

## Computer-integrated production in offset printing plants

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Schweisser:

In my speech I would like to report on the employment of Print Pilot in daily practice. Taking MAN Roland's Graphic Centre in Offenbach as an example, you will recognize the advantages which result from the employment of the information-processing-system, Print Pilot, for our customers. The first Print Pilot system will be installed in our department, where it should be great success in daily use.

Along with the advantages of the modulated development in production control, our software- and electronic specialists can constantly have direct access to the network. It guarantees optimal teamwork on the development of the departments concerned.

First of all, I will briefly introduce the Graphic-Centre itself to you.

The Graphic Centre in Offenbach is the training- and instruction centre of MAN Roland. It is a big printing plant, where daily training- and printing demonstrations are carried out by 63 employees on 18 sheet-fed offset presses with 69 printing units, in all size classes and various equipment, for our customers all over the world.

High printing quality, great flexibility in planning appointments and a smooth turn-out of production are constantly required here. How profoundly our capacities in the Graphic Centre are utilized, makes the following statistics plain.

The number of training programmes have risen from 110 to 240 yearly, between 1982 and today. In this time span, the number of printing demonstrations has risen from 155 yearly to 600 yearly. We expect a further, strong increase in the future.

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In order to cope with these great tasks, naturally the employment of the information processing system, Print Pilot, offers many services.

The modules which will be integrated into the network, will be clearly visible from the next drawing.

In all, 9 Personal Computers will be inter-connected into the network by a common server, which will form the central station in the network. The information will be stored on this server. It will be then accessible to the single stations. Furthermore, a connection to our host will be realized.

The following modules will be installed in the different departments:

Material Pilot	->	Incomig materials
Material Pilot	->	laboratory
Storage Pilot	->	Paper-store
Operations Schedule	->	Department "Printing demonstrations"
Operations Schedule	->	Department "Training"
Auto Pilot	->	Press room
OP Pilot	->	Department "Technical Management"
Quality Pilot	->	Department "Quality-control"
Manager Pilot	->	Management "Graphic Centre"

The control of incoming material will be carried out by the receiving office and in the laboratory. Let me explain how the process will work: The usefulness and the quality of material supplies are controlled at the materials receiving office. The tests are carried out on the Personal Computer.

Its structure results in a list of crossed-out words. Emerging mistakes are marked and noted. When this is completed, established mistakes are inserted into the Personal computer from this test-form. An examination certificate, respectively a sorting assignment, which describes the condition of the supply, automatically follows. What is new in this system is, that all the established mistakes automatically flow into the statistical evaluation. These statistics can be called up anytime and provides statements on the supplied material for definite periods of time.

With that, it is possible to prevent production problems which originate from mistakes in materials. The requirement is that all the incoming paper supplies are checked, because otherwise a statistical evaluation makes no sense.

Parallel to the control of incoming material, another similar control happens in the laboratory. Tests in the laboratory will not follow constantly, but only according to need. The reason for this is the considerable high cost for such a special test. Paper and ink are tested in our laboratory according to definite, established criteria like the tensile strength of paper and the tack of certain inks. Our quality control programme at first admits differentiated and numerical visible analysis, which the requirement of a differentiated quality control form. The advance-action corresponds, principally, to the proceedings of the material intake, however the produced certificates for this contain detailed statements on nominal value, tolerances, limiting values and measurements.

After the insertion of the emerged mistakes, likewise on reception of the examination certificate a protocol is automatically written. This summarizes the existing mistakes and specifies mean-values and standard divergences of measurements. In this way it is possible to efficiently operate the incoming material control in the sense of quality safety.

The next module in our network is the Storage Pilot. This is a specially developed programme for the warehousing of paper palettes. With this programme a new high bay store is full of over 700 palette-spaces. In the paper store, incoming stock is recorded, one of the specifications of paper is identified according to the storage space in the high bay store. Search-criteria can be inserted. These can be the size, the weight, the paper's quality or the supplier. Therefore, a long search for palettes or remaining stock in the warehouse is avoided. The computer then identifies the corresponding palettes and their storage space. In this way, constant access to the present paper-stock is open. An inventory is retrievable at anytime. Mistakes and wrong orders can be eliminated.

The stock can be reduced through the computerized warehouse. Minimization in the cost of the material area is the result.

The module, Appointment Pilot, will be integrated for the operations schedule. There we must, of course, take into consideration the special demands, which exist because of our organizational scheme. This module will be employed in the printing demonstrations and the training department and takes over the Graphic Centre's whole operations- and capacity schedule. Both departments will have access to a data bank, in which the common capacity of the staff and presses will be stored. Our instructors are engaged rotation-wise in internal service for training and printing demonstrations as well as service for instruction in the customers' printing plants.

Without the use of the Appointments Pilot, changing appointment preferences are rendered more difficult, there is a drawling communication with the customers, which in turn makes the disposition of the available capacity more difficult. Double occupancy, overlapping and lack of consideration for the capabilities of staff and machinery can be avoided through an obvious representation of the disposition in the affected departments. The programme will be so visibly designed that the printing demonstration- and training departments can completely renounce the conventional disposition-board, after an original bridging phase. The occupancy of this programme's resources are not limited to a relatively short time-span like the conventional disposition table, but the dispositions can go on on a really big scale and time-span. Another advantage of this programme is that it also contains the holiday-schedule and the tending time of the machines' capacities.

The order preparation consists of a programme to initiate and define a new printing order to be prepared. General details of the order, technical and subject-related input, are prepared by the technical manager in the Graphic Centre, and furthered to the corresponding printing press through the network.

The operations schedule Pilot is equipped with an On-line connection to the electronic plate scanner EPS, and the positions of the ink slides, which are calculated there, are taken over in the different ink units as colour profiles. The flow of data will happen here on On-line also and no longer with a cassette as a data medium.

Through the pre-setting of the order and the machine-related data, the preparation time on the printing press will be increasingly shortened.

All the worked orders will be laid-down and stored in the data bank and can be called up again, when needed. Through given search- and sorting conceptions, a selective list of all the orders can be distributed.

The Auto Pilot, just like the CCI - automatic Ink Control System, belongs to the category of the automatic inking regulation system. It consists of an additional console to an RCI- ink control system with the following aggregates:

manuel densitometer, a computer with colour-monitor, a colour printer for reports and connections between the Auto Pilot and RCI-Ink control systems.

The Auto Pilot exists in 2 separate versions:

- a) Auto Pilot with screen and solid density control.
- b) Auto Pilot with screen and solid density control plus the colour-balance control according to the Brunner-PCT (Picture Contrast Technology)

The Auto Pilot does not work with the automatic densitometer like the CCI-Ink control unit. The printer takes the measurements, which he wants to evaluate with the manual densitometer. From there, the ink zones are collected in image zones. The whole number of ink zones are regulated with one measurement in the colour-balancing-field. Therefore the measurement can be made easier and accelerated.

There is a great advantage in the printing of package material, where it is not always possible to print continuous measuring bars with the printing run. Measurements of the glueing flaps can also be estimated with the Auto Pilot manual densitometer, or solid fields can be drawn to measurement directly on the image area.

Working with the EPS printing plate scanner is absolutely recommendable, in order to get a better starting point for the picture-related control. The programmes in the Auto Pilot on the printing press will allow the take-over of important knowledge on the printing of orders from the work preparation. This programme will catch the information from the densitometer and in given cases, other data related to the process.

The data is visibly represented on the screen. It recommends certain settings of ink zones to the printer, and by a switch of the RCI-inking system, this can be carried out.

Of course, the printer, rich in experience, is not excluded from the regulation. The excellent representation of data on colour and specifics of the presses gives him a safer estimation of the printing situation, where he can call up the service programmes anytime to direct changes in them. He can input new specific data on machines, for example, the distribution of colour on the colour sequence, ink vibrating sequence, ink vibrating strip remote or the speed of the ink fountain roller and still, at his will, he can correct the ink zones by hand.

All the functions of the Auto Pilot can be served by a rolling ball and 2 single keys. The control is, therefore, not so complicated. An extensive keyboard is not necessary.

The Quality Control should first of all replace the work which the printer has to do for the customer. Furthermore, variations in the printing process, caused by outside influences such as inks, printing materials, are recognized early in the printing run, which retain harmony in the process. Specially produced programmes take over certain data on orders and measurements, make measurements on the printing sheets possible, represent them on the screen and print their respective reports.

A statistics program mediates statements on the colour-balance-control during the printing run.

The same program can be employed in quantitatively analysing the colour variations at times during the process.

The last station in our network is the Management Pilot. All information present in other stations is available to the printing plant's management. These could be condensed to information on the utilization of the presses, with regard to tending time, amount, customers, state of material, situation and operation of orders, and supply the management with a basis for decisions. The representation of the results can follow alternatively in graphic- or table form.

Let's finish with a summary. While the development of the first remote control technology was oriented at useful automation combined with simple operation and high process transparency, the second generation of remote control systems will aim at combining the different process interfaces into a single network with a common user-interface for the whole printing plant. Uniform computer standards, continuous documentation and compatibility with machine electronics will open new market possibilities for our customers. Registering, processing and storing information on production is daily work for most printing plants. That is valid for most systems in the first printing stages and also for further processing machines.

In recent years, ink control and regulation systems like RCI and CCI, have spread to offset presses in many printing plants. For years, ready isolated solutions in information processing have been introduced into certain areas, such as, the production schedule, the warehouse, the calculation of cost and performance, as well as the bookkeeping and accounts department. The information processing is limited to isolated solutions for the different applicable areas, therefore, no possibility of communication exists between the computers. So, tasks in the printing plant can only be worked out in serials, rather than parallel, as would be preferred.

As soon as this work runs parallel, the production time for printing orders will be increasingly shortened, through the reduction of organisation and preparation time. Thus, money can be saved. What is missing, is the integration of the different systems in an overall system.

Alongside the physical connection of single modules and the necessary data bank for that, it is necessary to find a common language, through which participating stations in the network can communicate with each other. For that we use the so-called mouse- and window technology. The mouse is a mobile rolling ball with which one controls the cursor on the screen.

Window technology is to be compared with materials on the writing desk, which through the activity of the mouse, can be called up and made visible and closed again.

There are terminals in every department, which are similarly and easily used. Through the possibility of cutting the information processing system down to the size of the customers' order profile, it is guaranteed that the resulting performance will increase and therefore a decrease in production costs can be managed. MAN Roland is developing a concept of the future with Print Pilot.

Print Pilot will be the Information processing system for the whole operation of orders in the printing plant. Through the fact that a network will be integrated into the Graphic Centre's structure, it will naturally give the excellent possibility of demonstrating the information processing system in practice.

Another demonstration hall will be furnished for this in our department, in which we will have constant access to operations in the Graphic Centre.

If you are ever in Offenbach, come and visit us, so as to get your own impressions of the advantages, which this system can also offer you.



Rettberg:

### The Print Pilot System

Many thanks for the invitation and opportunity to speak here. It is always an honour for me to speak on the newest Process Electronics in MAN Roland at TAGA. I have given many reports at previous TAGA-conventions on computerized solutions to measurements, control and regulation of the printing process. So that you can fully understand my actual report, I should recapitulate each single product to date:

#### 1. MAN Roland EPS (Electronic Plate Scanner).

The plate scanner serves to pre-set the ink zones. I gave reports on this installation at the TAGA-conventions of 1983 and 1985. The printing plates are scanned by sensors before being inserted into the printing press. By this method the percentage of ink for every single ink zone is determined. This data is stored on cassette and used for the pre-setting.

#### 2. MAN Roland RCI (Remote Controlled Inking)

All the Inking units are controlled and piloted from the control desk. The ink fountains have ink slides and build independant ink zones. Light emitting diodes show the respective ink feed. Outside of that electronic remote control, total or percentage-wise, is possible. This data can be memorized on cassette for repetitive orders.

#### 3. MAN Roland CCI (Computer Controlled Inking).

The same ink control as on the RCI, however in addition the automatic Densitometer-Measurement on printed measuring bars. There is a comparison between the required and actual data in the computer. Automatic correction of the ink feed takes place. Display of the ink density on the screen, as well as information on quality (dot gain, doubling effect etc...)

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Two years ago Felix Brunner and I gave a report in San Diego on the application of the PCP system in our offset presses. PCP means Picture Contrast Profile and is based on the perception that ink variation in the colour-balancing-field is recognized more exactly and more quickly than in the single solid fields of the measuring bar. Therefore changes in the colour-balance receive highest priority from the computer-regulated ink feed. Besides, the data of average picture graduation and of solid ink density flows into the calculation of network.

In contrast to the already existing methods of reading the different fields, the Brunner-system supplies plenty of important information. In this way, especially with sensitive image areas like skin colour, hair colour, homogeneous grey areas etc...a considerably more exactly regulated ink is reached. The common development of MAN Roland and Brunner has become more intense in the last 2 years. In the meantime PCP has become PCT, Picture Contrast Technology. The newest item is the MAN Roland Auto pilot.

As a separate panel, this system can point out the standard in quality according to the PCT-Picture Contrast Technology or automatically with the impulse of the Auto-Pilot for the printing press. The regulation of all zones takes place simultaneously; necessary corrections in colour are carried out without delay. The results are graphically represented in a hexagon-diagram on the screen. After printing, the tolerances in colour-balance, that is, the variation in ink, can be represented in a hexagon. The hexagon's representation of the variation in the colour-balance gives an impression of the height and the direction of the divergence. Depending on the printing difficulties of the picture, the range of tolerances is determined in quality classes. A statistics program graphically represents the measurements of the order on the screen.

MAN Roland Auto Pilot makes the take-over of the most important information on order preparation. In this way, data on the EPS (Electronic Plate Scanners) can flow in.

With these basics the Auto Pilot has all the requirements for a highly ordered system.

Technical development in recent years has supplied every field, for example, the printing press, with great advantages. Up to now the interconnection of information has always been missing. Cassettes are often used as a means of transporting data, such as on the plate scanners and ink controls.

It has always been our company's aim and, of course, our customers' wishes, to install a highly ordered data-system in the printing plant for the fulfilment of all orders. That is, instead of the "isolated solutions" like Remote Controlled Inking, Computer Controlled Inking, Electronic Plate Scanner, Quality System PCT, a complete overlapping system is necessary.

This is being made possible by MAN Roland with the Print Pilot. The order preparation with specific data on orders, for example, materials, appointments, etc., will be added to the already available solutions.

As further information, perhaps the most important: the Management station, in which all the information of the company runs together. Firstly, through the Management station, the installation of the Computer Integrated Production in offset printing plants will be reached.

The different Pilot stations and functions of this model are arranged in the following way:

OP Pilot	=	Order preparation
Auto Pilot	=	In the press room on the sheet fed-offset and web-offset printing presses
Q-Pilot	=	Quality station
M-Pilot	=	Management station

All stations are inter-connected, can communicate with each other and make necessary information available. The order preparation gathers specific data on orders. It is connected to the EPS (Electronic Plate Scanner), which supplies the data for the pre-setting of the press. The utilization of the press and time-table are done here.

The Auto Pilot takes over this data and transfers it into the pre-setting. Apart from that, it makes use of the ink control RCI (Remote Controlled Inking) and when needed, the PCT-system.

Then, from there the quality information on the orders goes to the Q-Pilot, for example the range of tolerances in colour-balance during the whole printing run. The data, which comes from the incoming material control for paper, ink, plates etc.. goes in here, too. In this way, the data from the outgoing product control is stored in the Q-Pilot.

In the Management station, all information from different stations run together and are, at one's wish, retrievable.

Information on the condition and effectivity of the presses, material usage, accurate costs and the situation can be purposefully condensed. The whole company and all situations in production can be made visible, like under a microscope.

With the second generation of Remote Control Technology, the different process-interfaces are connected. They result in a network with a common user-interface for the whole printing plant.

The compatibility of this new Electronic Process from MAN Roland with the already available press-electronic is an important requirement.

The general information and documentation, such as the uniform computer standards, show useful automation. Computer-integrated production brings down production costs, shortens the production time and opens new opportunities on the market for printing plants.