Construction Machinery

1 ZX200X-7/ZX330X-7 ICT Hydraulic Excavator

Hitachi has released a new information-oriented construction hydraulic excavator model, which will play a key role in information and communication technology (ICT) construction solutions. Equipped with unique machine control functions, this hydraulic excavator is compatible with i-Construction* implemented by the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) and supports ICT construction at various sites. When the bucket is tracking the target surface, automatic control of the boom motion enables construction with only arm operation, reducing the operational burden on the operator.

Also, an area control function is provided that allows the operator to set the restricted area for vertical and horizontal movement of the hydraulic excavator on the monitor using three parameters: height and depth, turning angle and turning radius, and surface. By pre-specifying the area where the machine can be moved for a site with narrow spaces or obstacles, the speed of operation can be slowed down or stopped as the machine approaches the preset boundary during front or turning operation to assist operation by the operator.

(Hitachi Construction Machinery Co., Ltd.)

* See "Trademarks" on page 150.

2 Mini Excavator: ZX40U-5B PAT Blade Machine Control

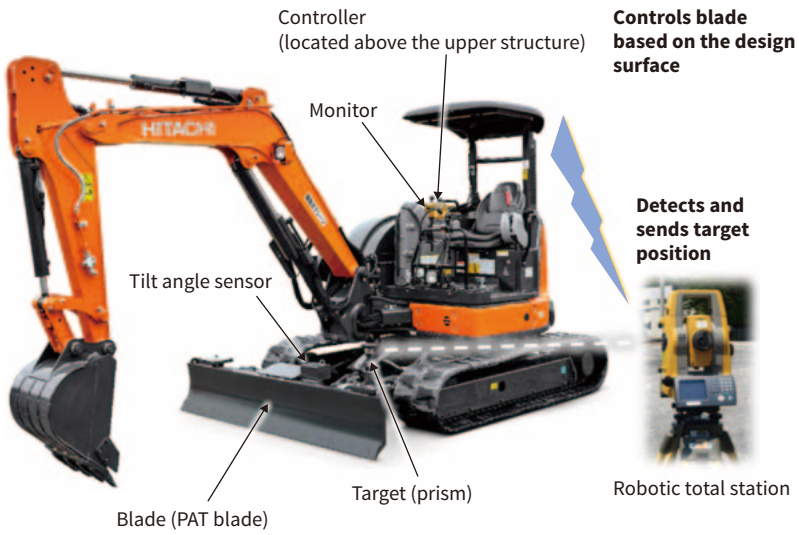
Hitachi has released the ZX40U-5B power angle tilt (PAT) blade machine control mini excavator with automatic blade control used for land shaping operations in small-scale paving work, for the Japanese market. This machine carries on the functionality of the ZX35U-5B PAT blade machine control, which was launched for sale and rental in 2018.

The main features of the ZX40U-5B PAT blade machine control are as follows:

(1) The automatic blade control system obtains information on the position of the machine and the tilt angle of the blade from the robotic total station, the target (prism) mounted to the blade, and the tilt angle sensor. Then, the operation of the PAT blade is automatically controlled in real time based on this information and the three dimensional (3D) design data that was imported into the machine controller beforehand.

(2) The ZX35U-5B PAT blade machine control had a technical issue in which the machine had limited swing range due to an external cable connection between the tilt angle sensor mounted on the blade and the controller for the blade control on the upper structure. In this model, the connection method was modified to enable

1 ZX200X-7 ICT hydraulic excavator



2 ZX40U-5B mini excavator PAT blade machine control

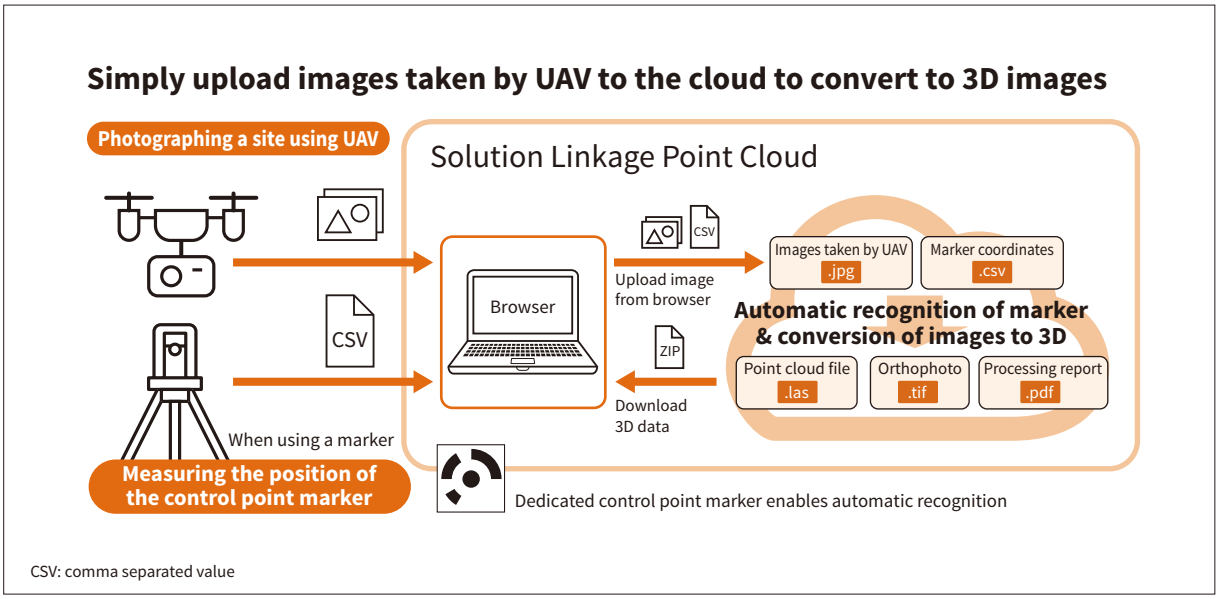
360-degree swing at all times. This improved the bucket usability for work, such as when spreading roadbed material with the bucket.
(Hitachi Construction Machinery Tierra Co., Ltd.)

3 "Solution Linkage Point Cloud" for Converting UAV Photos into 3D Point Cloud in the Cloud

The Solution Linkage Point Cloud is a cloud service that allows customers to take aerial photographs of construction sites with their own unmanned aerial vehicles (UAVs) and create 3D point cloud data in the cloud.

In the ICT construction implemented by the MLIT, the amount of soil to be constructed is increasingly being calculated using point cloud data at the site for managing the construction status. However, subcontracting data creation to a surveying company or other provider is expensive and requires considerable time to receive delivery, and moreover, a large initial investment is required in specialized software and a high-performance PC. Consequently, Hitachi developed this service as a cloud service that allows customers to create point cloud data easily and inexpensively.

To use the system, aerial photos are taken using a dedicated automatic airspace control point marker and automatic photo shooting software that comes with the UAV recommended by Hitachi Construction Machinery, and then the photos are uploaded to the cloud. The cloud



3 Overview of cloud service

server uses the structure-from-motion (SfM) method to generate the point cloud data and returns it to the user as a file. The user can open the created file with any commercially-available point cloud processing software to measure the soil volume and distance at the site, thus reducing the work required for construction management.

This service has been developed in collaboration with Hitachi Solutions, Ltd. as part of the One Hitachi initiative. Hitachi aims to provide this service as an entry point for users who are working on 3D surveying and ICT construction.
(Hitachi Construction Machinery Co., Ltd.)

4 ZC120S-6 Soil Compactor

Hitachi started renting of its new soil compactor, which meet the 2014 standards of the Off-road Act, in Japan from April 2021 and sales are scheduled to begin in FY2022.

The diagonally shaped engine cover and the pillar-less design of the operator's seat window glass joint ensure enhanced visibility from the operator's seat. In addition, the camera image from the vehicle's rear can be checked from the monitor in the operator's seat to reduce the blind spot near the vehicle's rear end and improve safety.

The monitor in the operator's seat displays the time until servicing is required for engine oil, hydraulic oil, and other components. The monitor also provided an operation guidance display function to assist operators unfamiliar with the operation, a compaction meter (optional extra) that displays the degree of compaction using an acceleration sensor, and a pass counter that displays the number of compaction cycles, enabling more efficient compaction operations.

The engine cover mechanism in which the vehicle's rear side can be open wide allows the operator to access from the ground to the parts that are routinely worked on and inspected for reducing the work burden on them.
(Hitachi Construction Machinery Camino Co., Ltd.)

5 Autonomous Compaction System

With the decrease in the working population and the aging of skilled production workers, improving productivity while saving personnel becomes a challenge in the construction industry. Therefore, there are high expectations for developing autonomously operated construction equipment. This led Hitachi to develop an autonomous operation system for soil compactors that incorporates the concept of ZCORE, a system platform that is the core of cooperative construction equipment that achieves both cooperative safety, where man and machine cooperate to improve the safety and productivity of the entire construction site, and highly autonomous operation.

This autonomous operation system consists of an operation system that directs the travel route mission, a compaction progress management system that visualizes the work history in real time, and a "recognition, judgment, and execution" function that can respond to changes in the construction site.

Since the market for autonomously operated construction machinery is still in its infancy, Hitachi plans to use this autonomous operation system to explore methods of operation at construction sites with its customers

4 ZC120S-6 soil compactor

5 Autonomous compaction system unit

and then to expand the system to include monitoring devices and systems that cooperate with other construction equipment.
(Hitachi Construction Machinery Co., Ltd.)

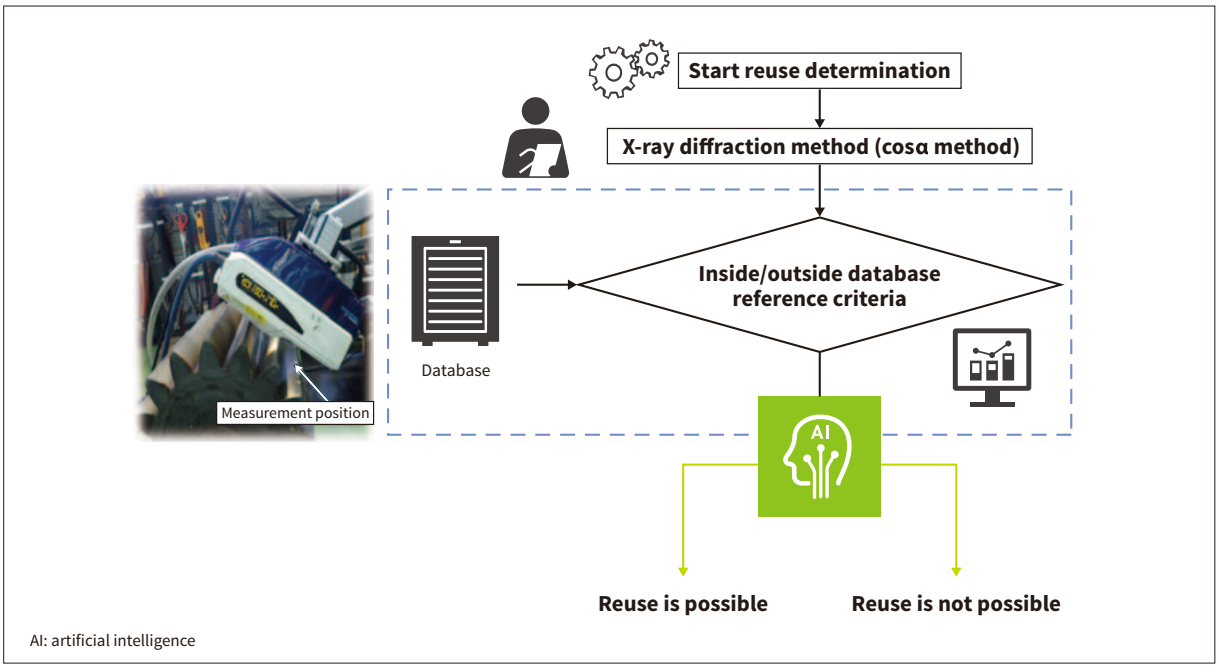
6 Reuse Judgment Technology of Gear for Remanufacturing

To contribute to a carbon-neutral and circular society, Hitachi is conducting a global rollout of its remanufacturing business that includes hydraulic equipment.

The main technical challenges in the remanufacturing business are the technology for determining the feasibility of the reuse of parts and the technology for restoring functions. Hitachi picked up the gears used in construction and mining equipment as the subject of this development. Because they are large in size and costly, they are one part that would be highly valuable for enabling reuse.

The reuse judgment technology, developed in collaboration with the National Institute for Materials Science (NIMS), makes it possible to determine the feasibility of the reuse of gears by detecting mechanical changes (residual stress ratio) and microstructural changes (retained austenite ratio) inside the gear. By making it possible to determine the feasibility of the reuse of gears that have been disposed of as scrap due to their age and the difficulty of determining whether reuse is possible, the reuse rate of parts can be increased, leading to effective utilization of resources and cost reduction, thus achieving both environmental and economic benefits.

In addition to gears, the concepts behind this technology are also expected to be applied to bearings and welding parts.
(Hitachi Construction Machinery Co., Ltd.)



6 Development of technology for judgment feasibility of reuse