

ALD passes on the benefits of a fully integrated architecture to its aerospace customers

Vacuum technology company deploys integrated, single-platform, Logix-based solution for the control of automation, safety, process and motion.

Solutions

A Rockwell Automation solution was installed, which included:

- RSLogix5000
- Allen-Bradley ControlLogix PAC
- Allen-Bradley GuardLogix PAC
- Allen-Bradley Kinetix6000
- Allen-Bradley PanelView Plus
- Safety I/O
- ControlNet
- DeviceNet

Results

- Unit can be modularised making it easier to address specific customer needs
- Additions can be made independent of the existing system
- Safety, motion, process and automation are all combined into a single architecture
- Reduced wiring effort
- Reduced commissioning time
- Easier troubleshooting
- Established name in the aerospace industry therefore attractive to customers



The new SmartCoater expands ALD's product portfolio

Background

ALD Vacuum Technologies GmbH (ALD), a subsidiary of AMG Advanced Metallurgical Group N.V., is a manufacturer of vacuum process plants for metallurgy and heat treatment. Based in Hanau, in Germany, the company is a leading provider of vacuum systems and vacuum process technologies; covering all areas of vacuum metallurgy and vacuum heat treatment with high-tech products and services.

With partners and subsidiaries in the USA, Great Britain, France, China, Japan, Central America, Russia, India and Singapore and more than 70 sales partners worldwide, ALD has a discerning international customer base.

The company's new "SmartCoater", part of its offering for the Electron Beam/Physical Vapor Deposition (EB/PVD) product segment, has been developed for coating turbine blades. While the company's existing XXL-Coater is used for production, the smaller SmartCoater, which deploys a Logix-based control solution from Rockwell Automation, is designed for laboratory use and repairs.

The prototype Smart Coater has been successfully installed in "Aviation Valley" in south-east Poland for a Polish university. During process commissioning ALD was quickly able to demonstrate stable, reproducible production parameters and the high quality and uniformity of the coatings produced.

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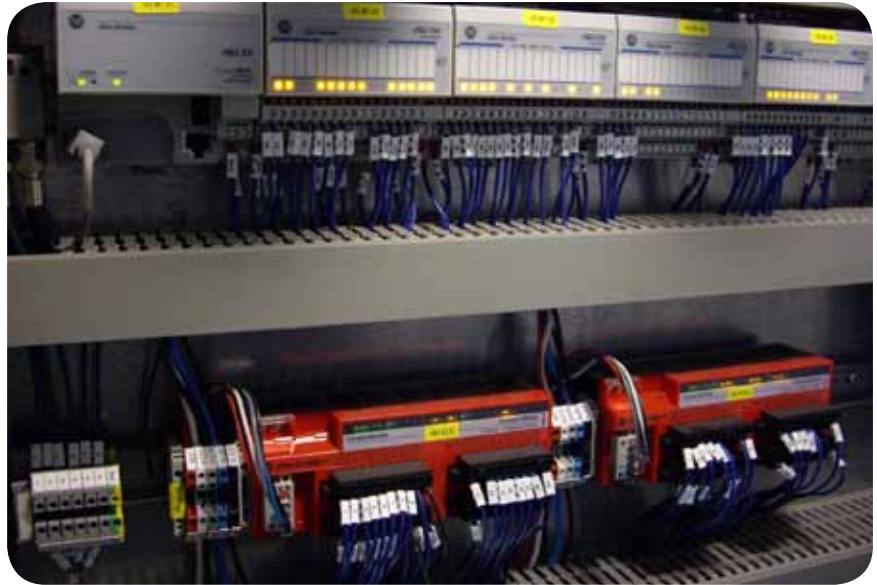
Challenge

A manipulator transports the turbine blades to be heated and coated in a vacuum. A heating- and gas-profile is followed. A ceramic material is then vaporised, using a high-voltage electron beam. The turbine blades are moved in the emerging ceramic vapour cloud using an individual motion program, which comprises multiple axis movements suited to the defined process conditions (pressure and temperature). The ceramic is then deposited onto the blades in a precise uniform manner.

During the selection of the automation platform ALD faced an issue in that it needed a solution that could combine all the aspects of the technologies deployed in the process. The controller had to be able to undertake complex measurement and control tasks such as regulating pressures and temperatures. Also, exact movement profiles for the multiple-servo-axes system had to be reliably co-ordinated. Interfaces to measuring equipment and control systems from various other manufacturers was also a requirement.

Solution

The Allen-Bradley ControlLogix and GuardLogix programmable automation controllers (PAC) offered the necessary performance with an easy-to-use development environment. The high degree of integration of the PAC, I/O modules and the programming software also reduces the time required for development and commissioning.



Standard PACs and safety PACs are installed in a common rack in order that the safety functions can be implemented easily alongside the control program, addressing the functional safety requirements in conformity with the Machinery directive. Integrated motion modules simplify the control of the servo axes and their incorporation into the process program.

To control the process plant, various measurement and control tasks must also be undertaken using an array of instruments and features, all of which are connected to the PAC using a variety of communication interfaces.

The control of pumps, valves and analogue measurements is realised using remote Flex I/O nodes that are accessed via ControlNet. The pressure measuring equipment is accessed via DeviceNet as are the gas controllers. The control unit that controls the electron beam, which is a powerful real-time system, is also operated via DeviceNet. Commands and set points can be sent directly from the PAC, making it possible to react very quickly to feedback from these control units.

From a safety perspective, the CompactBlock Guard Safety I/O is connected to the GuardLogix PAC over DeviceNet using CIP Safety. The requirements relating to the safety of machine control systems in accordance with DIN EN ISO 13849-1 can be realised efficiently and with significant cost advantages by means of integrated safety. This usage of common components for standard control systems and safety control systems also minimises costs for hardware, software, development and support.



The motion solution comprises an Allen-Bradley Kinetix 6000 multi-axis controller, which is integrated into the control system using Sercos. The complex multiple-axis motion control for the manipulation of the turbine blades was implemented in the RSLogix5000 development environment and therefore did not require any interfaces to external systems.

The use of GuardLogix, with integrated safety has proven to have significant advantages. The wiring effort and planning costs were reduced while the commissioning times were significantly shortened. Troubleshooting is also easier than with conventional hard-wired safety technology.

Thanks to the integrated safety option for torque shutdown (Safe Torque-Off) the Kinetix servo drives meet the safety standards up to SIL3/ PLd. The stop categories can be realised within the safety routine.

The system is operated using an HMI PC and an Allen-Bradley PanelView Plus. The PC is used for recipe preparation, operating mode selection, process information display and logging, while the PanelView Plus attached to the loading chamber is used to operate the manipulator's servo axes.



Results

The Coater comprises individual modules, each with the related vacuum components and drives. Due to the high degree of flexibility of the ControlLogix and GuardLogix systems, a modular approach was adopted, which made it possible and straightforward to react to customer requirements. Additions can also be made independent of the existing system.

One possible addition is an additional loading module. The process chamber can then be loaded from two sides and the cycle times for the system halved. A ControlLogix 1756 PAC is allocated to each side. The process module is controlled by a 1756-L61S PAC (SIL 3, Cat. 4, PLe) and the related 1756-LSP PAC, which takes over the central co-ordination of the overall system and monitors the safety functions in accordance with DIN EN ISO 13849-1.

The use of GuardLogix, with integrated safety has proven to have significant advantages. The wiring effort and planning costs were reduced while the commissioning times were significantly shortened. Troubleshooting is also easier than with conventional hard-wired safety technology. A further advantage is the possibility of displaying the safety interlocks in the information display, as a result a quick diagnostic overview of the state of the system can be provided for the system operator.

ALD can look back on many years of collaboration with Rockwell Automation. As the aircraft industry spread from American, products from Rockwell Automation have been used from a very early stage. Even with growing demand from European customers, ALD will continue to rely on the extensive experience of Rockwell Automation and achieve further success.

Additional Information
www.rockwellautomation.com

The results mentioned above are specific to ALD's use of Rockwell Automation products and services in conjunction with other products. Specific results may vary for other customers.

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