



The new playhouse in Copenhagen has three stages and can accommodate an audience of around 1,000.

Automated stage technology at the Royal Danish Theater in Copenhagen

Embedded PC controls movable stage turntable at historic Danish theater

The playhouse at the Royal Danish Theater in Copenhagen serves as Denmark's center for dramatic arts programs. In addition to the actors' performances, advanced stage technology plays a key role in the production of the theater's impressive shows. A prime example is the movable stage turntable, produced by German manufacturer HOAC and intelligently controlled by a Beckhoff Embedded PC.

Established in 1985, HOAC Stage Technology GmbH, based in Moers, Germany, develops and manufactures aluminum-based systems and machine components for theater and stage technology. Supported by leading-edge PC-based control technology, the system-compatible structures offer a high degree of flexibility and functionality. The company is EN 1090 1-3 and ISO 3834 certified, represented in almost all European countries as well as the major theaters in North America and Asia and provides cross bars, stage and ballet carts, as well as stands and curtain pulley systems. HOAC also supplies stage turntables, which are available in various sizes, with internal or external drives, and with manual or programmable control.

Movable turntable for the new playhouse

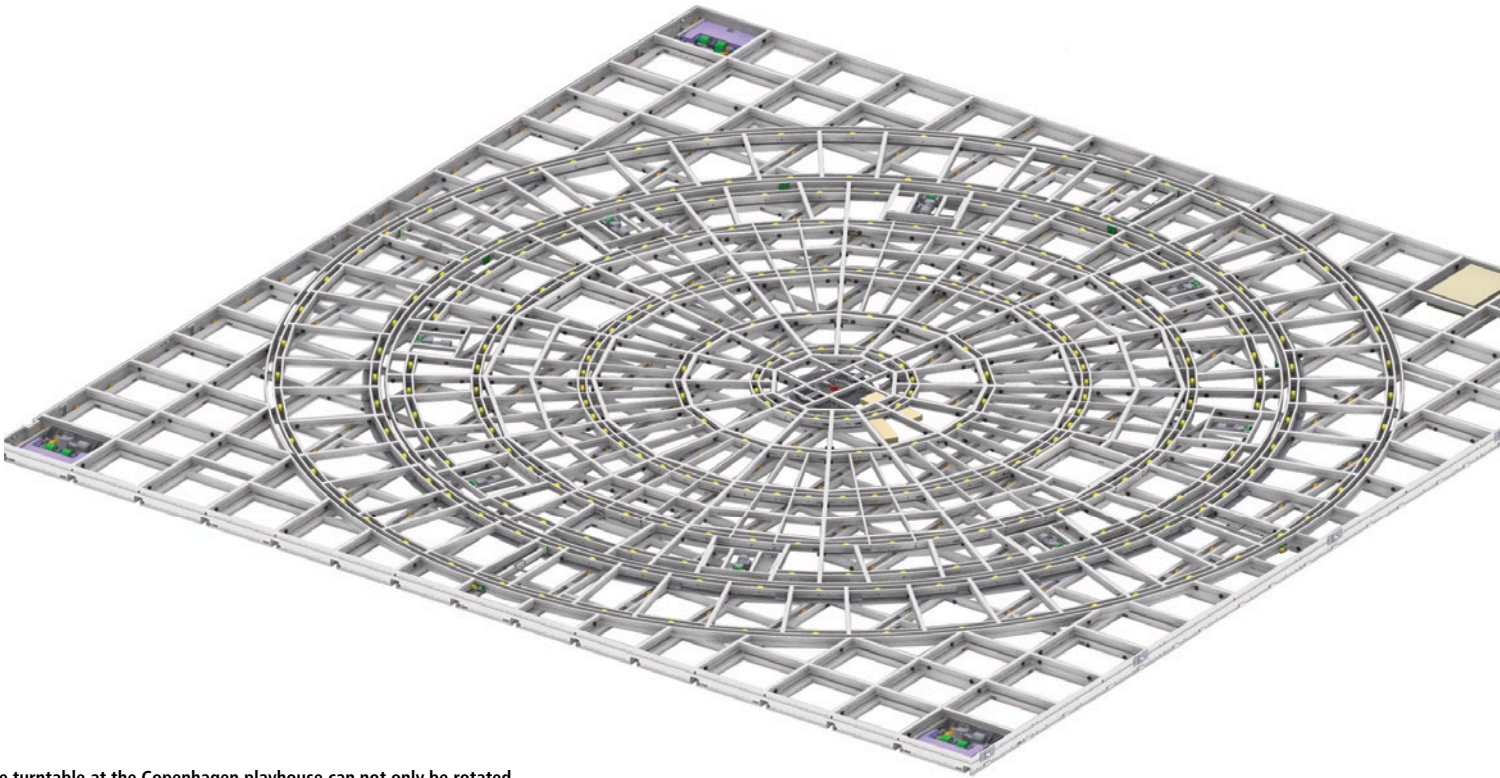
The Royal Danish Theater – Det Kongelige Teater – in Copenhagen was established in 1874. The new Royal Opera was opened in 2005, and a new playhouse was built in 2008 to provide adequate space and advanced stage equipment for all performance types. At the time, the designs for the play-

house had to be scaled back to some degree, in order to meet budget and time constraints. For example, the turntable that had been proposed for the stage machinery was not realized, despite the fact that enough space would have been available.

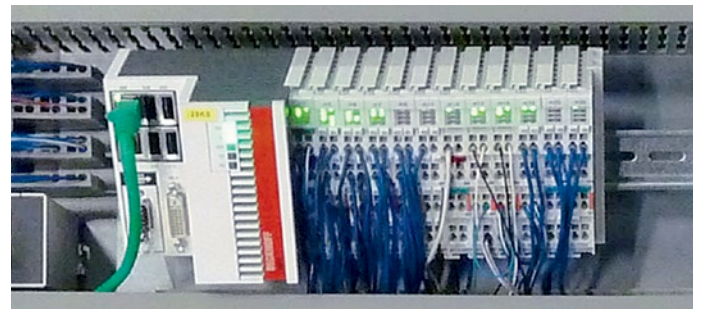
In 2013, this deficiency was rectified using a movable turntable from HOAC, as managing director Dr. Gabriele Hogg explains: "We used a 16 x 16 meter scenery wagon, including a turntable with an integrated outer ring measuring 15 meters in diameter. The scenery wagon moves from backstage to the main stage by means of four integrated motors, guided linearly by lateral rollers in the recessed platforms and is lowered to a depth of 30 cm. This enables fast switching between shows utilizing the turntable and shows that take place on the podiums of the main stage, for example. The turntable can even be moved during the rotary motion."

Embedded PC controls all movements

Christian Leurs, who is responsible for design and process engineering at



The turntable at the Copenhagen playhouse can not only be rotated but at the same time moved from the backstage to the main stage.



A high-performance and very compact control system was implemented using the CX5010 Embedded PC and EtherCAT Terminals.

HOAC, describes one of the special design requirements necessary for the turntable: "For the Copenhagen project, a scenery wagon with integrated turntable had to be positioned using a bar code. Thanks to the flexibility of our system, we are able to move over a defined distance without actual data. Control is handled by a CX5010 Embedded PC with Intel® Atom™ processor, as the flexibility and openness offered by PC Control from Beckhoff were particularly important to us. For example, it enabled the I/O level to be implemented in a compact and modular manner via EtherCAT Terminals, in particular the EL1008, EL2008 and EL2004 digital terminals, and EL3051 and EL4032 analog terminals."

A further advantage of the openness of the system is simple and precise control of the asynchronous motor frequency converters via the EtherCAT Terminals, as well as point-to-point axis positioning with TwinCAT NC PTP software. Added to this is the use of established IT tools, as Dr. Gabriele Högg explained: "The turntable controller can store the programs for up to 10 different shows,

with up to 50 scenes each. These can be easily transferred to a USB stick and edited in the form of an XML file. Another very important aspect for us is remote maintenance, which is also easy to implement with the corresponding option that is integrated in Beckhoff controllers."

Further information:

www.kglteater.dk

www.hoac.de/en

www.beckhoff.fi