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Paper No. 4: MAPS - GP (Graphic Piping) Present and Future Capability

U.S. DEPARTMENT OF THE NAVY
CARDEROCK DIVISION,
NAVAL SURFACE WARFARE CENTER
The National Shipbuilding Research Program REAPS 5th Annual Technical Symposium Proceedings Paper No. 4: MAPS - GP (Graphic Piping) Present and Future Capability

Naval Surface Warfare Center CD Code 2230 - Design Integration Tools Building 192 Room 128 9500 MacArthur Blvd Bethesda, MD 20817-5700

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MAPS-GP (GRAPHIC PIPING)
PRESENT AND FUTURE CAPABILITY

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Mr. Kobayashi is a member of the engineering department in the system headquarters and is the group leader of the team developing MAPS-GP. His past experience includes work with a graphic N/C system for steel plate flame cutting and a graphic piping system for a chemical plant.

Mr. Kobayashi is a graduate of Tohoku University, department of science.
MAPS

Originaly

Mitsui Automated Pipe Shop system
(Mitsui Shipbuilding & Engineering Co., LTD.)

present

Mitsui Advanced production System
(Mitsui Engineering & Shipbuilding Co., LTD)

MAPS-GP ; Graphic Piping system
MAPS-NC ; Graphic Steel plate Cutting system
MAPS-DATA ; MD 7000 work station terminal
MAPS-GRAPH ; YM9000 satellite graphic terminal
MAPS-M ; Modularized plant production
Why MAPS-GP?

- High... Low Economic Development
- Alter company's need
- Reduce Input Cost
  - Shorten the EXEC. Time
- Change Organization
- Enhance production design
- Distributed System Request
## Long Range Plan of MAPS-GP

<table>
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<tr>
<th>Step</th>
<th>Range</th>
<th>Object</th>
<th>Technology</th>
<th>Need</th>
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<tr>
<td></td>
<td>1970-75</td>
<td>Ž Numerical Information System</td>
<td>Large scale Computer</td>
<td>Ž Mass Production system</td>
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<tr>
<td></td>
<td></td>
<td>Ž Automated Pipe Shop</td>
<td>Ž Part coding &amp; Batch job</td>
<td>Ž Improved Shipbuilding</td>
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<td></td>
<td></td>
<td>Ž Separation the routine and judgement work</td>
<td>Ž Interactive Computer Graphics</td>
<td>Ž Large scale investment of equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ž Elimination Part coding</td>
<td>Ž Distributed Systems</td>
<td>Ž Reduce ship acquisition time</td>
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<td></td>
<td></td>
<td>Ž Reduce the TAT'</td>
<td></td>
<td>Ž Design power up</td>
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<tr>
<td></td>
<td>1976-78</td>
<td>Multi purpose system</td>
<td>Ž High accurate digitizer</td>
<td>Ž Cut the equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cut off the drawing work</td>
<td>Load sharing System</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>High speed data input</td>
<td>Large scale file</td>
<td></td>
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<tr>
<td></td>
<td>1979-80</td>
<td>Automated piping design</td>
<td>Ž Computer Network</td>
<td>Concentrate design office</td>
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<td></td>
<td></td>
<td>Ž Perfect unmanned pipe shop</td>
<td>Ž Advanced CAD/CAM</td>
<td>Wide range application</td>
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<td></td>
<td></td>
<td></td>
<td>Ž Full Automated pipe shop)</td>
<td>Separate production design</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>1981–</td>
<td></td>
<td>Engineering power up</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ž Perfect unmanned pipe shop</td>
<td></td>
<td>Ž Concentrate production management</td>
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The Object of II step MAPS=GP

- Low Cost
  - Simultaneous operation with GNC system ..... effective use
  - Cost down . . . . . 30\% of design cost
  - Shorten the design time
  - Improve: the design accuracy

- Step by Step Approach
  - Eliminate part coding
  - Move the most load from center to work station
  - Shorten T. A. T.

- Output Production Management Data
  - Reduce the Pipe shop idle time
System’s Characteristics

Interactive Graphics

2 Tutorial Operation

2 Function Key

2 Easy Programming

• instant Correcting Errors
Operation Functions

Ž Pipe Line Generation
  (Piping Root, Node Point, Branch)

* Setting parts
  .Valve, Reducer, Flange, Elbow, ...

Ž Pipe piece Data Generation
 Ž NC Cutting & Fitting control Data
 Ž NC Bender Data
 Ž Pipe piece Drawing . . . . Dimension, comment

Ž Scale

Ž View change

Ž Display Hull Line

Ž Change
YM-9000 Graphic Display

Remote (Full, Half duplex), or Local

• Refresh type CRT display
• 17 or 21 inch Screen
• 2048 X 2048 dot matrix
• 16 intensities
• Blinking, Scroll, Rotate
• Light pen, Tablet
• Random scan
• Analogue stroke
• using 2 µ processors
MAPS - GP Software

Application Software

Geometric functions

File data management

- Interactive graphic package (I. G. P.)
- standard data file maintenance
- Generate production management data

Support Software

. G O S (Graphic Operating System)

. Multi programming (4 job)

. Virtual memory management

. Fortran executable
III Step MAPS-GP

- Improve the IIstep MAPS-GP
  - Complete it as a tool of production design
  - promote the high contact with pipe shop"
  - Link with host machine (2400 ~ 48000 bps)
    - Load Sharing System
    - Work Station Type
- Yard plan Drawing
OVERVIEW of FILES & SOFTWARE

- DESIGN STANDARD
- ITEM SPEC
- PROJECT SPEC.
- HULL BODY OFFSET DATA
- PIPE SHOP SPEC.

MODELING & DATA VALIDATION PROGRAM

3-D PIPE PIECE DIGITAL MODEL FILE

- DRAWING PROGRAM
- PIPE DETAIL PROGRAM
- PIPE PIECE DETAIL & ASSEMBLY DWG.
- MATERIAL COUNTING PROGRAM
- PAILLET, ORDER, MATERIAL LIST
- PIPE STRESS ROUTINE
- STRESS ANALYSIS
- WEIGHT & MOMENT ROUTINE
- W & MOMENT SUMMARY
- FLOW & ROOT ANALYSIS

( !: FUTURE )
MAPS-GP & OBJECTIVES:

- Total production cost down
  - Low cost automation
  - Enhanced Management control

Maximize Man power & System resource

Full Modularized System

- Flexible system
  - Coordinate CAD/CAM System
  - Interface Engineering/Manufacturing
  - General purpose System

Promote GP system use by wide segment of industry
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