

# SURVEY OF DATA MANAGEMENT SYSTEMS USED IN THE PULP AND PAPER INDUSTRY

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## *Abstract*

Pulp and paper mills are increasingly implementing process information systems with the goal of better tracking, troubleshooting and optimizing their processes. In the field of process engineering as well as in the field of business process engineering, these information systems are playing an increasingly important role. However, their potential is far from being fully exploited, in large part due to a lack of dedicated resources for applications development at mills. There is also a rapid growth in applications capability being driven by system vendors, expanding the potential for finding value in process data. Some applications in the pulp and paper industry discussed in this paper include: 1. data historians for storing process data and using this data for process trouble-shooting; 2. enterprise asset management systems for streamlining maintenance tasks; 3. manufacturing execution systems for streamlining manufacturing, distribution operations and business processes.

*Keywords: data management, business management, pulp and paper industry*

## **Introduction**

By implementing data management systems, pulp and paper (P&P) mills have dramatically increased the availability of real-time data that can be used to better track, troubleshoot and optimize their procurement, production, distribution and sales processes. Accordingly, these information systems are playing an increasingly important role for pulp and paper facilities (Scharpf, 1999). Real-time data can give mills a competitive advantage by allowing facilities to make rapid and well-informed decisions (Yeager, 2000) and, if integrated at the corporate level, the data can also permit corporation-wide analysis and decision-making. Typically, the overall objective is to use data to simultaneously improve process efficiency by holistic analysis, and improve customer satisfaction by a more efficient management of the value chain within the mill (Lail, 2000). Mills should not restrict their view to the site only (Hagy, 2000) but rather look beyond the boundaries of their own operations and establish inter-organizational systems that facilitate the collaboration between companies in the supply chain.

## **Application Areas**

### *Process information systems*

Process information systems might be considered as data warehouses that consolidate and structure manufacturing data in multiple formats, and make data available for use by mill operations as well as for communication to enterprise resource planning (ERP) systems. Typically, data are stored after being “compressed” by basic data filtering and/or data reconciliation. Important information can then be presented in trend curves or graphic overviews.

In general, a distinction can be made between specific software products configured to address applications particular to the P&P industry, and generic software products that do not offer services and applications directly related to this industry. The advantage of specific products is that their suppliers develop critical applications and services, and enable rapid implementation of value from data management systems. On the other hand, generic products give the costumers the freedom of developing their own applications. P&P mills have generally chosen generic products (OSIsoft, 2002).

## Enterprise resource planning (ERP)

Compared to other industry sectors, ERP and enterprise wide management systems are not yet used extensively in the P&P industry but are increasingly likely to be adopted due to globalization (Bottiglieri, 2000; Maxwell, 1999). The newest generation of ERP-products, by focusing on collaborative commerce, enables companies to better coordinate information flows between their suppliers and customers. Indeed, packages increasingly focus on Customer and Supplier Relationship Management (CRM and SRM) and industry portals have been created and customized to transfer information to third parties. Supply chain management plays an important role in developing and cementing relationships with the mill's partners. In this environment, there is significant potential to achieve total cost control and perform real-time value chain optimization. By simulating different scenarios, one is able to find out if an order can be met by applying ATP (Available To Promise), CTP (Capable To Promise) or PTP (Profitable To Promise) criteria. Finally, flexibility is an important asset of an ERP-system in order to be able to adapt to changes in the business environment (Baan, 2002; Honeywell, 2002; JD Edwards; 2002; SAP, 2002).

## Enterprise Asset Management (EAM)

The P&P industry is one of the most asset-intensive, and asset maintenance can be a significant component of total production cost (estimated by some to be as high as 30-40 %). This has driven the development of EAM software whose objective is to improve the availability, reliability and utilization of the process assets in order to maximize Return On Assets (ROA). Integration of EAM with an ERP-system provides additional value by reflecting the impact of malfunctioning assets, and adding asset intelligence to the total integrated system, e.g. drawings and manuals. Therefore, preventive planning of maintenance work becomes more efficient and reliable (Avantis, 2002; JD Edwards, 2002; SAP, 2002).

## Methodology

In this study, system supply companies were selected on the basis of being active in one or more of the following three applications: EAM, ERP and Process information systems. The following table summarizes the contacted companies by application area. Furthermore, a selection of Canadian P&P mills was contacted, specifically their IT-departments, in order to obtain a perspective of how the mills themselves consider these data management systems.

Table 1: List of participating companies

EAM	ERP	Process informations systems
Avantis	Baan	Kvaerner MOPS
IFS	Honeywell	Metso
JD Edwards	JD Edwards	OSIsoft
SAP	SAP	

## Results & Analysis

Four basic product development goals were identified by the software suppliers participating in the survey:

- **Data management:** collection, storage and presentation of data to ensure data accessibility.
- **System Integration:** for most of the suppliers, full integration is a necessity.
- **Maximizing ROA:** providing software and services to streamline maintenance, inventory and procurement activities.
- **Quality management:** process management is tightly linked to quality management by e.g. production loss analysis.

Clearly the focus is on IT-issues (data management and integration), and suppliers have considered less the effectiveness of the operation (maximizing ROA) and responsiveness towards customers (quality management).

The reasons why pulp and paper mills implement data management systems are related to the following points:

- **Effectiveness:** Improved profitability is given a high emphasis in mills, and implemented systems focus on operations management, reliability focused maintenance and process analysis.
- **Responsiveness:** High service levels to customers, meeting short lead-times, handling variability and quality management.
- **Data Access for Decision-Making:** Transparency and access to data throughout the facility are important.

The surveyed P&P mills use a wide spectrum of applications by Honeywell, i2, AspenTech, SAP, Indus, PeopleSoft, Kvaerner MOPS, Majiq, MRO, ABB, OsiSoft, Foxboro and Oracle or sometimes, systems developed in-house. P&P mills typically have process information systems (mainly OSIsoft) for process data and EAM systems. None of the mills surveyed had an ERP system. Figure 1 summarizes the factors that the surveyed mills considered for implementing new data management systems.

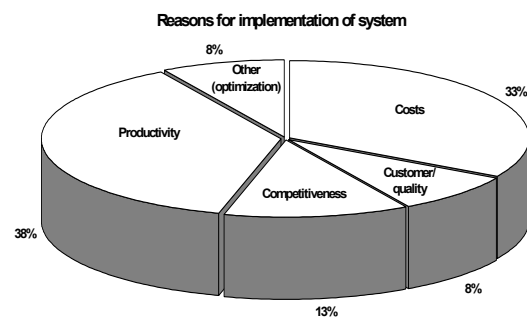


Figure 1: Reasons for mills implementing data management systems

## Benefits & advantages of the implemented systems

After implementation, it is interesting to note that mills indicate that the primary value of the data management systems was simply from getting process information to the right people in a timely fashion. Overall, mills indicated that they are pleased with the systems in place and most of them would choose the same software products again.

More specifically, the principle benefits of the systems were described as follows:

### 1. Effectiveness

- Reduced work-in-progress (WIP) inventory;
- Process analysis and optimization;
- Process troubleshooting;
- Better maintenance management.

### 2. Responsiveness

- Accurate ATP and CTP;
- Quality monitoring.

### 3. Information Technology (IT)

- Visibility of the mill operation in real-time to all departments within and outside the mill.

The noted benefits are mostly in the effectiveness of their operation as summarized in *Figure 2*.

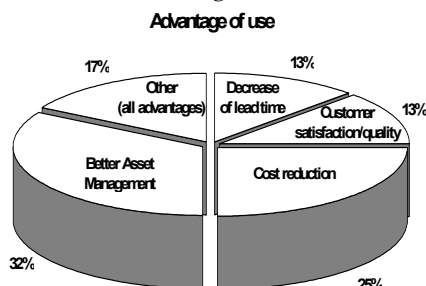


Figure 2: Advantage of the use of data management software

## Criteria of selection and comparison

The following are the main criteria used by mills to select a system:

- **Cost of implementation and cost of ownership:** although this is not the driving force behind selecting a system, it is an important criteria. Costs items include purchasing agreements, service contracts with system vendors, and development costs.
- **Experience in the P&P industry:** selection of a product that has already been adapted to their needs.
- **Integration with existing systems:** ease of integration with systems already in place at the mill.
- **Availability of strong local support:** remaining up-to-date with the latest technology developments.
- **Ease of use:** the user-friendliness of the system.

Mills do not see big differences between the systems that are available on the market because few functional features distinguish them. In contrast, the software suppliers try to differentiate themselves based on many criteria. Typically

they focus on the items identified above for system selection and in particular, the ability to provide value-added services that help organizations maximize the use of the software tool.

The most important similarity between the mill criteria of choosing a system and the differentiators between software suppliers is the amount of experience in the P&P industry. Still, there are only a few suppliers who focus on P&P applications - Kvaerner MOPS and Metso DNA. In contrast, other suppliers' strategy (e.g. JD Edwards and Osisoft) is to develop generic software packages that can be applied in any industry. Some suppliers focus more on IT-related issues than on the needs of P&P mills.

## Modes of Implementation

Generally, systems have been implemented mainly at the mill, by both corporate and the mill, or primarily by corporate. The systems have been implemented and developed mainly internally and with the help of consultants. The mills have software maintenance agreements with the software vendors that provide the latest software releases, product support and reduced training costs. The systems are managed by the IT-department at the mills, while the applications are managed by the users.

Only in a few cases mills have linked their systems or part of their systems to customers. The main reason for this is that the mill is concerned over who is accessing the data and therefore, fear of competition and a lack of trust of the partners. Nevertheless, some suppliers have linked to the mill systems for automatic monitoring of levels of the suppliers' products at the mill. However, new communication technology like the .NET-protocol will enable better information exchange with sufficient security.

## Improvement of systems

Mills identifies that they seek improvement in the following fields:

- Better integration of disparate data sources;
- Flexibility;
- User training;
- Higher resolution of data collection;
- System management and development;
- User-friendliness;
- Reference to non-time based data.

As can be seen, these fields focus on issues related to information technology. The IT-department manages the systems and were contacted for this survey.

In the future the mills would like to see improved ease of implementation, better integration, higher flexibility and greater input of real-time information. Furthermore, since the P&P industry is asset intensive, the mills want more advanced solutions for life cycle management of products and assets. As shown in *Figure 3*, there is also a great interest in solutions for advanced planning and scheduling and collaborative commerce.

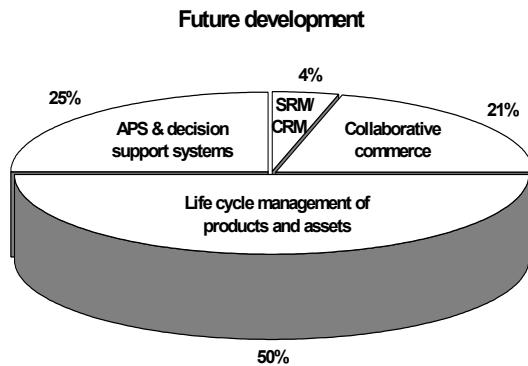


Figure 3: Interests of mills in future development

Certain of these solutions are already available on the market but the level of technology at the mills is less advanced than the state-of-the-art offered by suppliers. So far, software are generally horizontally integrated at the mills. With vertical integration of software, the true value of data can be better explored, e.g. the engineering department and the accounting department will use the same relational database to find information.

Data warehouses, where both continuous and discrete data can be stored and related, are powerful tools to reach this vertical integration and for example enable advanced planning and scheduling and improved decision making. In the short term, mills should be ready to embrace these applications. Furthermore, in the longer term, collaborative commerce will become more and more important because of the globalization of the market and the focus of competition between supply chains instead of independent companies.

The following are the main development areas for systems that the suppliers identified:

- transformation of data into meaningful information;
- methodologies to obtain a representative selection from large data quantities, sorting out erroneous data and handling missing data;
- Application of technologies including Microsoft.NET strategies and Java-applications.

The possibilities that exist for using data to add value to industries are limitless but the critical question is whether the developed application makes sense business-wise. Should the developed application “drive” basic business decisions over other strategies. The experience and acquired knowledge of pulp and paper processes and business models must be carefully combined to implement applications.

## Conclusions

A detailed survey was conducted in order to get a clear understanding of the software products available in the field of manufacturing and data management, and how they are currently - or potentially - implemented in the P&P industry.

Software suppliers were selected on the basis of being active in the field of Enterprise Asset Management, Enterprise Resource Planning and Process Information System. Several Canadian P&P mills participated in the survey in order to get a clear picture of the practical use of the software products.

Although the interpretation of data from data management systems has not been extensive, it is now growing steadily. Nowadays, process information systems and enterprise asset management are the two most used applications while ERP is still rarely used at the mill level. Interestingly the most important criterion identified by the surveyed mills for choosing a system is the supplier’s experience in the P&P industry, whereas only few of them truly focus on vertical industry applications. Data interpretation and so-called vertical integration are the most important issues that need to be addressed for applications such as improved decision making and advanced planning and scheduling.

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