Company Overview
Characteristics of the system
Background of and effects brought by introduction of the system
1. Outline of implementation
   System overview
   Implementation schedule
   Introduction cost
2. Explanation of scheduling system
3. About periphery systems
4. System issues
5. Wrap up
# OUTLINE OF COMPANY

<table>
<thead>
<tr>
<th>Founded:</th>
<th>July 25, 1987</th>
</tr>
</thead>
</table>
| Lines of business: | BUMP Business  
Film Devices Business |
| Production base: | Ohme Works (No. 1 & No. 2 plants)  
Yamanashi Works (No. 1 & No. 2 plants) |
| Capital: | 2,992 Million yen (as of March 31, 2006) |
| Turnover: | 25.1 billion yen (March 2006) |
| No. of employees: | 630 (March 2006) |
| Stock exchange: | JASDAQ |
| Securities code: | 6760 |
| Newspaper listing name: | C Micro |
| Newspaper listing column: | J stock |
OUTLINES OF BUSINESS

CONSTANTLY UPHOLDS THE INNOVATION OF
DIGITAL EQUIPMENT WITH MICRO METER BASED UNIQUE
AND REVOLUTIONARY TECHNOLOGIES

Film devices business  COF/TCP
BUMP business  Gold BUMP
Solder BUMP/W−CSP
FILM DEVICES BUSINESS

Used in large screen thin type PCs/LCD televisions for low cost

〈 COF structure 〉

Double coating film (PI+Cu)
LC driver
LC connecting part

PI : polyimide
Cu : copper
BUMP BUSINESS

SOLDER BUMP/W-CSP

Weight saving for multifunction mobile information terminal equipment

GOLD BUMP

Constantly evolving high definition color LC display
W-CSP APPLICATION EXAMPLES

Example of use (digital camera)
### PRODUCT CHARACTERISTICS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td><strong>PRODUCT CHARACTERISTICS</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Wafer inch size</td>
<td>5(\Phi), 6(\Phi), 8(\Phi), (12(\Phi))</td>
</tr>
<tr>
<td>(2) No. of models</td>
<td>About 100/month</td>
</tr>
<tr>
<td>(3) Lot size</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mass production</td>
</tr>
<tr>
<td></td>
<td>25 sheets (1~25 sheets)</td>
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<tr>
<td></td>
<td>Proto type</td>
</tr>
<tr>
<td></td>
<td>1 sheet ~ 10 sheets</td>
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<tr>
<td>(4) No. of processes</td>
<td>Min. 9 ~ Max. 67</td>
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<tr>
<td>(5) Lead time</td>
<td>Prototype 4 days ~ 14 days</td>
</tr>
<tr>
<td></td>
<td>Mass production 7 days ~ 10 days</td>
</tr>
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</table>

W-CSP: items handled by the scheduling system
CHARACTERISTICS OF MANUFACTURING PROCESSES


17. Descum


• 3,9 / 4,10,15 / 5,11,16 / 12,18 / 7,13,17

Note: The above manufacturing processes use the same equipment.
BACKGROUND INTRODUCTION

1. Intends to bring W-CSP business to our 3rd pillar of operation, which started full-scale mass production in 2004, and to attain the number one share in the world.

2. As this was a new package, it generated a number of sales order alterations in proportion to the increases in sales orders. Also, the percentage of its prototype was high. It was thus predicted that the definite scheduling adjustments would not be carried out manually.

3. This didn’t mean that we had to depend on an expensive package specially designed for semi-conductor processing. Nonetheless, we didn’t have enough time to prepare in-house developed scheduling software.

4. Our group company has introduced SMT based scheduler in the past. We were thus not worried about its validity.
EFFECTIVENESS OF INTRODUCTION

1. The company is not managed in a wait-and-see style but a mind-set for preparing planning is now permeating.

2. Productivity enhancement judging by results of the operation improvements as well as the information processing improvements.
   - Production productivity per person
     Enhanced by 43%
   - Operational time in preparing planning
     Shortened to 1/6

3. The manufacturing lead time was shortened.
   - Lead time
     Shortened by 20%
   - Unevenness of lead time
     Reduced by 30%
1. OUTLINE OF IMPLEMENTATION

1.1 SYSTEM OVERVIEW

SCHEDULING SYSTEM
HOST I/F, SCHEDULING, SETUP, WORK INSTRUCTIONS SHEET

ENVIRONMENTAL IMPROVEMENTS FOR THE OPERATION OF SCHEDULING SYSTEM

- MASTER IMPROVEMENT
  - RESOURCE MASTER
  - PROCESS MASTER
  - IMMEDIACY OF ACTUAL DATA RESULTS AND IMPROVING THEIR ACCURACY
  - PREVENTION OF INPUT MISTAKES
  - RECOGNIZING ORDER NO. (BARCODE) WHEN INPUTTING ACTUAL RESULTS
  - PREVENTION OF RECIPE INPUTTING TROUBLE

ESTABLISHING SUB-SYSTEM
ACTUAL RESULTS ARE INPUT (BARCODE IS INPUT) BY WIRELESS HANDY TERMINAL
- ID LABEL ISSUE
- RECIPE MANAGEMENT SYSTEM

PERIPHERY SYSTEM

CASIO MICRONICS CO., LTD.
1. OUTLINE OF IMPLEMENTATION

1.2 IMPLEMENTATION STRUCTURE

Throughput Double Propulsion Project

Production Improvement

Production Planning Scheduling

System Development Information Control Gr.

Master Maintenance Manufacturing Dept /Technology Dept.

In House Development 2 SE Personnel

Asprova Corporation

Review
President
Division Manager

Progress Meeting
Weekly
## 1. IMPLEMENTATION OUTLINE

### 1.3 IMPLEMENTATION SCHEDULE

### ASPROVA Implementation Plan (and results)

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<td>2</td>
<td>Environment prep</td>
<td>Eval start</td>
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<td>Data prep</td>
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<td>6</td>
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<td></td>
<td>Recipe management</td>
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</tbody>
</table>

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**CASIO MICRONICS CO., LTD.**

13
1.4 INTRODUCTION COST (REFERENCE)

- **ASPROVA**: License (option available)
  - For planning and executing main unit (server) 1 set
  - For shop floor 1 set
  - Maintenance fee

- **I/F Development**: Incorporating data from AS/400
  - *Actual results, master (manufacturing process, equipment), order*

- **Consultation**: For 6 months (about 10 times)

- **Introduction Equipment**: ASPROVA operating PC 2 sets

  Total **About 15,000,000 yen**
  (Scheduling system only)
2. EXPLANATION OF SCHEDULING SYSTEM

2.1 Information Referenced Diagram
2.2 Master Registration
2.3 Order Input
2.4 Actual Results Input
2.5 Work Instructions Sheet
2.6 Operational Flow
2.7 Work Progress Table
2. EXPLANATION OF SCHEDULING SYSTEM

2. INFORMATION REFERENCED DIAGRAM
2.2 MASTER REGISTRATION

Outline of data:  
No. of manufacturing process: about 70  
No. of equipment: about 80  
Operating 24 hours, 360 days/year

Incorporating the manufacturing process/equipment information from host machine (AS400)
  * Coinciding manufacturing processes, resource names and codes
  * Synchronization of update information  
    (synchronization of maintenance timing)

Inputting master data designed for scheduler
  Master registration examples that fit our company’s production characteristics
  * Calendar (maintenance time registration for equipment)
  * Shift table (24 hours 4 groups 2 shifts structure)
  * Overlapping, lot wrap up (furnace resource) operation
<table>
<thead>
<tr>
<th>品目</th>
<th>品目番号</th>
<th>工程コード</th>
<th>指図種別</th>
<th>指図コード</th>
<th>品目/資源</th>
<th>先行段取り</th>
<th>製造</th>
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</tr>
</tbody>
</table>

- **Manufacturing process, resource code**: Combined manufacturing process name and code (simple display, combined when master is synchronized)
- **Manufacturing process number (order)**: Handles manufacturing processes adding simulation by skipping every 10 digits
- **Manufacturing ability**: Time saved when registering new items by preparing the master separately
- Default equipment prepared for each wafer size

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**ASPROVA INTEGRATED MASTER SETUP EXAMPLE**

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**CASIO MICRONICS CO., LTD.**
2.3 ORDER INPUT

Receiving Order Production, Approximately 200 Orders Per Month, 100 models (Asprova in Place)

* Sales order:
  - Input when the order is placed from a client

* Manufacturing order:
  - Prepared when a manufacturing process is input
  - Prepared by host machine’s manufacturing process control system

Sales orders and manufacturing orders loaded from host machine.

Scheduling method:
* Appointing “FORWARD” based on the input date
* Sales orders (based on the scheduled warehousing date)
* Manufacturing order (based on the manufacturing process input date)
* Priority given based on the needs of urgency etc.
2.4 INPUTTING ACTUAL RESULTS

Imported from host machine (AS400) manufacturing process control system

* Actual operational results input automatically
  (completed time, number of finished item) for each model, each manufacturing lot, and each manufacturing process
* Automatically deletes manufacturing orders, using actual data results

Timing:

*At time of scheduling (once a day, around 17:00)
Prepared a menu for handling the interface data, using EXCEL with which the shop floor staff are familiar.
2. EXPLANATION OF SCHEDULING SYSTEM

2.5 WORK INSTRUCTIONS SHEET

This sheet is like a ledger sheet which makes it easy to give instructions to production site using ASPROVA scheduling results.

Details of ledger sheet:

* Outputs each manufacturing process’s scheduled production time, which is assigned by the scheduler. This is done for each manufacturing process as well as each equipment.
* Times are continually upgraded with hourly imported actual data results.
* Contains comments such as urgency, etc. if special instructions are required for some operations.

Operation of ledger sheet:

* The output work instructions sheets are distributed to shop floor staff at each manufacturing process, and the work is carried out.
* Defects or delayed input that occurred when the manufacturing processes were input are reflected to the next day’s production planning using the actual results, and work instructions are reviewed on a daily basis.
<table>
<thead>
<tr>
<th>NO.</th>
<th>Wiwire</th>
<th>Engineer</th>
<th>Resources</th>
<th>Lot No</th>
<th>Order No</th>
<th>Part No</th>
<th>Quantity</th>
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<th>End Time</th>
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</table>

- **Manufacturing process retaining status** (Indicated in grey)
- **Reflects the input results on an hourly basis**
- **Work in progress**: Updates in red letter
- **Completed work**: Half transparent letter

**CASIO MICRONICS CO., LTD.**
2. EXPLANATION OF SCHEDULING SYSTEM

2.6 OPERATIONAL FLOW

8:50 CHANGING SHIFTS
* Administrative staff accepts sales orders.
* Schedule forecast to customers
* Master maintenance

17:00 SCHEDULING PROCESSING & PREPARING WORK INSTRUCTIONS SHEET
* Rescheduling & preparing work instructions sheet based on new sales orders and actual operational results

17:30 DISTRIBUTING WORK INSTRUCTIONS SHEET
Referring work instructions sheet (sharing)

20:50 CHANGING SHIFTS
* Operator inputs actual results.

Automatically updates the actual results on an hourly basis
Since the work instruction sheet doesn’t provide all the information, the work progress status (from input to completion) is displayed in the form of a list where the comparison is made between the planning and the actual result for each manufacturing order.

DETAILS OF LEDGER SHEET

- Makes a comparison between the scheduler prepared plan (from input to completion) and its actual result for each major manufacturing process.
- Selects the planning data, to which the comparison is to be made, from the past ones that were planned at the arbitrary point of time.

OPERATION OF LEDGER SHEET

- Selects the past schedule for which the comparison needs to be made with the actual result.
- Possible to prepare a table as needed (possible to have continual updating of the actual results on an hourly basis.)
- Makes the comparison between the planned and the actual results, and analyzes the planning accuracy and the issues.
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進捗表 M1376191 QGAN

計画 vs 実績

延べ入差 所要差

Slow against planning ST

Delayed actual results input against planning ST

CASIO MICRONICS CO.,LTD.

27
3. PERIPHERY SYSTEM

* Establishing Sub-System in Order to Operate Scheduling System

3.1 Actual data input, using a wireless handy terminal

3.2 ID label printing

3.3 Recipe control system
3.1 INPUTTING ACTUAL DATA (INPUT BARCODE), USING A WIRELESS HANDY TERMINAL

PURPOSE:
- Improve the accuracy of scheduling system, by inputting the actual data into AS/400 in a timely manner.
- Implement accurate and easy input processing through the adoption of barcodes and the input of actual results in system time (promoting the input of the whole manufacturing processes)
- Provides the person in charge of operation (i.e., operator) with the operational procedures as well as the recipe information in order to prevent operational mistakes.

OUTLINE:
- Connection is made with AS/400 online terminal, in order to synchronize with the actual results input currently in use.
- Introduces a portable type wireless “handy terminal” equipped with a barcode reader.
3. PERIPHERY SYSTEM

OUTLINE FLOW DIAGRAM FOR HANDY TERMINAL (HT) INPUT SYSTEM

MANUFACTURING PROCESS

TAG
ORDER NO.
READ BARCODE
RECIPE INPUT
INPUT CHECK
RECIPE DISPLAY
ACTUAL INPUT RESULT INFO
WIRELESS
AS/400
MODEL: EQUIP.: RECIPE NO.

INPUT
RECIPE NO.
RECIPE DISPLAY
WIRELESS

COMPLETION
TAG
ORDER NO.
READ BARCODE
HT
COMPLETED ACTUAL RESULT INFO.
WIRELESS
STAFF NO.

TO NEXT MANUFACTURING PROCESS
3.2 ID LABEL ISSUING SYSTEM

Purpose
- Inputting of the actual results of manufacturing processes in a timely manner
- Prevention of mistakes such as mixing up lot cards and the actual item

Outline
- Replaces the ID label number on carrier cases that travel between manufacturing processes with an automated output sheet, complete with bar codes
- Links the ID label with a lot card by displaying the last 4 digits of order numbers
- Simultaneously processes the ID label upon the output of a lot card
OUTLINE OF FLOW DIAGRAM FOR ID LABEL ISSUING SYSTEM

3. PERIPHERY SYSTEM

Receiveing accepted

Receiveing inspection

Cut paper printer

Lot card

Affix

Tag

Label printer

ID label

Manufacturing Process

Image of ID label

Order number

8934

last 4 digits

Order number

CASIO MICRONICS CO., LTD.
3. PERIPHERY SYSTEM

ID Label

ID label and HT
3.3 RECIPE MANAGEMENT SYSTEM

Purpose
- Avoids mistakes in inputting the recipe during the manufacturing processing operations and thus improves the yield ratio
- The database of recipes will be compiled and utilized for speeding up various recipe outputs (i.e., screen/ledger sheet) as well as for the recipe output system of equipment which is under planning

Outline
- Establishes data base on host machine (AS400)
- Utilizes the data based recipe data for recipe output screen at HT, a lot card, etc.
OUTLINE OF BUSINESS FLOW DIAGRAM FOR RECIPE MANAGEMENT

3.PERIPHERY SYSTEM

Process condition table (EXCEL)

EXCEL data

Shared server

Already approved

Ready-to-input data

Check LIST

Selection/execution screen of EXCEL data of “Process Condition Sheet” that need registration

Operated by division’s personnel in charge

AS/400

Recipe master

Item master
Manufacturing orde master
Manufacturing process master
Equipment master

Recipe display
RECIPE SCREEN (ACTUAL EXAMPLE)

**Input:** Taro Maikuro

**Order No.:** M1193619A

**Laser mark:** WLP#1

**ZZZZ_YYY123BC**

**Seal spec.:** 10-0-4-9869

**F1:UP  F3:BK  F4:CHG**
4. SYSTEM ISSUES

• Improvement planning accuracy
  – More accurate scheduling can be obtained through the registration of human resources (i.e., operator skill)

• Expanding to other products
  – This scheduling system provides both the flexibility and speed required for sales order driven production
5. WRAP UP

■ Tips for utilization of ASPROVA
  - Clearly specify the purpose of the scheduling system
  - Set up scheduling to fit company’s own production (in this case: sales order based production, complex manufacturing processes)
  - Strike a balance between detail of master table, and accuracy of the resulting schedule

■ Linking to process management system
  - Avoids inputting master twice
  - Ensures consistency with ASPROVA by keeping information in a standard format
  - Requires immediate input of all available results data

■ Utilizing schedule information
  - Favor a work instructions sheet over a Gantt chart at the shop floor
  - Narrow down what you want in order to gain effective results
  - Use the scheduling system to further improve manufacturing processes
WLP manufacturing process

Completed product