R&D

Nippon Pillar Packing will create new value by upgrading our core technologies and strengthening our fundamental technologies based on the principles of CLEAN, SAFETY, and FRONTIER.

Executive Officer,
General Manager, Engineering Headquarters **Kazukiyo Teshima**

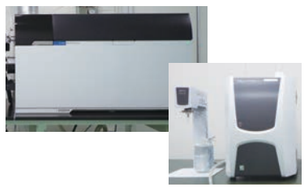
Nippon Pillar Packing's Core Technologies and R&D Concepts

Since our founding, we have utilized fluid control technology and material development to explore unknown materials and research and develop the latest technologies.

Research and development is based on our fundamental technologies such as seals, material engineering, mechanical engineering, injection molding, analysis, and mold design, which result in upgraded core technologies held by our electronic equipment business and industrial equipment business. Core technologies in the electronic equipment business include resin seals, fluorocarbon resin injection molding, microscopic analysis, and computer aided engineering (CAE), which are mainly used to develop products for the semiconductor market, which has high cleanliness requirements. The core technologies in the industrial equipment business are tribology, material formulation, and CAE, which are mainly used to develop products for the electric power and petrochemical markets. Core technologies upgraded in each business are shared through personnel rotations across the businesses, promoting efforts to create new value through the combination of core technologies and accelerate the advancement of core technologies. We are also making efforts through industry-government-academia collaboration by dispatching engineers to universities as part of measures to train future engineers and strengthen our fundamental technologies.

Analysis and Testing Equipment

As the owner of many patented products, we conduct a number of experiments under actual operating conditions before introducing our products to society. Our research and development, supported by the latest verification technologies, continues to evolve toward even higher goals.



Microscopic analysis technology

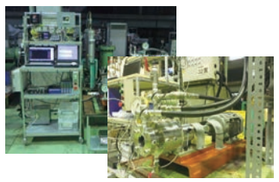
In order to meet the increasingly stringent cleanliness requirements associated with the miniaturization of semiconductors, we are building a system capable of multifaceted analysis (both inorganic and organic).

Design with 3D CAD

We perform basic structural analysis and design seamlessly, leading to faster product design and proposals.

Test equipment for semiconductor and liquid crystal manufacturing devices

To evaluate performance under severe operating conditions in the semiconductor market, we have thermal cycle test equipment capable of cycling through high and low temperatures.



Data collection and analysis test equipment for failure prediction

This test equipment is used to collect and analyze data on pressure, temperature, torque, vibration, etc. under operating conditions, including failure modes, in order to establish technology for predicting mechanical seal failures.

Low temperature test equipment for valves

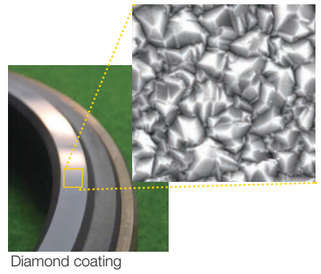
This test equipment is used to collect data on sealing characteristics, sliding characteristics, and stress relaxation characteristics of gland packing for valves in low temperature environments (-150 to 0°C). It is utilized for the development of gland packing suitable for low-temperature environments.

1000kN universal testing equipment

The device is capable of performing sealing, compression, and tensile tests while precisely controlling the load on products and materials. With 24-hour continuous operation possible, continuous data can be obtained on changes that occur over time.

Innovation through Industry-Government-Academia Collaboration

We are engaged in research on diamond coating as one of the ways to improve materials technology through industry-government-academia collaboration. Diamond is a material with a variety of excellent properties, and its use as a sliding material in mechanical seals can dramatically improve sliding properties, especially in high-load applications. In the mature sealing field, one of our approaches to dramatically improve product performance is to identify the relationship between the physical properties of diamond films and sliding properties and explore deposition technologies that form ideal diamond films.



Diamond coating

Efforts Aimed at the Semiconductor Market

Accompanying the miniaturization of semiconductors, particle reduction demands are increasing year by year, and there is a need to improve the cleanliness of individual components. In order to suppress particle occurrence and improve particle emission performance, we are promoting front-loaded development to identify and solve problems in the initial development stage by combining our basic data with CAE and testing hypotheses through verification tests, such as the development of a series of sweep fittings with a smooth flow path and piping design and pump wetted part design with consideration of pressure loss and liquid displacement. In addition, for cleanliness, we are building microscopic analysis technology to assess the current conditions and to check the state of further cleanliness solutions.

Super 300 Type Pillar Fitting
Sweep Elbow

Efforts Toward a Carbon-Neutral Market

As decarbonization of society progresses and diverse efforts are being made around the world, we are developing products based on the fundamental technologies we have cultivated in fluid control, material technologies, and resin molding. In product development for the hydrogen market, which is expected to become a next-generation energy source, we are restructuring our in-house evaluation equipment. As one of these efforts, we will install testing equipment and analytical instruments that enable evaluations in a hydrogen atmosphere to expand our knowledge of tribochemical reactions in sliding parts and create new value that meets the needs of the market. We are also developing products for the automotive industry, which is undergoing a major transformation from fossil fuels to EVs and FCVs.

Friction and wear test equipment in a hydrogen atmosphere

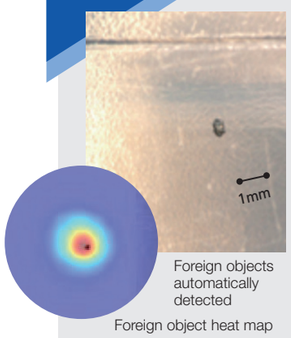
Utilizing DX

Promoting a Digital Transformation through the Fusion of Deduction and Induction

As one example of the utilization of a digital transformation, we are working on the automation of visual inspections of injection molded products (fluorocarbon resin products).

We aim to build an imaging environment suitable for our products and update the accumulated data of good and defective products through AI learning, thereby eliminating the need for human resources in the inspection process and saving manpower.

By combining the technical elements of a digital transformation (the inductive method) with existing engineering simulations (the deductive method), such as structural analysis and thermal/fluid analysis, it is possible to perform coupled analysis of complex physical phenomena with high accuracy and speed, previously considered to be difficult. This enables us to clearly set specifications that can be compatible with multiple target specifications in the early stages of development, and we are also working to achieve a design and development process (front-loading) with no backtracking.



Foreign objects automatically detected

Foreign object heat map