Introduction To Restructuring Mid-Tier Shipyard By Developing Rough Layout Concept

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AGENDA

- Introduction
- Objectives
- Approach
- Theoretical Foundation
  - Ship Production Processes
  - Simulation in Shipbuilding Industry
  - Description of Mid-tier shipyard
- Data Collection
- Experimental Procedure
- Conclusions
INTRODUCTION

► Shipyards facing the crisis
  – Change in their strategies

► Optimization of shipbuilding processes
  – Reducing delivery time/cost

► Simulation as tool for shipbuilding industry
  – Simulation of very complex systems
OBJECTIVES

DES model for production process
Coarse layout method
Data requirement
what if scenarios
APPROACH

DES model for production process → DES simulation tool

Coarse layout method → Long-term capacity planning

Data requirement → Information derived from real project

what if scenarios → Assessment of new scenarios
THEORETICAL FOUNDATION

► Ship Production Process

– Product Work Breakdown Structure – PWBS

• Hull Block Construction Method – HBCM
• Zone Outfitting Method – ZOFM
• Zone Painting Method – ZPTM
• Pipe Piece Family Manufacturing (PPFM)
THEORETICAL FOUNDATION

Simulation in Shipbuilding

- Monte Carlo Simulation
  - Time unnecessary

- Continuous Simulation
  - Mathematical models

- Discrete Event Simulation
  - Event occur at an instant
THEORETICAL FOUNDATION

Description of Mid-tier Shipyard

- Capacities
- Classification as mid-tier shipyard

http://desarrolloydefensa.blogspot.de/2008/08/cotecmar-excelencia-en-astilleros.html
DATA COLLECTION

► Product data
  – Project’s information

► Production data
  – Performance (m/h)
  – Elements 1 ton-steel

► Structural data
  – Schedule
EXPERIMENTAL PROCEDURE

► Simulation Tool Description
  – Objects represented by icons
  – Hierarchically structured
  – Graphical representation

EXPERIMENTAL PROCEDURE

► Current scenario
  – Hull weight distribution
  – Workflow
EXPERIMENTAL PROCEDURE

► Current scenario
  – Unidirectional workflow
  – Stations
EXPERIMENTAL PROCEDURE

► Scenario 1. Welding Robot in the production line

http://cfnewsads.thomasnet.com/images/large/515/515802.jpg
EXPERIMENTAL PROCEDURE

 Scenario 2. Restructuration of the Current Layout

Current Layout

Restructured Layout
## EXPERIMENTAL PROCEDURE

<table>
<thead>
<tr>
<th>STATION</th>
<th>CURRENT SCENARIO</th>
<th>Welding Robot Scenario</th>
<th>Restructuration of the current layout</th>
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<tbody>
<tr>
<td></td>
<td>Processing Time</td>
<td>Set-up Time</td>
<td>Processing Time</td>
</tr>
<tr>
<td>Warehouse</td>
<td>2h:30m</td>
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<td>2h:30m</td>
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<tr>
<td>Plate Storage</td>
<td>1h:00m</td>
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<td>1h:00m</td>
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<tr>
<td>Profile Storage</td>
<td>1h:00m</td>
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<td>1h:00m</td>
</tr>
<tr>
<td>Cutting Machine</td>
<td>1h30m</td>
<td>00h:45m</td>
<td>1h30m</td>
</tr>
<tr>
<td>Bending Workshop</td>
<td>7h:00m</td>
<td>2h:00m</td>
<td>7h:00m</td>
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<tr>
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<tr>
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<td>1h:30m</td>
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EXPERIMENTAL RESULTS

- Real Process: 100%
- Current Scenario: 95%
- Welding Robot Scenario: 107%
- Change Layout Scenario: 97%
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<td><strong>THROUGHPUT</strong></td>
<td>474 tons</td>
<td>532 tons</td>
<td>483 tons</td>
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RECOMMENDATIONS

► Develop very fine simulation model
► Evaluate impact of new machinery before investment
► Include all the processes related with shipbuilding
CONCLUSIONS

DES model for production process

DES simulation tool

DES tool shown capabilities

Coarse layout method

Long-term capacity planning

Rough layout concept as useful tool

Data requirement

Information derived from real project

Analysis of the information gathered

what if scenarios

Assessment of new scenarios

Evaluation of current and two new scenarios