

Innovative dike building machine revolutionizes flood protection

Wrapping technology instead of human chain

The flooding disaster that devastated entire regions in southern and eastern portions of Germany in June 2013 caused economic losses reaching a double-digit sum of billions of euros. Experts assume it to be the most costly natural disaster in German history. Of course, this is reason enough to consider new strategies for more reliable flood protection. As a result, the Gütersloh, Germany-based start-up enterprise Topocare GmbH has introduced an innovative solution with its Topomover 3.5 dike building machine. With this technology, endless geotextile tubes produced by means of a special “wrapping” technology can be used in a variety of ways for dam and dike construction and promise effective flood protection.

The development of the dike building machine, which was ready for series production in late July 2013, was supported as an innovative co-operative project through financial assistance from the German Federal Ministry of Industry and Technology. The solution is the result of close co-operation between the Draier engineering firm, Löseke & Marx Maschinen- und Anlagenbau GmbH (mechanical and plant engineering) and Beckhoff as the automation partner. The core of the invention is the geotextile wrapping technology which allows endless tubes – so-called topotubes – to be manufactured and laid on-site. “The use of

topotubes could revolutionize dike building in the future,” says Roland Draier, managing director of Topocare, presenting his invention.

Effective flood protection with textile tubes

Granted, using sand-filled tubes to create protective embankments on large-scale sites is nothing new. From the technical point of view the challenge was to design a robust machine that would permit an economical and fast implementation of this method. The method developed by Topocare for the



The Topomover 3.5 in front of an already-laid tube with a height of 70 cm. Using the dike building machine, the topotubes are manufactured and laid directly at the place of installation. The machine drives along the laying route at walking pace while the dike is being constructed.

manufacturing of seamless and endless tubes made of a sturdy, water-permeable material fits the bill perfectly. It is outstandingly well suited for use in temporary flood protection to quickly stabilize and increase the height of dikes. "In the case of floods success or failure often depends on just a few hours," explains Simon Jegelka, who is also a member of the Topocare management team. "According to one study, six helpers from THW, a German disaster relief organization, need 70 hours to erect a barrier 75 cm high and 100 meters long from 10,000 sand bags. The Topomover manages that same barrier in just one hour with one person to operate the machine. The dike building machine can produce or process up to 200 m of endless tubing and up to 80 tons of sand per hour. "The method we developed is not only fast, but also less expensive compared to conventional methods," stresses Roland Draier. The Topomover can be installed and moved on any traction system such as a tractor with a trailer.

CX2030 Embedded PC ensures a trouble-free process

The dike building machine consists of the conveying equipment, which transports the sand to the filling point via two corrugated-edge belts, the boom, which has every degree of freedom due to height adjustment, tilting and a positioning platform, and the wrapping technology, which consists of the filler pipe and the turntable for mounting three textile bobbins. The feeding of the filler pipe is controlled by a level sensor, which is attached to the hopper at the end of the boom. After filling the hopper, the wrapping equipment starts by wrapping the textile belt around the downpipe. At the same time the boom moves upwards along the z-axis so that the wrapped geotextile is continuously pulled off the pipe, creating a sort of sand column. This is continuously set down by the feed of the machine, which is synchronized with the wrapping speed. In order to lay the hose, the boom can be rotated in the x and y planes; it can also be moved in the y direction by means of the cross carriage.



The picture shows the starting procedure when laying a second tube. Subsequently, a third hose is added in pyramid fashion. In this way, protective dams of a considerable size can be manufactured quickly using the Topomover 3.5.

The PLC and motion control is handled by a CX2030 Embedded PC running TwinCAT NC I automation software. All sensors and actuators as well as the encoders are connected via EtherCAT Terminals. The drive components employed are Beckhoff AX5000 servo drives with the corresponding servomotors. A CAN-bus interface connects the "base station" of the manual control unit with the controller; communication between the manual control unit and the base station is wireless. Following the start-up procedure, the installation of the sand-filled endless tubes is performed automatically. The controller is monitored from the driver's cab.

"In addition to supplying the controller solution, we received great support from Beckhoff application engineering in the development of the Topomover: from planning to the construction of the control cabinet to assembly and commissioning," explains Roland Draier. The company aims to make the geotextile

wrapping technology usable on a large scale for onshore and offshore areas. For example, the tubes can be used as the stable core of a dike and could replace the method of washing sand into the interior of a dike. "The geotextile tubes, which have a diameter of between 60 and 100 cm, provide the grains of sand or gravel maximum positional stability, thus preventing erosion. Dikes manufactured in this way can also withstand overtopping and wave loads, so the danger of a dike breaking is several times lower," stresses Simon Jegelka.

Further Information:

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