Expectations For The MEMS-ONE Project

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As a variety of MEMS products led by automotive sensors are now entering the market, it is a safe bet that the applications for MEMS will continue to expand into other fields. Some areas that look particularly promising for MEMS are optical applications such as optical communication devices and optical sensors; information systems such as printers, displays, and data storage devices; micro/nano chemical systems and nano-biotechnology applications; and nano-technology applications such as scanning probe microscopes.

In order to accelerate MEMS commercialization in these diverse fields of application, it is important to develop not only individual products, but also a more complete infrastructure consisting of manufacturing equipment to serve as a foundation for micromachine-related industries, foundry services that undertake production, and design and analysis software. Since the development of such an infrastructure can reduce development and manufacturing costs for individual products, there is an increased likelihood that the degree of added value from MEMS can be used effectively toward the successfully marketing of MEMS products, for which the market scale is not always great.

The provision of a computer-aided design system is particularly effective in reducing the costs of trial production since the actual desired MEMS are produced after freely designing and analyzing the shapes of mechanical parts on a computer. This environment consists of a simulator for analyzing processes and electrical and mechanical properties suited to MEMS characteristics, and a database used by this simulator. Since the content of a database for manufacturing processes is heavily dependent on the device and its operating parameters, cooperation between a foundry company and companies involved in manufacturing the device is indispensable for constructing an effective database. By standardizing the manufacturing process and dividing the process into design, analysis, processing, and evaluation steps, a mechanical engineer will be able to apply a design and analysis simulator effectively to obtain design results approaching the desired final product, without being conscious of the actual details in each process step.

Now that MEMS technology has already made significant progress, manufacturing equipment and processes, as well as micromachines, actuators, and other devices developed for specific applications can be used intact in other fields after only slight changes. However, few businesses have the know-how for accumulating knowledge acquired through development processes in a form that can be used in other situations. Further, each business has limited specializations and may not have the capacity to appropriate this knowledge to diverse fields of application. Databases for accumulating intellectual property on MEMS design and production in a reusable form and simulators for applying this database to MEMS applied systems of various fields to demonstrate the functions of these systems are expected to play a large role in overcoming such limitations.

In response to these demands, NEDO has undertaken the MEMS Open Network Engineering System of Design Tools (abbreviated as MEMS-ONE) project as a consignment project for a three-year period beginning in 2004 with the aim of constructing a database and simulation software conforming to Japan's manufacturing environment and integrating research findings to date. The activities of MEMS-ONE involve conducting earnest research and development through collaboration with companies that develop design and analysis software, companies involved in manufacturing MEMS products, and The National Institute of Advanced Industrial Science and Technology through coordination by the Micromachine Center. Databases for materials and processes have also been constructed with the cooperation of MEMS foundry companies and universities specializing in MEMS or numerical analysis.

Upon completion, we plan to distribute a MEMS design and analysis support system and database to everyone at a very low price. The system is provided with sufficient functionality for use by scientists and students studying MEMS for the first time, enabling these users to simulate basic manufacturing processes and to analyze the structural properties of manufactured devices. To meet more advanced demands, various functions may be used to enhance the performance of the system, including an interface for connecting the system to existing or new development software programs and a function allowing users to expand the database.

It is my hope that this MEMS design and analysis support system will be used at various levels, from venture companies to large firms and from beginners to experts, to assist in the implementation of MEMS and industrial construction based on MEMS. I would be pleased if our project helps to promote new businesses by developing special analysis software and constructing special databases on a common platform.