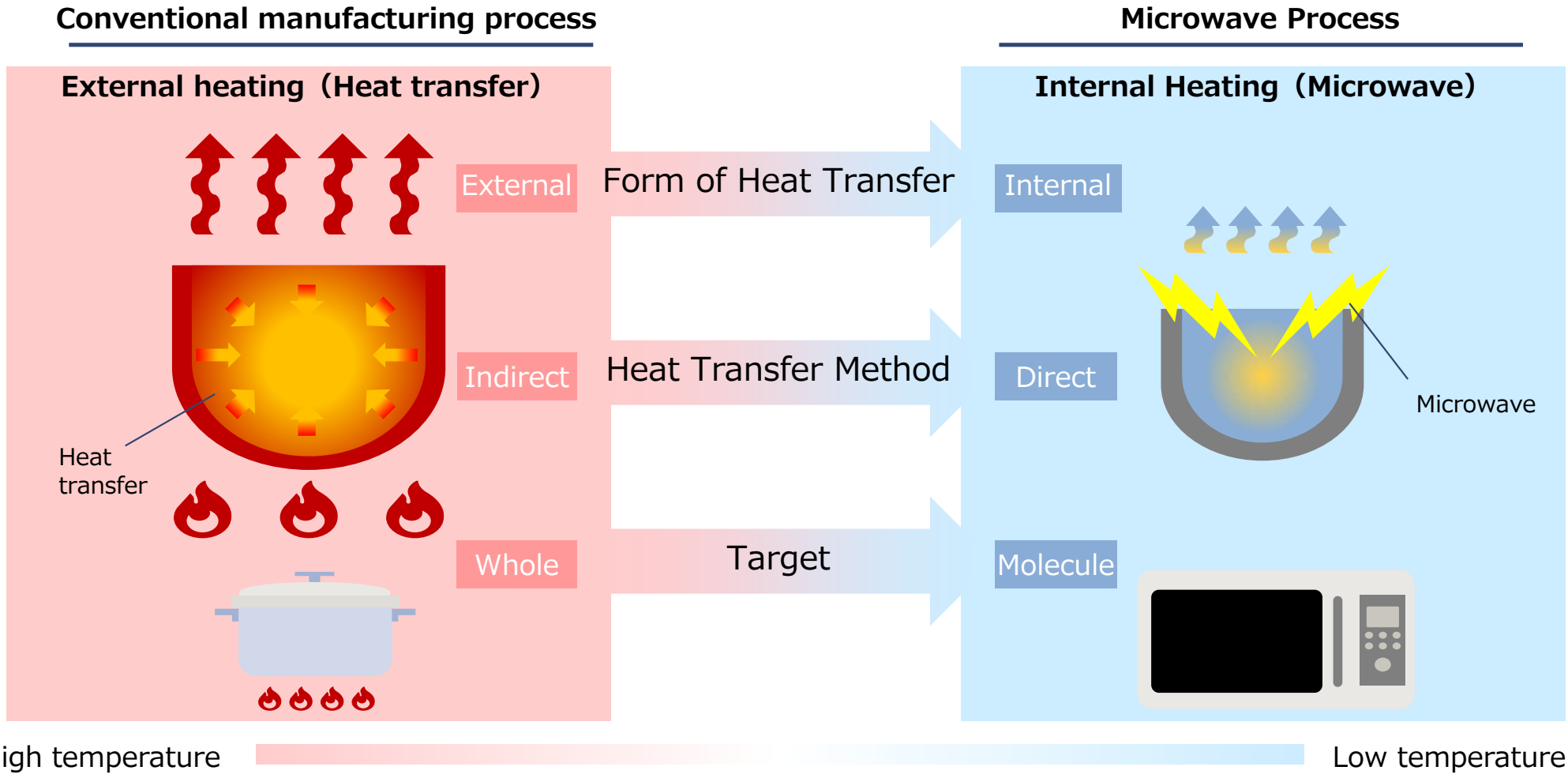
What is Microwave ?

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



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**.

Benefit of Microwave Process (1/2)

Legacy System

Source : BASF Corporate History

1900

Current

Innovation

Microwave **Chemical**

Benefits

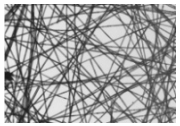
Process

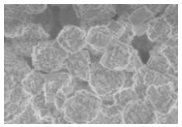
Reduce Energy consumption by 1/3[*1]

Highly efficient and reduces tact timey by 1/10[*1]

Small Footprint 1/5[*1]

Product





Development of new materials and high- quality materials

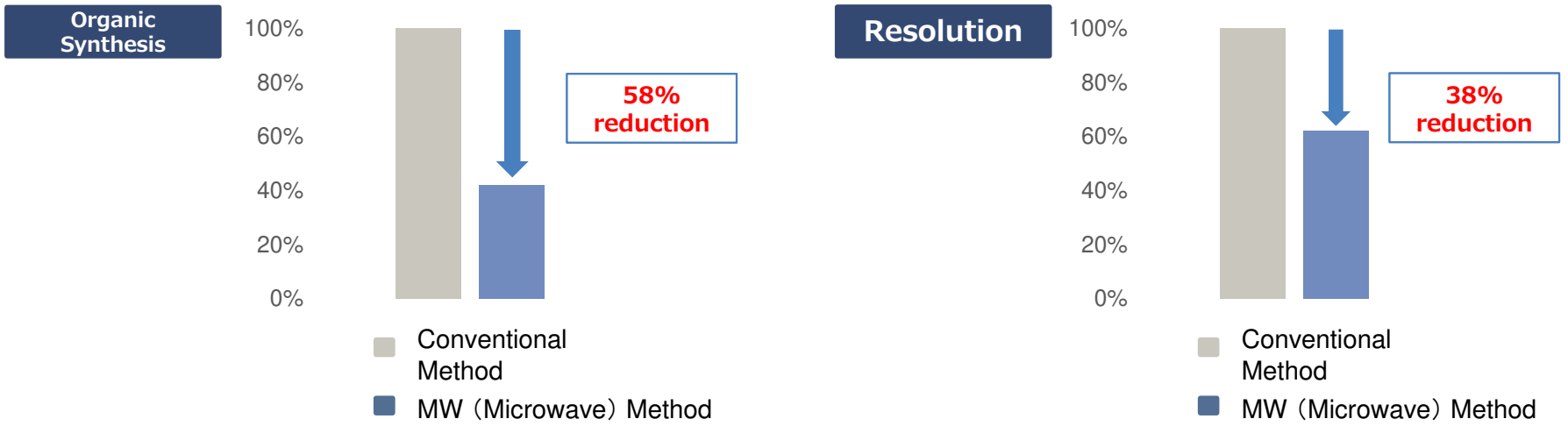
Decarbonation

90%[*1] **reduction of CO_2 emissions** with electrification using renewable energy

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

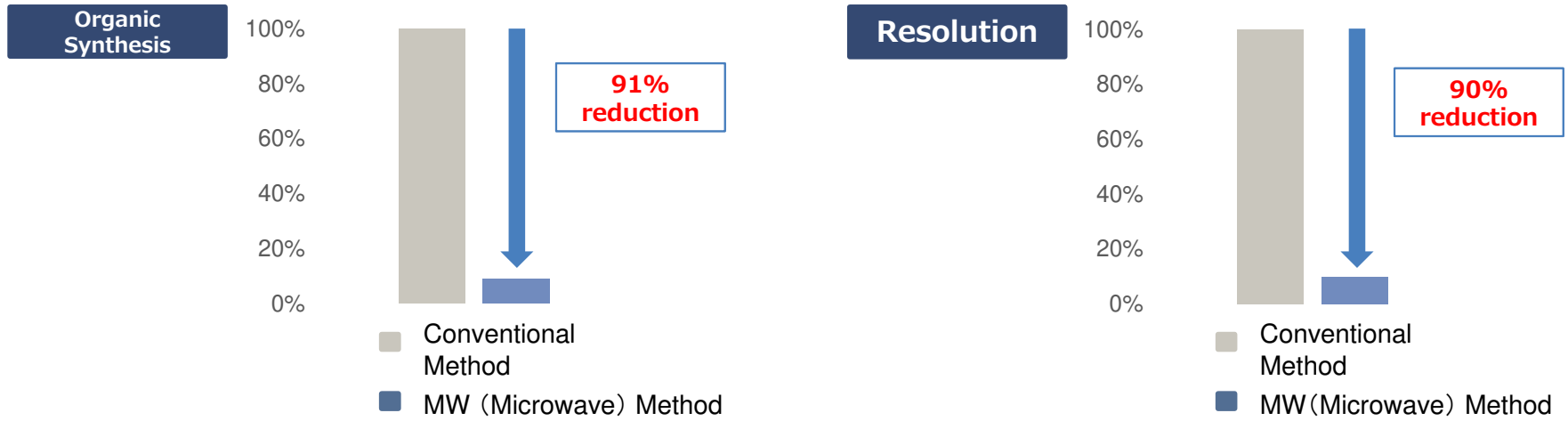
Benefit of Microwave Process (2/2)

Energy consumption: 1. Energy saving with microwave systems



CO_2 emissions:

1. CO_2 emission cuts = 1. Microwave-assisted energy efficiency × 2. CO_2 emission intensity by energy source

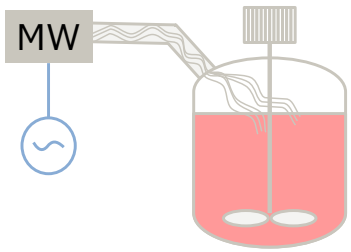
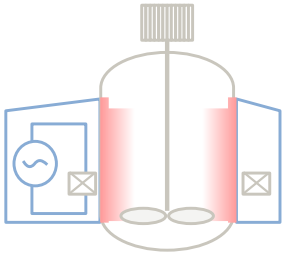
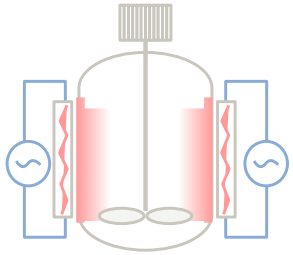


CO_2 emission cuts are calculated by multiplying 1. energy consumption by 2. energy sources used. Use of microwaves reduces energy consumption in many chemical reaction processes. There is a trend that chemical manufactures across the world are laying out their roadmaps, assuming that they significantly reduce the use of conventional fossil fuels to shift to natural energies, which will diminish the intensity of CO_2 emission from energy sources.

* MW Method assumes the use of photovoltaic electricity, CO_2 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

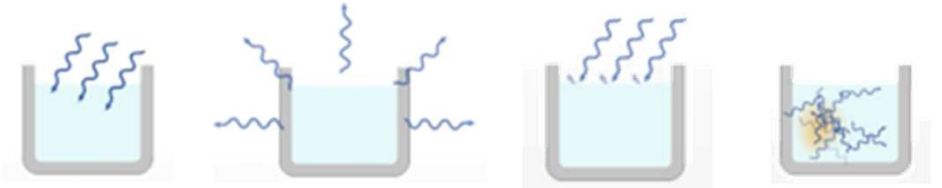
Microwave process is the only process that transfers energy directly, which provides advantage, such as scaling up, energy efficiency, and temperature range.

	Microwave Heating	Induction Heating	Electric heater Heating
			
Energy Transfer	Direct	Indirect	Indirect
Scaling Up	Easy	Restricted	Restricted
Energy Efficiency	High	Medium	Low
Temperature Range	-100℃ 0℃ 1,000℃	-100℃ 0℃ 1,000℃	-100℃ 0℃ 1,000℃

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.

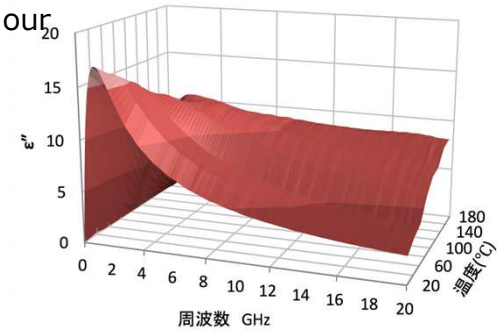


Depth of penetration | Leakage | Reflection | Distribution

Solved by Our Unique Approach

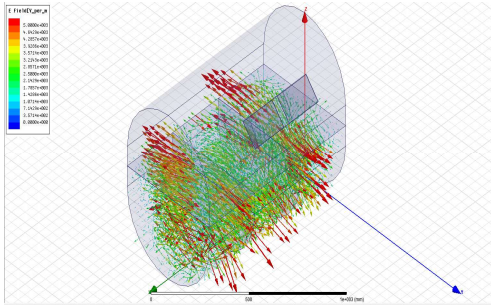
【Reaction System Design】

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

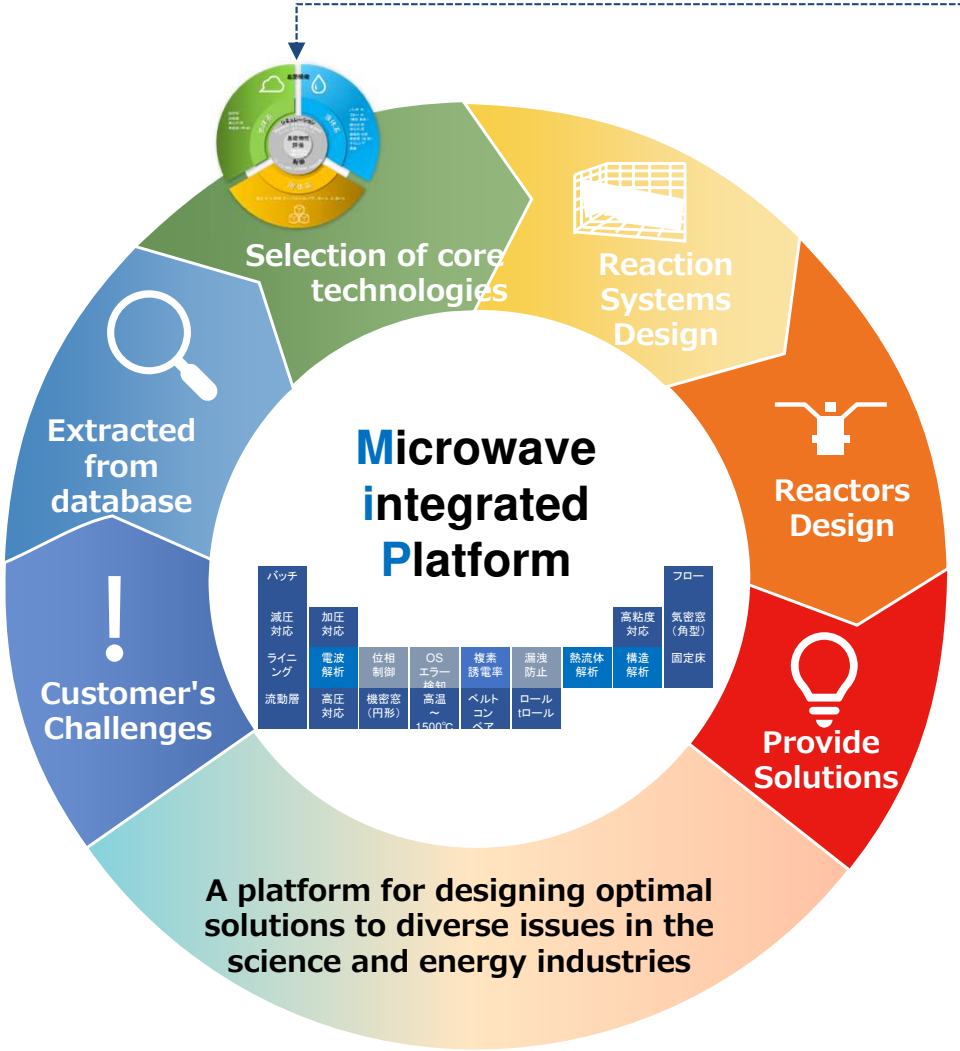


Realizing Industrial Applications of Microwaves

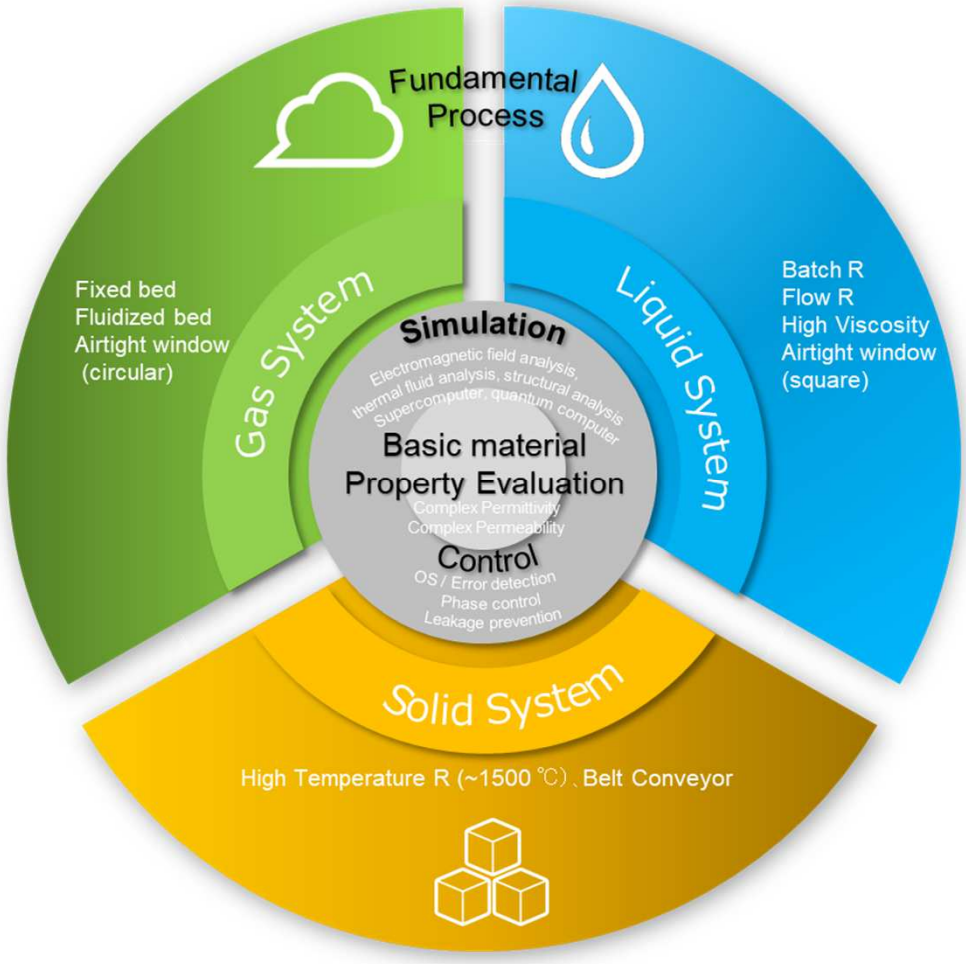
Completed large-scale chemical plant using microwave chemical process in Osaka in 2014 and started commercial operation complying with various laws and regulations such as the Fire Service Act.

Technology Platform and Core Technologies

Our Technology Platform

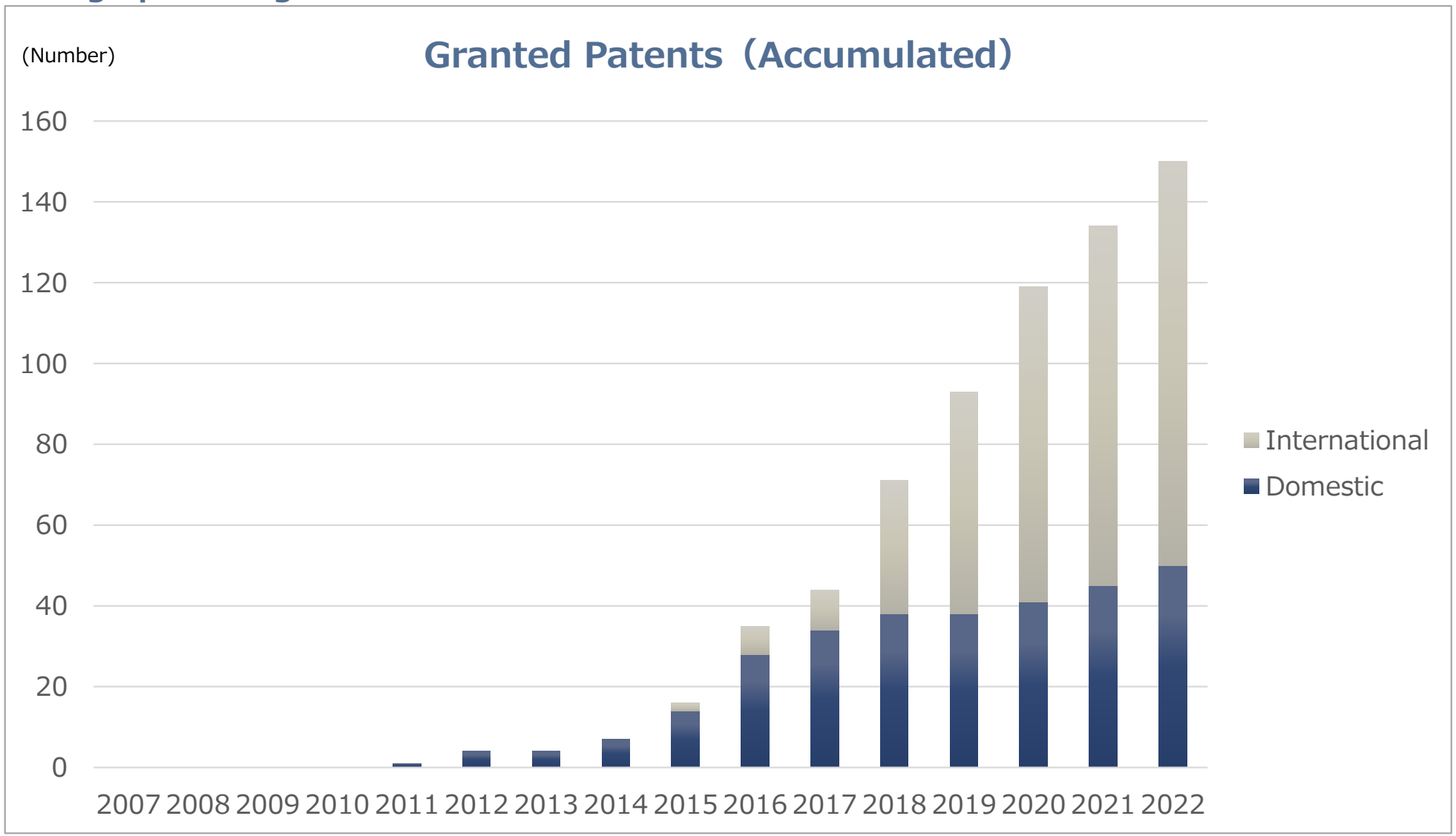


Our Core Technologies



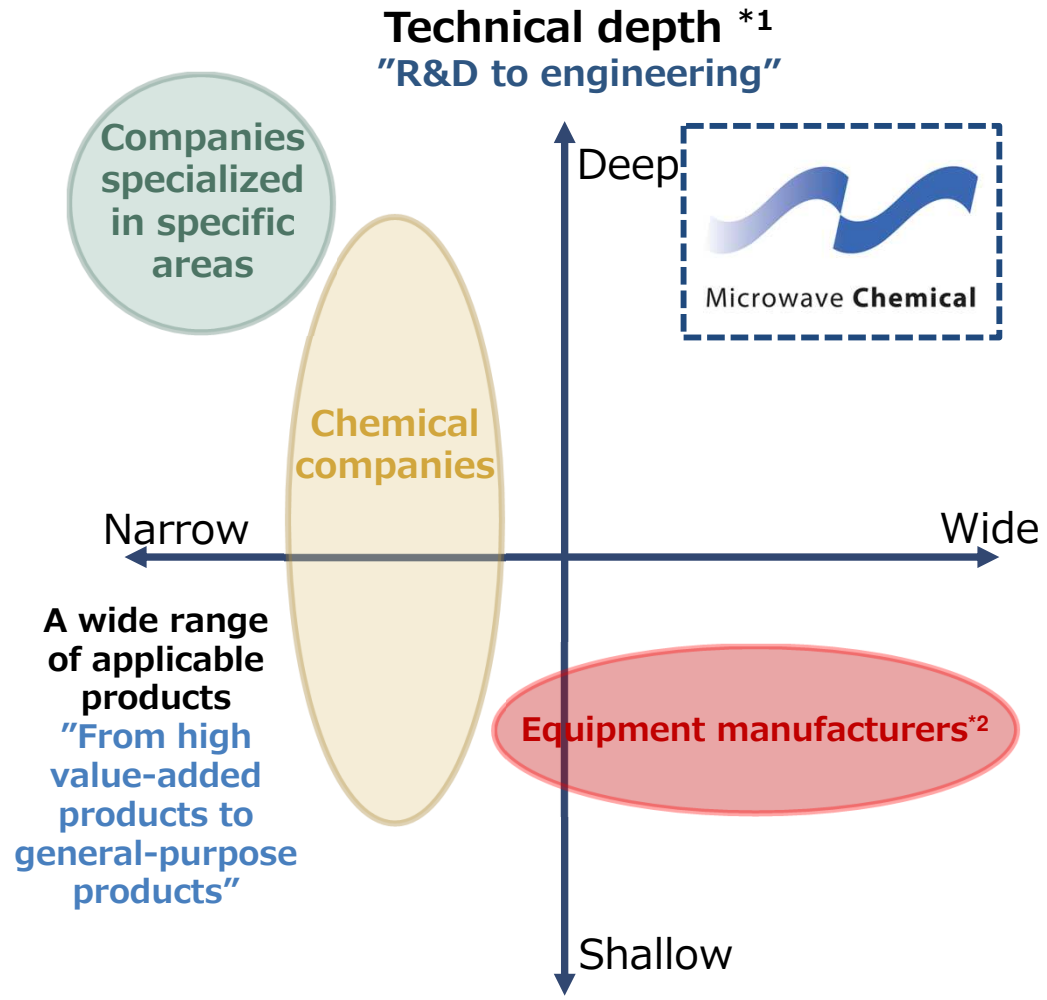
Patent Strategy

To ensure a competitive advantage, knowledge regarding **reaction and reactor design is kept confidential as trade secrets**, while knowledge centered around **hardware is protected through patenting.**



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

Earnings Structure

Revenue image by Phase

Estimated sales*1

Large-scale projects	JPY 10 million or more	JPY 100-1,000 million	JPY 500-1,000 million	Upfront payment + Recurring royalties
Mid- to small-scale projects	JPY 10 million or more	JPY 10-100 million	JPY 200-300 million	

Total Solutions

	Phase 1	Phase 2	Phase 3	Phase 4
	POC	Verification Development	Commercial reactor	Manufacturing support
Cost	• Development at laboratories • Major cost is labor one • Selection of Laboratory equipment	• Development at office or customers' site • Major cost is labor and equipment ones	• Delivery of microwave reactors to customers' plants • Major cost is equipment one	• Support for manufacturing at customers' plants • Major cost is labor one

Microwave **Chemical**

Platform of Technology

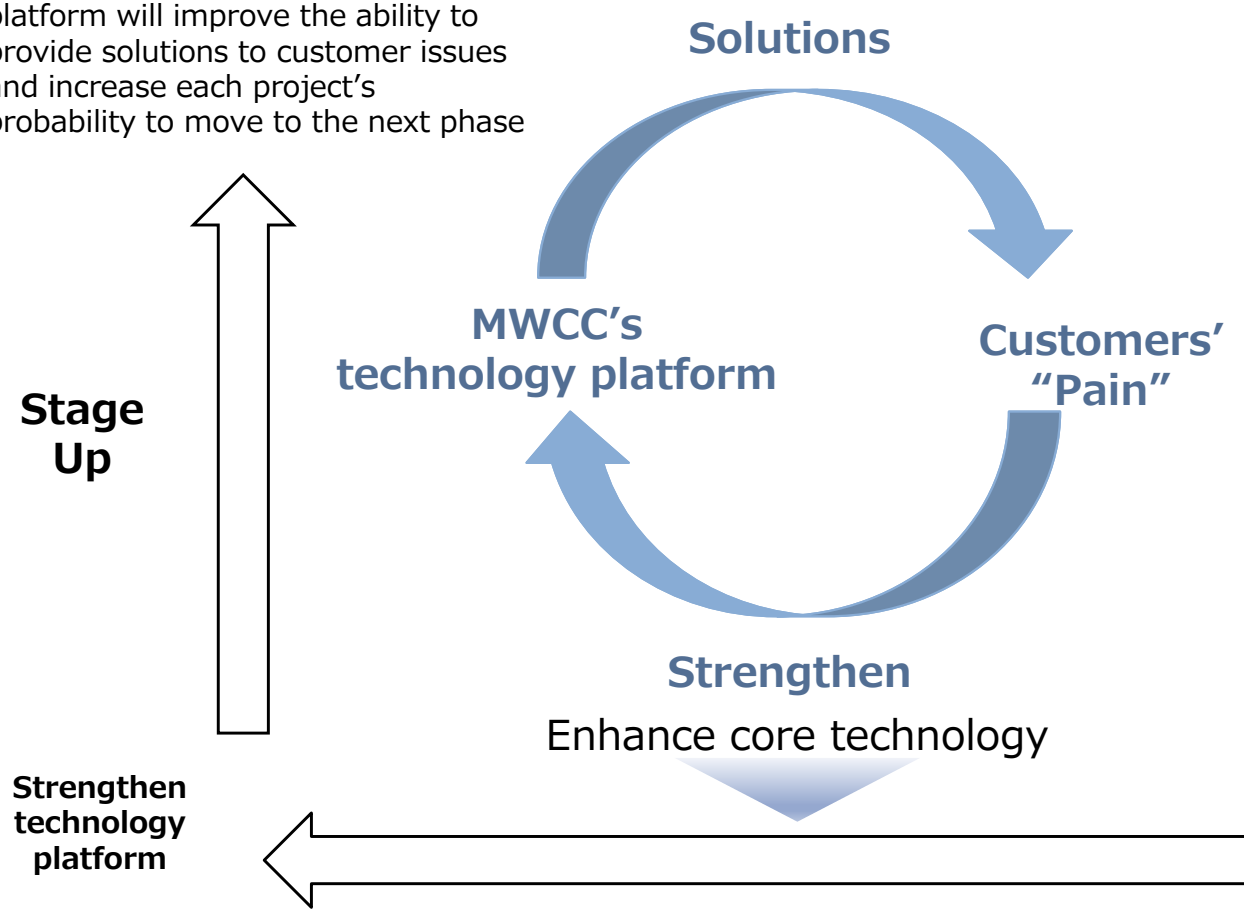
Development team (Scientists and Engineers)

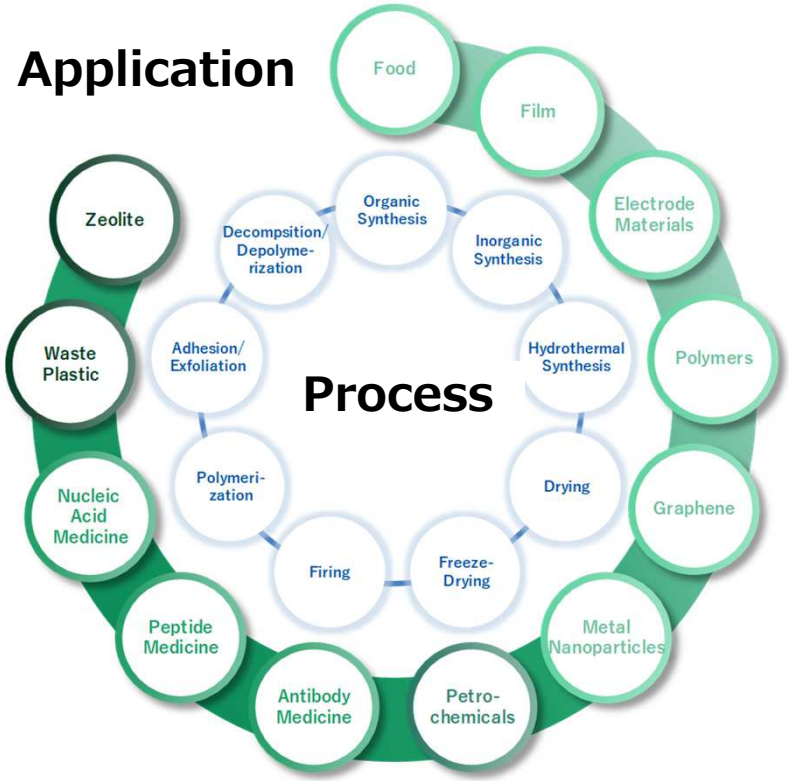
Development infrastructure (Laboratories, Pilot facilities, and Calculator)

Note : Currently, no recurring royalties have been recorded
*1: Assumed sales size classification based on past performance for each Phase, amounts are our estimates based on past results

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



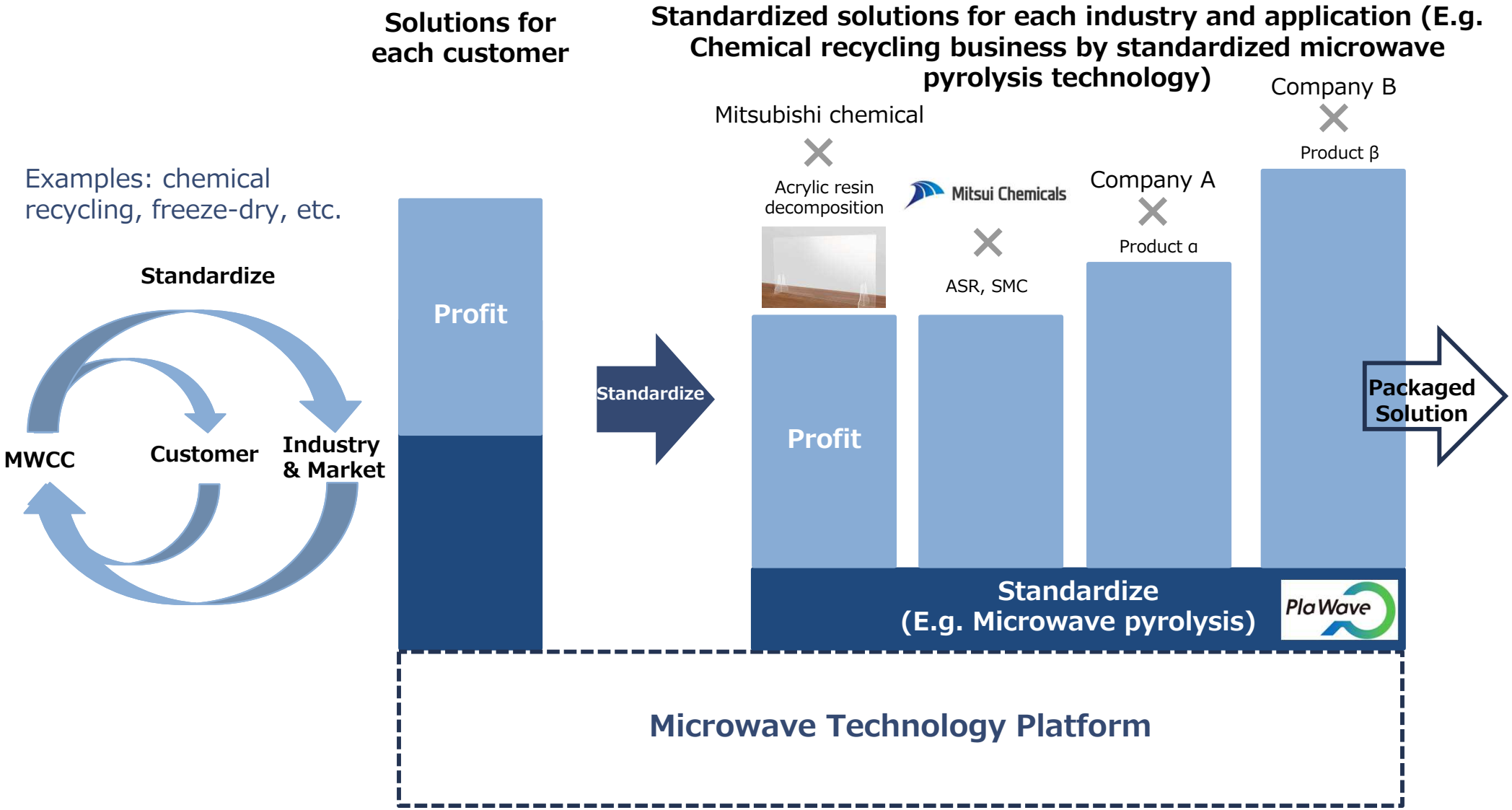


Expand Target Business Areas (process × application)

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

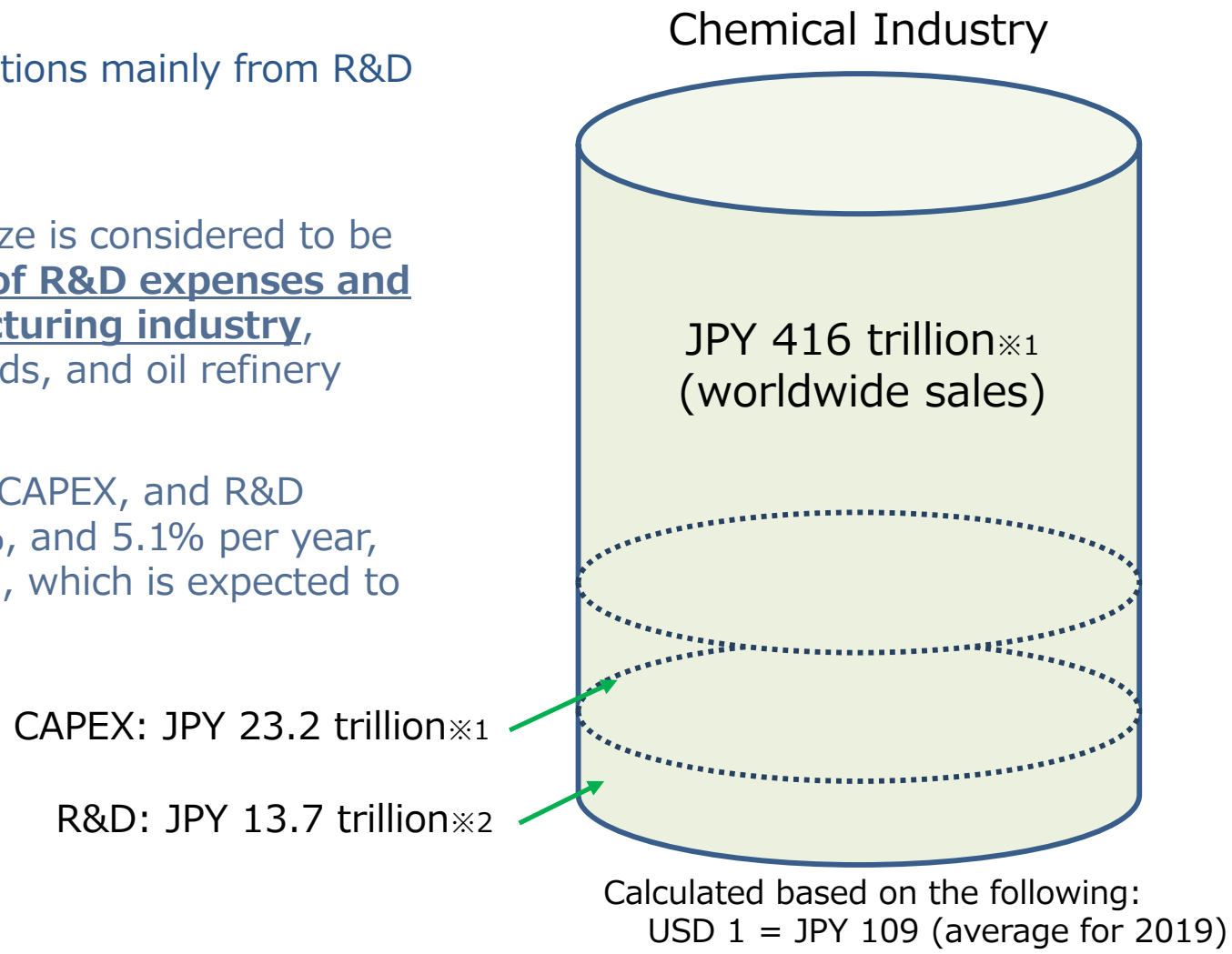
We scale our business by “standardizing” our technology platform and providing solutions to “pains” which is common to industries and markets. For example, we have conducted chemical recycling business using microwave pyrolysis technology, pharmaceutical-rerated and food-related business using microwave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



Note: This graph is an illustration of our own analysis of the scale of the business

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 ※3



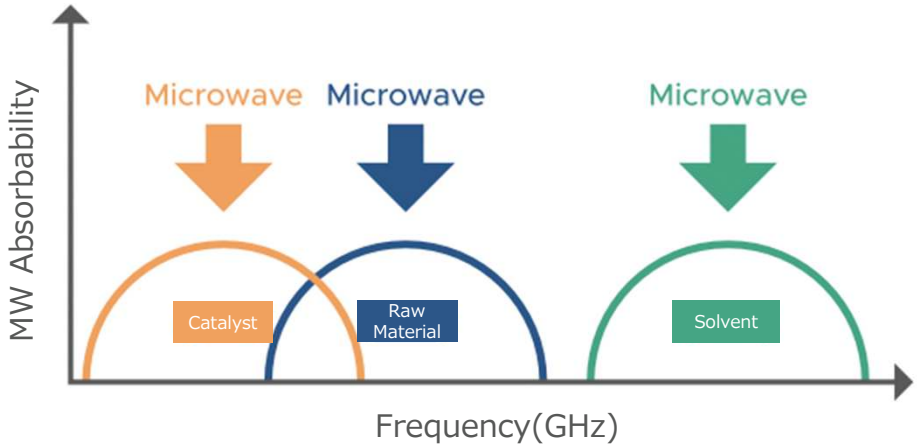
*1 Guide to the Business of Chemistry 2021 American Chemical Council, August 2021
*2 Forecast on global annual chemical industry capital expenditures 2019-2023
*3 Research spending continues on an upward trajectory) https://cen.acs.org/business/investment/Research-spending-continues-upward-trajectory/97/i23
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/

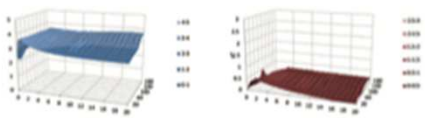
Reaction design

Microwave absorption rate varies by material with frequency and temperature dependency. We design the reaction utilizing this characteristics.

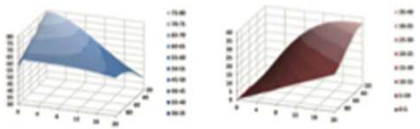
Reaction system design

Design Microwave transmission: Which target material at what frequency and temperature.



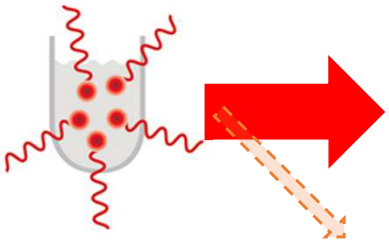


ε′ of 2-Ethylhexyl ester

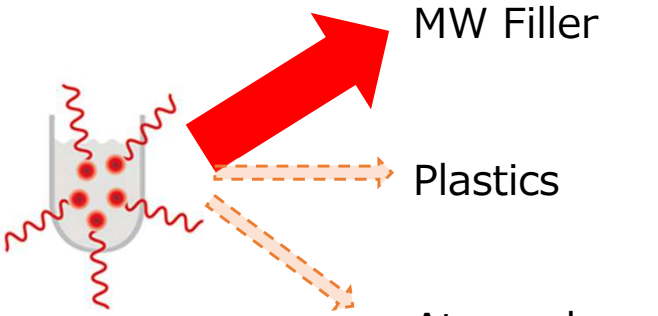


ε′ of water

Use case: Plastic decomposition



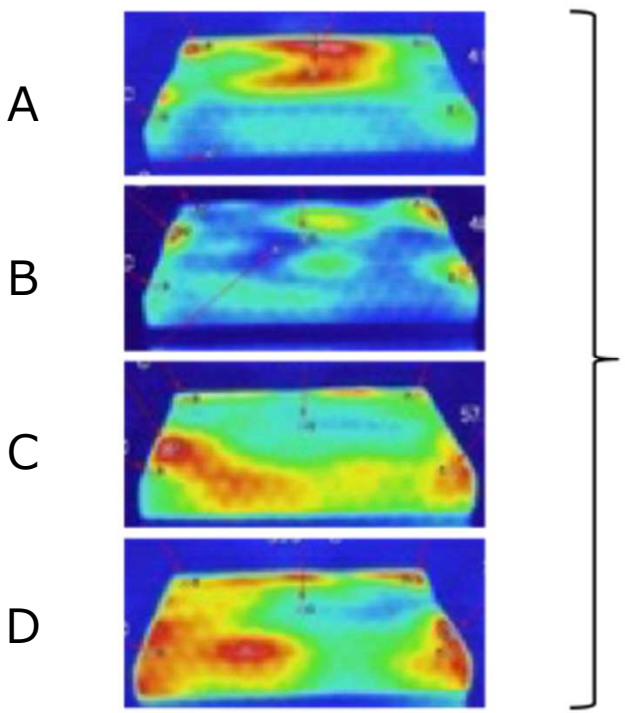
Select considering material dependence of Microwave absorbability



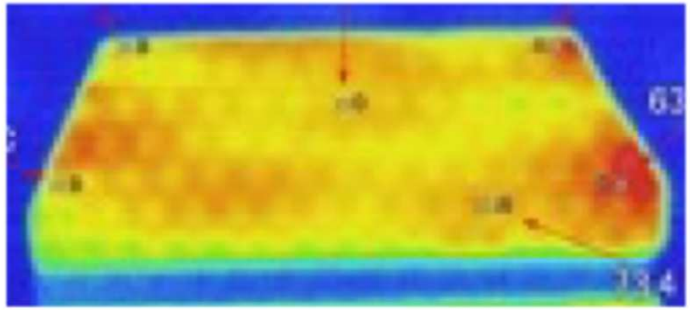
Microwave phase control

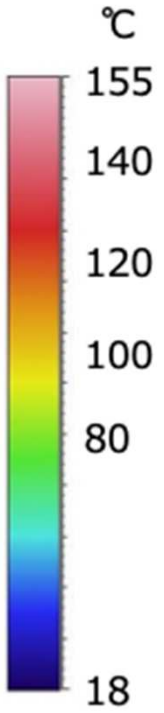
- ✓ Microwave is an electromagnetic wave, we realized precise control of the wave utilizing microwave absorption data and novel simulation technology.
- ✓ This allowed us to control the temperature distribution of the target material.

ex) By precise control of microwave irradiation condition from A through D, we achieved uniform heating that was difficult with conventional methods.



Combination of conditions A-D





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Make Wave,
Make World.

世界が知らない世界をつくれ