Control panel solution for printing machines

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Figure 1: The 96-pages roll offset machine Lithoman S with a sheet width of 2,86 m

PLC manufacturer

Biviator Industrieelektronik is an engineering office and a controller manufacturer. Coming from the watch industry, the company has 50 years of experience in automation, development, production and testing of the industrial electronics.

Machine manufacturer

The 65-years Lüscher Maschinenbau is specialized in development and manufacturing of mechanics and electronics for CTP (computer-to-plate) systems used in offset, flexographic, letterpress and screen printing processes. The portfolio includes computer-to-plate systems and automation solutions for job, packaging, industrial and security printing.

Biviator and Lüscher Maschinenbau jointly developed the Codesys-programmable Chimaera PLC (programmable logic controller) and HMI (human machine interface) for the Lithoman S offset printing machine. While the engineering process, the PLC was extended by a second CAN communication circle. Additionally, a pixel-clock card with a fiber optics interface was included into the controller's housing.

From the basic idea to have a cost-effective PLC and HMI solution in one device, the Chimaera Lu750 controller was developed, which is a version of Biviator's customizable Chimaera Embsys adapted to the machine manufacturer's requirements. The system features a 100-Mbit Ethernet interface, a file system and two USB host ports for connection to the PC world. For communication in the field two CANopen NMT master channels are provided. Programming of the system is fulfilled using the Codesys v. 3 development environment, which offers object-oriented programming, internal visualization and version management possibility. Further, diverse interfaces, GPIOs (general-purpose I/Os) and an FPGA (field-programmable gate array) are available. The latter allows hardware-programming in VHDL (a hardware description language for integrated circuits).

The machine may be operated via the controller's touch-screen as well as via a web-based visualizing tool. The functionality of the latter was extended to provide a support tool, using which a service technician from Lüscher may operate and maintain the machine on-site or via Internet from any connected PC.

Figure 2: Chimaera Lu750 embedded system board

Figure 3: Chimaera Lu750 control panel built in a housing

The Chimaera embedded system

Hardware
Central unit (module): Nvidia Cortex-A9 MP-Core, Tegra2 2 x 1-GHz (option), Marvell ARM Xscale, PXA320 (806 MHz) CPU
Memory: DDR RAM up to 512 MiB, Flash up to 1 GiB, MicroSD card
Interfaces: 2 CAN, Ethernet (100 Mbit/s), 2 USB (Host), RGB, DVI, HDMI (option), resistive touch, audio, 3 serial COM (option), 2 SPI, I2C, One Wire, address/data bus (option)
Peripherie: Digital I/Os, Analog I/Os, PWM, hardware-timer, IRQs, FPGA (co-processor, IP cores), power fail, watch dog and RTC
Displays: 5,7-inch to 15-inch touch display (option)
Power supply: Input 24 V; output 1,2 V, 2,5 V, 3,3 V and 5 V

Software
Operating systems: Windows CE 5, 6, 7, Linux, Android (option)
Programming: C, C++, C#. Codesys v. 3, Silverlight, VHDL
Server: HTTP, FTP, Telnet, file server (SMB), mail server; Codesys: OPC server, web server
Protocols: HTTP, FTP, TCP, UDP, SMB, Telnet; Codesys: CANopen, ModbusTCP
Database: MySQL
Tools: Remote display und BivTools
Visualizing: Codesys: Web, HMI, target visualizing

The documentation, programs and further files may be stored directly on the PLC by means of the included file system or on a server via a network access. Thus, a back-up image of the system's software may be created, downloaded and uploaded.

Printing facility

The printing facility consists of a plate handling system (PHS) and an imaging system. The PHS for the roll offset machine Lithoman S incorporates two plate magazines, which handle up to ten different plate formats. From there, the plates are inserted in one of the two imaging systems via a plate pickup drum. After imaging the plate is handed over for further processing via a second internal drum. The introduced PLC handles the control of the PHS and the imaging system. Thanks to customer-specific hardware (e.g. pixel-clock card interface, individual housing and form) and software (e.g. customized software image) adaptation a copy protection of the PLC is given.

The different variants of the PLC were built into the facility by stages. First, the plate handling system was equipped with the Lu750 control panel with HMI and PLC functions. Next, the control panel exchanged the previously used operator panel for the imaging system. Finally, the Lu750 was included into the imaging system. In addition, a further facility was equipped with a low-cost variant of the control panel.

Due to the modular concept and availability of diverse interfaces, the control system may be extended in the future, if further requirements are given. The device may also be used in other kinds of machines e.g. for punching water treatment, watch or textile industries. ◀