HONORABLE MENTION: Most Innovative Use of Process Automation Technology in an Implementation

Mediahaus Biering

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BACKGROUND
A description of the subject workflow environment and conditions prior to implementation:

The use of modern technology in the print media business demands a permanent adaptation to the innovation process and a continual willingness to invest. Our cutting-edge know-how is the basis of our customer relationships. This is a competitive advantage that we work permanently to expand and consolidate.

We need to cooperate closely with our customers to improve our operating reliability and the value added, to the advantage of both parties. By expanding our process chain, we have become a full service provider, a task that now also includes networking with our customers.

As a comprehensive service provider, we produce sophisticated prints, particularly booklets, annual reports and magazines. Products such as annual reports are developed together with our customers – this concerns schedules, proofprints, modifications etc. We can position ourselves with a customer through annual reports, and thereby gain access to other orders from this customer.

WORKFLOW ENVIRONMENT AND CONDITIONS PRIOR TO IMPLEMENTATION

Since 2003, we have been using the presetting values of the PPF data from prepress and ensured constant quality over the entire print run by means of an Image Control unit, as shown in Figure 1. The presses were connected to our self-developed MIS system via separate, non-integrated terminals. Integration as defined today did not exist during these days and the non-integrated workstations were used for shop floor data collection only.

The interface between the systems as well as the supporting functionality was not standardized in terms of increased efficiency. In this respect one can not describe our legacy systems as integrated workflow system but rather as systems islands which required considerable manual labor to transfer the job from one system to the next.

Based on the positioning of the 'Mediahaus Biering' as partner for the print media production for the highest quality expectations the gaps in the workflow became very obvious in the area of a consistent and automated quality management system for color. A fully into the production integrated color quality management system providing a high level
of automation was missing completely. Therefore the color workflow was our most critical bottleneck regarding efficient and profitable high quality print production.

**OBJECTIVES**

**Motivation**

It was high time for us to implement a method of continuous improvement in the color workflow. The color workflow needed to be an innovative pioneer for the entire company, because it allows us to attract new customers and orders through our competence and innovation.

Based on our extensive experience with the enormous effort concerning the quality management within the color workflow the level of automation of all processes in Prepress and Press involved were the main objective for the decision to invest into a system for the quality management of the color workflow. Talking about automation it was crystal clear from the beginning that our quality expectation would not be traded for a high level of automation. We always were looking for both: support of the highest possible quality and automation to achieve our goals regarding market positioning and increased profitability.
Based on this we defined our requirements for the new workflow system for color management:

**Qualitative goals**
- Differentiating ourselves from our competitors through a technological edge, especially for annual reports or important accounts
- Being able to handle color competently
- Implementing a continuous quality assurance and process control system
- Improving the coordination of prepress and the pressroom, including improving communication and data exchange
- Avoiding compromises at the printing press – such compromises cost time and money
- Ensuring that the print matches the proof
- Making production even more stable, i.e. involving the employees to a greater extent

**Quantitative goals**
- Cutting the setup times of the presses by half
- Cutting spoilage at the presses by half
- Speeding up the evaluation of customer-specific test forms, which usually contain ECI color charts, by at least 50%
- Increasing the part of annual reports in the product portfolio by at least 25%

**METHODOLOGY**

We tested the following suppliers of innovations in the color workflow:
1. Heidelberg Prinect Color Solutions
2. System Brunner
3. Profile Maker and the measuring devices Spectro Eye Gretag, Spectrolino Gretag, DTP 41 X-Rite for proofs and prints

Decision criteria:
1. Same measurement optics – to exclude as many error sources as possible.
2. Same profiling software for prepress and press.
3. Aids for a better communication between the pressroom and prepress:
   a. technical
   b. organizational: between employees
4. Same software and work concept with uniform user interface and logic to ensure the best possible coordination of prepress and press
5. Systems and integration based on the specification of JDF as the standard interface for the graphic arts industry.
After extensive tests and analyses, we found the approach of the System Brunner not quite as integrative as the solution offered by Heidelberg (Heidelberg Color Solutions) with the Calibration Manager, Prepress Interface and Image Control and the integration of the complete Prepress Workflow. The JDF approach was already discernible. At Heidelberg today the entire Prepress Workflow, the integration of the Press-room and the connectivity to the MIS is based on JDF. Thus we recognized a higher investment security and a continuing development in additional products. Since they meet our requirements, we decided in favor of the Heidelberg Color Solutions.

**IMPLEMENTATION STORY**

**TRAINING**

The training and tests for the adaptation of the new systems were conducted simultaneously. It took us just 3 months after the implementation to adapt the systems perfectly to our production. Mr. Rosenfeld (production manager) spent 3-4 hours a day on his own training and testing. The printers tested the systems during production at the press, i.e. using the “learning by doing” approach. This approach requires commitment and discipline on the part of the shift bosses as well. They needed to find out which are the most important menus in the new software that are useful and effective for us and which are really important for printing. Then they passed on their findings to the printers and the prepress staff. The Heidelberg Service supported us in the implementation, optimization and knowledge transfer, providing us with a basis for our own learning process and ongoing coaching in order to achieve the defined results.

**EXPERIENCES/OBSTACLES**

**Interest and commitment of the staff:** It was important for us to find the right people in our company who are interested in the solution and show commitment in the introduction.

**Printer know-how vs. device settings:** We learned that it is unwise to set up the Image Control so that the printer can rely on it blindly. It was important to let the printer know that Image Control is only an aid and cannot replace the work and final judgment of the printer.

**Quick habituation:** New printers in our company have grown so used to prepress data from the Prepress Interface that they hardly want or can make a press ready without the Prepress Interface.

**TIMELINE**

**PROJECT PHASE 1 – END OF 2003:**

**Objectives**

1. Implementation of Image Control with ColorInterface, Quality Monitor and Printopen profiling software;
2. integration of Prinect Prepress Interface with the JDF-capable workflow system Printready

**Targeted situation:** JDF based Prepress workflow fully operational as basis for the integration of the press-room. Color Management established throughout the entire Prepress and Print production processes

**PROJECT PHASE 2 – END OF 2004:**

**Objectives**

1. Completely automated color measurement based on Heidelberg Mini Spots, Heidelberg Prepress Workflow and Heidelberg Image Control
2. Standardization of color workflow throughout the entire production and automated maintenance of the standard during full print production without additional effort

**Targeted situation:** All processes supporting Color Management and Color Quality assurance integrated into one system providing full control for an overall responsible quality manager.

**PROJECT PHASE 3 – Q1 2005:**

**Objectives**

Installation of the Management Information System SSB Diso.

**Targeted situation:** Integration of the MIS into the production workflow and support of a JDF based Job Ticket for the production devices for the presetting of the job specification relevant important to quality.
Limiting the choices: After the introduction of the Mini Spots, the prepress staff was told to position the Mini Spots on each sheet. After a time of uncertainty as to which Mini Spot should be used, we determined to use a certain Mini Spot and made a sample imposition sheet showing where exactly the Mini Spot is to be positioned. Limiting the choices to a single Mini Spot was necessary to eliminate the uncertainty of the employees in choosing the right Mini Spot. For proof forms, a Fogra media wedge is positioned on the sheet in addition. The adjustment period lasted about 6 months, until mid-2005; Mr. Rosenfeld tested many settings himself. With clear instructions, e.g. as to which Mini Spot is to be positioned in which place, preparing the sheets has become much easier and more effective for our employees.

Documentation and simple operation: The function of the adaptive characteristic curves (Color Assistant) at the control station was implemented at one press in the course of 2-3 weeks. In this test phase, the printers carefully documented their makeready procedures. The findings were then applied to other presses.

RESULTING WORKFLOW/PROCESSES

The circle between the prepress and press stages of production has been closed, like a feedback loop system. The Mini Spots are positioned in prepress in the template of the impositioning software. The data required for selecting the correct calibration are automatically transferred from the SSB-Diso MIS system to the JDF-based prepress workflow Prinect Printready.

In order to ensure continuous process control, the Mini Spots are then evaluated once a day by a spectrophotometric measurement using Image Control. Image Control transmits the measured values directly to the Quality Monitor. If the statistics evaluation in the Quality Monitor shows that the CIP calibration must be adapted to new conditions, these measuring data are used directly to adjust the calibration in the Calibration Manager of the RIP.

This closes the circle, as Figure 2 shows. The changes compared to Figure 1 represent the essential innovation.

In addition, the adaptive ink setting characteristics were installed in all printing presses. This function is outlined in Figure 3 and described in the following paragraphs. The adaptive characteristic curves (Color Assistant software module) reduce spoilage and shorten makeready times particularly well if jobs with several plate sets are printed on...
the same paper. For the first plate set, the printer uses the dot area values from the PPF data, as usual. With these dot area values and the ink presetting characteristics, the system calculates the ink zone opening values. The first pull is still quite below the quality of the OK sheet, so that several pulls and fine adjustments of the ink zone opening are required until the OK sheet is achieved. The printer then confirms the optimized ink presetting characteristic and the control station saves the adjustments made between the first pull and the OK sheet.

For the next plate set that is printed with the same ink and the same paper, the ink presetting characteristics are automatically corrected using the adjustment values. In a way, the ink presetting characteristics learn the optimum settings for this ink and this paper. The adjusted ink presetting characteristics and the dot area values are then used to calculate the new ink opening values. The OK sheet of the first signature has already been optimized, so that fewer pulls and adjustments are required, since the optimized characteristic curves are used.

With the 3rd and 4th signature, it usually takes only 1 or 2 pulls to achieve the OK sheet. While we could, in most cases, sell the first pull, our quality standards are very high, so that we use the 2nd pull as OK sheet.
DETAILS FOR MOST INNOVATIVE USE OF PROCESS AUTOMATION TECHNOLOGY IN AN IMPLEMENTATION

A description of the innovative aspect of the process and an argument for why this is unique and new, with a comparison to traditional alternatives and a description of the primary benefit of the innovative aspect of the new process.

1. Innovative aspect
The innovative aspect consists in the combination of an optimum makeready for the printing of a job and continuous control of the entire process from prepress to printing. Thus the automated positioning of the Mini Spots on the sheet, the transfer of this information and the information about the paper and ink are based on the Prepress JDF Workflow and the RIP to the Press Control System. Based on this information the press adjusts itself automatically to the optimal setting for the job. Image Control automatically knows where the color control elements (=Mini Spots) are on the sheet. The feedback loop to prepress is closed by the possibility of adapting the prepress stage (plate calibration) very quickly and easily to new process conditions in order to maintain the desired inking result is another innovative aspect.

2. New and unique
Compared to the conventional method, this easy re-calibration of the entire process means that it is no longer necessary to:
   a. Print and evaluate a test form (which takes at least 0.5 days)
   b. measure measuring patches (automatically measuring the Mini Spots during print production is sufficient)
c. Calculate new calibration curves (the Calibration Manager of the RIP corrects calibration curves based on the measured values at the push of a button)

3. **Primary Benefit 1: With the installation of the adaptive ink presetting characteristics**

The following table shows the saving in makeready time and spoilage on the long perfectors for a job with 5 plate sets:

<table>
<thead>
<tr>
<th>Plate Sets 4/4</th>
<th>Makeready time</th>
<th>Pulls</th>
<th>Spoilage/Shts</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>60 min</td>
<td>4-5</td>
<td>800-1,000</td>
<td>~ 250 euros</td>
</tr>
<tr>
<td>No. 2</td>
<td>40 min</td>
<td>3-4</td>
<td>500-800</td>
<td>~ 350 euros</td>
</tr>
<tr>
<td>No. 3</td>
<td>25 min</td>
<td>2-3</td>
<td>300-450</td>
<td>~ 400 euros</td>
</tr>
<tr>
<td>No. 4</td>
<td>20 min</td>
<td>2</td>
<td>300</td>
<td>~ 400 euros</td>
</tr>
<tr>
<td>No. 5</td>
<td>20 min</td>
<td>2</td>
<td>300</td>
<td>~ 400 euros</td>
</tr>
<tr>
<td>No. 5 – n</td>
<td>20 min</td>
<td>2</td>
<td>300</td>
<td>~ 400 euros</td>
</tr>
</tbody>
</table>

The saving is based on an press-hour rate of 360 euros and a paper price of 1,000 euros/1,000 kg compared to the earlier situation without Prinect Color Solutions. In the past, we could not do with less than 40 min makeready time and 3-4 pulls for each plate set.

For an annual report with 5 plate sets 4/4, this adds up to an average saving of ~ 1,400 euros.

Our most important products usually have more plate sets. Below, you can see a list of our most important products with their volumes and processing times in 2005:

<table>
<thead>
<tr>
<th>Products</th>
<th>Booklets</th>
<th>Annual Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of Total Prod.</td>
<td>55%</td>
<td>18%</td>
</tr>
<tr>
<td>Signatures/Job</td>
<td>8 plate sets</td>
<td>12 plate sets</td>
</tr>
<tr>
<td>Processing times</td>
<td>7 days</td>
<td>14 days</td>
</tr>
<tr>
<td>total production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Makeready times</td>
<td>3.5 h (2005)</td>
<td>4.5 h (2005)</td>
</tr>
</tbody>
</table>

Thanks to the innovations – faster processing times, higher production reliability and better color competence – we were able to acquire and produce 52 annual reports in 2005, compared to 37 in 2004.

**Conclusion:** Makeready times for large-volume products could be reduced by 40%, spoilage by 50%.
4. Benefit 2: Color competence with the Mini Spot workflow
The Mini Spots are used to check the gradation and full-tone inking of print sheets once a day for conformity with the offset process standard. Image Control can use the position of the Mini Spots from the PPF data directly for an automatic positioning of the measuring masks. The more Mini Spots are on a sheet, the more time is saved with this automatic positioning.

The analysis of the Mini Spots represents an early warning system: “acting instead of reacting”. Before the quality deteriorates beyond the tolerance, the printer can comfortably adjust inking, see section 2. The quality logs are also used as proof of quality in case of complaints.

The production reliability achieved with the Prinect Color Solutions enables us to save a considerable amount of time and money. When catalogs are printed, for instance, only about 20 pages of a total of approx. 600 are proofed at all. Both we and our customers rely on this optimized and quickly calibrated workflow to produce the quality we want.

5. Benefit 3: Competence in test printing and proofprinting for customers
Image Control and Quality Monitor allow us to evaluate test prints and proofprints within a few minutes, sometimes while the customer is watching. Witnessing the use of this innovative technology and our competence makes customers feel confident about us. This is an important factor for customer retention as well as for the acquisition of new customers, who have us print sophisticated test forms to be able to assess our quality before placing an actual order.

6. Benefit 4: Checking proofs
The media wedges on proofs from external sources are measured with Image Control, and the measured values are evaluated in the Quality Monitor. This tells the printer early on if difficulties are to be expected during printing. Again, this is an early warning system “acting instead of reacting”. It is important to use the same measuring technology for proofs and prints. In the past, we used different devices that furnished different measuring results, which often led to confusion and discussions.

7. Other benefits:
Every 6-8 weeks, an ECI test form is output on the proofer. The evaluation in Image Control with Color Interface and Quality Monitor using measuring masks now only takes 5 min. With a Gretag measuring device, the same evaluation used to take over 2 hours.
Likewise, we save a considerable amount of time on:
• Proofprints for customers with special paper when we generate the ICC profiles for this paper.
• Checking profiles for FM screens and Aniva (highly pigmented inks) for which there is no inking standard (regular proof output and evaluation every 6 to 8 weeks).

With the introduction of the SSB-Diso MIS system, information on paper grades, ink types and screens (FM or AM) is automatically transmitted to prepress to make these data available for a reliable and correct calibration of the printing plate output. In the past, operators sometimes chose a wrong calibration. The right calibration depends on the following parameters and their possible combinations:
• Paper grade
• Ink type (standard or highly pigmented)
• Screen (FM or AM)
## ROI CALCULATION AND CONCLUSION

<table>
<thead>
<tr>
<th>PERIODS</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount rate</td>
<td>6%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discount factor</td>
<td>0,9434</td>
<td>0,8900</td>
<td>0,8396</td>
<td>0,7921</td>
<td>0,7473</td>
</tr>
</tbody>
</table>

### 1 Discount factor

<table>
<thead>
<tr>
<th>Benefits (in savings)</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calibration of process</td>
<td>96.240,00</td>
<td>96.240,00</td>
<td>96.240,00</td>
<td>96.240,00</td>
<td>96.240,00</td>
</tr>
<tr>
<td>Reduction make-ready</td>
<td>882.320,00</td>
<td>1.323.480,00</td>
<td>1.764.640,00</td>
<td>2.205.800,00</td>
<td>2.205.800,00</td>
</tr>
<tr>
<td>Additional Sales</td>
<td>0,00</td>
<td>0,00</td>
<td>540.000,00</td>
<td>540.000,00</td>
<td>540.000,00</td>
</tr>
<tr>
<td><strong>Total annual savings</strong></td>
<td>988.176,67</td>
<td>1.429.336,67</td>
<td>2.410.496,67</td>
<td>2.851.656,67</td>
<td>2.851.656,67</td>
</tr>
<tr>
<td><strong>Cumulative savings</strong></td>
<td>988.176,67</td>
<td>2.417.513,33</td>
<td>4.828.010,00</td>
<td>7.679.666,67</td>
<td>10.531.323,33</td>
</tr>
<tr>
<td><strong>Discounted annual savings</strong></td>
<td>932.242,14</td>
<td>1.272.104,54</td>
<td>2.023.899,48</td>
<td>2.258.779,18</td>
<td>2.130.923,75</td>
</tr>
</tbody>
</table>

### Total investment

- **External investment (products)**
  - Image Control | 140.000,00 |
  - Update Image Control | 8.000,00 |
  - Calibration and Profile | 10.000,00 |
  - Toolboxes incl. Installation and training | 30.000,00 |
  - Print Color Management | 30.000,00 |
  - Color Assistant incl. | 20.000,00 |
- **Internal investment (tests and internal training)**
  - Time quality manager | 13.200,00 |
  - Press time | 23.760,00 |
  - Material (paper) | 6.600,00 |
  - Maintenance costs (recurring)
    - Internal maintenance | 8.320,00 |
    - Update cost | 10.000,00 |
| **Total annual costs**: 251.560,00 | 18.320,00 | 18.320,00 | 18.320,00 | 18.320,00 | 18.320,00 |
| **Cumulative costs**: 251.560,00 | 269.880,00 | 288.200,00 | 306.520,00 | 324.840,00 | 343.160,00 |
| **Discounted costs**: 251.560,00 | 17.283,02 | 16.304,73 | 15.381,83 | 14.511,16 | 13.689,77 |
| **6 Net benefit**: -251.560,00 | 969.856,67 | 1.411.016,67 | 2.392.176,67 | 2.833.336,67 | 2.833.336,67 |
| (annually) (=2-5) | 718.296,67 | 2.129.313,33 | 4.521.490,00 | 7.354.826,67 | 10.188.163,33 |
| **Discounted net benefit**: -251.560,00 | 914.959,12 | 1.255.799,81 | 2.008.517,66 | 2.244.268,02 | 2.117.233,98 |

NPV (Net Present Value in €) | 8.289.218,59 |

ROI (Return on Investment) in % | 3295,13 |
With the extraordinary **NPV of 8,289,218 €** and the **ROI of 3295%** we were able to achieve is made possible by the perfect fit of the Heidelberg workflow systems and the needs of Mediahaus Biering. We truly believe that each print shop with a comparable production environment and job structure can achieve an outstanding results based on the Heidelberg systems. From todays perspective three main factors enabled the result mentioned above:

1. The clear strategy and target setting Mediahaus Biering defined before the project was kicked off

2. The discipline and the reinforcement through management throughout the entire project phases

3. The superiority of the Heidelberg Color Management System as a fully integrated and JDF bases quality management tool.

Only with the innovations described above can we today achieve the processing times and quality demanded by the customers. However, the success of the innovation depends not only on the technology, but also on the involvement and instruction of the staff in this process.