Oji Paper’s Case Report & Expansion Plan of PI Usages

Takahiro Ishizaki, Group Manager
Oji Paper Co., Ltd.
Contents

1. Overview of Oji Paper Company & Paper Manufacture
2. PI Deployment
3. PI Utilization
   a. Fuji Mill
   b. Kasugai Mill
   c. 3 Mills, Bulk Purchase
   d. Tokai Mill
4. Future Plans
Who we are

- **Founded**: February 12, 1873
- **Established**: August 1, 1949
- **Paid-in Capital**: 103,880 Million Yen (2009)
- **Sales**: 11,084 Million $ (2008)

**Largest Paper Company in Japan, No.6 in the world**

**Major Business Lines**
Production, conversion/processing and sales of printing, writing and related papers; packaging and wrapping papers; carbonless papers; household products; containerboard and boxboard. Production and sales of such end-use products such as corrugated board and boxboard containers; paper-board containers; plastics; thermal paper; self-adhesive paper and disposable paper diapers. Production and sales of chemicals for paper making and packaging equipment. Leasing of Company's land and property. Reforestation inside Japan and overseas; maintenance of Company owned forests.

- **Number of Employees**: 20,415 (2008)
- **Number of Mills**: 9 (Kushiro, Tomakomai, Fuji, Kasugai, Kanzaki, Yonago, Kure, Tomioka, Nichinan)
- **Group Companies**: Oji Paperboard (11 mills), Oji Specialty Paper (4 mills), Oji Nepia (3 mills)
Paper Making Process: Chips ~ Products

1. Cut-up: Make chips
2. Digesting: Boil chips → Pulp
3. Bleaching: Pulp
4. Beating: Beat Pulp Fiber
5. Paper making
6. Dry
7. Finish: Roll conversion, Flat conversion

Related Facility:
1. Electricity → Power Generator, Receiver, Distributor
2. Steam → Boiler
3. Water → Drainage equipment

Recycling
Panelboard
Chemical Pulping
Mechanical Pulping
Stock Prep.
Mechanical Pulping
Paper Making
Wood Handling

Paper Making Process Diagram:
- Recovery Boiler
  - Steam
  - Electric
  - Combustion

- Chips
  - Make chips
  - Recovery Boiler
  - Black Liquor
  - Corrugated Fiberboard
  - Wrapper

- Pulp
  - Beat Pulp Fiber

- Pulp Liquor
  - Sheets (dry)
  - Big-roll winding

- Sheets
  - Roll paper
  - Flat paper

- Waste Paper
  - Waste Paper processor

- Ship out Products

- Waste Paper processor
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## History of PI Deployment at Major Mills

<table>
<thead>
<tr>
<th>Installed</th>
<th>Mill</th>
<th>Objectives</th>
<th>Overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. 2000</td>
<td>Kure</td>
<td>Machine operation analysis (PI as the first PIMS)</td>
<td>Installed on existing paper machine to analyze broken paper ※2,000TAGS</td>
</tr>
</tbody>
</table>
| Oct. 2001     | Fuji          | Operation support system development for New machines (PI as the first PIMS) | Installed on new machine to support consolidated operation (preparation ~ finish)  
Presented at PI UC in Japan. ※16,000 TAGS                                                |
| Aug. 2005     | Kasugai       | Power equipment report & analysis system renovation (Replace Hitachi report system) | Replaced existing system with PI to analyze operation ※2,000TAGS                                   |
| Dec. 2006     | Kasugai       | Pulp information system renovation (Replace Fujitsu MES domain, PIMS area)  | Installed PI (as PIMS) on area built w/ existing comp system to manage performance & to analyze operation ※20,000TAGS |
| May 2008      | Ebetsu (Oji-Sp) | Pulp Operation Analysis                                                   | After trial deployment at KP Plant, decision was made for permanent installation. ※1,000TAG   |
| Nov. 2008     | Tomioka (Kure) | Operation support system renovation Base operation data visualization and benchmark data management (T: New PI, K: Replace ASPEN, Y: Replace Toshiba) | Utilize PI as de facto standard of PIMS; Bundled package contract to install PI in all 3 mills ※60,000TAGS |
| Oct. 2009     | Tokai (Oji-Sp) | Machine Operation Analysis Support (Operation cost reduction by KPI Visualization) | Improved operation performance by benchmarking operation cost and trend monitoring using KPI visualization ※2,000TAG |
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Case Example
Oji Paper Co., Ltd. (Fuji Mill)

<Objectives of PI Introduction>

- High Quality, Small Lots, Short-Delivery Order Intake
  - Need for a control system that communicates directly with the info. system
  - Need for consolidated operation control system – from pulp manufacturing stage through downstream stage

<Functions>

- Operation & Quality Data Management by Reel
  - Provide reel quality info. in finishing stage
  - Production history management (Data stored for 1 year)
  - Collection & management of test data

<PIMS Selection Criteria>

- Ease of user’s display creation
- Ease of cut & paste of trend display as a standard feature
- Ease of data read-in to Excel
- Ease of data analysis & editing
- Ease of connections to paper mill-specific instruments.
- Proven records from Pulp & Paper applications
System Configuration at Fuji Mill

In-house Broadcast Web Server

Brand Management Server

PI Server

Op. Data & Graphic Data

DCS

QCS

WIS

Inspection System

Finishing & Logistics System

Host Computer

Finishing Production Management Server

Vertical Integration (Info. Sharing by PIMS)

Horizontal Integration (Single Window Operation)

Real Time Information — Currency of the New Decade

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QCS / WIS Overlay Display
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Case Example: Kasugai Mill

<PI Implementation: Purpose & Aim>

- Centralized management of pulp manufacture process data
  - Renewal of existing system
  - Effective utilization of existing Excel report format (Feed into PI)
  - Eventual cost reduction through company-made reports

- Effects of PI implementation
  - Reference to process data of different DCS’s in 1 display
  - Ease of creating trends & reports by department
  - Reduction of report function cost
  - Ease of retrieving & reusing past data
  - Save time through simplified data analysis & thus trouble analysis
## Process Operation Status

<table>
<thead>
<tr>
<th></th>
<th></th>
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<tr>
<td>1D IV</td>
<td>IN OPE</td>
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<td>RPM</td>
<td>DIP L1</td>
<td>OCS</td>
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<td>T2M/C</td>
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<td>M3/H</td>
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</table>

**Last Update:** 2009/10/10 10:05

Update Data
# Kasugai Mill / Water Usage Display

## Water Usage by Department

### Last Update: 2009/10/10 10:05

(Unit: M3/H)

<table>
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<th>Target</th>
<th>Snapshot</th>
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### Water Usage by Process

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<th>Low Limit</th>
<th>Lowest</th>
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</thead>
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<td>99.9</td>
<td>99.9</td>
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<td>99.9</td>
<td>99.9</td>
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<tr>
<td>Steam 2 well</td>
<td>99.9</td>
<td>99.9</td>
<td>99.9</td>
</tr>
<tr>
<td>7, 8 M well</td>
<td>99.9</td>
<td>99.9</td>
<td>99.9</td>
</tr>
<tr>
<td>T-M/C well</td>
<td>99.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Update Data
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Case Example
PI Deployment at Oji Paper’s 3 Mills
- Mill Operation Control System Renovations -

<Background>
- Aging Operation Control System (OCS) must be replaced.
- New OCS should cover Pulp Milling, Paper Machines and Utilities and integrate all process data in each plant consistently.

<Objectives>
- Consolidate all process data by each Mill and standardize data management.
- Consolidate all process data by Pulp, Paper and Utility facilities in each Mill.
- Utilize data to keep track of operations and create Daily/Monthly reports.
- Provide data to Operation Control System.
- Unify code numbering structure, external interfaces, terminology, infrastructure and operation management.
Case Example
PI Deployment at Oji Paper’s 3 Mills

<Issues to Be Addressed>
- Conventional database can hardly keep up with OS updates.
- Renewal is costly.
  (Each hardware replacement imposes verification cost of applications)
- Interfaces differ by facility depending on DCS (Extra cost).
- Data crucial for managing quality & cost are not consistently collected.

<PIMS Selection Criteria>
- Ease of end-user’s display creation
- Ease of data read-in to Excel
- Ease of data analysis & editing
- Ease of connections to paper mill-specific instruments.
- Proven records from Pulp & Paper applications
- Ease of data exchange with other OCSs
PI Positioning at Major Mills of Oji Paper

Nantong/China

Production Management

Prod.Mgmt
Prescription
Process Mgmt

Fujitsu

Oper. Control
Prescription
Result
Quality Trace
ability

PIMS(PI)
OSIsoft/Yokogawa

External Equipment

Interfaces
QCS, WIS, Drive, IJP
PLCs

ALIS
Yokogawa

Toshiba

Production Management System (Oji Business Center)

Operation Control System
Fujitsu

PIMS(PI) OSIsoft/Yokogawa

Instrument Vendors (DCS, QCS, etc)

Real Time Information — Currency of the New Decade
System Configuration at Tomioka Mill

- **PI Clients**
  - ProcessBook DataLink
  - PI ActiveView

- **Web Server (New)**
  - PI ActiveView

- **Recipe Management System**
  - Recipe Report Data

- **PI Server (New)**
  - QCS Data

- **Operation Control System**
  - PI ActiveView

**PI Network**

- **PI Software**
  - FA LAN
  - Yokogawa CS3000
  - PI OPC 1/F
  - Yokogawa DS300
  - Yokogawa CS3000
  - Processing #7,#8
  - Processing #9
  - Coating
  - Yokogawa Centum-CS
  - HMX

**Hardware**

- Add (IP Change)
- Customer Yokogawa
- Processing Paper Making Coating

**Processing**

- Yokogawa 9000CS
- Yokogawa 9000CS
- Yokogawa 9000CS

**Coating**

- Yokogawa 9000CS
- Yokogawa 9000CS
- Yokogawa 9000CS
System Configuration at Yonago Mill

Operation Control System

PI Server

PI Client

Web Server

DWH

Windows/Oracle

PI OLEDB Data Access Option

PI Network

OPC Client

OPC Network

OPC Client

OPC Client

OPC Client

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System Configuration at Kure Mill

[Diagram showing connections between PI Client, PI Server, Web Server, and other components such as OP/Client, PI Network, and Operation Control System.]
Display Sample 2 / Steam Balance Monitor
PI License Used

- PI Enterprise Server
- PI OPC DA Interface
- PI Measurex HMX/ODX/MXOpen Interface
- PI COMBO (ProcessBook, DataLink)
- PI ActiveView
- PI API / PI OLEDB

Same PI components at Tomioka, Yonago and Kure Mills
Benefits of PI and Next Steps

**Benefits**
- Reference multiple machine data in single display
- Reduced cost for maintenance, analysis, reports by EUC
- Reduced cost for system building

**Next Steps**
- Enhance quality traceability by leveraging PI capability
- Enhance unit cost management in real-time
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Case Example
Oji Specialty Paper Co., Ltd. (Tokai Mill)
- Cost reduction by utilizing “Real-time Unit Cost Display System” -

<Issues and objectives of PI introduction>
- Reduce material/energy cost & improve yield rate through real-time visualization of production status & optimized operation under the circumstances of small lots, many grades and low machine operation)
- Improve time efficiency (=cost reduction) through automated daily reports & decreased operator load

High-Mix Low-Volume
Little awareness of specific production cost

Energy Loss
Smaller lots but full energy usage (esp. electricity)

Challenges

Fluctuation of Variable Cost & Yield Rate*
Cost-optimized manufacturing pattern yet to be established
*Causes production variance and affects to product price decision

Extra Man-hour Cost and Work Load
Hand-written Daily report

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Real-Time Operation Progress Display (Proto)

★ View by Brand

Fujinomiya B-2M/C Operation

<table>
<thead>
<tr>
<th>Brand Data</th>
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<tr>
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<tr>
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</table>

★ Show Cost (Cost Awareness)

Basic Unit Cost Comparison

Current

Top Performance

★ Comparison with Top Performance (Conscious Improvement)

Real-Time Cost Trend Monitoring

★ Monitor Rejection %, Stock Blending %, Density & Flow Variation ➔ Action for Improvement

Real Time Information — Currency of the New Decade

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Paper Machine Overview / Visualization

Overview

Brand#: 999  Brand Name: HJ98-MKK  Basis Wt Set: 450 g/m²

Wt Add Cost (Basis Wt Trend)
Top Performance Comparison

Pulp Unit Cost/Rejects Ratio
Total Unit Cost/Steam Usage Ratio

Pulp Unit Cost/Top Layer Ratio

Wt Add Cost/Day 45.5 x10000 Yen
Pulp Cost/Day 560.0 x10000 Yen
Total Cost/Day 720.0 x10000 Yen

★Link to Pulp Unit Cost (by Layer)  ★Link to Pulp Composition  ★Link to Machine Speed

Most intuitive!
Effect Confirmation Daily Report

- **Point 1**
  - Focus on the chart showing cost reduction status by shift. The chart displays shifts labeled as Shift-1, Shift-2, and Shift-3, with bars indicating cost reduction amounts (Yen) and rejects/weight adding.

- **Point 2**
  - Analysis of data by shift, grade, and cost reduction target items. The table highlights basis wt, setting, past avg, target basis wt, actual basis wt, telesis mark, and reduction (Yen) for different shifts and grades.

- **Point 3**
  - Examination of real-time information, currency of the new decade, emphasizing the importance of data-driven decision-making and market responsiveness.
Future Prospects

• Continual activities for improvement and sharing know-how
  – Sustained cost-conscious operations
  – Implementation of measures for promoting KAIZEN notebook entry

• Improvement/Utilization/Expansion
  – Improvement of accuracy for cost understanding
  – Boosting yield
    • Chest residue calculation and display
  – Regulation compliance and laborsaving
    • Calculation for waste paper blending ratio

• Cost DB establishment
  – Development for other mills
  – System construction that enables wide-area deployment
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Efforts for Enhancement of Business Competitiveness

Visualization of management info and speeding up of PDCA cycle
- Support for agile decision making by provision of integrated management info and KPI
- Early grasp on accurate performance results and feedbacks to production planning
- Cost reduction and efficiency improvement at corporate level

Plant wide establishment of advanced informatization and PDCA cycle
- Viable production planning and instruction issuance
- Automatic collection of production performance data and sending consistent data to ERP
- Speeding up, visualization and upgrading of plant management work

Visualization of plant operation info
- More efficient plant operation management work
- Automatic plant data collection
- Automatic quality analysis data collection
Thank you

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