Versatile testing methods are given a flexible implementation

The quality requirements for the vacuum pumps and compressors made by Becker and used all around the world are particularly high. Precision in the configuration and matching of all components, and the continuous optimization of tolerances to achieve even greater efficiencies are very important. In this context, flexible test systems reduce the long set-up time required to test highly varied settings. Vogel Automatisierungstechnik GmbH implemented the test system, including the ObjectVIEW visualization software. Automation components from Beckhoff provided the basis for the control technology.

Becker GmbH & Co. factories in Wuppertal and Apolda qualify more than 80,000 vacuum pumps and compressors each year following a successful test run. The parameter test and the functional testing are indispensable elements in the products' quality assurance. Because the products are used in all parts of the world, they must support the power supply voltages at the site where they will be used. This can vary between 110 and 600 V, has frequencies of between 40 and 85 Hz, may supply a power of up to 90 kW, and may be available as three-phase power or as simple AC. This wide variety makes particular demands on the flexibility of the test system. The test system must meet very varied requirements, according to the device type – and must do this without long set-up times.

Testing the electrical and pneumatic parameters of pumps and compressors is done in a number of stages. Following final assembly, the devices are given numbers so that they may be uniquely identified. Each product type also has a factory number, by means of which the supply voltage parameters required for testing may be determined. In the subsequent phases, a barcode reader identifies the item by its factory number and device number. To begin with, the voltage parameters recorded in the device type are set. The device is then allowed to warm up for one hour, during which the electrical parameters are monitored, recorded and archived. This includes the measurement of effective power, current and voltage. After the warm-up phase, the pneumatic parameters of input and output pressure, input and output temperature and the volume rate of flow are measured. These parameters are determined and archived for at least three working conditions: full load, half load and idling. The ambient conditions, such as temperature and air pressure, under which each measurement was taken are also measured and appended to the set of test data. For the purposes of quality assurance and subsequent statistical analysis, the test results for each device are placed in a long term archive, and can be recalled at any time.

A total of six test units constitute the quality assurance system for the pumps and compressors. Each unit controls twelve test locations in parallel. The test benches are co-ordinated by a higher-level server. The Bus Terminal technology and bus-compatible components such as frequency converters and effective power instrumentation are consistently put to use at the I/O level. Each test system acquires about 70 digital and 100 analog signals through the Beckhoff Bus Terminals. The fieldbus devices communicate with the associated test location PC via Interbus. At the heart of a test bench is an Industrial PC for control of the test locations and six compact PCs of type CP7132 for visualization. The 15 inch Control Panel with Touch Screen and integrated add-on PC meet protection class IP 65. The test and inspection processes are controlled with the TwinCAT automation software. ObjectVIEW from Vogel Automatisierungstechnik, is used for visualization and parameterization of the test locations and test procedures. Also, ObjectVIEW is used for coupling to the higher-level server. TwinCAT OPC provides the link to the control software.

The tasks of the visualization software are divided into a number of modules. The first step is to provide the controller with the appropriate parameter data; thus, depending on which type of device has been read, the correct monitoring parameters and test procedures can be provided. The appropriate data is transferred to the frequency converter, so that it can provide the necessary supply voltage, and the test locations are synchronized. Another module is the one for operating and observing the test processes. Detailed information on the current state of the individual test processes can be examined. If any of the monitored parameters are exceeded, it is reported and archived. The implementation of automatically executed safety strategies when limit values are exceeded avoids destruction of or damage to any test items that may have faults. A central server is used to manage the data for the test benches. Its tasks include the acceptance and archiving

Vogel Automatisierungstechnik GmbH

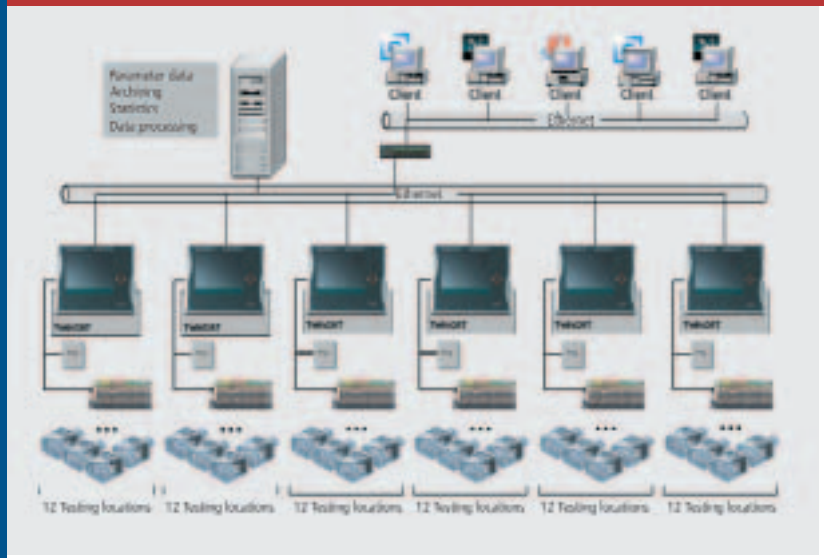
Vogel Automatisierungstechnik GmbH, as partners for the integration of automation and IT systems, implement customized technical applications and integrate them with company information systems. Vogel have brought pioneering innovations to the application of the LabVIEW graphical programming system from National Instruments through the extension of "Graphical Object Technology" with ObjectVIEW. This allows design, implementation and documentation to be carried out in the course of one working process, based on graphical data and event flow, object and Petri networks. ObjectVIEW is based on LabVIEW, a graphical programming tool in widespread use for instrumentation applications, but which until now has primarily been restricted to measurement tasks, and was not intended as a universal programming tool for distributed systems. With ObjectVIEW extending the functionality of LabVIEW it is possible to create applications of any size graphically. The software structure is based on intelligent distributed software nodes. Real objects such as sensors or intelligent bus components are assigned to software objects. This means that the application no longer consists of enormous blocks, but of a large number of small components that interact with one another. ObjectVIEW makes it possible to program complex test procedures as flow diagrams, and to execute them directly. The software is many times clearer and more transparent than implementations involving text-based programming tools such as C or Visual Basic. Changes to the test processes can be implemented rapidly without having to make far-reaching modifications to the software. This can bring a significant reduction in the effort required to develop and implement the software, and this finally results in a not inconsiderable cost advantage.

→ Vogel Automatisierungstechnik GmbH, Jena, Germany
www.vat.de, www.ObjectVIEW.de

Picture proof: Klinisches Medienzentrum (Clinical Media Centre) FSU-Jena, Michael Szabó

Test location for Becker vacuum pumps in the Apolda works

Systematic organization of the control system



of the test results, saving them to CD, and the management of all the necessary parameter data sets for the testing processes. The ObjectVIEW Server provides Internet client's access to the test system data. This means that modifications can be made to the parameter data sets, individual test results can be researched, and a variety of statistical analyses made using a standard Internet browser.

Jens Vogel, General Manager of Vogel Automatisierungstechnik GmbH, summarized in conclusion: "The combination of TwinCAT as the PC-based controller, and ObjectVIEW as the visualization and archiving software offers both large cost benefits in contrast with proprietary controllers, as well as a powerful technology that can effectively be adapted to future developments."