



# Technical Prospects for Hydraulic Components Business

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## 1 Introduction

Hydraulic Components Operations (hereinafter, HC) designs and manufactures its own hydraulic products for global markets. These core products include pumps, valves, motors, and cylinders for mobile equipment such as construction, agricultural, and industrial vehicles. Today's automotive market is undergoing dramatic environmental changes due to disruptive technological innovation based on digitalization and emerging competitive players. Such environmental changes are also occurring in other industries. The business environment in which HC operates is no exception.

This report outlines the technologies and products that HC is developing. In particular, it describes some research and development programs that engineers are working on with an eye to the future, contributing to increased competitiveness and the implementation of the growth strategy.

## 2 Overview of Technologies and Products Under Development

### 2.1 Direction of Development

In response to the market's increasing demand for digitalization and carbon neutrality, we are developing electronically controlled hydraulic equipment and its sensors, as well as condition diagnosis systems using their combined technologies. In this way, we are working to create new value in addition to the traditional development of new models or lower-cost products.

### 2.2 Research and Development System (Fig. 1)

HC manufactures its product groups (pumps, motors, valves, cylinders, and equipment) at various production plants in and outside Japan. HC's development teams stationed at these plants work to develop products in parallel with their production sites in a cost-conscious manner. The Engineering Div. includes the Basic Technology R&D Center, which conducts a wide range of advanced research on basic technologies such as materials, control, information, and electronics; the Production Technology R&D Center, which conducts advanced research on production techniques such as machining, assembly, and heat treatment; and the CAE Promotion Department, which supports the promotion of analysis technology. These departments constantly work with HC's development teams to support their development.

### 2.3 New Departments for Electronification and Electrification

In addition, new functions have been created to speed up the development of products with integrated electrical/electronic elements, which

are difficult to handle by engineering departments specializing in mechanical engineering alone.

These new functions are the System Engineering Department and the Advanced Electrification Unit Development Office. The System Engineering Dept. supports HC's engineering departments with electrical/electronic elements and devices such as sensors and electronic controllers, control system software development, and analysis technology including model-based development. The Advanced Electrification Unit Development Office conducts unit development specializing in electrification.

### 2.4 Testing and Evaluation

Prototypes developed by the engineering departments are tested and evaluated by dedicated departments whose functions are different from those of the development departments. The evaluation of prototypes is carried out on testing equipment specific to the production site.

We are also developing and expanding actual machine test sites where developed products can be installed on the parent machine and evaluated and even demonstrated to validate the entire machine system. Through these sites, we are helping engineers improve their ability to develop systems and present them to customers.

The development teams of HC, the R&D teams of the Engineering Div., and the new functions work together on a daily basis to achieve synergy effects, improve the quality of technology and product development, and accelerate development.

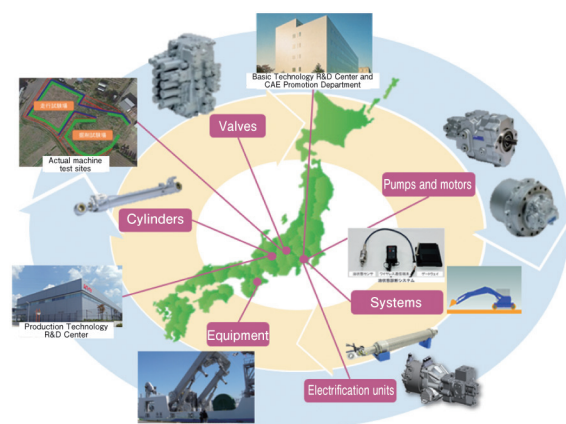


Fig. 1 Research and development system

## 3 Development for the Future

### 3.1 Oil Condition Diagnostic System (Fig. 2)

We have developed a system for real-time diagnosis of

the condition of the hydraulic fluid of hydraulic equipment used in plant equipment, construction machinery, or other equipment. Currently, it is common practice to periodically replace the fluid of hydraulic equipment to prevent the equipment from shutting down due to the occurrence of problems, even if the fluid is in good condition for use. The system we developed connects the target hydraulic equipment with sensors and communication devices to the customer via the cloud and analyzes and diagnoses the oil data using an algorithm based on the knowledge and expertise accumulated at KYB. The system uses the Internet of Things (IoT) to estimate whether the oil or equipment is deteriorating or abnormal, and suggests maintenance or replacement at the right time, contributing to less waste of hydraulic fluid or higher efficiency in maintenance operations.

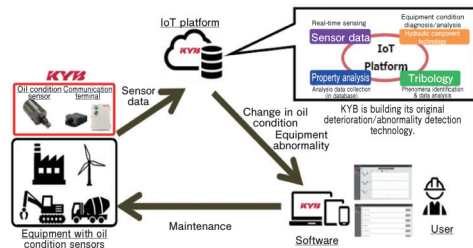


Fig. 2 Oil condition diagnostic system

### 3.2 Energy Saving System for Excavators (Fig. 3)

We are currently developing an integrated electronically-controlled hydraulic system with a pump, valves, and ECU (software) for power excavators and other hydraulic equipment to improve productivity and reduce CO2 emissions. With the original system with electronic control, we aim to minimize energy consumption and improve operability, contributing to energy savings and higher productivity.

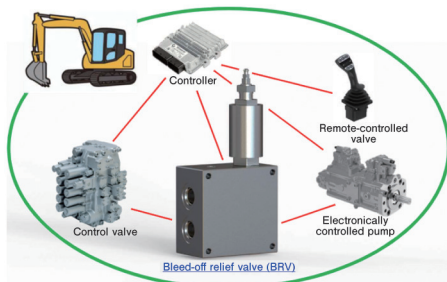


Fig. 3 Energy saving system for excavators

### 3.3 Motor-driven Pump Unit for Construction Machinery (Fig. 4)

In the context of the global movement toward carbon neutrality, the construction machinery and industrial

vehicle industries, including power excavators, are accelerating efforts to replace their diesel engines with motors. In line with these efforts, we are now developing a motor-driven hydraulic unit that integrates the variable displacement hydraulic pump for load sensing, which has proven its performance in mini excavators, with an inverter, motor, reduction gear, and motor oil pump for cooling. By combining the low-noise, high-efficiency variable displacement pump with the high-speed motor including the reduction gear, we will realize a highly efficient compact unit that will contribute to the achievement of carbon neutrality.

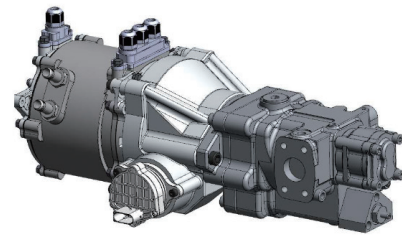


Fig. 4 Motor-driven pump unit

## 4 In Closing

Under the corporate spirit of “vitality, love and creativity” established by founder Shiro Kayaba, KYB has created its original products based on the “hydraulic DNA” relentlessly refined and inherited from the founder, thus contributing to the development of society. Traditionally, with the goal of contributing to energy savings and higher operability of parent machines, the company has continuously improved hydraulic equipment, especially by improving its circuits and increasing the pressure and efficiency of the equipment. By making full use of various analysis technologies for materials, fluids, mechanisms, and structures, it has mainly advanced its internally established proprietary technologies. But these are not enough. In addition to electric/electronic/motor technologies, we need to further combine digital technologies such as ICT/IoT with our existing technologies. In this way, promoting open innovation while introducing external management resources in a timely manner will be necessary conditions for us to accelerate commercialization and continue to grow.

KYB will continue to introduce external resources and combine them with its existing experience, track record, and technical capabilities to create value beyond customers' expectations. By improving the safety and productivity of construction machinery and agricultural equipment, we will help make people's lives more prosperous.

Author



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Joined the company in 1991. General Manager, Engineering Headquarters, Hydraulic Components Operations. Taken present post after working in Hydraulic Engineering R&D Center,

Design Sect., No.2 of Urawa Plant, Valve Design Sect. of Sagami Plant, and Sagami Hydraulics Engineering Dept. Engaged in design and development of hydraulic equipment.