

Introduction

From the first time you use the product, you will be able to use it to develop products in the

2 Market environment and product developments in the precision machinery field

(1) Excavator field

Because of an expanding global market, including China and India, the excavator market is expected to reach 1.2 million units by 2020.

to a future shift in power sources, and the excavator market is now in a state of major change.

Offering high-performance products and responding closely to customers' requests, we have been increasing our market share in hydraulic pumps, motors, and valves (. . . 1). Today, however, we are required to offer not merely hydraulic equipment but also hydraulic systems that can contribute to enhancing the value of excavators. Therefore, we are developing hydraulic systems with sophisticated controls and hydraulic equipment for these hydraulic systems.

Hydraulic equipment is required to have high performance that contributes to energy saving, high reliability for use in emerging countries and automation, and high controllability for use with sophisticated systems, and we have developed technologies necessary for individual products and put those products on the market. For hydraulic pumps, which greatly affect the energy efficiency and reliability of excavators, we have developed the K7V Series, which features high efficiency and high power density, to enhance the lineup of this series. We used the research results we have accumulated over the course of many years to design the rotary of the K7V Series, thereby achieving the world's highest level of efficiency. As for KMX Series control valves, we have developed a new series that significantly reduces pressure loss with fluid analysis and supports electronic control that enables advanced control with the aim of pursuing energy

saving and higher operability. In addition, we have put low-hysteresis, compact electromagnetic proportional solenoid valves and electric joysticks with high operability on the market, both of which are essential in electronic control systems. We will be working to develop technologies necessary to reduce pump noise and increase pump speed for future electrification of drive systems.

(2) Mobile machinery field

The "mobile machinery field" is a generic term for fields other than the excavator field. Various machines including construction machinery are used in a variety of fields. These machines are manufactured by many different manufacturers, including large manufactures and small niche manufacturers, forming a larger market than the excavator market. In the mobile machinery field, manufacturers are required to show their presence to be recognized as a global-standard company, and we are also working with our group companies to make a full-scale entry into this field.

The equipment specifications and load conditions

for high-pressure, large machinery, for a wide range of fields, including steel making plants, press machinery, and other kinds of industrial machinery.

5 † 2 ERU2-7.0, a electric jack, used for, e.g. construction machinery, hydraulic, etc. †, in a double-
-class, ability, etc.

† 3 The M7V. See, e.g. the high-
-pressure, etc. †, in a double-
-class, ability, etc.

fuel cell and drive the motor to run, are drawing attention. FCVs are characterized by their shorter fueling times and longer cruising ranges than electric vehicles (EVs) and are expected to spread if sufficient infrastructure is provided. It is said that by the 2040's, electrically powered vehicles will have spread all around the world and that FCVs and EVs will both be in use all over the world.

Based on high-pressure gas control technologies we have accumulated for defense products, we began developing hydrogen gas valves for fuel cell vehicles in 2001. We developed and delivered prototypes with automobile manufactures and industrial vehicle manufactures, and began full-scale development for mass production around 2014. Today, we are mass-producing and delivering tank valves, which are used to open and close the tank, and high-pressure regulators that reduce the tank pressure from 70 MPa to approx.1 MPa, as core products, to automobile and industrial ve

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robots. In addition, we are developing compact electro-hydraulic actuators for industrial applications.

(3) Utilization of ICT and IoT technology

ICT and IoT technology are used more and more in the marine machinery industry, including, for example, advisory services for monitoring ship conditions and optimizing maintenance. Sensors are used to collect various kinds of data in a ship, and that data is then sent to an on-shore facility. After the data is analyzed, feedback, including ship condition and maintenance timing, are sent to the ship (. . .). Also, for steering gears, failure diagnosis sensing will be performed for condition monitoring and maintenance. The data will be analyzed in the ship to identify a faulty part and notify the ship owner of the faulty part via the Internet.

This shift is even taking place in the industrial equipment industry as well where ICT and IoT technologies

are not commonly used. N-ECST, the controller for ECO SERVO, whose development began in 2015, is a system that enables remote control and data collection via the Internet. Applying these technologies to equipment used in hydraulic units makes it possible to monitor the condition, communication, and control necessary for maintenance with the condition monitoring function (. . .).

Conclusion

In the medium-term business plan "FY2019 MTBP", the Precision Machinery Business Division is aiming to more than double its consolidated sales from fiscal 2018 by fiscal 2030. To achieve this goal, we will be promoting the development and sales expansion of products and at the same time creating new products and businesses with synergy of the precision machinery business and robot business.