



Standing in front of the many control cabinets equipped with Beckhoff control technology: Dardan Zeqiri, automation electronics technician at Continental Tires; Alexander Kruse, Key Account Manager in the Beckhoff Hannover office; Franz Stuefer, CLC plant manager; and Dr. Paul Malliband, Project Manager of Control and Drives at Continental Reifen.

PC-based control and OPC UA form the basis for Continental's Industrie 4.0-compliant truck and bus tire plant

Environmentally-friendly and efficient retreading plant relies on open, highly scalable control technology

In 2013, Continental Reifen Deutschland GmbH opened the sustainable ContiLifeCycle (CLC) plant in Hannover-Stöcken, Germany, which combines bus and truck tire retreading with a rubber recycling system. As a result, the company was not only able to establish the innovative production process for tire retreading, but to enhance raw materials utilization significantly as well. A major contributor to the efficiency of the new plant is its universal automation system with PC-based control technology from Beckhoff, featuring optimal scalability and standard connectivity for Industrie 4.0.

According to Franz Stuefer, who heads the CLC plant, the new process for buffing, rebuilding and curing tires in a sustainable and resource-efficient manner represents a huge step forward in the retreading business for Continental and the industry as a whole. "Retreading extends the useful lifecycle of the tires, saves resources and reduces vehicle fuel consumption and CO₂ emissions by improving the rolling properties of tires. These are significant competitive benefits, because reducing the fuel consumption of trucks and buses is just as important to our customers as the tread life of their tires. After all, retreaded tires account for about 40 % of the market in the truck and bus segment."

Complete resource recycling

When a tire is retreaded, the buffing process generates rubber granulate. In the past, the granulate was either disposed of or it was recycled into lower end products, such as filler material for rail ties. With a new process, 100 percent of the granulate is now processed into high-quality raw ingredients for the new rubber mixture. "This concept of reusing 100 percent of the granulate completes the ContiLifeCycle recycling process," explains Franz Stuefer. "The lifecycle of a tire begins with its production, using raw materials like synthetic rubber, natural rubber or carbon black. Next, the tire hits the road and, if desired, customers



During the hot retreading process, an operator uses a Beckhoff CP7931 Control Panel with a 12-inch display, alphanumeric keyboard and add-on keys to apply a new rubber mixture to a truck tire's running surface and sidewalls.

have the option of re-cutting the tread to get more miles out of their tires. Once the tread is worn down, it comes to our CLC plant and is buffed. The granulate enters the mix production process after having passed through an innovative recycling test procedure to finally re-enter the production cycle. Then another tire is retreaded with this mix."

The conditions were ideal for the construction of the new factory, remembers Franz Stuefer: "We completed the project in only 12 months with roughly 200 Continental employees. We benefited from the fact that R&D, quality management, mixing production, inspection, engineering and Continental Machinery – our own machine and system engineering company – were already on-site. This also generated many synergies. For example, we now fully analyze and evaluate each tire that is sent to us for retreading. This provides the R&D department with valuable information that ultimately benefits the development of new tires."

Universal control technology

Dr. Paul Malliband, Project Manager of Control and Drives at Continental, notes that the company was also able to apply its synergies and many years of control technology experience for ContiLifeCycle: "We employ PC-based technology from Beckhoff for all control systems in this plant. At the start of the CLC project in November 2012, we used four different controller types. However, to make the maintenance process as simple as possible and streamline the controller interfaces to the MES level, we decided to make PC-based control the standard system. In addition, Continental Machinery, the machine manufacturing business unit of Continental Tires, has used Beckhoff technology in production machines for many years, which provided us extensive expertise directly on-site."

Beckhoff C6925 and C6650 control cabinet Industrial PCs (IPCs) are used to control all 25 production machines. Malliband explains: "The PC-based control technology from Beckhoff is highly scalable to accommodate every individual application requirement. We use the C6925 predominantly for basic machinery like our vulcanizing presses. The C6650 comes into play whenever more computing power is required. Examples include the multi-axis machines for attaching the tread strips to the tire casing in the cold retreading process, or for layering the strips in the hot retreading process. The same applies for the HMI, where we



The C6650 control cabinet IPC provides ample performance to control even large multi-axis machines.

use the proven CP7931 Control Panel with 12-inch touchscreen and an alphanumeric keyboard. This is supplemented with additional electromechanical keys where necessary, for example when a machine offers many application-specific motion control options.

MES connectivity via OPC UA

In line with Industrie 4.0 concepts, the entire facility is fully networked and connected to management-level IT systems. This is where the openness of PC-based control really shines, according to Malliband: "Vertical integration, i.e. the communication with the SAP system that serves as an MES (Manufacturing Execution System), is implemented via OPC UA. Since all C6925 and C6650 Industrial PCs run an OPC UA client, they directly communicate with the SAP system. At the start of the project, Continental's standards called for OPC DA for this purpose. OPC UA had not been tested at the time, but it is currently being analyzed for new production plants containing a large number of machines. We currently use several basic communication functions. The move to OPC UA positions Continental as a trailblazer in this area."

The benefits for universal OPC UA communication are already clear for Malliband: "It will increase the flexibility and efficiency of our production overall as envisaged in Industrie 4.0 concepts. For example, we plan to scan the tire barcode directly on the machine at the start of the retreading process and pass it on to the MES. The MES will then recognize the order for this specific tire and return the appropriate processing recipe to the machine." Alexander Kruse, Key Account Manager at the Beckhoff Hannover office, adds: "The SAP system is closely linked with the control platform. Production data, such as the barcode data, or different production steps can be exchanged directly via OPC UA. Method requests directly from the PLC into the SAP system will also become more common in the future. This will speed up communications while freeing up processor capacity for other tasks."

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