

Modular control system for high-performance rotation processes

As the leading vendor of high-speed bonding and fold humidification systems in rotary press printing machines, PLANATOL Systems International, Rohrdorf, has cooperated with ECKELMANN Steuerungstechnik GmbH, Wiesbaden, for many years now. For the COMBIJET 8MOD system for intermittent or continuous application of adhesives and soft agents for fold gluing or humidification in rotary press printing machines, by order of Planatol ECKELMANN has now developed a new control system on the basis of its own field bus modules that encompasses control of the application heads, glue or soft agent monitoring and sequential control. This application replaces a predecessor model that ECKELMANN had also conceived and manufactured for Planatol at the start of the nineties. The rising complexity and processing speeds of modern printing machines are placing particularly high demands on the modularity and realtime capabilities of the control systems used. The new Combijet 8 MOD now does justice to these requirements.

Longitudinal gluing and fold humidification

Brochures, magazines and newspapers consist of folded pages placed inside one another. In the case of longitudinal gluing on rotary press printing machines, a trace of glue is applied in parallel to the paper web's direction of motion. When the webs or paper strands are guided over one another, a glued fold then comes into being as a result of folding and pressing on the glued webs in the folding unit.

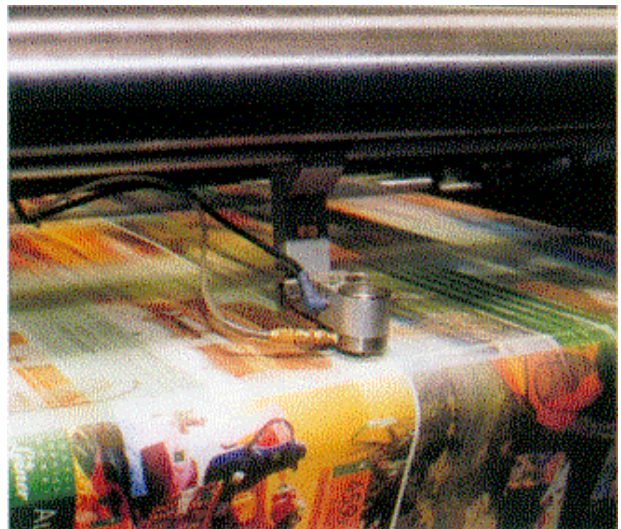


Fig. Application head

Fold humidification functions in accordance with the same principle. In this case, a soft fluid is applied which facilitates later precise folding of the webs. Depending on the width of the printed paper webs or the page size of the printed product, several application heads are used in a corresponding position in the folding unit. The glue or soft agent is applied continuously or intermittently in a parameter-definable line pattern and in synchronism with the printing speed.

The predecessor model - a tailored multiprocessor control

The Combijet 7 COM predecessor control consisted of three different modules: the head control, the media control and the operator control units.

As the master, one head control was able to control four or eight application heads, with the module for four application heads realised with fewer components. Further slave head controls were used to be able to implement larger printing machines with up to sixteen application heads. The head controls were placed in the superstructure of the folding unit. The second module of the control system based on a decentralised design was the media control installed in the direct proximity of the glue and soft agent receptacles to monitor all filling levels and to actuate media selection valves. The operator control units, which do not contain any process functionality, were accommodated in various positions on the printing machine or in a central control console. The individual control components communicated with each other via the CAN bus.

Although the Combijet 7 COM-System was able to keep up with the evolution of printing machines in the past years, its limits are now clearly evident.

Further development in depth and width

Planatol Systems International is constantly endeavouring to extend the limits of the longitudinal gluing system in terms of speed and the number of application heads. Where only one printing machine with one folding unit and up to sixteen application heads used to be controlled, with the new control system it is now possible to control up to five printing machines with one folding unit each and a maximum of 64 application heads.

Planatol is also achieving greater penetration of the market with supplementary products such as transverse gluing and the supply of inks for printing machines, and so a maximum of flexibility and standardisation is demanded of a control system.

Flexible solution in a new modular design

In the new Combijet 8 MOD system, all the aforementioned control functions are realised with the aid of ECKELMANN Field Bus Modules. The FBM series is based on intelligent I/O modules that possess their own processors and which are able to independently execute parameter-definable functions, for example for positioning or limit signalling. These functions are permanently programmed in the module. In the simplest case, these modules work as powerful interface modules distributed over the machine which communicated via a CAN bus. Programmable CPU modules can be added to the interface modules to produce self-contained miniature controllers. Every miniature controller assumes a subfunction in the machine, constituting a self-contained unit. These machine functions must be tested separately during commissioning, maintenance and service. Via the built-in RS232C interface, any CPU can be programmed locally or remotely. A file download for programs and data is possible via analog or ISDN modems. In future, planned modems will even permit cyclic remote maintenance of the machine without the need for deployment of a fitter.

For the longitudinal or soft system PLANATOL COMBIJETS, two autarchic FBM units were conceived for the media and head controls. The media control consists of the standard FBM CPU and a number of digital input modules adapted precisely to the scope of the machine for reliable monitoring of the glue and soft agent tanks' filling levels and corresponding output modules for control of the valves and pumps.

A special CPU module, the CPU-AKS, was developed for the head control. Its particularly powerful processor calculates the necessary activation and deactivation processes of the application heads on the basis of the parameter-defined patterns of the glue lines and depending on the speed of the paper rollers. As there is a delay between signal generation and the actual opening of the head valves, the control must calculate a certain lead of the control signal. This lead is dependent on the speed and calls for considerable calculation capacity, especially in acceleration phases. The processing unit used by ECKELMANN supports this process up to a paper speed of 20 m/s, and each CPU-AKS can operate up to sixteen heads.

The CPU-AKS, in turn, controls special two-channel power modules that open and close the application heads' valves via a programmed voltage profile. To this end, the

power module possesses an adjustable characteristic curve for over-excitation and the holding current as an independently executable closed-loop control function.

Besides containing the operation and monitoring functions, the operator control units also include the main program with the organisation blocks. The operator control units also store and manage order-related data and exchange this data via ARCnet, or in future via Ethernet TCP/IP, with the printing machine's control console.

Advantages of the new concept

Thanks to the modular structure of the FBM series, control applications can be designed that are freely scalable to customers' wishes. In this way, the printing machine manufacturer or the printer receives only as much control hardware as the application needs. The modularity principle also affords considerable advantages for the new PLANATOL control. Each CPU-AKS module computes and controls one to sixteen application heads. Thanks to external CANBus coupling of up to five CPU-AKS modules, gluing and soft systems with up to 64 application heads can be put together. Thanks to independent processing of the machine function, the control is not tied to one specific printing machine, but can serve up to five different printing machines with different production outputs and processing speeds.

However, the modular design also facilitates later upgrading of existing systems. If, in the old system, a machine was to be upgraded from four to eight heads, for example, this meant replacement of the head control pc board that had been manufactured specifically for the machine. In the FBM system, a further power module is simply attached to the existing CPU via the internal ME bus. Therefore, this process saves time and investment costs when it comes to later upgrading.

Thanks to the consistent use of standard interfaces and external communication, the FBM modules can be combined easily with control modules from other manufacturers and with all common operator control units and remote maintenance tools. This facilitates interfacing of the printing machine periphery to the tailored system environment.

FBM control applications - flexible, low-cost and powerful

Therefore, the highly dynamic head control for PLANATOL COMBIJET 8MOD is a tailored development of a new module from the ECKELMANN field bus series, while the media and transverse gluing control and the planned ink supply can be realised

with standard modules. FBM control applications units the advantages of a low-cost and proven series architecture with the option of application-specific special solutions.

Fig.: FBM modules

ECKELMANN FBM modules are used not only in the PLANATOL longitudinal gluing system. The standard CPU module and diverse intelligent I/O modules with specific functions of their own are also used in other peripheral applications such as remote monitoring and in the open and closed-loop control of hydraulically, pneumatically and motor-driven units. The technical and economic advantages of the FBM series come fully to the fore in these applications also: thanks to the use of local processor units with maximum distribution of specialised tasks, the ECKELMANN machine controls achieve maximum control performance in comparison with conventional system and with clearly lower investment costs.

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