



Innovative Design/Manufacturing Technologies

New Production 2020 Project

Innovative Manufacturing — Manufacturing of New Function, High Performance and Unprecedented High Added Value

In order to prevail against recent fierce international competition, businesses need to create high-value-added products. The objectives of this program are to develop innovative manufacturing technologies leading to products comprised of unconventional materials and functions satisfying a variety of personal and business needs, and to build a platform/system where those technologies can be used. The goals of the program are for the creation of high-value-added products spurred by new ideas conceived through experiencing new technologies, and to strengthen Japan's industrial competitiveness and revitalize its regional areas.



Program Director

Naoya Sasaki

Hitachi, Ltd.

Corporate Chief Engineer, Research & Development Group

Profile

Dr. Naoya Sasaki joined Hitachi, Ltd. in 1982. He assumed the duties of corporate chief engineer in 2014. Throughout his career, Dr. Sasaki has been engaged in the development of mechatronic products and the development and spread of mechanical systems technologies and molecular simulation technologies. He holds a Ph.D. in engineering. Dr. Sasaki has been named a fellow of the Japan Society of Mechanical Engineering, and serves as President-elect. He has also been named a fellow of the Japan Society for Computational Engineering and Science, and serves as an auditor. Dr. Sasaki is also a member of the Japanese Society of Tribologists.

Research and Development Topics

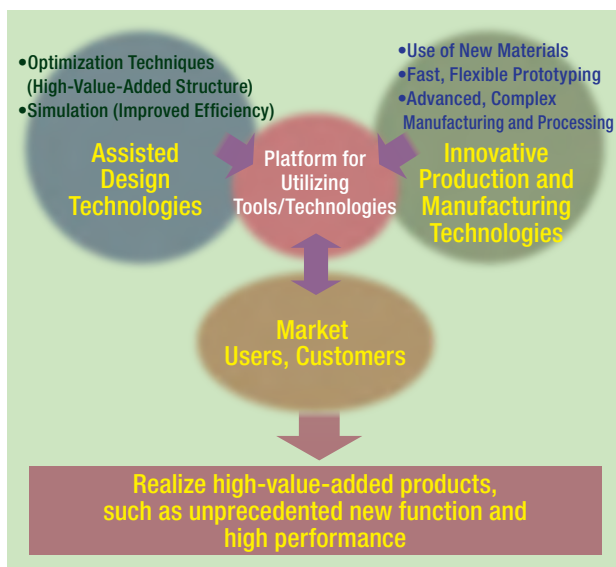
1 Research and develop innovative production and manufacturing technologies

Research and develop innovative production and manufacturing technologies that make possible new structures, complex shapes, greater function, better quality and lower cost. From fiscal 2017, priority will be placed on promoting 3D fabrication technologies aimed at the diverse application of materials and the development of new materials, and on functionality-adding technologies, such as bonding and surface treatment technologies which add resistance or other diverse functionality.

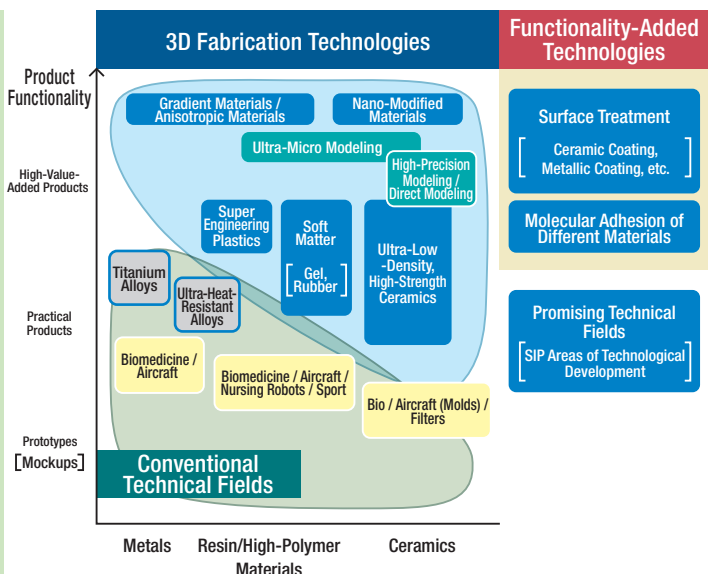
2 Research and develop assisted design technologies utilizing optimization and simulation

Research and develop technologies which make possible diverse functional design, based on needs, value and performance, as well as high-quality product design, incorporating a variety of data such as production and manufacturing conditions. From fiscal 2017, a particular focus will be placed on strengthening and promoting assisted design technologies, such as simulation and optimization, with a goal of realizing high-value-added product design.

•Approach to Innovative Manufacturing



•Positioning of Innovative Production and Manufacturing Technologies



Exit Strategies

✓ Develop tools from R&D results, provide technologies

From this fiscal year, focus on more promising and advanced industrial areas, such as healthcare and the auto industry, and prioritize 3D fabrication technologies and surface treatment/bonding technologies. Going forward provide tools/technologies to industry which contribute to their practical application in business, such as manufacturing equipment and software.

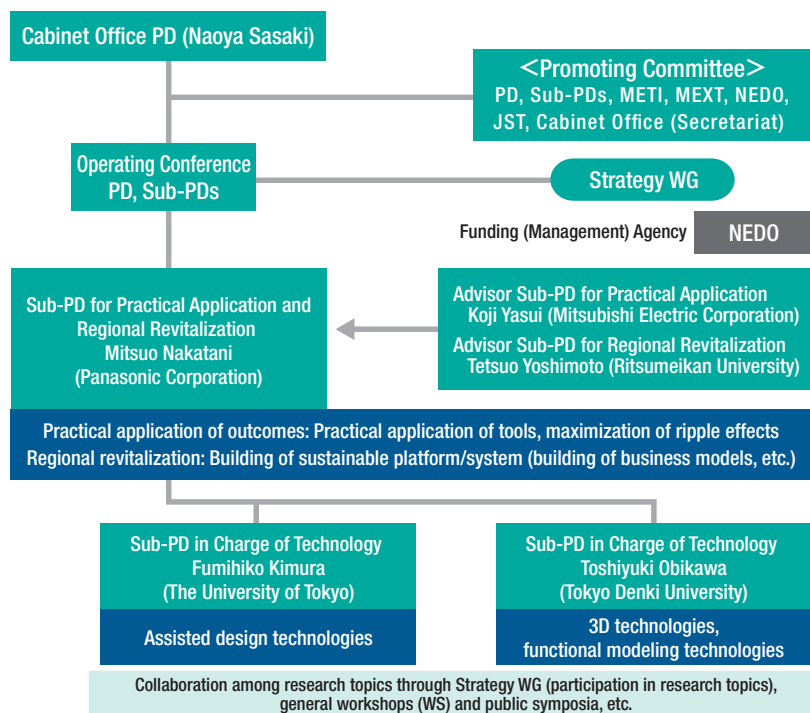
✓ Build a system for creating high-value-added products

Build a platform where regional SMEs and microenterprises can experience and use tools/technologies. Enable businesses to create high-value-added products, spurred by new ideas conceived through the experience. In addition, build mechanisms enabling the platform to continue to be used beyond SIP.

Implementation Structure

The Promoting Committee is chaired by the Program Director (PD), who formulates and promotes research strategies. The Cabinet Office serves as secretariat. The Committee is composed of relevant ministries, agencies, and experts who provide overall coordination. This committee uses funds and management capacity offered by the New Energy and Industrial Technology Development Organization (NEDO). The Committee has selected the best research and development personnel as needed through open recruitment.

In fiscal 2017, a new position of Sub-program Director (Sub-PD) for Practical Application and Regional Revitalization has been established to strengthen the practical application of development outcomes and initiatives for regional revitalization, and personnel have been assigned from industry. The Committee strengthens and promotes initiatives designed to move the program closer to exit.



Progress to Date

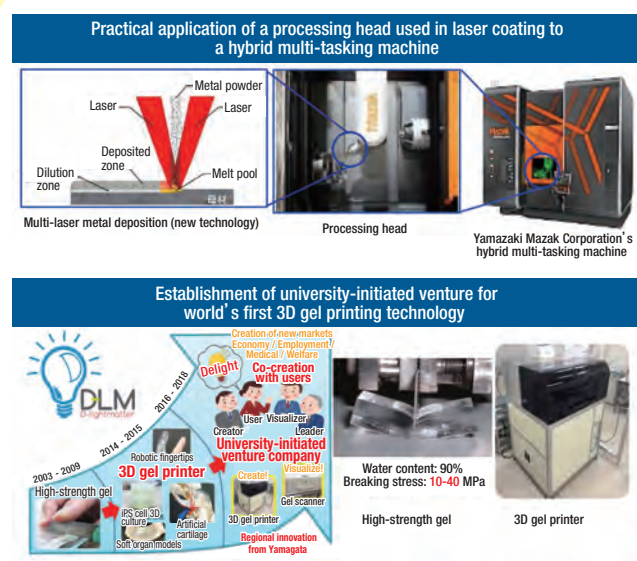
Practical Application, Dissemination and Expansion of Tools/Technologies

During the past three years of research and development, the program has laid out the framework enabling businesses to utilize a number of technologies and tools that are already at the practical application level.

For instance, the processing head comprising six superposed beams for use in laser coating, which was developed by the SIP research team led by Professor Tsukamoto of Osaka University's Joining and Welding Research Institute (JWRI), has been applied by the Yamazaki Mazak Corporation to its hybrid multi-tasking machines.

In addition, on November 1, 2016, D-Light Matter, Inc. (DLM) was established by a team led by Professor Furukawa of Yamagata University's Life-3D Printing Innovation Center (LPIC), as a means of creating business through the practical application of gel materials in devices based on the results of SIP research and development.

In fiscal 2017 and beyond, the program will promote business applications for other research topics too, building them up into highly versatile and practical technologies and tools.



Practical Application of Innovative Production and Manufacturing Technologies, Centered Around 3D Fabrication Using New Materials

The goal of this program is for manufacturing to achieve high added value, boosting the competitiveness of Japan's manufacturing industry. During the program's fourth year, we commenced activities aimed at the practical application of outcomes in some of our research topics, especially for production/manufacturing technologies. In conjunction with this, in order to realize innovative manufacturing across industry, academia and government, we have also advanced a concrete plan for a platform/system where developed tools and technologies can be used and we are promoting trials by external users.

Responding to Diverse Manufacturing Needs

This program aims to stimulate manufacturing and create new markets supporting local economies, by linking business, universities and public institutions together. The program primarily promotes research that can be used by SMEs and microenterprises.

In terms of "innovative production and manufacturing technologies," we are looking at innovative manufacturing technologies that take advantage of the specialized and unique technologies owned by participating businesses and universities. In particular, this program is focused on unconventional non-ferrous materials and production technologies (ceramics, rubber, gel, super engineering plastics, etc.) in which Japan already has a competitive advantage. Here, researchers are developing materials that offer new value, and creating products with unprecedented complex shapes, functions and properties by means of various 3D fabrication technologies as well as molecular adhesion technologies which allow for different materials to be bonded together strongly.

As for "assisted design technologies utilizing optimization and simulation," we are establishing technologies that take full advantage of innovative production and manufacturing technologies, on the basis of techniques for statistically

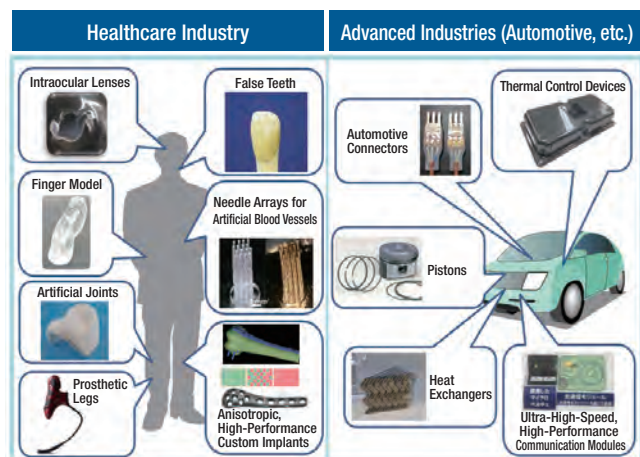
evaluating diverse needs, topology optimization which allow structures and characteristics to be achieved that meet required specifications while also satisfying various constraints, and manufacturing process simulation technologies.

A number of technologies have already reached a level where they can be utilized by business, such as the 3D gel printer and the processing head used in laser coating described on the previous page. It is expected that other high-value-added products will be continue to be created using these technologies.

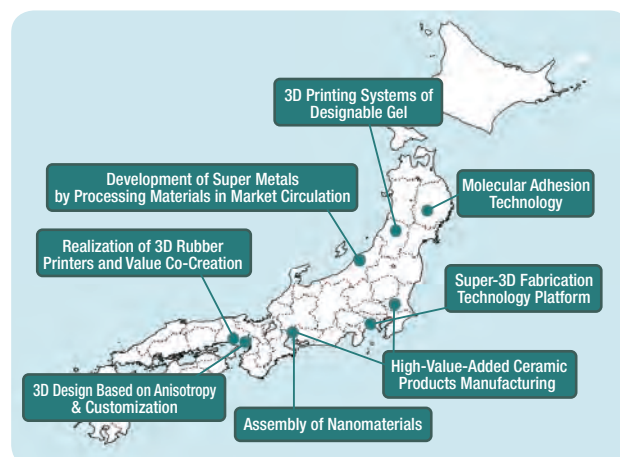
Initiatives for Practical Application in the Manufacturing Industry

Building on these outcomes, Program Director Naoya Sasaki comments, "Over the next two years, by repeating a process of utilizing technologies in business, receiving feedback and further refining them, we will work to improve their degree of versatility and perfection so that industry can employ these technologies for high-value-added manufacturing." To this end, topics for fiscal 2017 onwards have been carefully selected. In terms of innovative production and manufacturing technologies, the target areas linked to exit strategies have been specified as future growth industries, the healthcare industry offering new business opportunities, and

•Target areas



•Places Where Tools/Technologies Are Utilized (targets for end of fiscal 2018)





the advanced automotive and aircraft industries. A particular focus has been placed on 3D fabrication technologies, centered around 3D printers as a technology creating new added value, and on manufacturing technologies that add high value to components and products, such as surface treatment and bonding. As for design, the focus has been placed on technologies utilizing optimization, which have liberated manufacturing from conventional constraints thanks to 3D printers, and on technologies which support process design corresponding to new manufacturing technologies.

Sasaki continues, “Japanese materials and components manufacturers possess highly specialized technologies, as well as high-quality, high-efficiency production/manufacturing techniques. However, more than a few specialize in custom-manufacturing due to divisions of labor. To strengthen the competitiveness of Japan’s industries, it is important that regional SMEs and microenterprises be given advanced expertise from universities and public institutions, and that they establish new methods and techniques. To achieve this, an environment is necessary where they can experience and utilize newly developed tools and technologies. My hope is to provide for such a mechanism that can be maintained even after the end of SIP.”

As part of this program, there are plans to also build places in

regional areas where developed tools and technologies can be utilized. Several tools and technologies have already been set up at local public research organizations, and businesses have used them on a trial basis. This will lead to construction of a mechanism, taking into account any issues that arise here.

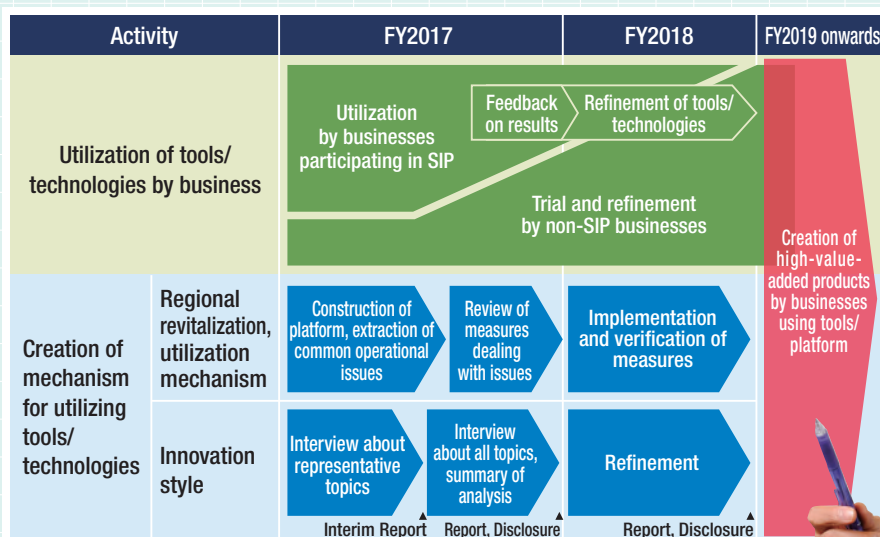
Building Greater Potential for Japanese Manufacturing

Going forward, in order to further deepen “innovative manufacturing,” we plan to strengthen research topics from the perspectives of practical application and regional revitalization.

SIP’s vision for the future is to form a platform/system for innovative manufacturing, based on innovative design and manufacturing technologies yielded through this program, and on a network of people across industry, academia and government. This will also contribute to the improvement of industrial productivity and the creation of new industries, which are two objectives of “Society 5.0” listed in the government’s 5th Science and Technology Basic Plan, and will help enhance our captivating manufacturing industry.

Future Plans

From fiscal 2017 onwards, we will focus on promoting initiatives aimed at the practical application of development outcomes. We will also work on building a platform/system designed for utilizing those outcomes, and we will provide an environment which facilitates regional SMEs and microenterprises in continuing to create high-value-added products even after the conclusion of SIP.



We are establishing innovative manufacturing technologies, helping to strengthen Japan’s industrial competitiveness and contributing to innovation that originates in regional areas.

