


Channel dredging is one of the main methods of developing the waterway, increasing and maintaining the scale of the waterway, and is of great importance to its passage. Every year during the rainy season a large amount of sediment is brought into the river, causing a build-up of silt on the river bottom. This is why the waterway authorities need to carry out regular dredging works such as underwater breaking and dredging to ensure the safe and smooth flow of the waterway.



## Application of Excavator 3D Guidance System in Waterway Dredging

### Project Background

The Liujiang River is an essential channel for water transportation in China. In recent years, with the rapid development of the water transport economy along the route, the port throughput has been rising year by year, the demand for transport vessels has been increasingly intense, and the people along the route are looking forward to the expansion of the Liu River.

The construction of a 2,000-tonne waterway on the Liujiang River is a common aspiration of the transport system, the local government, and the general public. Construction began in December 2021, and the project will significantly increase the passage capacity of the channel after completion, which can effectively solve the bottleneck problem of water transport on the Liujiang River.



### Pain Point Analysis

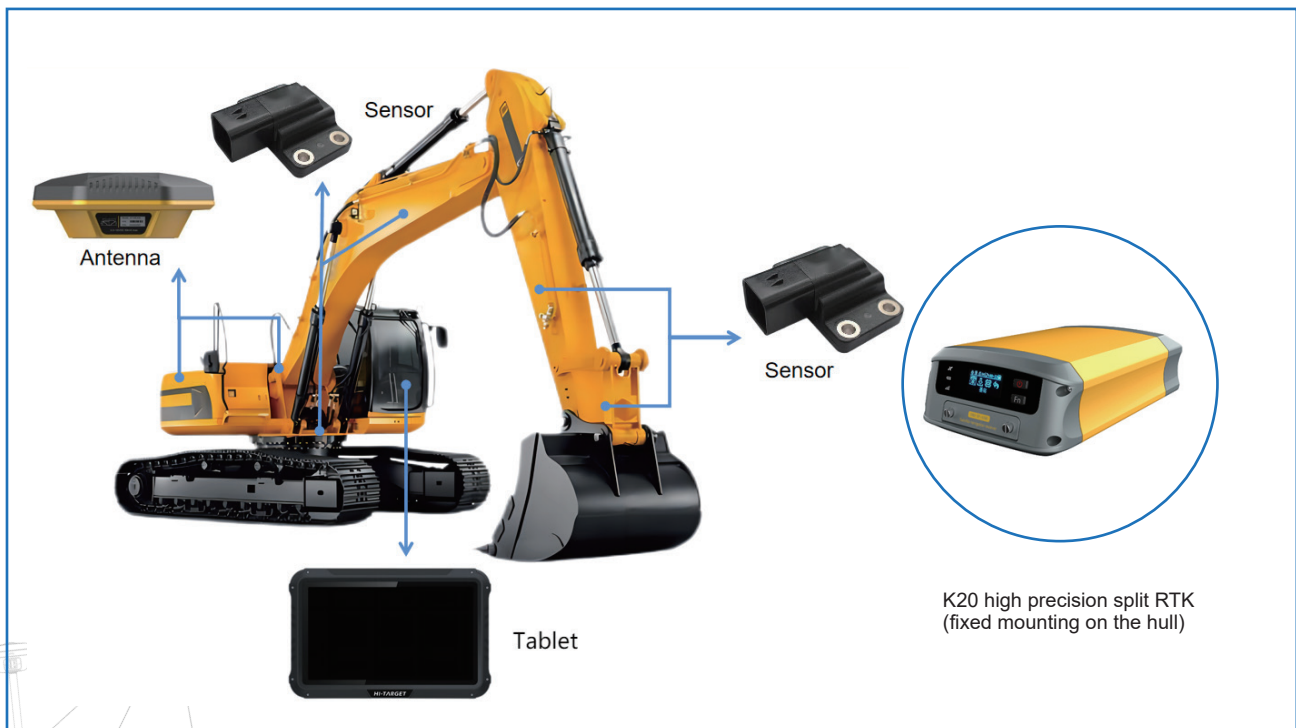
- The routine way of channel dredging is mainly through manual operation of dredger or other machines for underwater excavation. As it is difficult to see the underwater operation area clearly, the operator can neither find the boulder precisely nor control the position and control the clearance elevation precisely in the process of crushing and clearing dredging, which can easily cause leakage, over-digging, under-digging and even reworking, resulting in uncontrollable construction cost. At the same time, the operation is easily affected by weather and light, and the operation efficiency cannot be guaranteed.

## Implementation Program

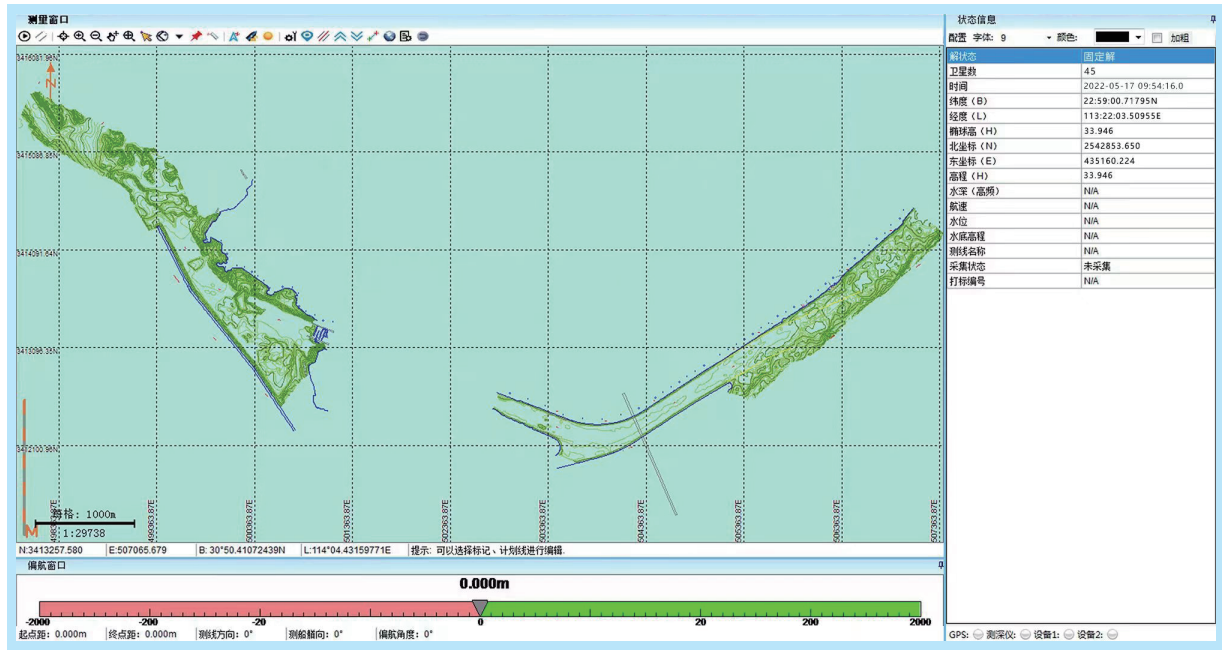
In order to solve the channel dredging problem, Hi-Target provides the solution of ECS900 excavator 3D guidance system (hereinafter referred to as ECS900) with K20 high-precision separate RTK (hereinafter referred to as K20) for the customer.

The ECS900 uses high-precision positioning technology to calculate real-time and accurate 3D position information of the crushing hammer head and bucket teeth in combination with reading the values of various angle sensors and major pivot dimensions installed on the excavator, and guides the operator according to the 3D graphics and values displayed on the flat panel terminal installed in the cab to prevent missed, under- and over-digging in the work area. It can guide the operator to work accurately even in the blind area where the vision is not good, or in the case of poor lighting conditions.

The K20 serves four primary purposes: First, it improves construction accuracy based on centimeter-level RTK positioning accuracy. Second, it facilitates the operator to better control the instrument and understand its working status from the ship's cockpit. Third, by placing the main body in the cockpit, it is protected from the special environment on the water and increases its service life. Fourth, in addition to providing high-precision positioning, it can also provide high-precision heading. Fifth, the K20 can be used with the Hi-Target HiMAX software, which not only provides high-precision management of the real-time status of the boat but also provides a fine display of the boat's direction and travel trajectory.



ECS900 with K20 diagram **FIG1**



Hi-Target HiMAX software operating interface **FIG2**

## Workflow

### 1. Survey design

The project team first assessed the underwater topography and the amount of rock to be broken up, dredged silt and rock, which was based on multibeam scanning data.

### 2. Design construction drawings

After multi-beam scanning, the construction design drawings (CAD.dxf) are formed according to the requirements of the channel class.

### 3. Surface dredging

The ECS900-equipped excavator machine performs dredging of the surface silt. Guided by the cab-mounted ECS900 terminal plate, the operator can perform precise work on the surface silt.

### 4. Fixed-point crushing

After the excavator equipped with ECS900 is replaced with a crushing hammer, it can perform fixed-point crushing on the whole rock mass or large rocks. With the ECS900 and guided with high precision by referring to the software, the underwater rock mass or large rocks can be crushed precisely in operation sequence.

### 5. Clear excavation to the specified elevation

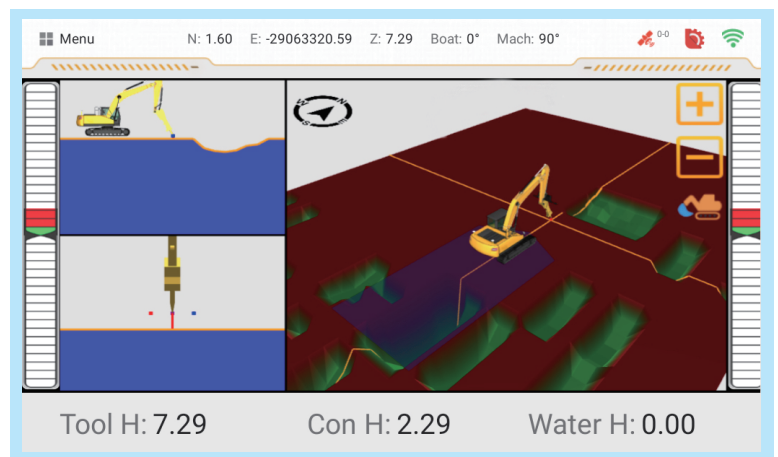
After breaking into small stones, the operator then clears the dredge to the specified elevation (including silt, etc.) and transports the silt, etc. out of the channel.



Equipment installation **FIG3**

## Result

Based on ECS900, it can not only show the vessel type and orientation of the crushing dredger in real time, but also provide precise assistance and guidance to the dynamic operation of the crushing hammer head and bucket, ensuring the accuracy of construction operations and preventing missed excavation, under-excavation, and over-excavation. Digging not only reduces the waste of manpower and material resources, but also improves the level and efficiency of operations.



Interface of the ECS900 combined with the K20 guidance software for construction work (dynamic position and orientation of the vessel in transparent blue on the right, with remote access to set control)

**FIG4**

## Project Summary

ECS900 has changed the way excavators operate underwater, helping customers reduce costs and increase efficiency.

In terms of cost reduction, the ECS900 guides the operator to work accurately by setting the operation boundary and showing the orientation and angle of the hull and excavator crushing hammer head/bucket in real time, avoiding rework due to missed excavation, under-excavation and over-excavation, saving the customer manpower and material resources.

In terms of efficiency improvement, the efficiency of ECS900, which can be operated at night, is increased by more than 50% compared to traditional construction methods. Boosted by the digital construction method, channel dredging will be completed with more precision, efficiency and cost, contributing to the high-quality development of the waterway.



More information at <https://en.hi-target.com.cn/become-our-partner/>

## About Hi-Target

Established in 1999, Hi-Target is the first professional high-precision surveying and mapping instrument brand to be successfully listed in China.

Hi-Target provides a wide range of surveying equipment including GNSS receivers, CORS stations, Total Stations, 3D Laser Scanners, GIS Data Collectors, UAV/UAS, and Hydrographic products to offer complete commercial solutions for various industries.

As the leading brand in the geospatial industry, Hi-Target invests heavily in research and development, on top of collaborating with more than 100 universities globally to bring the latest positioning technology and innovation for product development.

For over 20 years, Hi-Target has approximately 2,500+ employees worldwide, with an established network of 20+ subsidiaries, 28 branches and more than 200 partners in 100+ countries / regions to service and support our customers.

Visit us at: [www.hi-target.com.cn](http://www.hi-target.com.cn)

E-mail: [sales@hi-target.com.cn](mailto:sales@hi-target.com.cn)

Phone: +86 20 2868 8296