Increasing competition in machine tools
The manufacturers of standard machine tools must continuously improve their products in respect of speed, flexibility, performance and efficiency. At the same time, the machines themselves need to be manufactured more economically in order to sell them successfully in a competitive market. The majority of machine builders install controllers, particularly hardware, that is based on standardized technology available in the marketplace. The only chance to differentiate against competitors is the use of sophisticated software technology.

Increasing pressure on companies using machine tools.
The plant management must cope with the ever increasing demands with regard to the quality and supply of their products in the marketplace and associated documentation. In order to achieve still better integration of production and production data into the production management systems (PMS), the data is archived and processed where it originates: at the machine! It goes without saying that in the digital age of open controls paper reports are not to be used any more to avoid any human errors. The information should be provided to the operators, the end users and the manufacturers of the machines as well in order to fulfil the continuously growing requirements in manufacturing.

What can the users gain from this information?
The end user has the insight to ensure that the supplied parts correspond to the necessary quality criteria. For the machine manufacturer, the availability and maintenance data is of interest. The main beneficiary however is the plant manager, because from a PMS he can gain the necessary overview ofCompanyNameOverview
EMAG Maschinenfabrik GmbH - Salach, Germany
EMAG Maschinenfabrik GmbH is a market leader in CNC machine tools, boasting innovative vertical lathes and multifunctional Production Centres that drill, mill, grind, gear cut and allow for the application of lasers and other techniques. EMAG were originally Founded in Bautzen, Saxony, but were reestablished in Eslingen, Germany to as a manufacturer of lathes and special purpose machines. In 1969 the company moved to Salach, today’s Group headquarters and employs approximately 1,500 workers.

by Wonderware GmbH
modern day by day production. A PMS supplies information about orders, from which the manufacturing costs (cost per unit) can be directly derived. Longterm data archivement provides the ability to review batch times, the production rate and the rejection rate, in order to evaluate the process. From this any potential “bottle necks” can be identified.

At the moment, if a plant manager wants to gather such data the machine builder is usually dependent on external solutions. However such products always represent proprietary solutions, which are associated with high hardware and software costs. In addition to this, it is entirely probable that the data from today's plants is not directly compatible with the software of the future. In order to be prepared for these IT issues in the future, EMAG developed its own production management system in cooperation with a company named PAS.

Requirements

The following global requirements for a production management system were defined:

- First of all, the data must be archived locally, so that inquiries can take place directly at the machine. The data must also be available over the network, so that it is directly accessible to the plant management at any time. A central data archive must be made available without causing great cost.

- Due to EMAG's in-house control standards based on different vendors, the PMS must be able to integrate with each individual system so that the data from individual machines can be compared directly with each other, even though they use different protocols.

- The investment made in developing the system must be safeguarded for the future, that is to say that upgrades to a new operating system such as Windows XP should be possible, without the need to reinvent the software.

- All data must be available in a central, reliable and network-wide resource. Likewise, the relevant data must be available in the right format, at the right time, at the right place as required.

Based on these requirements, EMAG and PAS chose Wonderware FactorySuite from the systems on the market.

For the first implementation, a Sinumerik 840D CNC platform was selected. The system should be fully integrated into the interface of the controller. The hardware platform comprises a PCU50 with HMI Advanced version 6.x software installed.

This solution can also be implemented in combination with the following controllers:

- GE Fanuc 160i, 220i
- Rexroth Indramat (Bosch) 200 Series
- Heidenhain on all Windows based PC Controllers

Scope of Project

The visualization of the system was realized using Wonderware InTouch. Data acquisition and storage was implemented with Microsoft SQL Server and Wonderware IndustrialSQL Server. ActiveFactory is used to retrieve data from the network, and integrate into Excel or Word so that reports can be easily generated.

The production management system for EMAG contains the following modules:

- Analysis of technical availability (of which reliability is a factor);
With so much information, it is possible to analyse all aspects of a machine, such as the production phase, failure reports, etc. In addition, the operator can supplement the data with further information, for example maintenance and preparation times, which can be easily typed in using soft keys. As a result any weak points that are found will be revealed by monitoring. By analysing the plant during a production run, any potential bottlenecks can be identified, and adjustments can be made to the process parameters that increase the overall yield.

In combination with maintenance modules, the time, duration and frequency of downtimes can be recorded, and the planned downtimes can be calculated better. Apart from the production time, the OEE factor (Overall Equipment Effectiveness) is available at any time as a measure of plant efficiency. The comprising OEE factors performance, availability and quality of production are available at any time.

Without a doubt, a key highlight of the system is the fully automated measurement data logging, which does not require additional hardware. This allows data to be logged, archived and displayed in control charts, whether they come from internal measuring instruments or from external measuring instruments. The administration of the control charts is fully automatic, so that the user cannot forget anything, and the system will interface with third party statistic systems (eg. QS-Stat) that are in widespread use by customers.

Advantages and Uses
The system supplies 'objective' data, that isn't susceptible to the usual 'interpretation' that arises from human intervention. By abolishing the paper reports, today's complex production plants can be understood and examined much easier. The stability of the processes, and the quality of the products produced are directly accessible at the machine. Punctual recognition of downtime is a powerful tool, preventing potential bottlenecks and leading to an increase in production. This leads to an enormous cost reduction - the return on investment is clearly evident.

The interconnection of machines to server systems and the potential integration of existing high level ERP systems or databases, like SAP or Oracle, is now possible. With this system, the goal of complete horizontal and vertical integration in the area of industrial IT is much closer.