

PC Control helps ensure maximum flexibility

America in Motion revolutionizes automatic guided vehicles



Using onboard TwinSAFE technology, AIM has integrated emergency stops and bumper stops into the AGCs.

Automatic guided vehicles (AGVs) have traditionally been a niche technology used at relatively few facilities in the United States. As a company that is unwilling to spin its wheels on old technology, manufacturer America in Motion (AIM), based in Charlotte, North Carolina, USA, has reinvented the AGV design based on a PC-based control platform. The new automatic guided carts (AGCs) are easier for end-users to integrate and cost about half as much as traditional AGVs, making the technology attainable for far more applications than previously possible. Specific examples include news printing, automotive assembly, the plastics industries, food and beverage and general warehousing.

"AGVs are an ideal solution here to increase flexibility and cost-efficiency with a highly mobile alternative," said Tommy Hessler, CEO of America in Motion. Compared with conventional material handling systems based on automatic conveyors, transfer cars or manually operated vehicles, AGVs offer a high degree of flexibility. If loads being transported from A to B suddenly need to change directions, the AGVs from AIM will immediately change their route and handle the new tasks without the operator having to lift a finger.

Flexible controls enable application-specific configuration

AIM has introduced a dynamic new line of AGVs, which are actually automatic guided carts (AGC). They feature a full PC-based automation system from Beckhoff. The AGC consists of a standard burden carrier 'base' with an adaptable top to which different load handling devices such as roller decks or lifting forks can be added. "It's quite easy to add or remove capacity based on the type of load the AGC must handle due to the modular structure of the Beckhoff controls," Hessler said.

On-board intelligence

"PC-based controls have allowed AIM to integrate on-board intelligence into the vehicle," noted Theresa Blasius, Vice President of Engineering at AIM. "Our AGCs can be best utilized in applications that already have some automation control such as robot cells or automatic conveyor systems with a PLC. Via OPC, these types of controllers can easily command our AGC to carry the load anywhere in the facility, a feature that previously was unobtainable for stationary automation," Blasius emphasized. "PC-based control with Windows CE as the operating system enables us to integrate voice-activated commands," Hessler added.

Panel PC as the all-in-one system controller

AIM uses the Beckhoff CP7202 Panel PC with 15-inch touch screen as an 'all-in-one' system controller and user interface. Installed in a central location as a fixed AGC operator station, the Panel PC handles a broad range of functionality including traffic management, vehicle selection optimization, vehicle task management, load tracking, user interface for system monitoring tools, path programming logic, and AGC fault finding & diagnostics.



The mission of AIM is to transform AGV design and make it far more affordable so it can be applied in a much wider range of applications.

CX1010 Embedded PC for controlling internal functions

The onboard CX1010 Embedded PC handles all internal functions required for the AGC to operate, partly using TwinCAT automation software from Beckhoff and partly through C# software developed by AIM. The main functions of the Embedded Controller are guidance (magnetic tape or wire), routing (RFID), charging, steer control, drive control & precision stop, manual control via pendant, automatic load handling and safety devices (managed by TwinSAFE).

TwinSAFE onboard – the safe bet

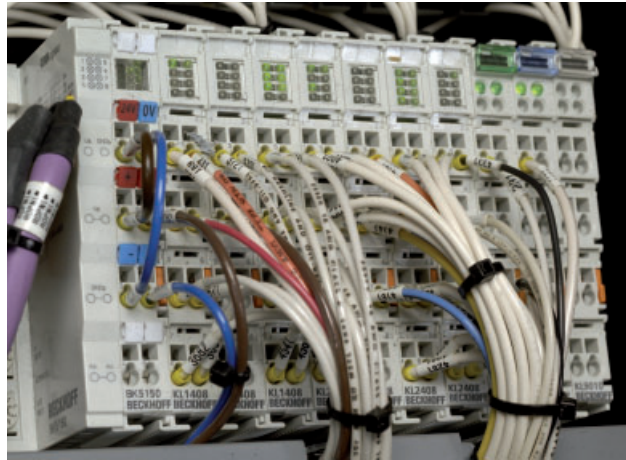
The CX1010 devices are directly connected to Beckhoff Bus Terminals and TwinSAFE Terminals for streamlined implementation of safety devices on the AGCs. TwinSAFE Terminals do not require a dedicated safety PLC, resulting in significant savings for wiring of safety devices. The KL6904 TwinSAFE controller terminal deals with the required logical link between the inputs and outputs. "TwinSAFE technology helps AIM maintain a competitive advantage by easily and cost-effectively integrating emergency stops and bumper stops into the AGCs," Blasius said.



A pendant-mounted CP7202 Panel PC handles a broad range of functionality including routing and traffic management, as well as overall system logic.



Tommy Hessler, CEO,
America in Motion



AIM utilizes Beckhoff Bus Terminal I/O onboard the AGCs and in a distributed fashion near CP7202 operator stations.

Flexible communication via WLAN or OPC

AIM also typically installs distributed Bus Terminal I/O near the Panel PC stations and utilizes WLAN communication between the Panel PC and the CX1010 onboard the AGCs. OPC is used for communication between the AGC system and other PLC controlled equipment, such as conveyor systems and robotic controllers. TwinCAT OPC Server helps AIM easily integrate their AGC systems with other material handling products while facilitating streamlined system communications.

Costs reduced, reliability increased

"The new AGCs containing the complete Beckhoff control system have run flawlessly in production mode," Hessler said. "With our new design running in the field since August of 2008, we have determined that AGC reliability has been superb and system uptime has been maximized for our customers." With our recent cost reductions, Beckhoff controls have helped AIM get into more markets by reducing the cost of our AGCs. "We can now reach numerous applications, such as food and beverage that are often too cost-sensitive for full fledged AGVs," Hessler added.

Commissioning – including installation, testing and acceptance – of a traditional AGC is typically a two or three week project. "AIM successfully completed the commissioning of the new Beckhoff controlled AGC in only four days," Hessler said. "Utilizing the Beckhoff Embedded PC with Windows CE environment, AIM has been able to quickly integrate with our other equipment to create the total solution," Blasius added. "We have also implemented remote access for

customer service and support using the CP7202. This saves AIM a great amount of engineering time and expense that would otherwise be spent for on-site support visits."

Driving toward the future with AGCs

"By using PC-based controls with PLC functionality, we can offer outstanding flexibility to all our customers," Blasius said. "Users of AGCs from AIM can be highly involved in the customization of system programming or they can simply run and maintain the systems; the choice is theirs."

AIM intends to continue moving AGC technology forward using PC-based and Industrial Ethernet technologies. "To serve our customers even better, we plan to implement EtherCAT I/O terminals and expanded WLAN capabilities," Blasius said. "We don't think there are any serious alternatives to Beckhoff considering the available tools from Windows CE to .NET framework, to the open, PC-based architectures." "I think we are on the brink of seeing PC-based control used in new ways such as AGCs paired with robotics," Hessler said. "This would be a way to tie both technologies together where the robot is the master and the AGC acts as the slave in the application. In this way, systems integrators could offer more than just the robot, they could also offer the material transportation to the warehouse."

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