

Armstrong: PC-based production line for acoustic ceiling systems

→ Lightbus was introduced in 1989 as the Beckhoff system bus for high-speed machine controllers. Since then, it has become well established in many sectors including production machines for windows, woodworking machines, presses, packaging and machine tools. As one of the first Lightbus applications for materials handling equipment, a production line for ceiling panels was realized at Armstrong Building Products in the summer of 1990. Due to its interference-proof and high-speed fieldbus communication, Lightbus today is still regarded as "state of the art."



The system for cutting large panels into smaller ones at the Armstrong plant in the Dutch town of Hoogezaand is equipped with PC control and Lightbus network.

The panel saw for longitudinal and cross cutting.



After 15 years, Lightbus technology is still "state of the art"

Armstrong Building Products has 23 production facilities worldwide and is the leading manufacturer of acoustic ceiling systems. For the European market, Armstrong produces mineral fiber acoustic ceiling panels at four locations: Hoogezaand (Netherlands), Team Valley (Great Britain), Pontarlier (France) and Münster (Germany).

In the Dutch plant at Hoogezaand, Beckhoff control and fieldbus technology has been in use for more than 14 years. The process of cutting large panels, including the panel saw, is PC-based and controlled using a Lightbus network. The panel saw cuts large panels (3.6 m x 5 m) to the format of the base panels.

Henk Duijm, principal engineer for Asia and Europe at Armstrong Building Products, explains: "The PC control system consists of a desktop PC and a monitor that is integrated in the operating panel. The PLC/NC S1000 software – the predecessor of today's TwinCAT automation software – runs on a DOS operating system." Beckhoff technicians wrote the application software and developed the visualization system. The visualization of the production interface – the sectionalized representation of the plant – is programmed in "C".

Maintenance and handling simplified

At the time, the Lightbus I/O modules M1400 and M2400 (for digital and analog devices respectively) were selected for I/O communication. Armstrong uses the Lightbus modules both locally and in the central control cabinet. The I/O components installed throughout the plant control sensors and actuators. The use of local Lightbus components reduced the installation effort and the costs. The Lightbus devices in the control cabinet include the frequency converters that control the speed of the roller conveyors.

Andreas Hülshorst, who now works in sales for Beckhoff and was plant engineering project manager at the time, commissioned the Hoogezaand plant in August 1990. "One of the special features was that the speed of each roller conveyor of the conveying unit was controllable. In this way, the distance between the ceiling panels on the conveyors could be changed to suit each process. The roller conveyor speed could be set via the software PLC without the need for complicated calculations."

Simple extension with additional functions

After commissioning, Armstrong technicians extended the system even further. "Thanks to the Lightbus system, the plant configuration can be modified or extended simply and quickly," said Henk Duijm. "All data are set automatically during initializing so that no complex device settings are required at the local modules."

The panel saw consists of a 2-axis saw for longitudinal cuts and a 4-axis saw for cross cuts. The saw settings of the pole-changing motors can also be changed via



Fast, interference-free communication:
Standard fiber optic technology is used for
transferring the Lightbus data.



Henk Duijm, principal engineer
for Asia and Europe at
Armstrong Building Products.

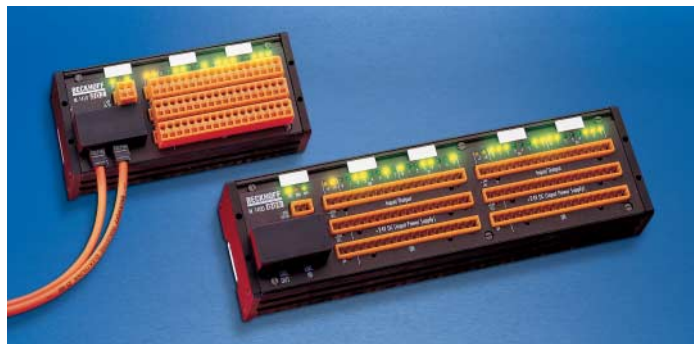


M1400 digital Lightbus modules. The position of the saw axes is monitored via M3000 absolute encoders.

One technological highlight is the 12-level dryer for drying ceiling panels. The dryer is continuously filled with basic ceiling panel elements and emptied via an elevator. This process requires short set-up times and fast loading and unloading. Here too, the Lightbus system excels with high performance.

Fast, modular and interference-proof

The decision for using the Lightbus system at Armstrong was based on several factors. One important criterion was modular expandability of the system. The production line, including the panel saw, had to be converted in only two weeks' time. In order to guarantee quick assembly and commissioning on site, the plant was pre-configured for testing purposes at the supplier of the transport system – the machine manufacturer Hüttenhölischer. "The individual system components were equipped with Lightbus I/O components and tested section by section. For final assembly in the Hoogezand plant, the individual system components simply had to be connected with optical fiber and motor cables," said Henk Duijm. "Further reasons for the use of Lightbus were operational benefits and straightforward expandability through integration of modules into the optical fiber ring." Interference immunity against electromagnetic influences and complete galvanic isolation of the connected modules among each other were crucial benefits. "The control cabinets are installed in a separate control room, which is 160 m away from the last machine component. The encoder lines for the saws are subject to EMC interference. Lightbus communication via glass fiber (HCS fiber optic)



Lightbus: from Beckhoff system bus to global fieldbus system.

EtherCAT: 14 years after the introduction of the Lightbus system,
EtherCAT – previously having the working title "Fast Lightbus" –
represents the next generation of the high-speed ring bus.



ensured that the data transfer to the absolute encoders was reliable and very interference-proof," said Andreas Hülshorst.

Proven technology is preserved

"For window production machines, Lightbus was used as early as 1989. Armstrong was one of our first customers that operated materials handling systems with saws," Andreas Hülshorst remembers. The materials handling equipment was commissioned in August 1990, and in September the first ceiling panels were produced.

Armstrong will retain the Lightbus technology during their forthcoming relocation of production facilities from Hoogezand to Münster in early 2005. Henk Duijm said, "By closing the Dutch plant, we are reducing the number of Armstrong plants in Europe from four to three. This measure is aimed at reducing production costs and increasing output at the same time."

Since the ceiling panel production process remains largely unchanged, the machine components with the proven Beckhoff PC control system and Lightbus fieldbus will be re-installed at the new location. "Controllers are usually replaced after about 10 years," said Henk Duijm. "In this case there is no need since Lightbus still works very well. We will integrate new functionalities via the flexible, modular Bus Terminals with the Beckhoff Lightbus Bus Coupler."

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