

Advanced Excavator digging project at Alblasserdam

Project description

Near Alblasserdam in the Netherlands a tunnel project started as part of the Betuwe railroad from Rotterdam to Germany. One of the special jobs in this project is to dredge material away, very accurately, between buried piles below the waterline. Those piles are specially placed to position the tunnel entrance.



For this selective dredging method excavators are used with a special digging tool and extensive instrumentation to meet the high (required) accuracy. The excavator equipped with a bucket/clamshell/pump dredge system is not allowed to hit the fresh placed piles. Martens en Van Oord is one of the partners in the joint venture and up for a challenging dredging job.

IHC Systems has recently provided upgrades for the eXcavator Position Monitor (XPM), the Real Time Kinematic (RTK) / On The Fly (OTF) / Differential Global Positioning System (DGPS) receivers and last but not least the latest by IHC Systems new developed Dredge Track Presentation System (DTPS). This overall system makes it possible to handle the job with an overall accuracy of 10 cm and be sure a minimum of piles is touched by the excavators bucket.

Excavator

The new excavator of Martens en Van Oord is extended with a special built-up cabin with an under and front box. The front box on the cabin is for the two 15" colour screens and the under cabin box is used to place the ruggedized XPM, DTPS computers and other hardware. Instead of using (sensitive) maintenance gyro's, the excavator is equipped with two RTK receivers to calculate the exact position in X,Y, Z with a corresponding compass angle. To mount, vibration free, the two RTK antenna's, Martens en Van Oord has developed a special mounting frame on the back of the excavator.

Working method

The excavator has three interchangeable dredging tools each with their own limits and sizes. Depending on the material and location, the fixed bucket can be interchanged by a rotating clamshell bucket. When all the material around the piles with a 10-cm window around the pile is dredged away, the bucket will be replaced by an underwater pump with water jet to remove the last material around the pile.

Dredge Track Presentation System (DTPS)

IHC Systems has developed the new Windows NT 4.0 based multi language DTPS system which communicates with the already existing Excavator Positioning Monitor. The DTPS system generates a screen image which helps the excavator operator to manoeuvre the bucket /clamshell/pumps with accuracy of < 10 cm between the piles.

The DTPS system shows on-line the excavator in the Digital Terrain Model (DTM) topview with contours and piles, sideview and frontview. The DTM or Bathymetric topview with geographical co-ordinates can be rotated on-line by the operator and is also capable to store default views. The alphanumeric windows show all relevant data.

Dredge Track Position Monitor (XPM)

The DTPS systems communicate bi-directional with the XPM. All XPM data is converted to absolute position data and transferred back to the XPM. The channel design with objects will be triangulated (max 300 triangles) and transferred on request to the XPM. The depth matrix of the working area will be continuously updated with bucket/clamshell dredge depth positions. The operators are able to see positions to be dredged or where digging is stopped. The DTPS system stores all the time tagged

data, such as RTK positions, gyro, bucket depth, angles, downtime and conversions. By replay of all logged data the operator is able to make a scaled DTM and Bathymetric plots on a colour printer.

Excavator Position Monitor (XPM)

The excavator position monitor enables the operator of the hydraulic excavator to control the position of buckets and other digging tools in sideview and topview related to waterline and setpoints for depth and profile. Very helpful features are the system's swinglimit, outreach and pontoon protection messages. The XPM system is extended with communication to the DTSP system and geographical positioning.

Transducers/transmitters

The XPM makes use of special by IHC systems developed rugged mechanical transducers for measurement of angles of boom, stick, bucket, rotation transmitters and inclinometers. All mentioned transducers withstand the environmental conditions on a dredge and are suitable for submersible use.

The digging work is in progress. Mr. B.F. Faber of Martens en Van Oord mentioned that the decision to use the IHC Systems XPM in combination with the new DTSP software has proven to be one of the critical success factors of this specific, challenging, dredging job.

(Source: Newsletter March and April 2000)