Universität Rostock

EMship Advanced Design

Title: "Modeling & Simulation of a Production line(Panle line) in Shipbuilding Industry using Tecnomatix Plant Simulation 9.0"

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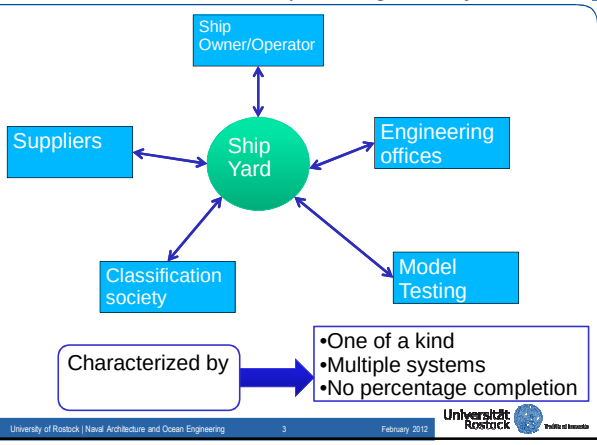
Presentation Outline

- Introduction
- Objective
- Research Methodology
- Flow Chart
- Data Collection & Synthesis
- Model Development
- Scenario Analysis
- Interface with MS Office
- Conclusion

Introduction/Overview of ship building Industry



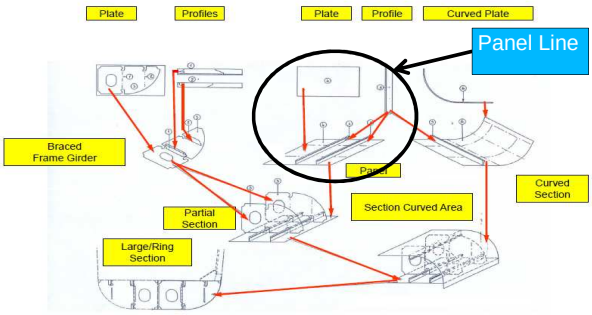
Objective of the thesis

- General Objective
  - Analyze and optimize the panel line
- Specific Objectives
  - Data identification and synthesis
  - Model and simulate the panel line
  - Bottleneck identification
  - Investigating the effect of new work station

Research Methodology

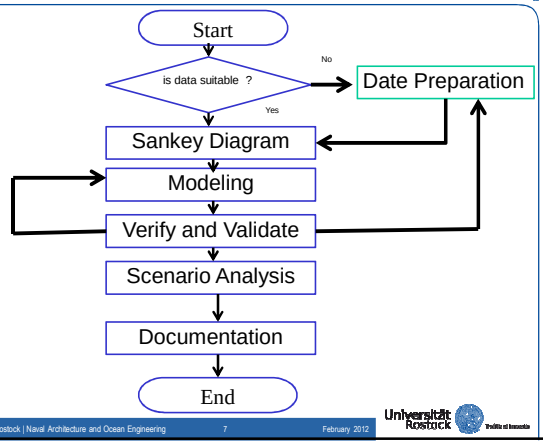
Literature Review	Books, Journals, Articles, Manuals, people etc.
Data Collection	Spread sheet and drawings
Analysis and Synthesis	Converting the data in to suitable format
Model Development	Representation
Verification & Validation	Checking the developed model against some checklists
Scenario Analysis	Developing alternative solutions
Conclusion	Summarizing the results

Steel Structure Production Sequence



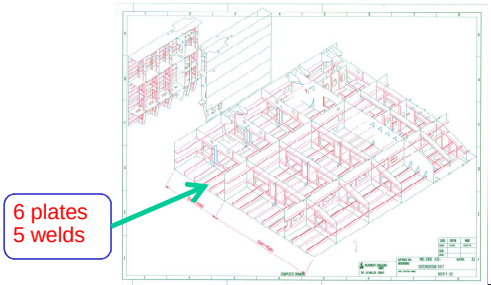
Ref. Ship production Lecture note (Permission from Dr. Ulrich Kothe)

Flow chart

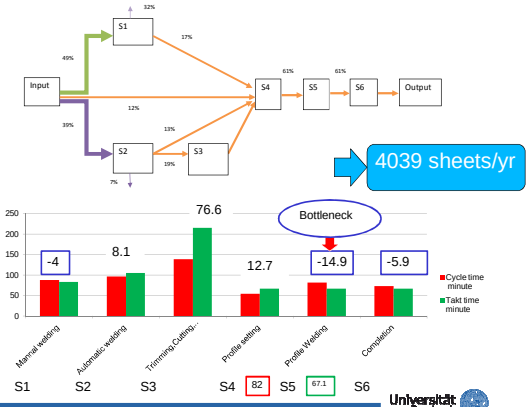


Date Collection and Synthesis

- Data Available
  - Spread sheet from P and S ship yard (Container Ship)
  - Drawing (Tanker Ship)

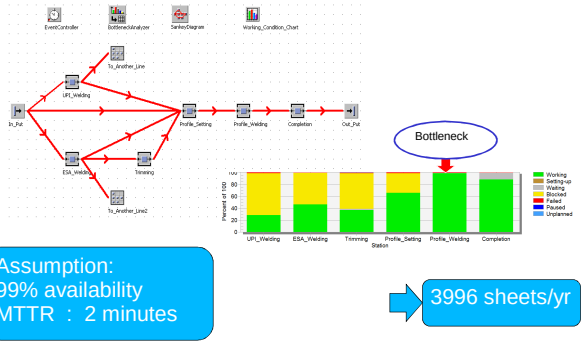


Sankey Diagram, Cycle and Takt time (Container)



Model Development (Tecnomatix Plant Simulation 9.0)

- It is a discrete event simulation (DES) program



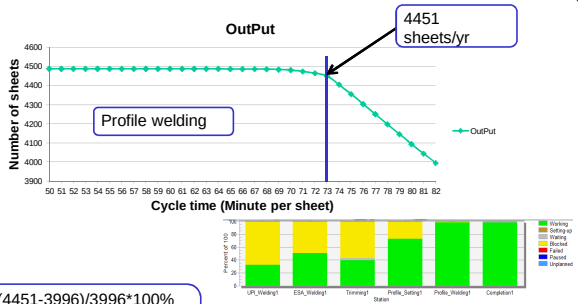
Assumption:
99% availability
MTTR : 2 minutes

Verification and Validation of the Model

The following check lists have been taken into account

- Does it provide utilization of each work station?
- Helps in decision making process (PPC)?
- Are the results easy to understand and interpret ?
- Does it indicate the influence of each workstation?
- Effect of adding a new work station ?

Improving production rate (Experimental Manager)



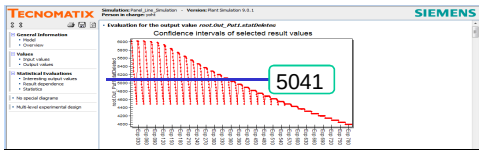
=(4451-3996)/3996*100%

=11.4% improvement

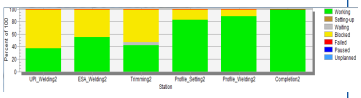
Points for improvement:

- **Additional manpower hiring**
- **Improving the technology**
- **Future demand**

Profile welding and Completion Combined



Experiment	Profile welding Minute	Completion Minute	Output Sheets
16	50	65	5041
40	51	65	5041
64	52	65	5041
88	53	65	5041
112	54	65	5041
136	55	65	5041
160	56	65	5041
184	57	65	5041
208	58	65	5041



=(5041-3996)/3996*100%

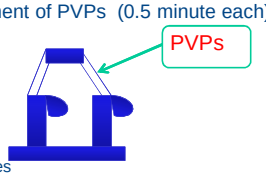
=26.2% improvement

Adding new work station (PVPs station)

Purpose: Analyzing the effect of new work station

Parameters:

- One stiffened panel comprises 2.25 sheets
- Ten points for proper placement of PVPs (0.5 minute each)
- Robot welding
  - Speed , V=0.0083 m/s
  - Length, L=2.8 m

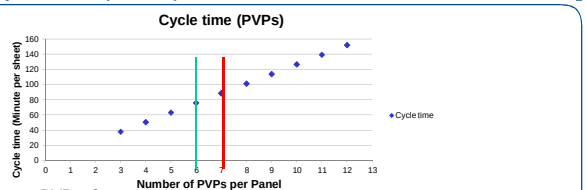


Single run, time=L/t= 5.62 minutes

Considering 4 runs to entirely weld the PVPs = 4*5.62=22.5 minutes

Total time for a single PVPs operation = 28.5 minutes

Cycle time (PVPs) Station



PVPs=6

3994 sheets/yr
No significant effect

PVPs=7

3695 sheets/yr

Decline by 7.5 %

Genetic Algorithm (GA)

GA helps to find out an optimal solution based on a stochastic approach and it starts with an initial random solution set [20].

Objective: Maximize Production rate

Subject to :

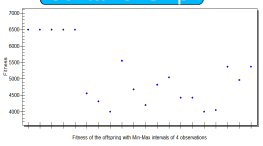
30<=X1<=54.4 / Profile setting station/

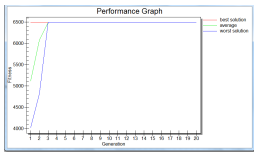
50<=X2<=82 /Profile welding/

50<=X3<=73 /Completion/

Genetic Algorithm (GA)

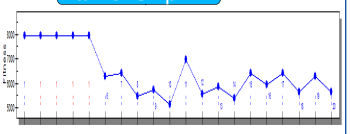
Container Ship

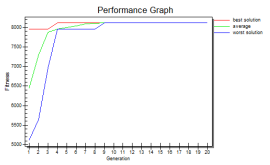




X1=33, X2=50, X3=50
6497 sheets

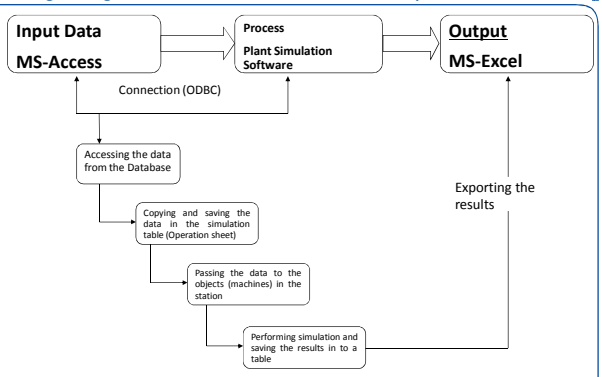
Tanker Ship





X1=40, X2=40,
8120 sheets

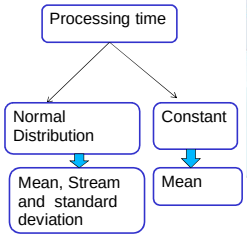
Integrating Ms Access and Excel in the process

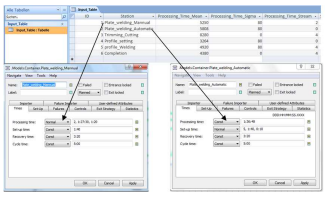


Data consistence

Due attention has been given for data consistence. For example :

Description	MS Access	Simulation
Processing Time	Integer(Second)	Time





Conclusion

- ❖It facilitates the decision making process
- ❖Profile welding is the station where due attention has to be given
- ❖It is suitable for new work station design
- ❖Max number of PVPs are 6 and 4 for Container & Tanker respectively

Future work :

- ✓Cost benefit analysis has to be incorporated

Thank You

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