

EBARA IR Day 2023 <Day 2>

Precision Machinery Company
Dry vacuum pump automated plant tour

Summary Explanation of Automated Plant "V7"



Looking ahead,
going beyond expectations
Ahead > Beyond

December 5, 2023

株式会社 荏原製作所

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1. Introduction

Haneda Head Office & Precision Machinery Company Major Domestic Locations



Fujisawa District,
Kanagawa Prefecture



Precision Machinery Company

Company Head Office Functions

Component product design, development, production

Semiconductor manufacturing equipment design, development, production

Building Service and Industrial Company

Standard pumps, cooling and heating product design, development, production

Corporate Research & Development

Dry vacuum pump production
automated plants



EBARA Corporation Haneda
Head Office, Tokyo

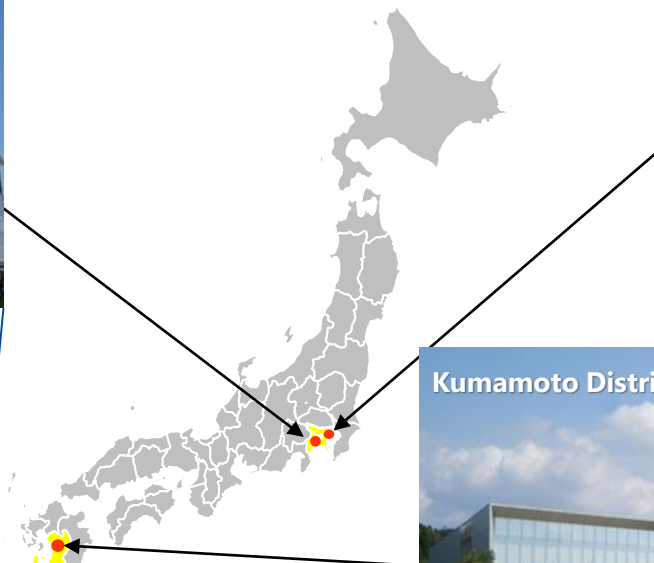


Kumamoto District, Kumamoto Prefecture



Precision Machinery Company

Semiconductor manufacturing equipment (CMP systems, Bevel polishing systems) mass production plant



Fujisawa District Overview

[Overview] Address: 4-2-1 Honfujisawa, Fujisawa-shi, Kanagawa
Lot: 372,703 m²
Employees: over 3,000

[History]

1965: **Opening**

Started with Standard Pumps Business (P1 Building) and Chillers Business (R Building)

1987: **Completed building V1 as the first production plant in the precision business**

1990: **Completed V2 building for precision business dry vacuum pumps and equipment factory**



1998: **Precision business equipment factory (V3 building) completed; V2 building converted to a dedicated component factory**

2014: **Main building completed**

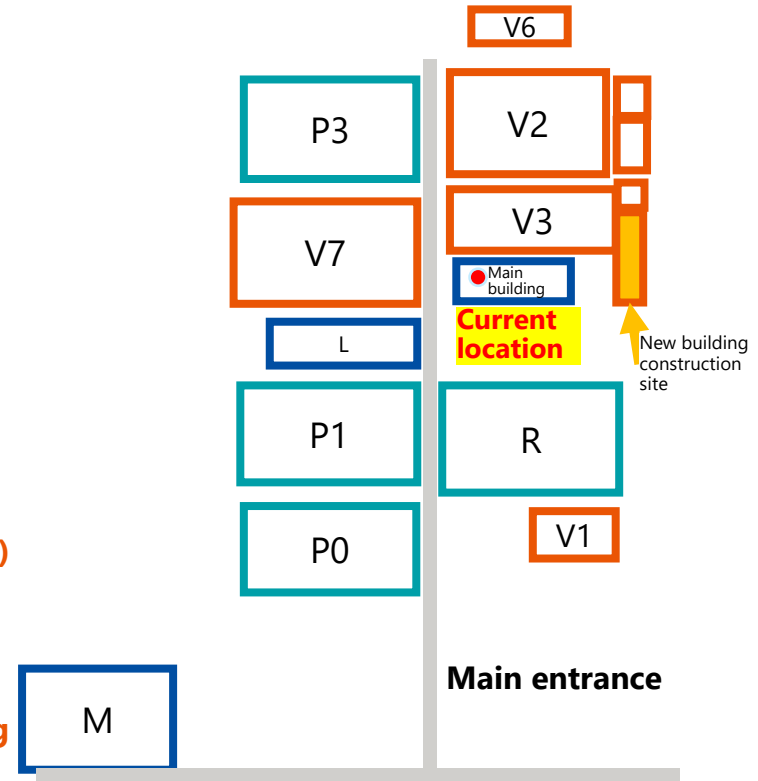
2018: **Precision business component development building (V6 building) completed**

2019: **Precision business dry vacuum pump automated plant (V7 building) completed**

2025 (planned): **Precision business equipment development new building (V8 building) scheduled to be completed**

 Precision Machinery Company
 Corporate

 Building Service and Industrial Company



Component products

Dry vacuum pumps



- ✓Energy saving
- ✓Temperature control
- ✓High throughput
- ✓Compact air cooled

Gas Abatement Systems Combustion/Dry bed/Fluorine captured



- ✓PFC abatement

Integrated dry vacuum pump/gas abatement systems



- ✓Harmony of vacuum & abatement
- ✓Total CoO reduction

Exhaust system for EUV lithography systems



Turbo molecular pump



- ✓High throughput
- ✓Safety solution

Ozonized Water Generator



- ✓Cleaning for < 0.1 μm
- ✓Polymer removal

Semiconductor manufacturing equipment products

CMP (Model: F-REX*)



Bevel polishing system (Model: EAC300*)

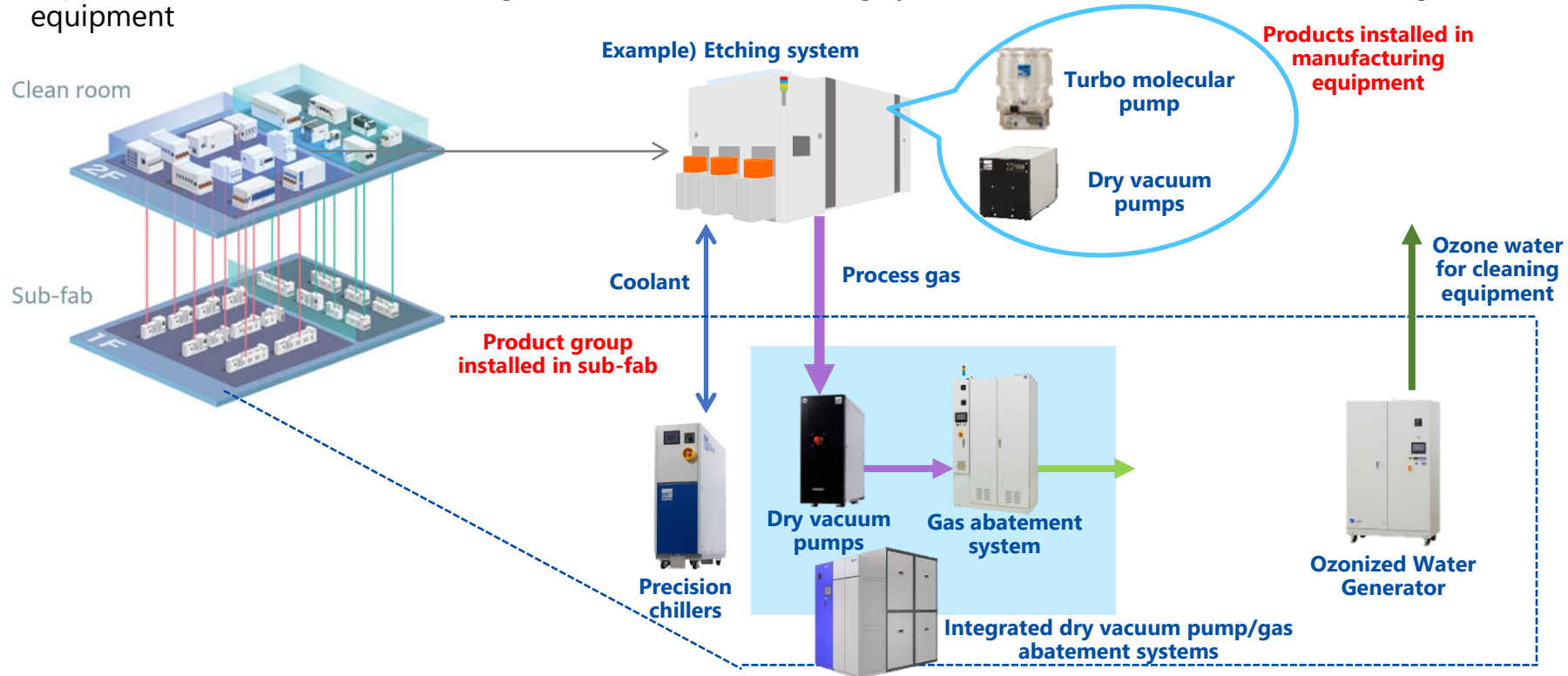


Plating systems (Model: UFP*)



Installation Environment for Components Business Products inside Semiconductor Factories

- Vacuum products that create a vacuum environment in semiconductor manufacturing equipment and products that detoxify process gases
- Supplies ozone water for the cooling chillers and wafer cleaning systems of semiconductor manufacturing equipment



Exhausts gases (toxic and corrosive) used in semiconductor processes to create a clean space

**World No. 2 share
Total shipments from Fujisawa reached 200,000 units**

Also used in manufacturing LED and solar panels



(1) Increase production capacity to respond to market growth and higher market share

Demand for semiconductor manufacturing equipment is increasing with semiconductor market growth demand for dry vacuum pumps, which are essential at semiconductor manufacturing sites, is increasing. We will increase production capacity to meet this demand.

(2) Revamp production and business processes centered on automated plants

Apply automation technology to advance "Mindora activities", our production innovation initiative, to make Ebara manufacturing more robust.

(3) Strengthen product competitiveness

Establish competitive manufacturing capabilities by incorporating the concept of (2) into design, production technology, organization and human resource development.

2. Automated Plant V7 Overview

Automated Plant "V7" Plant Overview

Building surface area: Approx. 18,000m²

Total floor area: Approx. 42,000m²

Height: 4 floors

History: March 2018: Concept evaluation started

January 2019: Construction started

December 2019: Construction completed

March 2020: Production started

Features: Automation of logistics, processing,
and assembly

More than 50 robots in operation

Innovating internal systems to efficiently operate automated equipment

Automatically collect information from RFID^{*1} and equipment and visualize operating status using BI tools^{*2}

*1. RFID (Radio Frequency Identification): A system that uses radio waves to read and write data without contact

*2. BI (Business Intelligence) tools: Tools for supporting informed decision-making and problem solving by aggregating, visualizing, and analyzing the various data accumulated by companies



Logistics automation

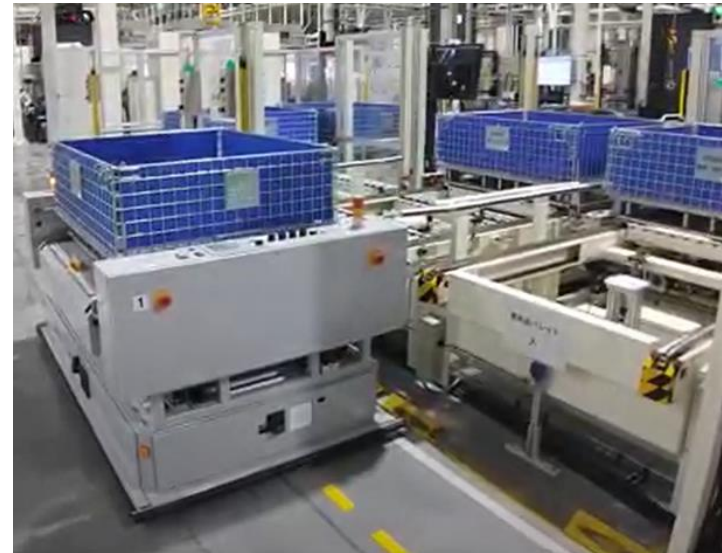
- Using 40,000 RFID tags to ensure the information of parts
- Incorporating the latest digital picking system and projection picking system to streamline picking work



Automation of processing

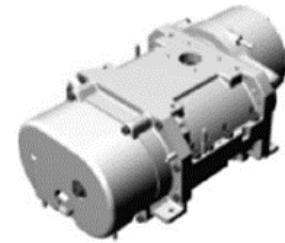
- Using robots and AGV* to automate the transportation of parts between processing machines
- Adopted a vision system to automate material handling
- Automated serial number engraving

*Automatic Guided Vehicle (AGV): An unmanned guided vehicle



Assembly automation

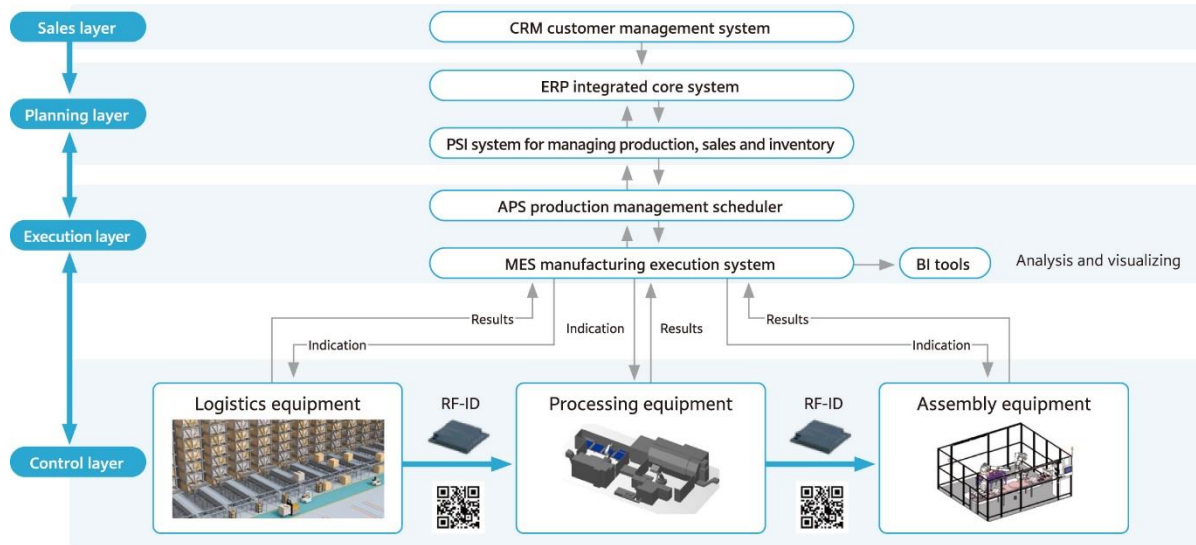
- Automated assembly of pump modules*
- Achieved by optimally combining cutting-edge automation equipment such as robots, nutrunners, and vision systems



*Pump module
(A unit that creates a vacuum)

Innovating internal systems to efficiently operate automated equipment

- Built a "production planning optimization system" that uses AI to automatically draw up production plans
- Renovated MES to send necessary information to automated equipment at the required timing
- Automatically collects performance data such as work progress information and quality information from RFID and PLC, and stores it in a database
- Using BI tools to visualize collected information



Benefits of Operating Automated Plants

Number of personnel: **10%** reduction

Production capacity: **Doubled**

Environmental impact: Coating usage:
Reduced by **20%**

Solar power generation:

Covers **10%** V7 power

(Power generation started on
November 29, 2023)



YouTube: Ebara dry vacuum pump automated assembly plant "V7"

https://www.youtube.com/watch?v=Un6YXHco_9k



Ebara Engineering Review: Introduction of a New Factory for Dry Vacuum Pumps (Japanese language only)

<https://www.ebara.co.jp/jihou/no/list/detail/265-3.html>



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