Glossary

Digital Twins

Refer to In-house application of XR (cross-reality) technology for realizing digital twins (page 7)

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1 Digital Twins [1),2)]

Digital twins are a concept proposed by Michael Greives of the University of Michigan in 2002. Digital twin technology uses data collected from the real world to recreate the environment of the real world in a virtual world, just like a twin, for various purposes including verification and improvement.

For example, digital twin models in a virtual world can be used to safely conduct failure tests that would be risky in the real world. This technology is expected to provide product optimization, work efficiency improvement, time/cost reduction, and other various effects.

2 Mechanism of Digital Twins

Fig. 1 shows a conceptual illustration of digital twins. A digital twin consists of a real world and a virtual world and the exchange of information between them. The role of the digital twin is to predict what might happen in the real world through simulation in the virtual world and to facilitate improvement. The digital twin process is shown below:

[1] Collect data from various types of equipment in real time by using IoT.
[2] Based on the collected and accumulated data, perform analysis and prediction in a virtual world by using AI and CAE.
[3] Feedback the results of analysis and prediction to the real world, and then take action and make improvement in the real world.

3 Features of Digital Twins

While digital twins are a type of simulation, they allow you to conduct simulation and evaluation under conditions that more accurately reflect the real world, using collected and accumulated latest data, compared to conventional simulation. In addition, their real-time function can be used to efficiently promote theoretical development such as model-based development (MBD). Digital twin technology is also helpful in quickly identifying problems, finding causes, and taking action in case of failure. In addition, the technology can provide improvements in various areas, including preventive maintenance by predicting signs of failure and taking action at the appropriate time.

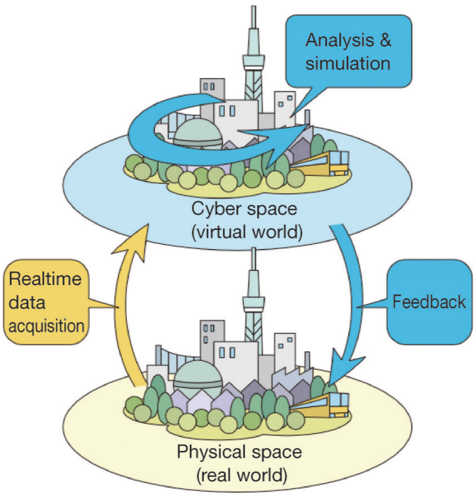

Fig. 1 Conceptual illustration of digital twins

References

1) Website of the Ministry of Internal Affairs and Communications, JAPAN
https://www.soumu.go.jp/hakusho-kids/use/economy/economy_11.html
2) The Ministry of Internal Affairs and Communications, JAPAN: Study Report
https://www.soumu.go.jp/johotsusintokei/linkdata/r03_06_houkoku.pdf

Glossary

HCS mechanism

Refer to "Development of a performance and
quality improvement structure for φ37-mm upside-down front fork" (page 26)

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1 What is the Hydraulic Stop?

The hydraulic stop (HS) refers to the general structure installed at the ends of the cylinder to absorb the energy of the shock absorber (SA) at the points where compression and extension are at their highest, by means of hydraulic power, thus preventing excessive impact.

The part of the HS that works when the SA moves to the compression side is called the hydraulic compression stop (HCS), while the part that works when the SA moves to the extension side is called the hydraulic rebound stop (HRS). An HS with both HCS and HRS functions is called a double hydraulic stop (DHS) (Fig. 1). Also refer to the article on the DHS included in the KYB Technical Review No.58.

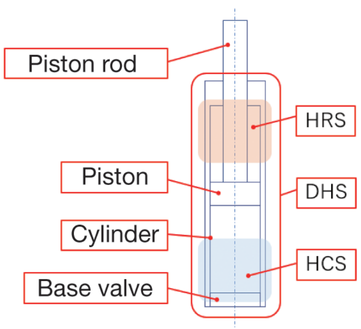

Fig. 1 Simplified structural illustration of DHS

2 HCS Mechanism for Motorcycle Products

The motorcycle front fork (FF) uses the HCS as described in the product introduction paper. Fig. 2 shows typical HCS structures. Although these HCS types differ in geometry, they all have the same mechanism in which the stop piece enters the case in the second half of the stroke to increase the internal pressure to absorb the shock. In addition, they all have a check function to suppress the noise that may be generated when a vacuum is created in the case during the stroke to the extension side.

The HCS have different characteristics depending on the length of the parts and the conical shape of the orifice (Fig. 3). Several standard parts are currently available so that customers can select the optimum characteristics during on-vehicle testing.

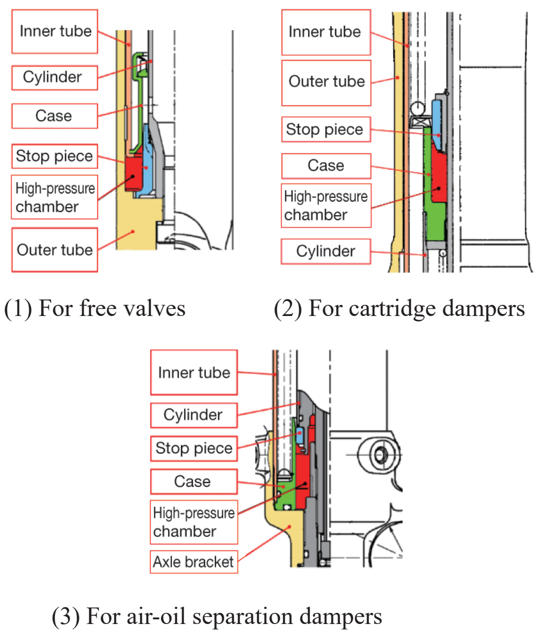

Fig. 2 Motorcycle HCS structures

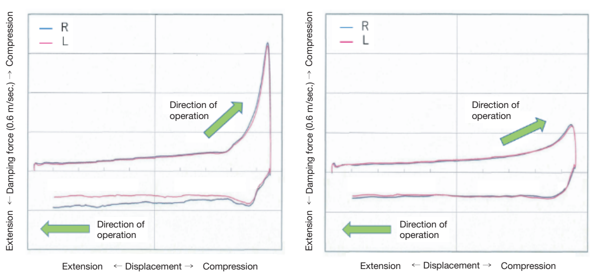

Fig. 3 Difference in HCS characteristics (damping force)