

# 2005 CIPPI Award Winner

## Biggest improvement in efficiency and customer responsiveness as a result of process automation

### Kraft Druck und Verlag GmbH

Kraft Druck und Verlag GmbH, Ettlingen-Oberweier, Baden-Württemberg , Germany. Submitted by Stefan Reichhart, CEO of Hiflex GmbH.

**Products incorporated:** Creo Prinergy Workflow System 2.3, Creo Synapse Link 2.0, MAN Roland Druckmaschinen AG presses running the PECOM system including three MAN Roland 700 presses (74x104 cm, one 4-color, one 8-color and one 5-color, varnishing unit), and Hiflex MIS System.

**Background:** Machinery (plant)/tools — Kraft Druck has been working with the Hiflex management information system (MIS) since 1995. It is used for order management (administrative processing, estimating, costing, invoicing, production planning, and data collecting) and shop floor data collection (Production Data Collection, Hiflex PDC), and it's goal was to objectively measure costs and performance.

In 2000, the e-business module of Hiflex MIS software was installed. Since then, customers have been able to see historic information on closed jobs using any standard Internet browser. In prepress, the Creo Prinergy PDF Workflow (which replaced thier Brisque workflow) was implemented at the beginning of 2003. At the same time, Kraft Druck replaced an older Lotum 800V with a fully-automatic Lotum 800 Quantum thermal platesetter for digital platemaking. Simultaneously, the three MAN Roland 700 sheet-fed offset presses were updated with the PECOM system.

Kraft Druck's workflow prior to the JDF implementation at the end of 2003 — Multiple entry of job data was common practice, including the risk of typing errors or having to deal with inconsistent data. Moreover, communication of job information and status required several steps and several people (high administrative overhead). In detail, it was organized as follows:

#### **Former workflow: prepress / Prinergy —**

- a) When the estimate evolved into a live job, the job ticket was forwarded to the prepress department. When the job was created in Prinergy system, the relevant job data had to be manually re-entered. Errors inevitably occurred, as some of the fields in the Prinergy system where completed incorrectly, or the data entered differed from that on the job ticket. This inconsistent data handling produced problems, especially in when searching archived jobs, i.e. searches did not yield the expected results.
- b) Materials such as plates, page proofs and form proofs, and all other operations (and their respective times had to be manually entered into the Production Data Collection and the order book of the Hiflex MIS. The scheduler called a database report that showed him to which jobs the plates had already been exposed. He then manually transferred this information on to his planning board.
- c) One of the key requirements of the internal quality management was to track house corrections (Printer's Errors) as well as authors' corrections (chargeable and non-chargeable). All of the communication about corrections was carried out by manual data entry, and the correct notations of those entries within the Production Data Collection (Hiflex PDC) by the prepress personnel.
- d) At the end of every month, Kraft Druck performed an inventory check of plates and actual consumption with the number of consumed plates reported in the Production Data Collection. Discrepancies were investigated in order to allocate the difference to specific jobs and causes. These investigations always involved a lot of time, costs and staff.

On average, every month about 5 % of the exposed plates were not entered into the Production Data Collection (Hiflex PDC). Reasons for that could be, for example: an extra plate had to be exposed during the night shift because it was faulty and/or the prepress personnel simply forgot to manually enter the plates. The invoicing process had to be suspended during the investigation period, and the head of the prepress department (Mrs. Kunze) spent at least four hours per month on these investigations. About 96 % of the “lost” plates could be eventually accounted for.

**Former workflow: press / PECOM —**

- a) The head of the press department received the job schedule (rough planning) from the scheduler in the form of a printout.
- b) Paper job tickets arrived in press department (i.e. were transferred from prepress to press).
- c) Final planning as well as last minute changes to the job sequence were marked manually on the printout of the schedule.
- d) Job data had to be entered manually into the PECOM system. Again, several problems could occur: typing errors, incorrect abbreviations of names and expressions noted on the job ticket, incomplete fields (fragmented entries). As a result, the press operator had to deal with inconsistent data as notations of job data on the job ticket (derived from the Hiflex MIS) differed from the job data recorded in the PECOM system.
- e) Unavoidable modifications of the production planning (because of a shortage in capacity or a machine failure) had to be manually corrected in the PECOM system.
- f) After production, the press operator manually entered information about the produced quantity and the fact that the production run had finished into the Production Data Collection (PDC) of the Hiflex MIS. The scheduler gained feedback on the current production status by a report on the data entered into the Hiflex PDC. This report can be produced on demand.

**Former workflow: customer communication and responsiveness —** For Kraft Druck, a high and professional level of customer services has always been their declared intention. The customer’s contact person is the customer service representative (CSR). When customers were checking on the order status or wanted to communicate new or additional information regarding their jobs, the CSR usually had to call back the customer after checking the job status with the prepress or press departments. To get this status information he had to make several phone calls or make a tour of the company in order to get hold of the “right” person.

This time- and cost-consuming process was necessary, because the CSR did not have online access to up-to-date information from the prepress or press departments. He could not see if the customer’s files had been received and he did not have reliable information with respect to page/form proofs. As the information about exposed plates was manually entered into the PDC system, it was possible that the entry (if it was not forgotten by the operator) was considerably delayed. Furthermore, the CSR lacked up-to-date data on the job’s progress once it was actually on press. The detailed machine progress (like speed and counters) was not visible to him.

Altogether, taking account of customers’ preferences and providing services to achieve customer satisfaction always consumed a lot of time and money, several phone calls and considerable administrative effort at Kraft Druck.

**Objectives:** Kraft Druck was searching for seamless, cross-vendor communication between the corporate-level Hiflex MIS and the production systems in the prepress and the press department with the aim to improve customer services by organizing operations more efficiently and enhancing transparency and flexibility in the production process. The motivation for the networking of the production process was to:

- Improve efficiency in the order processing
- Improve customer responsiveness
- Enhance transparency and flexibility in the production process

- Cut costs, or rather exploit cost-cutting opportunities that were previously impossible because they were not apparent
- Enable consistent quality management

In particular, these targets were to be achieved by

- Eliminating inefficient steps, such as redundant manual data entry. Time savings of about 2 minutes per job creation were to be realized.
- Access to precise, up-to-date information about the job status with 100% accuracy. The data should be updated at least every 3 minutes. Prepress processes such as page/form proofs, exposed plates, and the progress on the job in the press department should be visible to the CSR. This should improve customer communication and customer responsiveness, as a customer's request for job status could be satisfied instantly.
- Exploiting the possibility of tracking exact material consumption (e.g. plates) in order to invoice earlier and, in a single step, review all chargeable costs. The 4 hours of investigation on 'lost' plates were to be eliminated.
- Constantly improving production standardization throughout the company and minimizing errors.

Kraft Druck's ROI target was less than 2 years.

**Methodology:** In the process of selecting a solution, it was most important for Kraft Druck that the integration would reliably streamline information exchange between the different applications and systems. It was possible to either install proprietary solutions or to implement JDF interfaces.

Proprietary interfaces have several disadvantages. On the one hand they usually have a higher total cost of ownership. On the other hand they address specific software and hardware products (i.e. not vendor independent). Consequently, Kraft Druck selected the open Job Definition Format standard from CIP4 as the solution, which allows for a standardized, cross-vendor communication between the different systems.

For Kraft Druck, JDF meets all the requirements of an automated, efficient, and standardized print process, encompasses everything from conception, through production, delivery, billing and job costing. JDF technology allows Kraft Druck to meet customer needs through consistent quality management.

**Implementation Story:** The JDF implementation at Kraft Druck started in November 2003 and progressed in several steps. Today (April 2005), Kraft Druck profits from a fully integrated workflow between the Creo prepress, the MAN Roland press department and the Hiflex MIS.

### **The implementation steps in detail — Connectivity to the Creo Prinergy Workflow System**

*Participants* — Kraft Druck: Mr. Thomas Brickwedde (Head of office-based sales and IT), Project Manager; Hiflex (Development Department); and Creo (Development Department)

#### **Step 1: JDF connectivity Hiflex MIS and Prepress**

- Start: November 2003
- JDF-Specification Version 1.1
- Communication method: HTTP
- Prinergy 2.1, Creo Synapse Link 1.1
- Hiflex MIS Release 2003, Hiflex Scheduling (JDF Controller)
  - A.) Test period of about 2 months:
    - Implementation of 'Job Create' from MIS to prepress. Example: To create a Prinergy job at the time a new order is inserted in the Hiflex order book, the CSR only has to push a button in the MIS.
    - Implementation of 'Job Create' from prepress to MIS, including the correct assignment to the order number in the MIS.

- Additionally, Hiflex monitors information provided by Creo Prinergy (approval events and prepress operations). The test period did not include automatic cost booking in the MIS.
- B.) The test period ended in January 2004, when automatic cost booking was activated. Since then, prepress events and approvals are translated to cost center and material data in Hiflex (no manual entry of prepress production data and shop floor data collection any longer).
- C.) Tracking error costs and authors' corrections by mapping on specific material numbers. The corresponding costs are taken the account for the costing report.

**Obstacles overcome** — When there were communication problems (one of the two systems not available, network problem, installation of a new release) occurred, production data was lost because it could not be transmitted between the systems directly. The problem was solved by setting up a temporary storage of all JDF/JMF messages in a JDF event buffer which collects all data as long as the communication problem continues. When communication is restored, the buffered information is processed.

**Step 2:** Update of JDF connectivity Hiflex MIS and Prepress

- Start: June 2004 (after drupa 2004)
- JDF-Specification Version 1.2
- Communication method: HTTP
- Prinergy 2.3, Creo Synapse Link 2.0
- Hiflex MIS Release 2004

Due to software updates, new features were implemented:

- a) Display of up-to-date job status in the MIS including a thumbnail previews of pages from the prepress system.
- b) The structure of the prepress imposition scheme was made available in Hiflex (i.e. which page is on which form)
- c) Possibility of setting individually defined event-filters. This allows special views of the following events:
  - Job Create
  - Page events: approved, waiting for corrections, rejected
  - Page proof events: done, approved, rejected
  - Form proof events: done, approved, rejected
  - Prepress operation events: normalizing, color management, trapping
  - Plate events: done, approved, rejected
- d) Authors' corrections can be tracked and displayed in different colors (e.g. red for chargeable alterations)
- e) Ability to choose between the history of a page's status changes or just the current status.

**Connectivity to the PECOM system of the MAN Roland presses:**

*Participants* — Kraft Druck: Mr. Thomas Brickwedde (Head of office-based sales and IT), Hiflex (Development Department), and MAN Roland (Product Management Department).

**Step 1:** JDF connectivity between Hiflex MIS and Press

- Start: November 2003
- PECOM v. A006A3
- Communication method: hot folder system
- Implementation of JDF connectivity between the MIS and the PECOM system of the MAN Roland presses. Automatic Job Creation in the PECOM system. The PECOM control systems receive job

information (e.g. customer name, job number, product designation) and relevant printing parameters (format, paper, length of run, number of plates and inks) via JDF from the Hiflex MIS.

**Step 2:** Update of the JDF connectivity between Hiflex MIS and Press

- Start: March 2004
- PECOM v. A006B2
- Communication method: hot folder system
- JMF feedback from the PECOM system is fed into the MIS. Production data, such as progress on the job (in percent), good sheets and waste, speed and status of the machine (e.g. idle, set up, production in progress) is automatically transferred into Hiflex Production Data Collection and/or Hiflex Scheduling.

**Step 3:** Update of the JDF connectivity between Hiflex MIS and Press

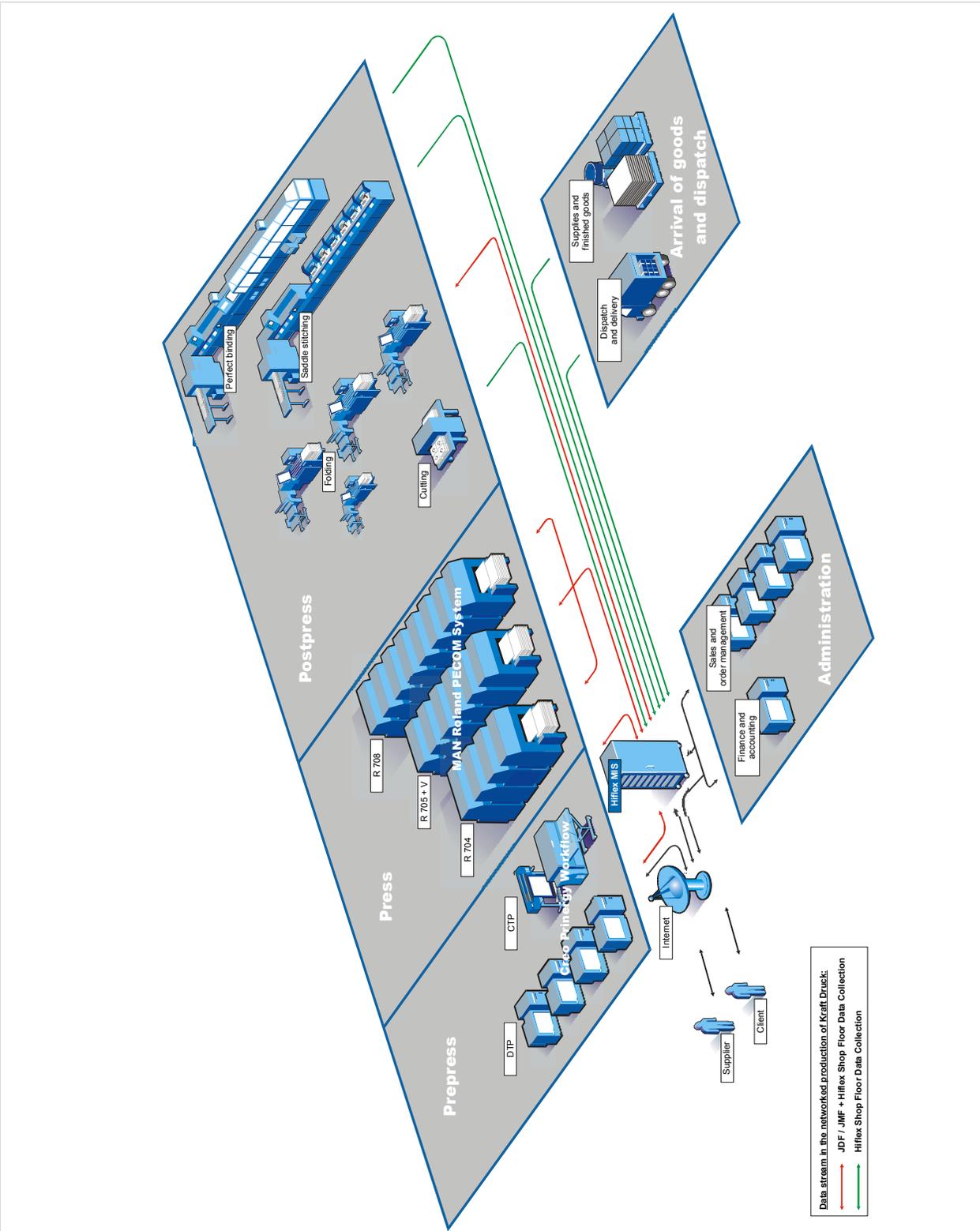
- Start: December 2004
- PECOM v. A007A1
- Communication method: HTTP
- Shift of communication method from hot folder system to HTTP.

The next step of JDF integration will be the online connection between Hiflex and systems in the postpress department. This additional JDF connectivity is planned in the next few months.

**Resulting Workflow/Process:** JDF/JMF connectivity is realized between the Hiflex MIS and the Creo Prinergy Workflow System, as well as between the Hiflex MIS and the PECOM System of the MAN Roland sheet-fed offset presses. The management and administration teams work with Hiflex and Office XP. They are using Windows 2000 clients connected to the Hiflex Print Linux server and to the Windows 2000 Office server.

**The resulting workflow at Kraft Druck** — A single manual entry of job data into the Hiflex MIS is sufficient. Hiflex uses the JDF interface to create customer details and printing instructions. The system automatically generates the complete production sequence, and the job information is ready to be passed on to the subsequent Creo and MAN Roland systems.

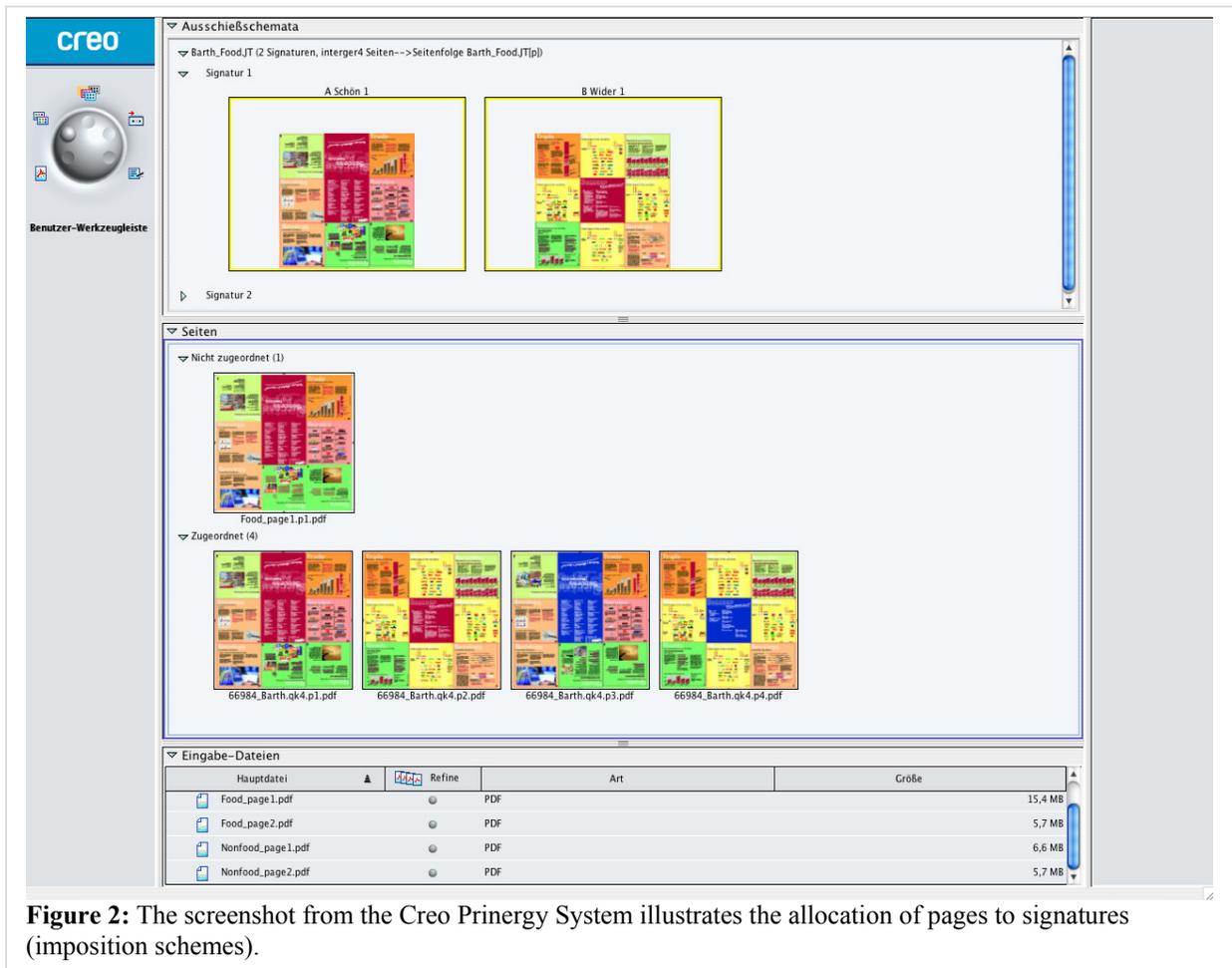
The integration concept is designed to provide each integrated machine and program with information from a central data pool within the MIS, thereby avoiding inconsistent data. Furthermore, all machines events are reported back via JMF and flow into the Hiflex order book, the Hiflex Production Data Collection and the Hiflex Scheduling board. Because of the JDF connectivity in the plant, any person concerned with the job can be provided with relevant up-to-date data about the production process, thus enabling a maximum degree of transparency and flexibility. Additionally, the staff at Kraft Druck is relieved of a lot of administration, re-keying of data, and redundant, inefficient work steps. (see figure 1 on the following page)



**Figure 1:** Illustration of the JDF/JMF data stream in the networked production at Kraft Druck (source: Kraft Druck)

## Resulting workflow: prepress / Prinergy —

a) As soon as an estimate evolves into a live job the Hiflex MIS automatically creates a job in Prinergy. The relevant data is passed via JDF. If historic information about former orders is needed, the consistent data handling through single entry of data enables reliable database searching.



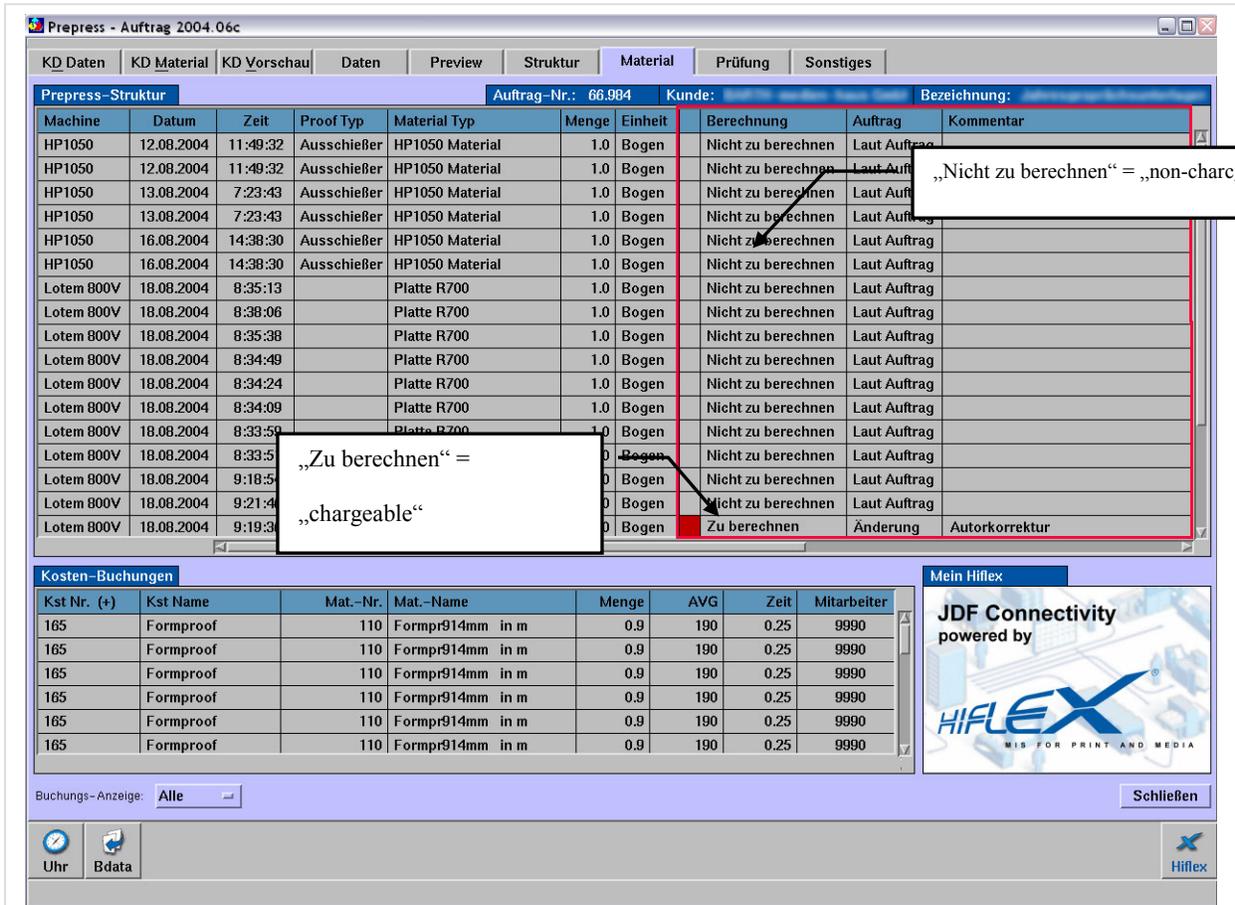
**Figure 2:** The screenshot from the Creo Prinergy System illustrates the allocation of pages to signatures (imposition schemes).

b) Prinergy returns all the information on subsequent activities, i.e. the JDF/JMF interface is used to supply the MIS with information about processing and output tasks during actual production. So information on produced page proofs, form proofs, and exposed plates is automatically passed to the Hiflex order book. Material consumption and cost center times are automatically booked against the job. Moreover, the exposed plates are automatically displayed on the scheduler's digital planning board. The scheduler can modify the job sequence in the planning board according to information updated minute by minute.

c) Author and proof reader corrections; as well as explanatory information (whether the correction is chargeable or not) is entered in the Creo Prinergy Workflow System. These comments are passed to the Hiflex order book, where they are automatically marked in red in order to make them prominent. This automatic transfer of information concerning house corrections (error costs) as well as chargeable and non-chargeable authors' corrections makes the tracking of costs for invoicing easier and more reliable.

Because of the real-time JDF/JMF interface between Prinergy and Hiflex, the CSR's job information is always up-to-date and he can immediately answer customers' questions regarding the job status and (extra) costs.

d) Kraft Druck's monthly stock-taking of plates is no longer plagued by discrepancies which could not be allocated to certain jobs or causes. All proofs and exposed plates are automatically booked, via JDF/JMF, against the relevant job, as there is no "output without booking". (see figure 3 below)



**Figure 3:** Screenshot from the Hiflex MIS. Chargeable and non-chargeable (error) costs are transferred via JDF from Prinergy to the Hiflex order book. The right-hand column shows the comments from the Creo Prinergy operator.

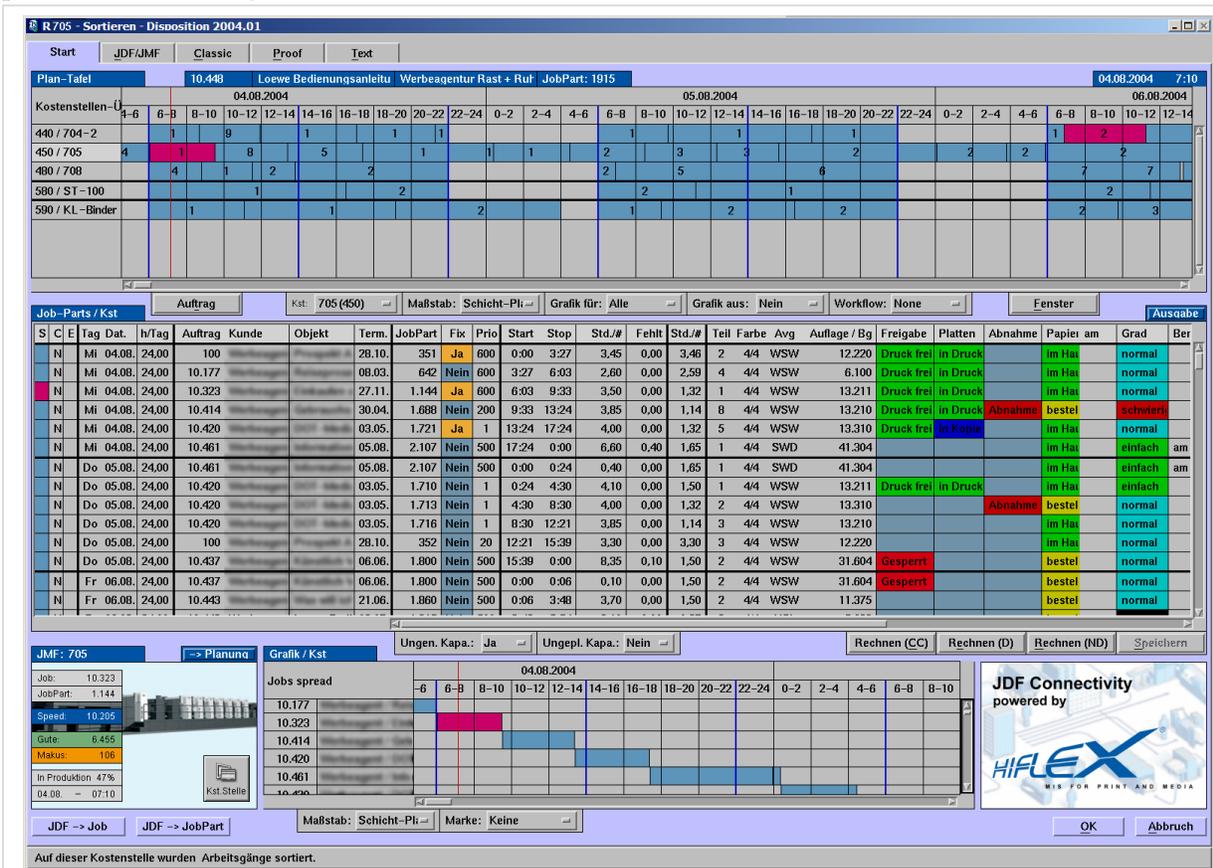
### Resulting workflow: press / PECOM

- All orders are automatically displayed in the Hiflex scheduling system. The scheduler carries out the rough planning of the job sequence. This means he can manually change the priority of the jobs on the digital planning board. He can change the job sequence according to both job status (e.g. plates exposed reported via Creo-Hiflex JMF link) and capacity.
- Printouts of the electronic job tickets arrive in the press department.
- The final planning is no longer done on the printout using a pencil. The head of the press department now also uses the Hiflex scheduling system (which simultaneously acts as a JDF controller) to determine the final job sequence and to send job information via JDF to the PECOM system.
- Just before the job goes to the press, the JobPilot in the PECOM system receives all administrative data (order ID, customer) and technical data (the relevant printing parameters such as information about the

product, the format, the press run, the paper, the number of plates/colors) via JDF from the Hiflex MIS. No manual entry of the job data into the PECOM system is required. This ensures precision and matching data on the job tickets and the jobs stored in the PECOM system. The press operator is shown the digital job ticket before the job starts. Using this, he can check for the current instructions on the job.

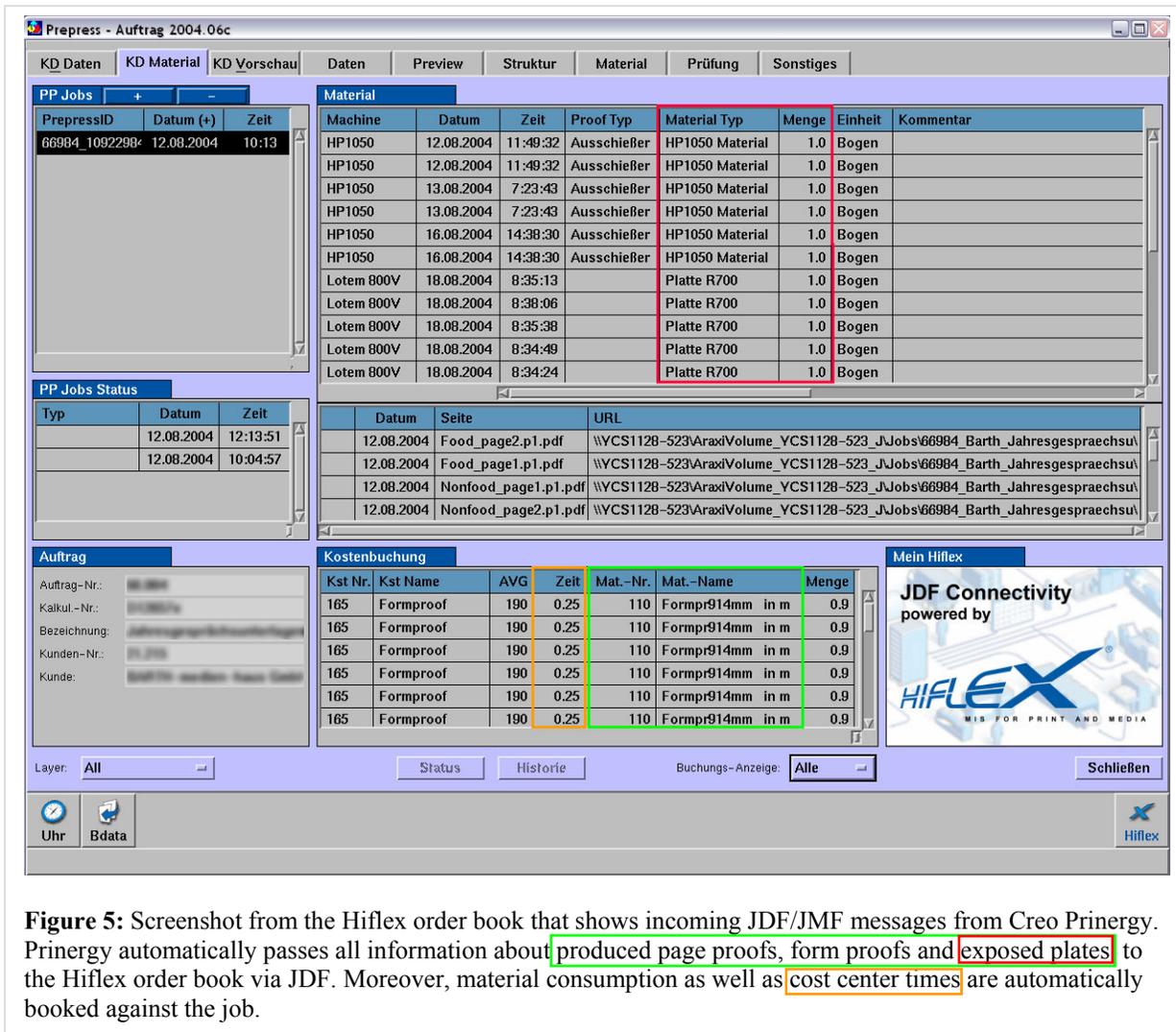
e) In case of modifications to the scheduling (re-scheduling), the job data in the PECOM system is overwritten with the new information.

f) The MIS is constantly updated via JMF with event information from the presses: good sheets and waste sheets flow into the Production Data Collection (Hiflex PDC), whereas the job progress, speed and the status of the machine are displayed in the Hiflex Scheduling application in real-time. Therefore, the planning and scheduling system is constantly kept up-to-date with the status of all jobs entered into the MIS. Moreover, data entry into the Hiflex Production Data Collection is simplified by extracting the produced amount of good sheets from the JMF stream between PECOM and Hiflex.



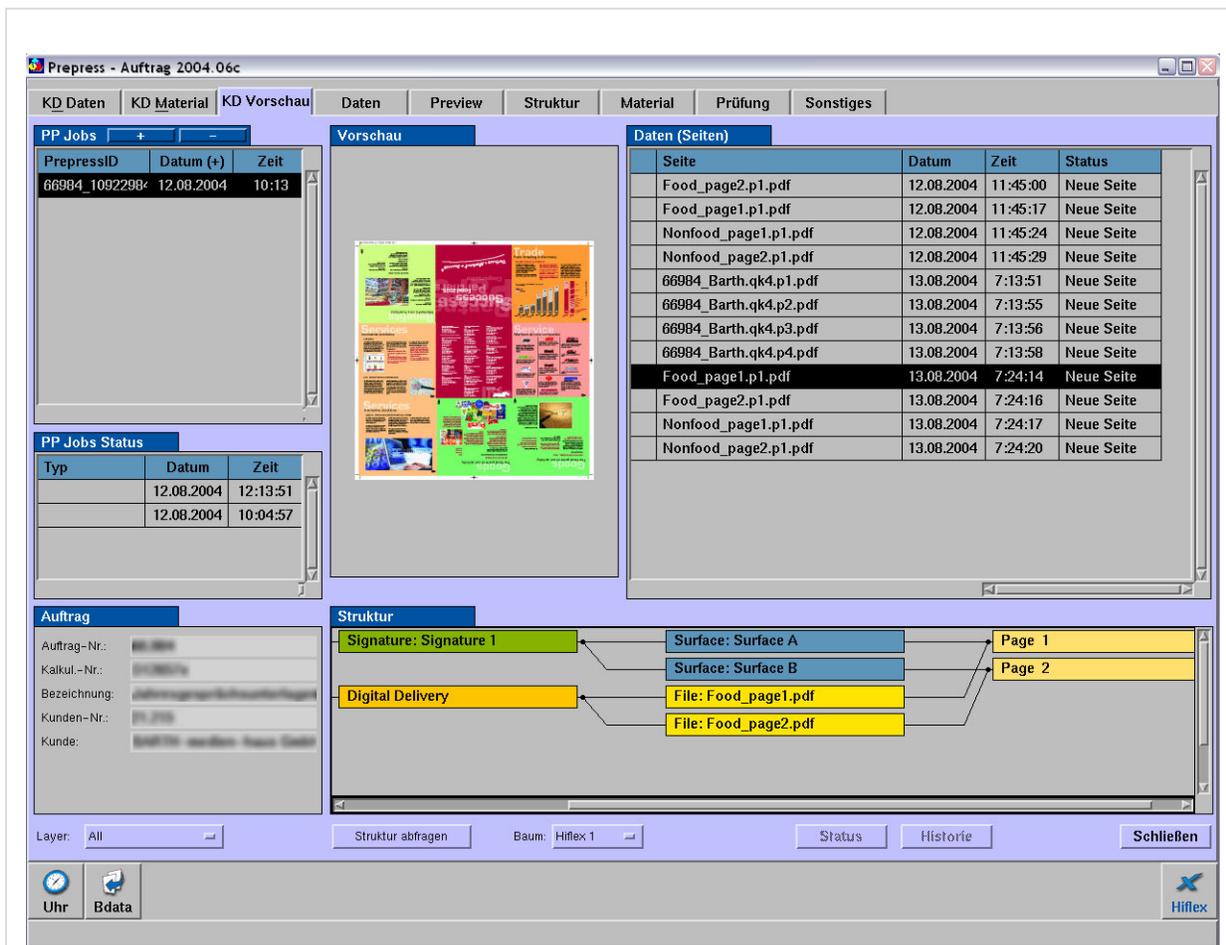
**Figure 4:** Screenshot from the Hiflex MIS showing the Scheduling application. The JMF feedback from the MAN Roland press machine is displayed at the bottom left corner.

**Resulting workflow: customer communication and responsiveness** — As a result of the JDF connectivity between the Creo Prinergy Workflow System and the Hiflex MIS, the CSR is provided with information about the job status minute by minute. Customer communication and responsiveness have improved considerably, since the CSR has reliable and up-to-date information about the status in the prepress department. If customers call to inquire about the job status, the CSR can answer immediately. He does not have to make a tour of the company in order to consult the prepress operator any longer. Furthermore, the now instantaneous access to the job status is very valuable when customers send modifications for a job. In such a case, the CSR can tell the customer, for example, whether or not the modification would be chargeable (e.g. because the plates have already been exposed).



**Figure 5:** Screenshot from the Hiflex order book that shows incoming JDF/JMF messages from Creo Prinergy. Prinergy automatically passes all information about produced page proofs, form proofs and exposed plates to the Hiflex order book via JDF. Moreover, material consumption as well as cost center times are automatically booked against the job.

Since the updates to Prinergy 2.3, Creo Synapse Link 2.0 and Hiflex MIS Release 2004 (Step 2: Update of JDF connectivity Hiflex MIS and Prepress), the thumbnail preview of a page is shown in the MIS. By clicking on the thumbnail, the corresponding high resolution PDF page can be opened in a PDF Viewer (e.g. Acrobat Reader). Which allows the CSR to answer detailed customer questions about the content (e.g. spelling of certain words or details on address data). Moreover, job tracking in the Hiflex MIS – realized by means of JDF/JMF – provides the CSR with up-to-date information on the latest job status, so that queries about the production status on the press or authors’ corrections can be answered immediately.



**Figure 6:** The screenshot shows the thumbnail-preview of a page in the Hiflex MIS. A click on a page in the right-hand box opens the preview in the center box. A further click on the preview itself opens the PDF file in Acrobat. At the bottom of the page, the structure of the imposition scheme is shown.

As the MIS is constantly updated with event information from the MAN Roland presses, the CSR also has a better overview of a job's progress in the press department. Likewise (as described above for the prepress department), the increased visibility of the current job status (e.g. the quantity of printed sheets) saves the CSR time and more tours through the company, and leads to improved customer service when it comes to inquiries about the job status.

**Biggest improvement in efficiency and customer responsiveness as a result of process automation:** The Return On Investment (ROI) of the JDF implementation at Kraft Druck is 446.5% within five years (which means that the investment is paid back 5.46 times). The Net Present Value (NPV) is EUR 579,826.-- or US\$ 759,777.-- which equals an Internal Rate of Return (IRR) of 168%.

Since the implementation was made in November 2003 the calculation is not based on ideal assumptions but on empirical data taken from 2004. The figures calculated for this project (ROI, NPV and IRR) should serve as a realistic example for decision makers who are in the course of evaluating costs and benefits of a possible JDF implementation for their graphic arts companies. When reading these results, two factors have to be taken into consideration:

(1) The prices used in the financial calculation are the list prices. This means that the costs are comparable to a similar investment made today. As Kraft Druck was an early adopter of JDF technology and profited from

special discounts on software, installation and training, the actual prices paid by Kraft Druck are lower and thus the ROI is actually higher (because of the lower costs).

(2) Although one period (2004) has already passed, all periods are discounted with a rate of return of 8%. The rate of return is the expected reward investors demand for investing in the project rather than carrying out alternative investments. The rate of return is often referred to as the discount, interest, hurdle rate, or company cost of capital. Without this consideration the ROI would be even higher.

When Kraft Druck went for JDF connectivity, they had already reached a high level of workflow optimization: they had already used the PECOM system and the Hiflex PDC for years (without being JDF connected), and electronic quality management had been carried out since 1996. As a result, error costs had been reduced by EUR 210,000.-- per year (Kraft Druck had realized a tremendous low error rate of only 1% of the total turnover – the average in the printing industry amounts to a total error costs of more than 3%).

Mr. Brickwedde points out: “As far as we are concerned, JDF has proved to be the icing on the cake of a business workflow that was already extremely efficient before we started.” Kraft Druck’s benefit, therefore, does not reveal itself in an overwhelming cash amount. However since the costs for implementing JDF was comparatively low, the relation between costs and benefit is enormous.

## **The Benefits:**

**Increase in sold productivity (C)** — The direct effect of the JDF connectivity project was an increase in productive hours (print run hours) in the first period of +9.6% (2004 compared to 2003). The extra productive hours multiplied with the hourly cost rate of the respective machines lead to an increase of added value. The direct costs are subtracted. This figure is also cross-checked with the increase of the net profit before taxes (which was taken from the company’s profit and loss statement), which results in the same value. For 2004 this is empirical and proven data. For the periods 2005, 2006, 2007 and 2008 the assumption was made that the number of productive hours and the direct costs will stay unchanged (increase compared to 2004 of + 0%).

**Reduced labor in prepress (D)** — For IT-manager (and head of the office-based sales) Thomas Brickwedde the benefits of process automation are obvious: “We definitely profit from the link between Creo Prinergy and Hiflex. Take, for instance, the automatic tracking of authors’ corrections and material consumption. Our invoicing has become more precise and much faster, since all chargeable and non-chargeable processes are automatically entered into the MIS and monthly investigations on lost plates are no longer necessary.”

Optimizing the workflow through automation provided the basis for a concise tracking of error costs (which again was crucial for Kraft Druck’s special concern: the internal quality management). All data about house corrections (error costs) as well as authors’ corrections (whether or not chargeable) are entered into the Creo Prinergy Workflow system and via JDF are available in the Hiflex MIS for analysis or invoicing. No data can be lost because of a forgotten entry. Due to Mr. Brickwedde’s announcement, the JDF connectivity between Hiflex and Creo saves prepress operators about 30 minutes a day in Production Data Collection and another 30 minutes for job creation.

This is clearly illustrated in the following example: a job creation in Prinergy (manual entry) takes about two minutes. If one assumes 3000 orders per year as a base at Kraft Druck, with each job creation saving two minutes since the JDF connectivity between the Hiflex MIS and Prinergy, the total time saving of one year equates to 6000 minutes. Calculating 250 working days per year (6000/250), the result is convincing: each day, prepress operators save 24 minutes time in the area of job creation.

Regarding the monthly stock-taking of plates, it is guaranteed that each output is automatically booked against a job now. This process automation improved the allocations of plates against from 96% up to 100% while making time-consuming investigations obsolete (formerly: minimum of 4 hours per month for head of prepress). With an internal hourly cost rate for a prepress operator of EUR 50.-- (including all direct and indirect costs) the costs of the saved working time sum up to EUR 13,400.-- per year (30 minutes/day on job creation + 30 minutes/day on Production Data Collection + 4 hours/month on lost plate investigations).

**Wage bill reduction (E)** — It is no longer necessary to employ a full-time scheduler. Since the end of 2003 scheduling is done by Mr. Fehrenbach, who is also responsible for internal quality management. The former scheduler Mr. Hoer works as customer service representative now.

Mr. Fehrenbach spends just 20% of his time on scheduling. Therefore a wage bill reduction by 0.8 persons is set as a basis for the calculation of the ROI.

**Communication and responsiveness (soft factor)** — Information about page and form proofs, impositions and plates is directly transferred to the Hiflex MIS via JDF. At the press of a button, this information is available to the CSR. Kraft Druck, can therefore provide their customers with more precise information, much faster, thus considerably improving customer services and responsiveness.

Making up-to-date CIP4-production data available through the Hiflex MIS saves on time, reduces the number of misunderstandings, improves efficiency and flexibility, and eventually optimizes the service. Thomas Brickwedde is very satisfied with the effects and is sure that it will have a lasting effect on customer satisfaction and their loyalty.

Since the consumed materials are now automatically booked (with 100% accuracy) against the job the CSR can generate invoices at the press of a button. This substantial improvement increases the cash liquidity because customers pay earlier since they receive their invoices earlier.

Thomas Brickwedde notes: “JDF has enhanced our visibility into the production process. Hiflex, which is the working tool of the CSR, displays the current job status and the products produced with a refresh period of one minute. The scheduler and customer service representatives (CSRs) are kept current about the job’s progress at all times. When customers call to check on the progress of their orders, the CSRs can respond with detailed and accurate information. Since the CSRs do not have to run around and interrogate colleagues, the customer gets his answers right away. Our customers have come to appreciate this a lot. They have the feeling that their jobs are the most important for us and that their print jobs are in best hands. The fact that the invoices are going out earlier is no concern to our customers: on the contrary, it is seen positively as professional order management. Moreover, the fact that the CSRs and the scheduler can now even see customer delivered files and approval state brought more transparency and increased our flexibility through a widened planning horizon.” When calculating the ROI, NPV and IRR, these soft factors were not taken into account.

**Additional benefits (soft factors)** — The enhanced transparency in the production process allows for flexibility when it comes to job scheduling. Customer approvals are instantly communicated to the CSR and the planning board. This allows optimal production planning and coordination of deadlines, as it gives an exact overview of the jobs that are ready to fill available capacity.

A further benefit that Thomas Brickwedde recognized is that new employees working on the presses are trained much faster, and become much more productive much sooner. This is a result of the automatic transfer of data from the Hiflex MIS to the press machine, which superseded the time-consuming and error-prone manual entries.

In general, the company improved their automation and experienced precise data handling by avoiding redundant data entry. Prepress and press personnel are no longer occupied with multiple data input and are better able to focus on the actual production tasks. Besides improved data quality, improvements in efficiency and time savings have been achieved.

Thomas Brickwedde adds: “JDF has proved to be an excellent means to optimize our workflow by automation. At the same time, it helps us to constantly improve production standardization throughout the company.” When calculating the ROI, NPV and IRR, these soft factors were not taken into account.

## **The Costs:**

**One time costs (I)** — Hiflex always comes as a company license with all modules on an unlimited number of workstations. Because of this model, Kraft Druck already owned the license for Hiflex Scheduling and JDF. Nevertheless, the license costs for the necessary modules were proportionally calculated as if an investment would have been necessary. The one time costs listing also includes the Synapse Link licenses and all necessary Pecom updates required for JDF/JMF connectivity. Additionally training, installation, terminal licenses, hardware, necessary machine updates, internal startup costs and ancillary IT infrastructure costs have been taken into account.

**Recurring costs (J)** — The recurring costs comprise the proportional Hiflex recurring fee (license and maintenance) for the Hiflex modules Scheduling, JDF and Production Data Collection, as well as external services and internal IT maintenance.

## The Calculation (ROI, NPV, IRR) —

Periods	Investment	2004	2005	2006	2007	2008
<b>1 - DISCOUNT RATE</b>						
A	Discount rate (expected Rate of Return)	8%				
B	Discount factor	1,000	0,926	0,857	0,794	0,735
<b>2 – BENEFITS</b>						
C	Increased added value					
	Increase in sold production					
	(Increase of added value minus direct costs)	€ 97,859	€ 97,859	€ 97,859	€ 97,859	€ 97,859
D	Reduced costs					
	Reduced work in prepress	€ 13,400	€ 13,400	€ 13,400	€ 13,400	€ 13,400
E	Avoided costs					
	Wage bill reduction (0.8 persons)	€ 72,000	€ 72,000	€ 72,000	€ 72,000	€ 72,000
F	Annual benefits (C+D+E)	€ 183,260	€ 183,260	€ 183,260	€ 183,260	€ 183,260
G	Cumulative benefits	€ 183,260	€ 366,519	€ 549,779	€ 733,038	€ 916,297
H	Discounted annual benefits = PV(F)	€ 169,685	€ 157,115	€ 145,477	€ 134,701	€ 124,723
<b>3 – COSTS</b>						
I	One time costs					
	License Hiflex Scheduling and JDF	€ 7,800				
	Training Hiflex 4 days	€ 5,120				
	Installation Hiflex 4 days	€ 4,096				
	1 Hiflex Scheduling Terminal License	€ 500				
	Hardware for 1 Hiflex Scheduling PC	€ 1,500				
	Update Pecom incl. JMF for 3 stations	€ 24,500				
	3 Machine Updates (Software)	€ 9,240				
	Training Pecom 8 days	€ 9,600				
	License Synapse Link	€ 15,000				
	Training Prinergy and Synapse Link	€ 2,000				
	Internal Startup-costs (1 month)	€ 9,000				
	IT ancillary infrastructure costs	€ 2,000				
J	Recurring costs					
	Hiflex recurring fee on license and maintenance	€ 3,900	€ 3,900	€ 3,900	€ 3,900	€ 3,900
	External Services	€ 2,000	€ 2,000	€ 2,000	€ 2,000	€ 2,000
	Internal IT maintenance (100h)	€ 5,000	€ 5,000	€ 5,000	€ 5,000	€ 5,000
K	Annual costs = (I+J)	€ 90,356	€ 10,900	€ 10,900	€ 10,900	€ 10,900
L	Cumulative costs	€ 90,356	€ 101,256	€ 112,156	€ 123,056	€ 133,956
M	Discounted annual costs = PV(K)	€ 90,356	€ 10,093	€ 9,345	€ 8,653	€ 8,012
<b>NET VALUE</b>						
N	Annual net value = (F-K)	-€ 90,356	€ 172,360	€ 172,360	€ 172,360	€ 172,360
O	Cumulative total	-€ 90,356	€ 82,003	€ 254,363	€ 426,723	€ 599,082
P	Discounted annual value = PV(N)	-€ 90,356	€ 159,592	€ 147,770	€ 136,825	€ 126,689
	ROI per Year = F/K	-100.0%	1581.3%	1581.3%	1581.3%	1581.3%
	ROI Present Value = SUM(H)/SUM(M)	446.5%				
<b>NET PRESENT VALUE</b>						
Q	Net Present Value (SUM(P))	€ 597,826				
<b>INTERNAL RATE OF RETURN</b>						
R	IRR (Internal Rate of Return)	168%				

## *The Net Present Value in US \$759,777.00*

### **About project financial analysis**

**Return on Investment** — The term Return on Investment (ROI) is frequently used in different ways. In financial circles, the strict meaning of Return on Investment (ROI) is Return on Invested Capital, a measure of company performance: the company's total capital is divided into the company's income (before interest, taxes, or dividends are subtracted).

Most business people use “ROI” simply to mean the “Return” (incremental gain) from an action, divided by the cost of that action. In this sense, an investment that costs \$100 and pays back \$150 after a short period of time has a 50% ROI. This is exactly how it is used in the financial analysis of Kraft Druck’s JDF project.

**Net Cash Flow (can be found in the line ‘Annual Net Value’ (N))** — Cash flow, like income, focuses on the difference between money coming in and money going out over a time period. (Net Cash Flow = Cash Inflows - Cash Outflows). Cash flow results do not include some items found in the income statement, such as depreciation expense. Depreciation expense, for example, does not represent an actual cash payment during the reporting period, but rather an accounting charge against earnings. As a result, depreciation expense is not a "cash outflow" in the above financial analysis.

**Discounted Cash Flow (DCF) (can be found in the line ‘Discounted annual value’ (P))** — The DCF is a cash flow summary that has been adjusted to reflect the time value of money. It is an important criterion in evaluating or comparing investments or purchases. All things being equal, the purchase or investment associated with the larger DCF is the better decision. DCF makes use of the Present Value concept, the idea that money you have now should be valued more than an identical amount you would receive in the future. Why? The money you have now could (in principle) be invested now and gain re-turn or interest, between now and the future time (interest rate used in the above financial analysis is 8%, (A)). Money you will not have until some future time cannot be used now. Therefore, the future money’s value is discounted in financial evaluation, to reflect its lesser value. What that future money is worth today is called its “Present Value”.

**Net Present Value (can be found in the line ‘Net Present Value’ (Q))** — The net present value is a form of calculating discounted cash flow. It encompasses the process of calculating the discount of a series of amounts of cash at future dates, and summing them. Therefore the height of the net present value is depending on the length of the period for the project financial analysis. The period which we have chosen for the financial analysis of Kraft Druck’s JDF project is five years.

**Internal Rate of Return (IRR)** — The IRR for an investment is the discount rate for which the total present value of future cash flows equals the cost of the investment. It is the interest rate that produces a 0 NPV. Another way to think of IRR is this: IRR tells you just how high interest rates would have to go in order to “wipe out” the value of this investment. Like DCF, the IRR is a cash flow summary that has been adjusted to reflect the time value of money. The IRR view of the cash flow stream is essentially an investment view: money will be paid out in order to bring in gains. The higher an investment's IRR, the better the investment’s return relative to its cost and the lower the risk.

#### **Note:**

1. IRR says nothing about the magnitude of the return. A tiny investment or expenditure may lead to a magnificent IRR. An alternative action with a smaller IRR might still be preferred if it brings in a much larger net cash flow, or DCF.
2. IRR has the most meaning when there is an initial net cash outflow, followed at least one period with a net positive cash inflow. IRR cannot be calculated with outflows only, or inflows only; IRR is thus not applicable to "cost only" analyses (such as the typical cost of ownership analysis).
3. IRR can be quite misleading if there is no large initial cash outflow. For instance, when comparing a “Lease” scenario with a “Buy” scenario for new computing equipment, the “Buy” alternative may show an IRR of, say 30%-70%, whereas the "Lease" approach may have an IRR in the thousands. This is because leasing may not involve much of an initial cash outlay. IRR is more appropriate for comparing alternatives that have roughly similar patterns of inflows and outflows.