

Activities of the Micromachine Center in Fiscal 2000

I. Investigations and Research on Micromachines

1. The AIST Industrial Science and Technology Frontier Program "Micromachine Technology" (delegated to MMC by the New Energy and Industrial Technology Development Organization [NEDO])

To achieve the goal of the basic plan for R&D (Phase II), research delegated to MMC was actively promoted after pre-final evaluation of this project.

(1) Development of Advanced Maintenance Technologies for Power Plants

- ① R&D of systematization technology (Experimental wireless micromachines for inspection on inner surface of tubes)

A final experimental system was produced. In metal tubes with curved sections, this system is able to move forward, backward, horizontally and vertically, stop optionally, and recognize its surroundings, as well as detect tube defects.

- ② R&D of systematization technology (Experimental chain-type micromachines for inspection on outer surface of tubes)

R&D of systematization technology was conducted through the production of an experimental micromachine system composed of a group of machines capable of combining or separating according to the form of the object to be inspected.

- ③ R&D of systematization technology (Experimental catheter-type micromachine for repair in narrow complex areas)

R&D of systematization technology was conducted through production of an experimental micromachine system capable of entering the equipment of various structures and performing measurements or repairing minute internal flaws.

- ④ R&D of functional device technologies

R&D was conducted to promote micronization, high performance, and multifunctionalization of functional devices with highly advanced micromachine technology.

- ⑤ R&D of common basic technologies

R&D was conducted on common basic technologies such as technologies for control, measurement, design, and evaluation necessary for realizing micromachine systems.

- ⑥ Comprehensive investigation and research

Comprehensive investigation and research of maintenance micromachines necessary for maintaining future power plants was conducted.

(2) Development of Micro-Factory Technology

- ① R&D of experimental micro processing and assembly system

R&D was promoted on systematization technology, suggesting its effectiveness, by completing the production of the second experimental system for processing and assembling, capable of manufacturing models of small parts.

- ② Comprehensive investigation and research

Comprehensive investigation and research was conducted on micromachine technology that is capable of performing leading investigative research, and that is expected to be put to practical use in the field of production. In addition, MMC conducted joint research with the National Institute of Advanced Industrial Science and Technology (former The Electrotechnical Laboratory of AIST on enhancing the performance of micro-electron guns for beam processing.

(3) R&D on Micromachine Technology

- ① Research on micromachine systems

In the medical field, R&D on miniaturization and the multi-functionality of micro-laser catheters and micro-tactile sensor catheters was promoted. R&D was also conducted on micro scanning imaging units.

- ② Comprehensive investigation and research

Comprehensive investigation and research was carried out on the applications of micromachine systems to the medical field. In conjunction with the AIST Mechanical Engineering Laboratory, MMC also conducted research on micromachine basic design and manufacturing technologies.

2. Investigative Research for the Development of Responses to the Industrialization of Micromachine-based Systems (delegated to MMC by the Japan Machinery Federation)

Business models for new businesses incorporating micromachine technology were considered.

3. Investigative Research for the Creation of Systems Incorporating Next-generation Micromachine Technology (delegated to MMC by the Mechanical Social Systems Foundation)

Focusing on the industrial sector in particular, we considered the clarification of the roles required of government, academia and industry, and the development of strategies for micromachine technology R&D.

4. Investigation and Research on the Applicability of Emerging Technology in Other Fields to Micromachine Technology

Investigative research was conducted to search out emerging technology in various other fields, to verify its applicability and fusion, and to contribute to its diffusion and promotion.

5. R&D on Micromachine Materials (joint research with the Mechanical Engineering Laboratory of AIST)

The following activities were conducted: (1) Research on the operating environments for micro-functional elements; (2) research on micromachine materials; and (3) feasibility studies on micromachine materials.

6. Investigation of R&D Trends in Micromachine Technology in Japan and Abroad

Review surveys of the latest development centering on international conferences.

7. Activities incidental to other Investigative R&D

Holding of R&D Section meetings, Investigative Research Section meetings, and departmental and general research meetings.

II. Collection and Provision of Micromachine Information

- ① Collection and storage of information and documents on micromachines

- ② Maintenance and expansion of the MMC library, with all information listed in a database

- ③ Publication of a periodical, "Micromachine Index" (published 8 times in FY 2000)

- ④ Publication of a newsletter (on research and administration trends and the like)

- ⑤ Methods for transmitting data via Internet homepages, such as database construction and data management operations, were considered.

III. Exchange and Cooperation with Worldwide Organizations Involved with Micromachines

1. Research Grants for Micromachine Technology (12 themes in total)

Six new themes and six themes carried over from FY 1999

2. Participation in International Symposiums and Dispatching Missions

- ① Participation in μ TAS 2000(the Netherlands) and ISAP 2000 (Glasgow, the United Kingdom) in May 2000

- ② Participation in SPIE 2000 Symposium (Santa Clara, U.S.A.) in September 2000

- ③ Participation in IWMP' 2000 (Freibourg, Switzerland) in October 2000

- ④ Participation in The 2000 ASME International Mechanical Engineering Congress & Exposition (Orlando, Florida, U.S.A.) in November 2000

- ⑤ Participation in MEMS 2001 (Interlaken, Switzerland) in January 2001

3. The 6th Micromachine Summit (Hiroshima, April 10-12, 2000)

4. The 6th International Micromachine Symposium (November 9-10, 2000)

Held at Tokyo Science Hall; jointly sponsored by MMC and the Japan Industrial Technology Association.

5. Overseas Seminars

- ① European Seminars in Poland, Austria and Switzerland in September 2000

- ② Asian Seminars in Malaysia, Singapore and Thailand in November 2000

IV. Micromachine Standardization

1. International Standardization Program for Assisting New Industries "Standardization of Quality Characteristic Measurement Evaluation for Micromachine Materials" (delegated to MMC by the New Energy and Industrial Technology Development Organization [NEDO])

The Round Robin Test started in FY 2000. In connection with this program, joint research with the Mechanical Engineering Laboratory of AIST was conducted.

2. R&D on Standardization

Consideration of the important elements, and the technological issues involved therein, of the Standardization Program established in FY 1998 has moved forward.

V. Dissemination of Information and Education about Micromachines

1. MMC published a public relations magazine, "MICROMACHINE" (published 4 times in FY 2000, in both English and Japanese)

2. MMC held the 7th Micromachine Drawing Contest

3. MMC held Micromachine seminars within Japan (in Fukui on September 22, 2000 and in Tokushima on February 9, 2001)

4. MMC produced videos of the 6th Micromachine Summit, the 6th International Micromachine Symposium, the 11th Micromachine Exhibition, and other events

5. MMC twice organized seminars presenting the results of "Research on the Applicability of Emerging Technology in Other Fields to Micromachine Technology in FY 1999" (in Tokyo on July 7, 2000 and January 12, 2001)

6. MMC hosted a workshop presenting the results of "Research Subjects for the 6th Micromachine Technology Research Grants (FY 1998)" on September 26, 2000

7. MMC assisted in the editing and publishing a booklet directed at high school students entitled Industry Graph 2001 Number 189: Our Country's Micromachine

8. MMC held the 11th Micromachine Exhibition on November 8-10, 2000 at the Science Museum in Tokyo