

Drive & Control profile

Rexroth Aluminum Framing and Flexible Conveyors Enhance Illinois State University's New Integrated Manufacturing Lab



Bosch Rexroth VarioFlow flexible conveyors allow students to connect the individual workstations with one another to integrate complete multi-step assembly tasks.

Generous grant from the Caterpillar Foundation and support from the Bosch Rexroth Linear Motion and Assembly Technologies group brings industry leading automation technology into the classroom

Funded by a generous \$1.2 million grant from the Caterpillar Foundation, Illinois State University's (www.tec.ilstu.edu) new Integrated Manufacturing Lab represents what university professors tout as industry

leading automation technology. The brand new lab comprises a classroom and an integrated automation systems laboratory with Bosch Rexroth components designed to give students authentic hands-on experience addressing

Challenge

Design a laboratory with industry-leading automation technology that provides students with hands-on experience

Solution

- Bosch Rexroth aluminum structural framing and conveyor components
- Rexroth VarioFlow modular chain conveyors

Benefits

- Students build their own fixtures using simple brackets, bolt-together fasteners and other aluminum framing components
- Freedom and versatility to configure workstations and assembly line as needed
- Conveyor's modular design facilitates quick system configuration, start-up and changeovers
- High tensile strength and low chain friction mean less energy and maintenance

major manufacturing trends like flexible manufacturing of small batch and custom orders, coupled with data collection.

Making the Grade

When ISU Department of Technology professors Kevin Devine and David Kennell learned of the substantial Caterpillar donation, they set out to design a laboratory that would provide students access to industry-leading automation technology that emphasizes hands-on tasks using the best automation components in the industry. To determine exactly which manufacturers were supplying the best automation components, Devine and Kennell visited neighboring universities, businesses, and industry sites to observe the types of technology being used. Time and again, one name kept rising to the top of the list...Bosch Rexroth.

“In nearly every assembly line we visited while conducting our research for this project, we found Rexroth aluminum structural framing and conveyor components being used to construct the workstations and assembly lines,” said Kennell. “Naturally, when it came time to choose products for our lab, there was no question. We were using Rexroth.”

Bosch Rexroth Linear Motion and Assembly Technologies representatives Tony Babich and Bashar Abdo worked directly with Devine and Kennell to design the workstations and conveyors and to select specific Rexroth linear motion components needed for



The VarioFlow single-strand flexible chain conveyor provides students with options to manage virtually any material handling requirement.

the lab. Babich was also part of a special advisory group, which included members from Caterpillar, Mitsubishi, Boeing and other manufacturing giants.

“The advisory group we assembled represented both the vendor and user perspectives—people who live and breathe automation every day,” said Devine. “The group was instrumental not only in helping us to decide what should go into the lab, but also in helping us develop relevant, practical uses of the lab in the form of projects and realistic manufacturing scenarios.”

The resulting classroom/lab combination is equipped to provide instruction in fluid and mechanical power systems, analog and digital electronics, programmable logic control, and a variety of manufacturing-based computer applications. The

laboratory contains ten identical workstations, each constructed of Rexroth aluminum structural framing, which allows students to build their own fixtures using simple brackets, bolt-together fasteners and other aluminum framing components and accessories on the slotted tabletop. The ease of assembly also permits students to perform configuration changes themselves where they can mount new components, electronic sensors and other devices without the need for special tools or training.

Within each workstation, students have access to a PLC, robot, a conveyor with variable frequency drive, vision system as well as radio frequency identification (RFID), human machine interface (HMI), sensors, DeviceNet and Ethernet-IP networks, and a personal computer. Additionally, two Rexroth VarioFlow modular chain conveyors enable students to connect the individual workstations and integrate an entire “system” for multi-step assembly tasks. The VarioFlow chain conveyor is a flexible industrial conveyor that provides students with options to manage virtually any material handling requirement. The industrial conveyor’s modular design facilitates quick system configuration, start-up and changeovers as students move from project to project. The chain’s high tensile strength and low chain friction also mean the conveyor system uses less energy and requires less maintenance for students and staff.

“Manufacturers are calling for more advanced knowledge from our students, so they have to learn how to integrate a variety of technical systems,” said Kennell. “The demand from industrial manufacturing is clearly for students who are capable of working with multiple automation components and systems for mass production as well as for the increasingly important small batch and custom demands. We’ve combined all of these options plus the capacity to introduce data collection applications into the Integrated Manufacturing Lab.”



As part of the curriculum, students must learn how to work in teams to simulate communication among a variety of manufacturing partners, including engineers, upper- and mid-level management, technicians, and end-users. To facilitate this communication, the ten workstations are linked together by the two “backbone” VarioFlow pallet conveyor systems. Each workstation typically accommodates two students, and workstations can be moved and configured to simulate a wide variety of manufacturing activities, such as machine tending, assembly, inspection, and palletizing. Identical workstations also allow instructors to replicate activities from station to station. Then, as students progress, the Rexroth conveyors are incorporated for multi-step assembly projects.

A Sweet Final Exam

For the official dedication of the Integrated Manufacturing Laboratory, students worked

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under the pressure of a real deadline to prepare a final assembly project. For the project, students designed an assembly line that allowed guests at the event to specify different types of chocolate candies that were to be placed in a pocketed box. Guests would go to an HMI screen to enter which flavor of chocolate they wanted placed in which of six pockets in the box. Once the guest completed his or her order at the HMI, the pocketed box would be loaded onto a VarioFlow conveyor pallet and an RFID tag would be written. The RFID tags, which contained the personalized recipe for that particular box of chocolates, were then placed on each pallet and the pocketed box would be filled according to the order. At the end of the line, each box received an identification label for pick up by the guest.

“The lab and projects like the chocolate boxes really immerse students in a genuine manufacturing scenario where they are called upon to perform under real time constraints,” said Kennell. “With products like the VarioFlow chain conveyor and the aluminum structural framing, students have the freedom and versatility to configure the workstations and assembly line as needed, using the conveyor to integrate each step. And, they are able to set up all the equipment completely on their own.”

For the candy project, two classes worked together with student programs running the tooling on the robots, and the entire setup was designed and built by students.

With the success of the chocolate candy project, Devine and

Kennell plan to incorporate new and more intricate assembly projects to prepare students for the real world demands of custom manufacturing and small batches. The department is also looking ahead with plans to expand the uses of data collection, including more applications of RFID.

“With the aid of Caterpillar and the leadership of companies like Bosch Rexroth, the Integrated Manufacturing Lab at ISU is now one of the most technologically advanced automation learning laboratories in the U.S.,” said Devine. “The department is pleased to provide students and manufacturing professionals throughout Illinois with this unique educational opportunity.”

Students at ISU are already clamoring to be part of next semester’s lab classes in the fall. Devine noted that student interest has been exceptionally high, and some new semester classes are full with waiting lists.

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