



AJYa Vacuum Technology from China specializes in vacuum-assisted die casting technologies for light-weight and structural parts in the automotive industry.

A CP2924 multi-touch Control Panel offers a clear overview of the current system status as well as zoom and swipe functions for convenient operation on 24 inches in portrait orientation.

PC-based control for vacuum die casting of automotive parts

High die casting quality through optimum control of vacuum generation

In die casting, vacuum generation in the shot chamber and mold cavity helps to avoid air and gas inclusions in the castings, as these would impair the stability of the finished parts. For this purpose, AJYa Vacuum Technology from China developed a complex but particularly effective multi-stage solution. A suitable control platform was implemented in cooperation with the automation partner Beckhoff.

Suzhou AJYa Vacuum Technology Co., Ltd., based in the Suzhou metropolis in the Jiangsu province, has been focusing on applications for die casting and injection molding systems since the foundation in 2010. Striving to meet the needs of customers and the market for the latest technologies, AJYa has consistently invested in research and development. That enabled the company to develop in-house a new generation of hydraulic vacuum valves, mechanical

hydraulic valves, mechanical valves as well as the HG series of high vacuum systems, the SP series of ultra-high vacuum systems and integrated multi-functional systems. This enabled breakthroughs for lightweight construction, which is becoming increasingly important in the automotive industry, in the areas of die casting, development and design of structural components and corresponding production technologies.

In 2021, the development team at AJYa focused on the field of integrative casting and broke through the bottleneck of multi-stage vacuum control for the die casting process. In cooperation with Beckhoff, AJYa developed a reliable and effective automation platform using PC-based control technology. The result is a control system that synchronizes all phases in the sequence flow of the multi-stage evacuation process. For that purpose, it accurately monitors and analyzes all key data such as the vacuum pressure in the mold cavity and shot chamber, the speed of the plunger rod and the contamination of each die during ongoing production. The resulting high vacuum of less than 50 mbar increases the yield strength of the castings by 10 to 15% and the corresponding elongation by 30 to 40%. The combination of multiple linked vacuum valves reduces the leakage risks and optimizes the vacuum generation. The machines offer a variety of production modes to help implement the suitable settings for maximizing the output of high-quality products.

AJYa has relied on hardware and software products from Beckhoff in various projects for motion control and high-precision measurement applications starting from 2010. The openness and expandability of the modular PC-based control technology from Beckhoff then enabled AJYa to realize the innovations and functional optimizations of the die casting vacuum control and leak detection system for the molds.

Innovation through flexible control technology

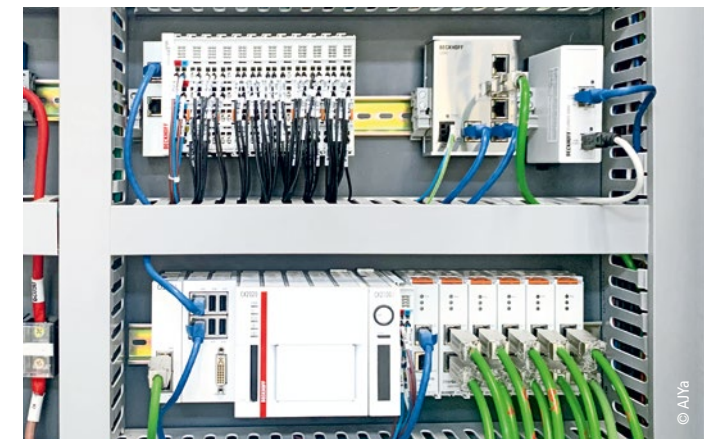
A powerful CX2020 Embedded PC with Intel® Core™ processor is used to control all system components. The control system also uses a large number of EtherCAT Terminals for digital and analog I/O signals as well as EK1122 junctions. Here, AJYa benefits from the Hot Connect function of EtherCAT through the flexible and reliable connection of multiple substations. The EL6631-0010 (PROFINET RT controller terminal) as well as the EL6692 EtherCAT I/O modules (EtherCAT bridge terminal) provide flexibility for high-speed communication with other devices.

The parameters required for system operation are mapped on the VacuMaster management software developed by AJYa in-house, which is integrated with TwinCAT automation software from Beckhoff via an ADS driver. On that basis, device information and process data from all units within the system are monitored, stored and analyzed.

A multi-touch CP2924 Control Panel is used for operation and monitoring of the system on site. According to Jinping Sun, an engineer at AJYa, the operator benefits from the advanced multi-touch functionality with convenient zoom and swipe functions. The visualization on the 24-inch display offers the operator a clear overview of the current system configuration.

Wengang Dai, Technical Director of the Technical Center at AJYa, explains the advantages of PC-based control technology from Beckhoff: "We have relied on PC-based control technology from Beckhoff since 2010. One of the main reasons for this is that the engineering environment enables the efficient development, debugging and reproduction of basic automation projects. The second reason is that the wide range of I/O modules from Beckhoff facilitates efficient design of the hardware configuration. What's more, it can be integrated with our customers' IT systems quickly and reliably. In addition, the modular structure and optimal openness of the control system offer great efficiency and flexibility. This means that Beckhoff components can be used in virtually all applications – as well as in our customer projects."

The AJYa experts Jinping Sun und Wengang Dai next to an SP series ultra-high vacuum system, where a PC-based control platform ensures optimum control of the multi-stage vacuum generation in automotive die casting machines.



A CX2020 Embedded PC and a variety of EtherCAT Terminals enable the acquisition of digital and analog signals for the precise monitoring and analysis of process parameters in vacuum die casting machines.

More information:

www.ajy-china.com

www.beckhoff.com/automotive