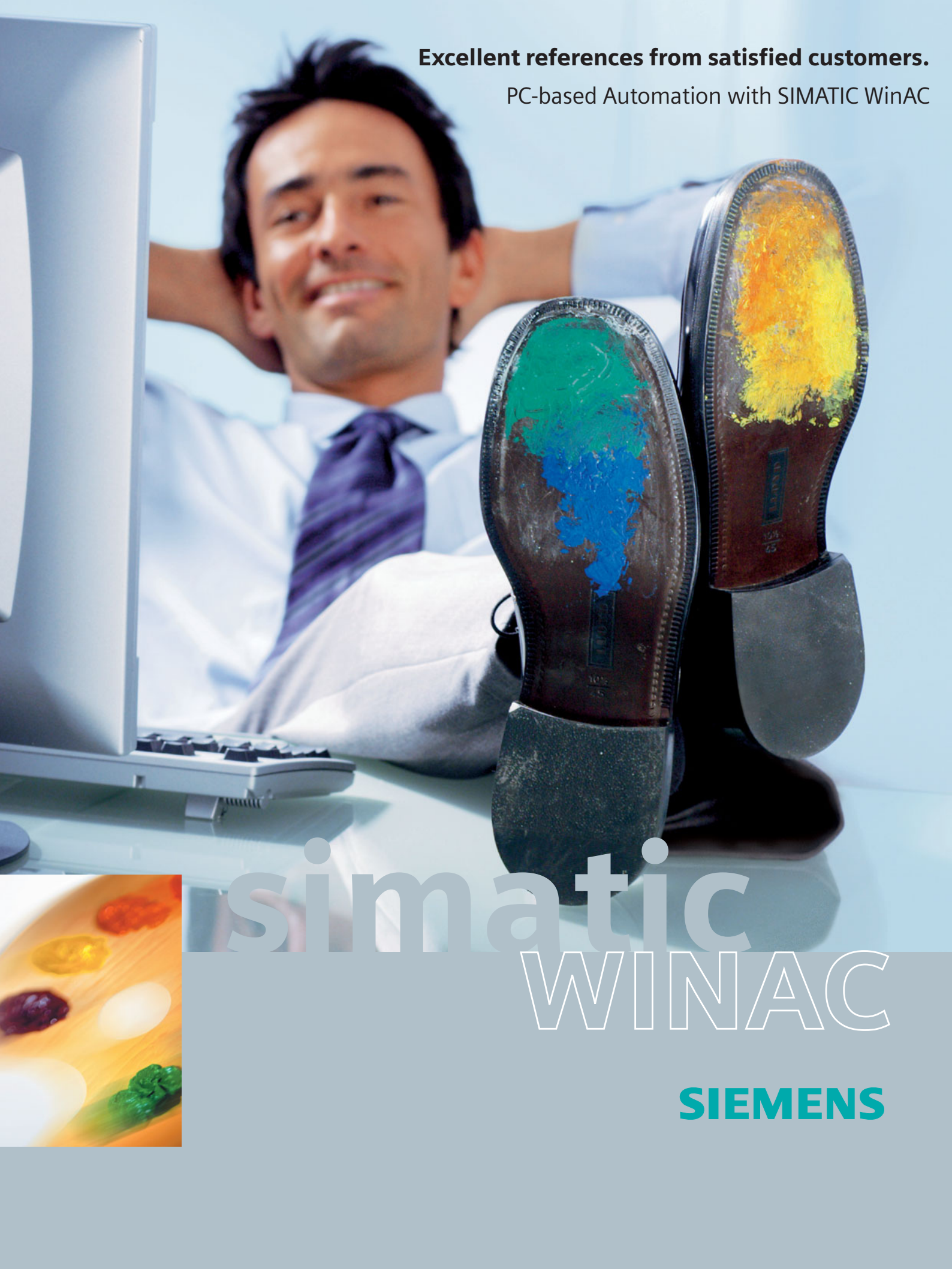


Excellent references from satisfied customers.

PC-based Automation with SIMATIC WinAC



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Flexible basis for creative solutions

SIMATIC® WinAC gives you access to an open, versatile and reliable basis for the implementation of your PC-based automation solution. Fully compatible with SIMATIC S7, capable of sophisticated technological tasks, and equipped with standard interfaces to the office world.

It lets you utilize all your know-how from typical PLC applications for even more complex tasks: From automation to IT integration, from data processing to motion control.

WinAC utilizes the field-tested engineering tools from the SIMATIC world. The developer will also find such outstanding benefits as programmability over LAN/WAN, online debugging, and the possibility of integrating self-developed software.

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The key to innovative sawing

Industrial sawing machines with PC-based technology controller

With its new TechnoControl concept, the market leader integrates tool- and material-specific know-how as well as additional distributed I/O in industrial sawing machines. A rugged industrial PC, in which a Slot PC quickly and reliably coordinates the movements of all positioning axes, ensures optimum computing power, openness and user-friendly operation.

When it comes to industrial sawing machines, not only the German market associates outstanding innovations and plant performance with Kasto Maschinenbau GmbH & Co. KG. The company was founded more than 150 years ago and after 1945 it became firmly established as one of the leading European manufacturers of industrial metal saws and long goods storage systems with the invention of the first metal hack saw. A second core business is stock devices, which are often supplied with full-service sawing systems.

With more than 500 employees at two national production facilities, regional offices in France, Switzerland and the U.S., and 26 agencies in Europe, Kasto is the only supplier to have all three types of industrial saws – hack saws, band saws and buzz saws – in its program. More than 110,000 units and more than 800 storage and order-picking plants have been installed to date in Europe, the U.S., Canada and Japan. Applications are found primarily in the steel industry, in the general machine construction and shipyards, in complex storage systems also in the windows construction industry and in the wood-processing industry.

Standardized control concept for all industrial saws

The industrial sawing machines that have been built in Achern, Germany, since the '80s were normally equipped with the company's own Kasto Minipos, Posimod or Compact-Control compact controllers. In order to consolidate the wide variety of customized control variants developed over the years, the manufacturer decided about two years ago to develop a completely new control concept for these highly automated industrial sawing machines.

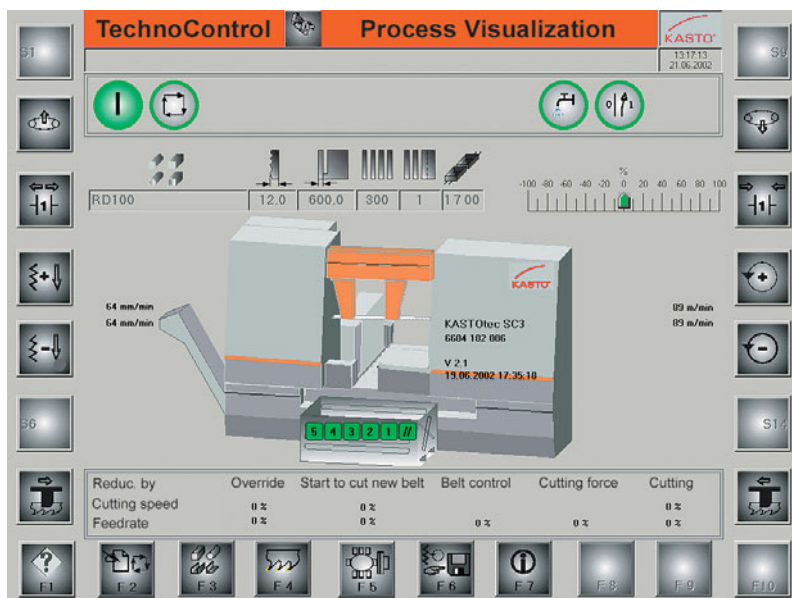
The objective was a modular system, based on standardized hardware and software, which could be easily and perfectly adapted to user-specific requirements by means of option packages. Subsequent expandability with distributed I/O components for material supply and removal – such

as markers, positioning drives or additional operator control components – was to be taken into account from the very beginning. It goes without saying that interfacing to higher-level control or inventory management systems was to be possible.

Another main objective was to make the extensive technological know-how accumulated over the years available to operators on the machine itself. The goal was to provide the first "technology controller" which, when given the optimum cutting data for a specific material, would ensure minimum machining time and maximum tool life. And the new HMI system was to be as simple as it was user-friendly in its ability to visualize the entire process, allowing job-trained personnel to quickly master the use of Kasto saws with a minimum of difficulty.

The compact operator control unit permits easy and problem-free operating on site: Industrial PC FI45 with Simatic WinAC Slot PLC





In automatic mode, all important process parameters are clearly visualized

Industrial PC with Slot PLC

"It was clear that only a PC-based system could fulfill such objectives," says the head of development, Dipl.-Ing. Matthias Eigbrecht. "And because we have always depended on PLCs from Siemens, the world market leader, the question of who the equipment supplier was going to be was quickly answered. After all, we wanted to focus on conventional standards to reduce excessive variations, and as far as we are concerned, one such standard is Step 7 for PLC programming." Another argument which played a significant role in the

decision-making process was the worldwide acceptance and availability of Siemens products, an advantage which is mentioned repeatedly.

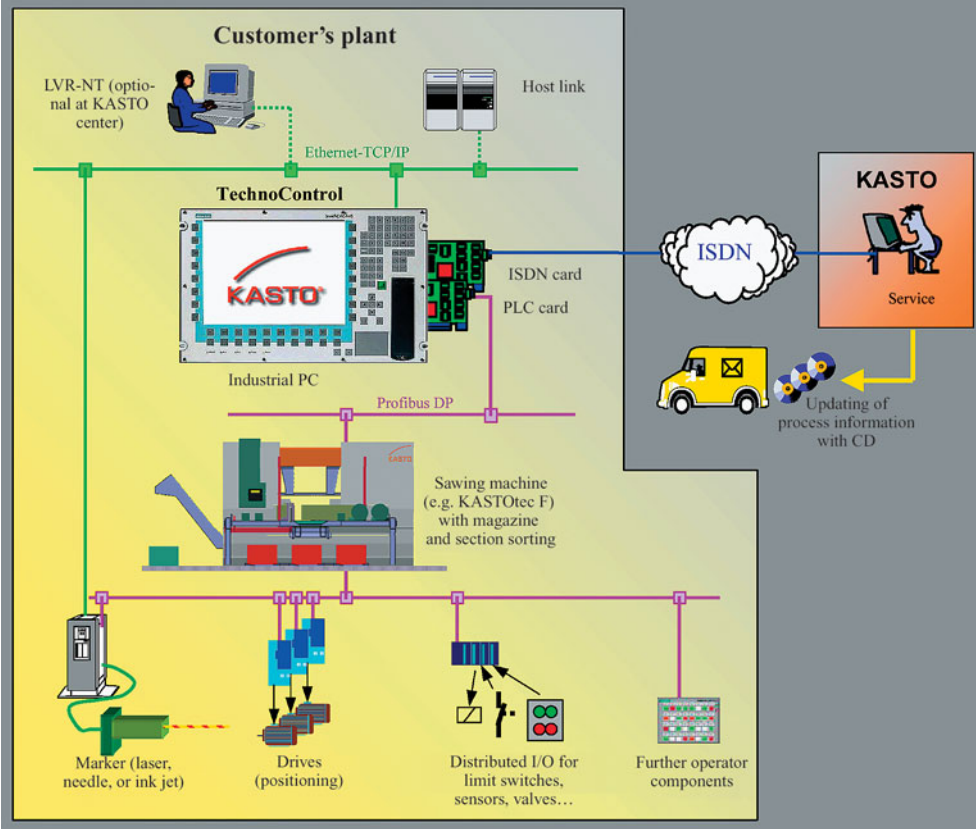
A suitable device for archiving production data and reading in software updates and technological data was soon found in the Simatic industrial PC FI45, a compact unit with 13" TFT display (resolution 1024 x 768 pixels), membrane keyboard, floppy disk drive and CD-ROM drive at the front. Although archiving and reading in can also be done over the FI45's integrated Ethernet interface, Kasto did not want to ignore the simple method

via floppy disk/CD, since the industrial saw machines on today's market are not necessarily networked.

When the question of PLC design was posed, a solution based on the state-of-the-art Simatic WinAC Slot PLC 412 seemed to crystallize into what was virtually the logical conclusion to the problem. "We had also thought about a pure software solution," says Eigbrecht, "which would have been possible, particularly in light of the now available real-time capable WinAC RTX with VenturCOM." Instead, in close cooperation with Siemens, the Slot PLC was raised to a new standard, which proved in retrospect to be an excellent decision, since, as Eigbrecht emphasizes, "the functionality we have since integrated was certainly not planned at the beginning."

The functional scope of the WinAC Slot PLC 412 is equivalent to that of a "conventional" Simatic S7-400 with CPU 412, which virtually predestines the slot PLC for applications with added demands on availability and operational reliability. Like the Soft PLC, it is fully compatible with the hardware devices, enabling direct transfer of program modules once they have been developed. Training went smoothly, posing no major problems. With increased support from the WinAC service hotline, extremely complex sawing machines have since been implemented.

In the most sophisticated project stage to date, the Slot PLC coordinates



Modular and flexible expandability: the PC-based control concept for all large sawing machines from Kasto

the smooth interaction of 13 positioning axes via Profibus DP. The intelligent motion control functionality is located in the converters in this distributed configuration. For a large plant of a Japanese customer, a number of hardware and Slot PLCs were also networked with a central master computer.

TechnoControl – open and flexible standard

On the basis of the hardware described above, Kasto developed and implemented its own user-friendly, graphical HMI system called "TechnoControl" – with a software package based on Visual Basic which underscores the openness and flexibility of the Siemens components.

The HMI system is based on the principles of workshop-oriented programming (WOP) and provides the operator with a clearly structured operator interface with practice-oriented function and menu keys. A conscious attempt was made to visualize as much information as possible using intuitive symbols in place of text. In addition, several supportive Help pages describing all inputs and functions in a variety of online-selectable languages are available for each menu item. To represent non-Latin characters, in Kasto's case most particularly Japanese characters, it was necessary to program Kanji characters in Unicode, which would have presented licensing problems with previous

standard operating systems for the industrial PC FI45 (Windows NT). By changing to Windows 2000 Multilingual, Siemens was able to eliminate this hurdle relatively easily and save costs at the same time.

Following input of material type and dimension (resp. a selection from the job list), the system suggests suitable technological data from the integrated material and cutting database which the user can either accept or modify. Following a belt or blade change, the controller automatically reduces the maximum feed rate values, which ensures "gentle" cutting in the beginning.

In Automatic mode, TechnoControl continuously visualizes all important process parameters and also controls marking of the cut parts as well as their removal, then their stacking, first in rows, then finally on pallets. The stacking commands come from a nested table generated in Visual Basic.

For the plant electricians, the circuit diagram, the device list and selected detailed photographs are stored in the system, enabling fast and detailed local fault diagnostics. Remote diagnostics via modem/ISDN also proved to be an efficient tool for reducing downtimes as well as the time needed for repairs.

Conclusion

The response to the first 25 PC-based industrial sawing machines with "TechnoControl" from Kasto is positive all around. "In fact, the first prototypes of our PC-based technology control systems were so successful," says Eigbrecht, "that the customers simply kept them." This is yet another reason why the automation engineers at Kasto are convinced that future innovations in industrial saws will come mainly "from the controller".

Source: *dima Die Maschine*, 10/02

PC-based for more transparency and improved diagnostics

Flexible automation of industrial dyeing machines

THEN Maschinen und Apparatebau GmbH is the world leader in textile dyeing machines and associated automation solutions. THEN innovated the color kitchen control system for its product program with a PC-based system, making the visualization of all process sequences considerably more flexible, clearer and easier. The heart of the control system is a real-time-capable SIMATIC Soft PLC from Siemens.

THEN was founded in Chemnitz, Germany, in 1919 and soon developed into a leading manufacturer of dyeing machines. In 1950, this family business moved its headquarters to Hesselstal (Schwäbisch Hall), where modern factory halls covering 5,700 square meters have been built over the last several years. With around 250 employees and 80 agencies all over the world, THEN develops and builds high-grade steel textile dyeing machines for the fabric and yarn-dyeing industry, most of them as air-pressure tanks for high-temperature dyeing. In past decades, the market for these machines has been repeatedly characterized by considerable geographical shifts. At

the present time, considerable growth rates are found primarily in Asia, especially China, and in Eastern Europe. In Germany, high-tech all-in-one systems, a segment in which THEN sees itself as one of the few competent manufacturers, are just starting to become popular. The company's electronics department, for example, develops and produces all automation and control station systems for all machines, including the color kitchen manager (CKM) with weighing station and dye solution system.

WinAC in open interaction with Visual C++

As with all purchased components, THEN has always depended on the highest quality when it comes to automation technology. Proportioning of chemicals, for example, was already being handled by a SIMATIC master PLC, SIMATIC I/O modules and a Profibus interface.

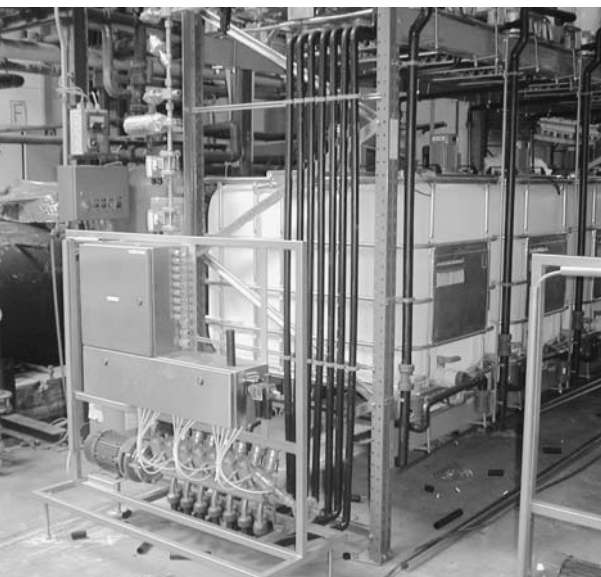
"The overhead required for direct access from our self-developed operator interface to the PLC was increasing more and more", explains Dipl.-Ing. Krumbiegel of THEN's software development department. "In our search for an equally reliable and powerful, yet flexible alternative, we therefore also considered a PC-based system. As Soft PLC with optimized runtime performance and reasonable response times, the SIMATIC WinAC RTX finally proved to be the suitable solution for the job."

For the automatic color kitchen, the chemical dosing (CHD) application and the dye solution station application have been successfully implemented using WinAC and Microsoft Visual C++. The CHD automatically transports any number of chemicals stored in a recipe (normally three or four) from a set of tanks to the dyeing machines as soon as the latter request chemicals in their dyeing program. The entire process – preparation, heating with defined dosing and heating curve, cooling and rinsing – is fully automated with no need for operator intervention. A large plant with 80 machines has already been installed and put into operation in China.

All function steps of the process sequence are put together by a recipe editor. In the PC-based system, the number of possible recipes depends only on the customer's specifications. All functions required to transport the chemicals are stored in the soft PLC. These processes, however, are triggered via the OPC interface by the C++ application, which specifies and synchronizes all necessary steps and thus off-loads the controller and the network. This makes it extremely easy to visualize and document the procedures involved.

Customized design for satisfied customers

The operator interface developed by THEN permanently displays the status of the most important valves, chemi-



Tanks and control cabinet for fully automated dosing of chemicals: Depending on plant size and recipe, as many as 80 machines are supplied with 1 to 6 chemicals without any operator intervention

icals levels and other process information, such as voltage, compressed air and dosing speed. "Thanks to the use of standard OCX controls", says Krumbiegel, "the operator interface can be individually reconfigured whenever necessary and adapted to meet specific customer requirements. This also makes it possible to use this concept for all WinAC-based process visualization applications." The dye solution station functions much like the CHD. As soon as the machine requests certain dyes or chemical solids, the system prepares a dissolving container of the proper size in accordance with a solution recipe (amount of water, temperature, ...) stored in the PLC's memory. When the operator has acknowledged the manual addition of the solids, they are transported to the relevant machine(s).

The use of OPC (OLE for Process Control) as uniform and vendor-independent software interface makes it possible to monitor and visualize all process data and control processes on the PC. Krumbiegel: "Direct access to sensors and actuators thus makes visualization of the processes exceptionally transparent while providing expanded diagnostic options, even via a modem connection. This is a decisive competitive factor, particularly in the global export business."

The OPC interface also makes it possible to access variables, even with other standard programs such as Visual Basic, which in turn makes the develop-

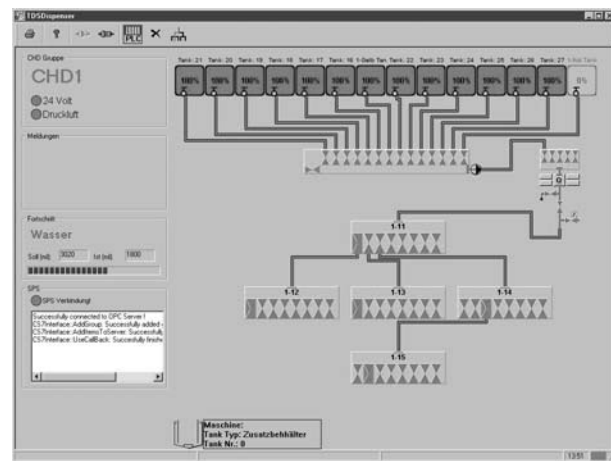
ment of commissioning and diagnostic tools much easier. Because a soft PLC comparable to a hardware PLC was installed on a computer instead of an actual hardware PLC, changes to important configuration data can now be copied directly to the PLC. In the past it would have been necessary to first program and send a new memory submodule. Now, the soft PLC makes that step unnecessary, which in turn also makes it much easier for THEN to archive the individual customer-specific program versions.

The success of THEN's PC-based color kitchen control system proves that, even in apparently conservative industrial sectors, innovative automation solutions quickly meet with a positive response – "when they run well!" concludes Krumbiegel.

Source: wdm, wägen, dosieren + mischen, 3/03



PC-based Automation with SIMATIC WinAC and Microsoft Visual C++: The real-time-capable soft PLC SIMATIC WinAC RTX ensures the required performance and can utilize the PC's entire main memory



Dosing with overview: From valve status to fill levels – with the aid of standard OCX controls, visualization can be easily customized whenever necessary, even to very specific customer demands

Flexible mixture

Totally Integrated Automation in elastomer production

Mixing rooms up to four storeys high for the production of rubber sheets are the core business of Gummi-mischtechnik Freudenberg. With its modular PKS 500 mixing room automation system, whose flexibly scalable “backbone” is based on uniform, horizontally and vertically integrated automation technology from Siemens, the subsidiary of ThyssenKrupp can meet an extremely wide and diverse range of requirements. The operators profit from enhanced transparency, flexibility, quality and productivity.

The mixture produced in the internal mixer is used as semi-finished component for a variety of important elastomer products, such as rubber goods (seals, sections, hoses, rollers), tires, cables, friction linings and brake linings). In addition to rubber processing, the mixing of rubber in the historical city of Freudenberg in southern Germany is one of the core businesses of Krupp Elastomertechnik GmbH, which was founded in 1997 and is now a subsidiary of ThyssenKrupp Technologies. With a total of around 850 employees in Hamburg-Harburg and Freudenberg (Germany), Topeka (Kansas/USA) and Belice (Czech Republic), the company is one of the world leaders in this sector. The company's strong points include engineering services and complete mixing rooms for the production of elastomer. The mixing rooms integrate all the necessary components – from receipt of raw materials (transfer to silos) to cooling the rolled sheets. The sister plant in Hamburg-Harburg supplies equipment for further processing to produce the final product (e.g. tires, sealing sections for cars).

From silo to sheet

In essence, the process of elastomer production consists of transporting (from silos and drums), weighing, feeding, mixing, extracting and cooling. In the mixer, solid, liquid and powdery materials – such as balls of rubber, carbon black, softening

agents, oils, special chemicals and additives – are carefully combined by two mixing spindles working in opposite directions until they form a homogeneous mass. Under extreme conditions (dust, heat, chemicals), this produces batches of the highest reproducible quality.

It is the job of the PKS 500 mixing room automation system to safely control and provide transparent visualization of the complex process. First of all, the system must ensure that the components required for the various recipes are automatically made available to the equipment in the mixing room at the right time and in the correct amounts. In the mixer itself, process parameters such as times, pressures, temperatures, torques, speeds and energy input must be maintained with absolute precision to ensure the quick dispersing of the mass without provoking an uncontrolled chemical reaction (interlinking or vulcanization).

From drive to management level

Correspondingly sophisticated is the PCS concept, which is distinguished on the one hand by uncompromising openness and “distributed intelligence” in autonomous function and data levels, while serving on the other hand as a classic example for horizontal and vertical “Totally Integrated Automation” (TIA) from the individual drive at the field level to the subordinate management level.

Distributed SIMATIC S7-300 controllers ensure the reliable, safe operation of the main units which are essentially independent of local disturbances. Depending on the configuration, the mixer (DP master), automatic and manual (computer-assisted) weighing stations for additives (KKV), rolling mill and downstream units are individually combined. The corresponding field-level units, such as weighing machines (SIWAREX U), temperature control units and hydraulic equipment, are connected to the controllers via distributed ET 200 I/O stations and PROFIBUS DP.

For local HMI, the preferred standard is also SIMATIC. Following in the footsteps of conventional text displays, operator panels and industrial PCs from the Siemens line of HMI (Human Machine Interface) products, the rugged SIMATIC Panel PC 670 in different versions has since garnered a permanent place in the PKS architecture.

The Panel PCs are used on the mixer as well as in the weighing of additives and on the rolling mill. “Downstream” they are connected via the SIMATIC Multi Point Interface (MPI) to the controllers. “Upstream” – with control room computers and database servers in the company network which supply material master data, recipe data and production data – they communicate over their integrated Fast Ethernet interface and a network hub.

The same interface also makes remote plant diagnostics possible.

The Panel PCs visualize completed production jobs and current process data in the field. The KKV computer also issues work instructions and prompts the operator to weigh additives manually before they are needed and to make them available for automatic operation. The rolling mill computer controls the rolling process and, among other things, provides information about how rolled sheets or strips are to be placed, cooled and, finally, packed.

Fully configured, the Panel PC 670 effortlessly withstands temperatures of up to 45 °C and is also well equipped to handle the high humidity levels common in Southeast Asia. Its vibration resistance during operation was tested to IEC 68-2-6 (0.075 mm at

10 to 58 Hz; 9.8 m/s² at 58 to 500 Hz), its shock resistance to IEC 68-2-29 (50 m/s², 30 ms, 100 shocks).

A vibration-resistant disk is available for the mobile revolving scale used to weigh additives. The devices are tested for electric strength and electromagnetic resistance in accordance with all relevant requirements (CE, EN, IEC and ENV). The industrial PC (with a choice of Celeron or Pentium processor), according to the manufacturer, can be upgraded with any auxiliary software. On the hardware side, in addition to the Ethernet, MPI and PROFIBUS interfaces, one USB port each at the front and back, two serial and one parallel port for I/O devices (printer, etc.) are available. The versions with 10 resp. 12-inch or 15-inch screens have a mounting depth of 130 mm.

Real-time control with Slot PLC

The link between the mixer's manual and automated control level is a SIMATIC WinAC. It is inserted as Slot PLC into the mixer's Panel PC 670, has its own 24 V power supply, and is completely independent of the Windows NT operating system, so that a computer fault has no effect whatsoever on the PLC.

The symbiosis between pure PLC and PC resp. information technology that has evolved over the course of several years has resulted not only in making new plants much simpler. Existing mixing rooms all around the world are also being retrofitted by the experts from Freudenberg. For example, porting of SCL applications from the SIMATIC S5 generation to the Panel PC 670 with Slot PLC made fewer autonomous controllers necessary, made response times up to 10 times shorter, and increased productivity by a double-digit percentage rate.

OPC – openness for transparency

The WinAC Visualizing module serves as the plant's central OPC (OLE for Process Control) server, and makes all automation data available on the mixer's PC for OPC-capable applications such as Excel or Access (OPC clients). The system is thus also open from a data-related standpoint for customer-specific expansions, for example for the analysis or documentation of any process data.

Source: KGK, 4/02



Distributed intelligence: one of three SIMATIC Panel PC 670s at the rolling mill at Krupp Elastomertechnik's development center



Control of paint shops for plastic vehicle parts

A plastics treatment plant in Fulda, Germany, depends specifically on a PC-based automation concept for modernizing and expanding its paint shops.

As specialist in the treatment of plastics, Teclac Werner GmbH is among Europe's biggest paint treatment companies for plastic parts for the automotive industry. At its Fulda and Lichtenstein (Saxony) locations, the company has a total of more than 500 employees.

Around 90 percent of Teclac's business comes from manufacturers and suppliers of Europe's vehicle construction industry, from Audi, BMW and DaimlerChrysler over Ford, Jaguar, Mitsubishi Europe, Opel and Porsche to Rolls-Royce, Volvo and VW. Typical parts treated by Teclac are bumpers, radiator grilles, trims, spoilers and door handles. Applications for the aviation industry, housings for household appliances, casings for cell phones, small series and customized samples as well as individual, hand-treated designer parts help underscore the company's flexibility.

Eight almost fully automated paint shops with robot-operated surface paint-spray and spindle systems are geared to different parts geometries and have a daily output of around 140,000 parts. Subsequent treatments such as printing, labeling, assembly and preparation (gluing, riveting, screwing) round off the com-

pany's many services. The foremost priority is always quality which, in addition to conformance with the current version of EN ISO 9001:2000, also requires certification to VDA 6.1 and QS 9000 especially for the automotive industry.

Complex topology ...

It was therefore predominantly a question of quality assurance and product liability which originally caused Teclac to use a higher-level computer to archive the process data of a paintshop for flat components, which, however, quickly evolved into a PC-based automation system with control tasks.

The flat-belt line which had taken shape over the years essentially consists of three spraying booths and two mixing systems for two-component coatings. The linking element is the conveyor system which is driven by frequency-controlled motors. A subsequently installed camera system automatically detects whether the parts need to be cleaned prior to treatment.

The individual units are networked over Profibus DP, and each has its own operator panel for distributed operator control and monitoring on

site. In addition, a small, rugged touch panel can be used for mobile diagnostics. It can be connected via the MPI bus of the control level at process-critical locations throughout the extensive plant.

All controllers and operator panels, even the camera system are from the Siemens Automation & Drives SIMATIC product line. The reason for such brand loyalty is not only the devices' guaranteed – and for use in paintshops indispensable – freedom from silicon, but also their problem-free integration in the PC-based automation concept.

For instance, older Simatic S5 controllers are networked here with controllers of the current S7 generation via the digital inputs and outputs of a distributed ET 200M I/O station. All threads come together in the higher-level PC, which communicates with central Linux servers over Industrial Ethernet and a downstream fiber optic network. In addition to archiving and process data backup, production data acquisition is now also integrated into this LAN.

... totally under control

The core of the PC-based automation concept is a Simatic WinAC (Windows



In Fulda, Teclac paints as many as 140,000 parts per day



To enable operator control and monitoring on site, a number of Simatic Operator Panels are connected to the WinAC controllers

Automation Center) software PLC from Siemens. The soft PLC, which is code-compatible with the Simatic S7 hardware, is programmed with the usual Step 7 tools, and attains instruction execution times of 0.2 μ s for binary instructions and 0.1 μ s for IEEE floating-point calculations.

The memory capacity is restricted only by the size of the computer's main memory. An uninterruptible power supply leaves sufficient time to shut the PC down safely in an emergency, ensuring maximum data integrity. As many as 125 Profibus DP slaves can be interfaced to the controller by means of a communications processor (CP 5613).

"I admit it, we were somewhat skeptical at first about depending on a pure soft PLC to control large parts of our paint shops", says Christian Mark of Teclac's electrical engineering department. But as soon as we saw that we did not have a single system crash under Windows NT in the initial phase, we decided to increase the PLC's control tasks step by step."

Using the Simatic ProTool/Pro configuration software, Teclac created its own interface comprising around 20 images for operator control and monitoring of the entire plant. "The switch from the familiar hardware controller to a software controller took a bit of getting used to, but wasn't really very difficult thanks to the uniformity of the programming and configuration

tools and the optimized interface in WinAC", says Mark. "And when necessary, Siemens Support provided prompt help."

The job data can be forwarded from the office level via Industrial Ethernet or entered directly into the central WinAC computer in the plant, which automatically transfers the relevant parameters to the local unit controllers and monitors the entire process.

First, a lifting system hoists the parts up one level, where a Simatic VS 710 (Vision Sensor) camera system automatically decides whether they have to be degreased. Following a visual check, the parts are dried for the first time in order to get rid of any water remaining from the cleaning process. Back on the lower level, batches of 2 times 5 pieces each are formed. In order to give the surfaces more "grip" and optimize the adhesiveness of the paint coating, a flame impingement by gas burners is the next step.

After another cleaning process, the parts are coated with primer. The parts pass through an evaporation zone before the primer is dried in a 12-pallet high dryer at 85 °C.

Following another visual check, the parts pass through the base coat booth at a medium speed of 1.6 m/min. A condensation time which is set to 12 minutes ensures that the base coat is just dry enough to provide maximum adhesion for the final clear coating, which is dried at 90 °C.



Safe and reliable: higher-level Simatic WinAC station with software PLC and UPS



Even the mixing of two-component coatings, although previously conventionally controlled, has become part of PC-based Automation at Teclac

The final inspection, which cannot be automated, is done visually.

Open to expansion

The precise sequence is specified by the operator of the higher-level WinAC computer by means of the item-specific program for the relevant application. The software PLC then transfers the corresponding parameters over the Profibus and the I/O module to the local controllers. The parameters for the conveyor systems' frequency converters are also transferred over the Profibus. Two mixing systems for two-component coatings have also been integrated in the PC-based system. Their fill levels are determined on the basis of flow rates by means of a counter module.

This makes it possible to convert the entire paint shop much more easily and in less time than before. Its operation is much more flexible and can be adapted much more quickly to customer specifications. The software PLC receives all status and fault messages as well as current parameters so that the operator always knows what is going on, which helps minimize downtimes.

Critical parameters – such as temperatures, humidity and the amount of fresh air and exhaust air in the individual booths, but also times, speeds and fill levels – are continuously collected and visualized by the WinAC station. Whenever the actual values fall short of or exceed the limit values

specified in ProTool/Pro, the system issues a warning or shuts down automatically.

Meanwhile, Teclac is so convinced of the advantages and operational reliability of the PC-based concept that in the future they do not intend to port the functionalities of their older S5 programmable controllers to S7 controllers, but rather straight to the WinAC level.

The first example is the flame impingement station. Here, a light curtain and an ultrasonic sensor make it possible to automate the complicated manual setting of parts position and parts height for the pass through the station, and to integrate them in the PC default parameters.

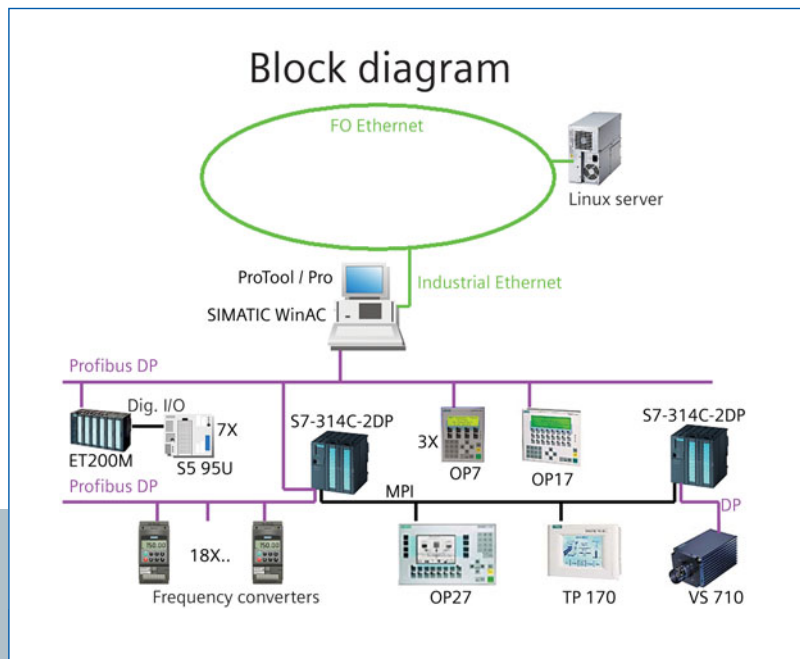
The WinAC system's software and hardware are still open to expansion. "We are very satisfied with the soft PLC. The system is absolutely stable and reliable. As far as the future trans-

fer of critical control functions from the conventional PLC level to the PC is concerned, however, we are also considering the use of the real-time Slot PLC from the WinAC range", concludes Mark. One convincing feature of the Slot PLC is the deterministic response so often essential for motion control or for closed-loop control tasks; use of the PS extension board also permits virtually PC-independent operation.

Based on the example of the first successful paint shop, Teclac has now reconfigured a second line (with continuous pallet train) for Simatic WinAC. The conversion of a third line is being considered – PC-based automation has indeed established itself well in Fulda.

Source: JOT, Journal für Oberflächentechnik 4/03

An automation solution for the flat-belt paint line at Teclac that has been expanded



Dosing of additives in packaging film production

PC-based dosing accuracy

The pharmaceuticals industry demands the highest quality in product packaging, and is demanding continuous proof of this quality with increasing frequency. In the area of additive proportioning, the pharmaceuticals division of a European packaging film manufacturer has recently begun fulfilling these demands with a PC-based control system that integrates many parts of the program and data management as well as a software PLC.

Pharmaceuticals are sensitive products whose packaging must often protect them against environmental influences for long periods of time. Typical demands on the mono and composite packaging films – for strip packaging, blister packaging or the packaging of suppositories include moisture barriers and gas impermeability, flavor protection, as well as to taste and odorlessness. Good appearance, haptics and, of course, the capability for further processing are required – and all of it at a competitive price. The precise characteristic profile is normally customized by mixing in special additives.

One of the biggest manufacturers of PVC packaging films for the pharmaceuticals industry is EVC Rigid Film GmbH, located in Bötzingen, Germany. EVC Rigid Film is ISO 9001 certified. Around 80% of the company's production consists of blister film for the packaging of pills. Special stretch films round off the product line. The Pharmaceuticals Division of EVC (European Vinyls Corporation) currently has about 280 employees and does its manufacturing in Bötzingen using five modern calenders and a coating plant. EVC Rigid Film is the first company in Europe to manufacture both

mono and composite packaging film at the same location.

Mixtures great and small

Large, centrally located silos supply five mixing lines with the main components for the various basic PVC mixtures. This produces batches weighing 200 or 400 kilograms for the film production process. At a certain time defined in the relevant recipe, a mixture of various additives, such as coloring pigments, titanium dioxide and emulsifiers, which must be weighed and dosed right down to the gram, are added to these batches. After all, it is the composition of a batch that is responsible for the constant quality of the mixture, and thus for the right color, consistency, dimensional stability, surface quality and other characteristics of the final product.

These additives are dosed separately so that the proportionally small amounts can be weighed to within the narrowly prescribed tolerance limits. In addition to systems for dosing large quantities, EVC has therefore had a separate additive dosing system for many years now. It consists of a revolving system of mixing vessels equipped with film bags which pass

through a row of twelve dosing/weighing stations and are accurately filled from smaller silos.

Since mid 2002, the supply of spare parts for the weighing technology in the additive dosing system, which is getting on a bit, is no longer guaranteed. In addition, the end customers in the pharmaceuticals industry demand the labeling and tracking of each and every mixture bag, which EVC wanted to combine with additional automation and process simplification. The recipes were to be read out of a central database and transferred to the additive dosing control system, while the latter, for its part, was to automatically inform the system regarding the amounts of additives actually added.

EVC contracted Contec GmbH Automation-Technologie from Meckenbeuren, Germany, for the planning and implementation. The service company, which employs primarily electrical engineers and process engineers, has acquired a great deal of knowledge and experience over the last five years, particularly in the areas of pneumatic conveyor technology, weighing and dosing, test stand engineering, and CNC applications. The result of this experience has been a

number of self-developed products, including a batch package (proportioning block) for single-component or multi-component dosing control systems. This proportioning block is suitable for liquids and bulk materials and can be used for precise, continuous dosing in differential dosing systems. In addition, Contec's engineers developed a software add-on for precise multi-axis positioning with Simatic S7 programmable controllers from Siemens.

Completely modernized

New to the additive dosing plant's automation network at EVC is a locally installed control PC with a Simatic WinAC software PLC from Siemens as

a basis. The pure soft PLC enables the economical conversion of non-deterministic processes in conjunction with data-intensive and extensive PC tasks. The resulting instruction execution times are 0.8 μ s for binary instructions and 1.2 μ s for floating-point arithmetic, which is more than adequate for additive dosing at EVC.

The soft PLC is in contact with two new compact weighing controllers from the Simatic S7-300 family, each for three two-channel Siwarex U weighing indicators. The former control system is still being used. It is now used for coordinating the distributed motors, sensors and actuators, and has been seamlessly integrated in the overall concept. Simatic MP

370 Multi Panels are used for manual operation and for monitoring the vessels/bags, with a Simatic PP17 Push Button Panel for emergency operation. The new solution is rounded off by a label printer, allowing EVC to fulfill the pharmaceuticals industry's demand for complete, uniform documentation.

"The new control PC with soft PLC," says Ludwig Gütle, who is responsible for engineering tasks at EVC, "now integrates the tasks handled by the old dosing computer and the functions of the previous PLC software. It also provides for simple interfacing to the higher-level 'coordinator PC', which in turn is connected to our central PPS host for job management and material management as well as with the 'report PC'." Higher-level tasks, such as the long-term archiving of production data over a period of up to 10 years, are thus decoupled from local tasks.

Optimized process sequences, results and transparency

In addition to the WinAC Basis soft PLC, a number of specialized software modules on the control PC of the additive dosing system ensure problem-free process sequences and con-



The operator can enter and modify recipes without putting load on the soft PLC executing on the same computer



At EVC, as many as twelve different additives are now weighed PC-based in accordance with a recipe and then placed in bags

sistent dosing results. Front-end for the operator is the MAWCtrl module (control of mixing instructions), which can be used to call up, edit and manage as many as 10 mixing instructions (recipes) from the coordinator PC's Oracle database. The module, which is programmed in the C++ language, functions as OPC client and edits the recipe data so that the soft PLC's OPC (OLE for Process Control) server can process them and precisely coordinate the mixing vessels on their way through the dosing/weighing stations via timed conveyors, roller conveyors and belt conveyors.

In addition, the WinAC soft PLC specifies the setpoint data for all twelve weighing stations over Profibus DP for the two weighing controllers, receives the actual dosed quantities as feedback, and balances the two in the background before finally sending them back to the PPS host resp. the report PC via the coordinator PC. The processing status is displayed on the control PC monitor. The transporting of the vessels can be monitored on the MP 370 Multi Panel, and the pro-

cess can be switched to Manual Mode using the PP17 Push Button Panel.

Software PLC with advantages

"Using the PC-based and pure software solution WinAC Basis was perfect for this situation because local PC functionality was required and the control overhead was manageable," explains Contec general manager Dipl.-Ing. Günter Tiefensee. "Uniformity and code compatibility within the Simatic S7 world were already given, making it easy and problem-free to apply program sections from the previous hardware basis." The company was able to develop and optimize all required software blocks itself. WinAC can execute on virtually all standard PCs under Windows NT or 2000 and the newest version executes under XP as well, so there are no new demands on the computer hardware.

The time frame for implementation was very restricted because production could not be interrupted or handled manually for too long. "The fact that it was possible to develop the

new process sequences and test them completely in the office without any additional hardware was a big advantage to everyone involved," underscores Dipl.-Ing. Jörg Preusch, (formerly employed at Contec, now Preusch in Tettwang) who is a specialist for the C++ programming of the application. The engineering took just under six weeks. Integration in the existing plant and commissioning, including the integration of a new coordinator PC, were completed in less than two weeks.

"Operators and plant managers at EVC had a very positive impression of our PC-based solution for additive dosing," says Günter Tiefensee. A statement confirmed by Ludwig Gütle: "The process sequences are now more user-friendly, more transparent and, in the end, more efficient."

Source: cav, chemie-anlagen + verfahren, 10/2003

PC-based control of textile machines

When the machine construction company A. Monforts Textilmaschinen GmbH in Mönchengladbach, Germany, moved the PC used for visualization, recipe management and archiving from the control console to the control cabinet for their stenter frames, the PC ended up right next to the Simatic S7 used for plant automation and control, connected via MPI and a CP 5611. To save space and avoid unnecessary hardware, Monforts turned to the market to find the optimum PC-based solution. There were many different possibilities, but at a customer event sponsored by the Siemens regional office in Cologne, Germany, the company found out about PC-based automation with Simatic WinAC. Since 2001, Monforts has converted all of its plants from using the classic PLC to the compact WinAC solution.

Monforts stenter frames

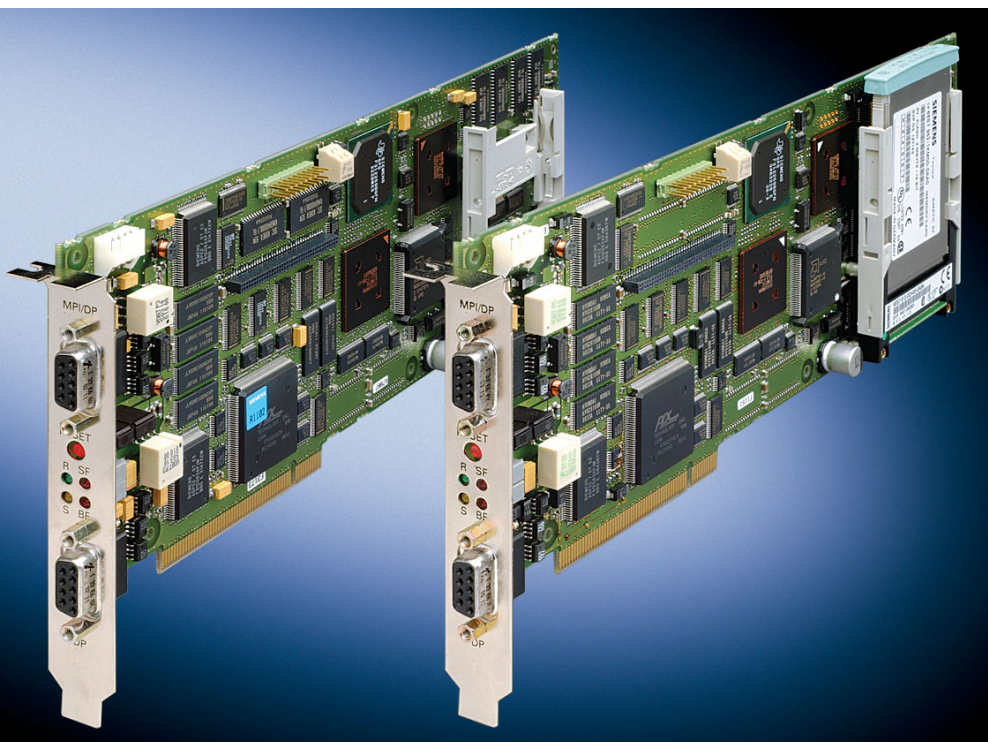
The most important product of the company is the "Montex 5000" stenter frame, which makes up approximately 60% of the total production. The modular stenter frames are used in textile finishing for pre-drying and for drying and dwelling processes (setting, condensing, coating). The patented Monforts "Twin-Air-Plus" system, with upward-flowing air and downward-flowing air which are sep-

arately controlled by means of frequency converters, ensure a constant temperature and an even flow of air during the process. The plants are modularly constructed. Between two and twelve chambers are combined with a wide variety of inlets, outlets and foulards. Each chamber is equipped with its own spindles for stentering the fabric and a chamber-specific profile for controlling air and heat.

The temperature in the chambers is between 200 and 250 °C. The length of fabric is secured by needles or so-called "grippers", which hold the fabric with clamps and stretch it. When the fabric passes through the stenter frame at up to 150 m/min (it normally passes through at about 100 m/min), the spindles that are individually controlled by the WinAC Slot can pull the lengths of fabric apart into any required preprogrammed full-width profile (up to 4,000 mm). The lint collected during the drying process is caught by sieves which can be cleaned out either manually or automatically while the machine is running. Monforts sells around 150 of these stenter frames all over the world each year, particularly to textile mills and suppliers, for example in Italy, Turkey, China or Pakistan.

Automation concept

The integrated control and automation platform used by all the plants includes a control cabinet PC with WinAC Slot 412-2DP PCI, a uniform visualization platform, Siemens Panels for local operator control, and Profibus DP and ET 200S for communication with sensors and actuators.



OLE for Process Control (OPC) serves as interface between the automation system and the other components (WinAC has a built-in OPC server). For interfacing to WinAC over distributed I/O via Profibus and ET 200SU, the Siemens "Competence Center Cologne for PC-based Automation" (CCC) in Cologne (CCC) developed a protocol interpreter for the 3964 R interface protocol. The new driver "RK 512 SI" is universally suitable for interfacing to serial data terminal equipment which have no fieldbus interface but which do have an RK12 interpreter.

The advantages of the WinAC solution were self-evident. The PLC rack, the power supply unit and the CP 5611 were unnecessary – a cost advantage which can be passed on to the end customer. The existing programs could be applied and the employees did not have to go through expensive training because Monforts was remaining in the SIMATIC world. The new solution is more compact, and communication is faster and more reliable over the internal PCI bus. In addition, the Monforts engineers gained a valuable interface. Availability was not a problem. Monforts therefore decided on a WinAC Slot

Card with its own 24 V power supply, which keeps the plant running even when the PC for some reason – even power problems – shuts down.

For safety reasons, the PC is also equipped with two mirrored hard disks. From its archive, Monforts can provide the customer at any time with a new hard disk containing all important data (automation programs, visualization, teleservice support, programming tools, tools for dimensioning and diagnosis of the frequency converters). The Step 7 control program is on the WinAC Slot, and also, complete with source code and comments on the hard disk.

The "Monformatic" computerized control system improves the profitability of the plants thanks to optimized dwell times and fabric speed. Monforts service also includes a clever teleservice concept: all set-up data records for fully automated machine settings (fabric width, temperature, speed, etc.) are stored, and can be activated at any time for quick conversion – even over telephone or Internet. With the aid of remote control programs and monitoring tools, the Monforts engineers can reach every controller in the plant that is connect-

ed to the automation system. And this is precisely where the future of the stenter frames lies: in addition to the optimization of operational ergonomics and dwell time, Monforts is continually working on the integration of additional sensors in the "Monformatic" control platform. And WinAC with its concentrated background PC power is just the right automation system for that.

Source: melliland textilberichte, 5/03

A totally automated assembly line for steel disc wheels

PC-based from sheet metal to wheel

From a rim and a disc a wheel is born. It is in accordance with this seemingly simple formula that steel disc wheels are created in a wide variety of different versions for cars and commercial vehicles of all kinds. Yet a totally automated wheel assembly line is proof that this sector has a lot of potential for innovation. Panel PC and Slot PLC ensure a significant advantage in flexibility, availability and even productivity.

In contrast to their light alloy sisters, steel disc wheels, commonly referred to as steel rims, are not made in one casting. The rim and disc are separately cut from the sheet metal coil, reshaped, and then assembled and welded. It sounds so simple, but a closer look unveils a quite complex sequence of steps which should be as efficiently coordinated as possible and, ideally, fully automated.

And this is precisely what Georg Maschinentechnik GmbH & Co. KG of Neitersen, Germany, managed to do in a most exemplary fashion with a new assembly line for Südrad GmbH. Südrad produces more than four million steel disc wheels in 500 different versions every year. As medium-sized company with around 80 employees, Georg Maschinentechnik takes its competence for such automation projects from more than three decades of experience in machine construction.

To a tested steel wheel in 13 stations

At Südrad, rim and disc are produced separately, transported to the assembly line over table rollers, and individually placed into the transfer system. Six sensors identify specific characteristics of the disc such as pin hole or vent hole and use them for precise positioning of the parts. Sensors also identify the valve hole, a process which involves lifting the rim out of the transfer system, turning it in front of a sensor, and returning it to the transfer system in the correct position. At the next station, a robot places the disc loosely in the rim's wheel-base, and in the next cycle it has already been pressed into the wheel-base hydraulically.

Four probes then ascertain the position of specific objects in the wheel, which serves as the basis for automatic vertical adjustment of four welding

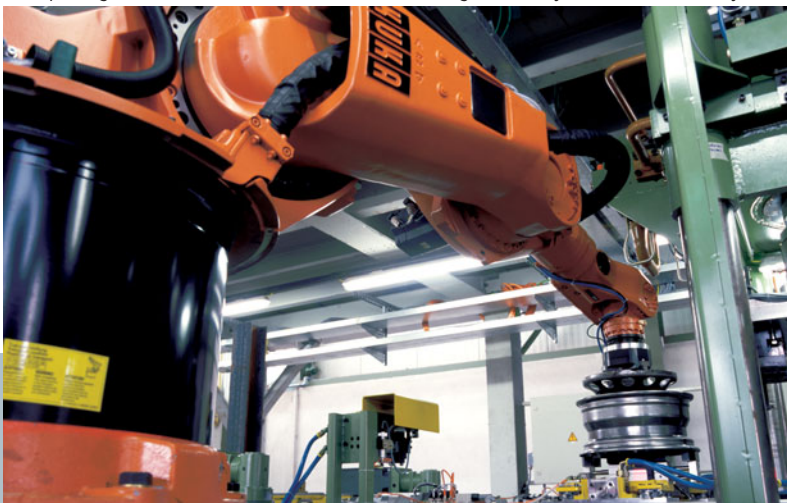
torches on each of two downstream welding stations. Depending on wheel type and welding program, either four or eight seams can be welded around the circumference of the wheel at these welding stations using the MAG pulsed-arc method. The next station is a free station, giving the operating personnel an opportunity to make a visual inspection.

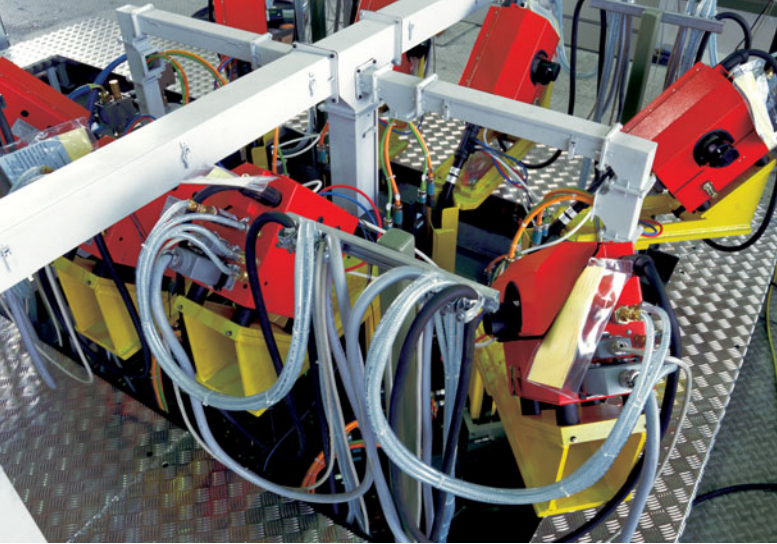
The iron scale formed during welding is removed by brushes which rotate as the wheel turns. In automated production, the extremely narrow diametric and radial tolerances on the rim flange, which forms the sealing surface to the tire, cannot be achieved. After cleaning, this section is therefore remachined in a calibrating station. In order to make sure that all weld seams meet Südrad's high quality standards, the seams are inspected carefully with the aid of the VIRO-3D weld seam inspection system. Wheels with faulty weld seams are automatically ejected for reworking.

Totally Integrated Automation from a single source

"To coordinate this entire complex line process, we have worked in close cooperation with Siemens to devise an integrated, distributed automation solution which could prevail over competitive concepts straightaway," says Dipl.-Ing. Guido Brassart, general manager at Georg. "Siemens enjoys

From placing the disc in the rim to removal after welding: the totally automated assembly line





Four welding torches are in use at the same time, and weld either four or eight seams per wheel, depending on the program

a good reputation in the automotive industry and with suppliers because the world leader's automation and drive technology is accepted worldwide as being rugged and reliable and is available virtually everywhere. As medium-sized company, we profit from our partner's extensive engineering know-how and service competence, which have proven themselves in this project again."

In this case, the joint recipe for success is based on a Simatic Panel PC 670 with separate touch screen and a Simatic WinAC Slot PLC 416, the more powerful of two plug-in PLC solutions from Siemens. The PLC program executes autonomously on the Slot PLC. The required data links between the two systems are implemented in the PC itself via OPC (OLE for Process Control) resp. S7 communication.

Another advantage is that the Slot PLC is accessible for maintenance and programming over TCP/IP in a company network, in the conventional manner via Profibus DP, or via the MPI interface. In addition, engineering for the drives can be implemented using integrated, standardized Simatic tools that are in use in virtually all industrial sectors. A UPS for Panel PC and Slot PLC ensures maximum availability as well as protection in the event of a power outage.

Georg gave the Slot PLC two Profibus DP interfaces in order to attain the

shortest possible cycle times even when there are a very large number of bus nodes. One line connects standard ET 200S/ET 200M I/O stations, among other things for regulating multiple hydraulic axes, and the other line connects more than 40 servo drives. The latter are all Profibus-capable devices of type Masterdrives MC Compact Plus, which enabled the use of simpler and therefore more cost-effective motors because it minimizes wiring overhead. The "intelligent" servos solve technological tasks such as position control, optionally also angular synchronism, synchronism, cam discs, positioning and more internally in the actuator, off-loading the controller CPU considerably. They are also linked to one another via the Simolink fiber-optics bus – a textbook case for Totally Integrated Automation.

Panel PC 670 – distributed configuration, time-tested and rugged

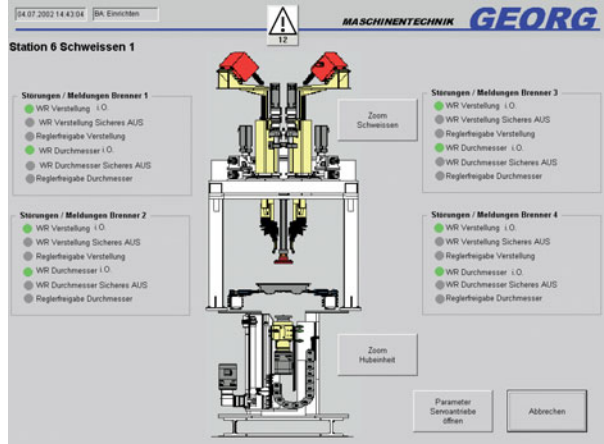
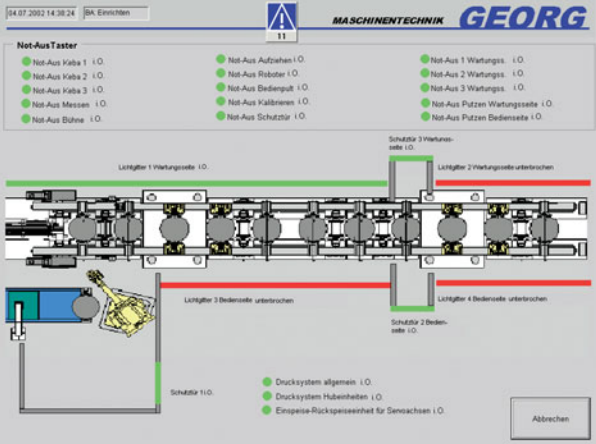
The interface between operator and machine is the Simatic Panel PC 670 in a distributed configuration, i.e. with separate computer component and a touch screen that is only 69 mm deep ideal for use at the machine level. More than just compact, this Panel PC meets the high demands specified by suppliers and operators with regard to the vibration load during operation. In the face of high welding currents, electromagnetic compatibility was also a basic prerequisite. Digital signal transmission be-

tween computer component and operator control component over a special 20 meter cable that can be trailed provides enhanced interference immunity.

The functionality of the distributed version is equivalent to that of the compact unit. All slots and interfaces were retained. Even the USB ports on the front panel with IP65 degree of protection remain active. The computer component is equipped with two additional USB ports. Commissioning overhead is virtually the same as before, and is reduced to simply inserting the rugged cable, which is resistant against industrial oils and designed for 10 million bending cycles.

As far as the communication capability of this solution is concerned, the Fast Ethernet, MPI, Profibus DP, serial and parallel interfaces and the above-mentioned USB ports of the Panel PC 670 leave no wish open. Südrad had already planned for a link between assembly line and corporate management level, which can be implemented without additional automation-level hardware or software.

The 15" touch display provides a lot of space for detailed graphical visualizations, and is the basis for state-of-the-art intuitive operator control, even of extensive plants. Just under 40 screen forms were generated with the Simatic ProTool/Pro configuration and visualization software, a quarter of them just for setting the extensive drive parameters. Standard under ProTool/Pro are an integrated message concept with error messages in plain text as well as job management based on simple CSV (Comma Separated Values) files.



More than 40 detailed screen forms were generated with Simatic ProTool/Pro; here the safety-related equipment of the line is shown

The 15" touch screen on the Panel PC 670 provides sufficient space for detailed visualization

Yet another advantage of the PC-based PLC solution: communication between Slot PLC and ProTool/Pro is extremely fast because it executes purely at the software level over the OPC driver – that is to say, without detours over additional hardware. This ensures the shortest possible updating times.

“Of particular importance to our customers was easy access to process data” says electrical construction engineer Helmut Merkelbach of Georg. “We have exhausted the extensive possibilities offered by the software and used ActiveX elements as well as our own scripts to manage the many product-specific traversing programs.”

In conjunction with the electronic single drives, it is very easy to switch the entire assembly line to a wide variety of different rim types virtually at the touch of a button, which minimizes downtimes and increases productivity. With close to 560 variables with the associated links, the risk of incorrect entries is considerably reduced.

Source: Automation & Qualität, 4/03

Additional information on SIMATIC WinAC is available on the Internet at:

www.siemens.com/simatic-winac

For a personal visit, you can find your SIMATIC contact at:

www.siemens.com/automation/partners

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