Kul-24.4130
Shipyard engineering

Lecture 7:
Production management and work planning
Lecture in course contents

- Production planning
- Outfitting
- Hull production
- Shipbuilding process and ship yard productivity
- Design process and materials management
- Introduction
Objectives, contents and literature

• Learning objective:
  – Understand the production management from the ship design and building process point of view
  – Understand the main tools used in the work planning

• Contents:
  – Production planning
  – Planning principles and hierarchy
  – Work planning

• Literature
  – Ship production, Storch et al., SNAME, 1995
Planning principles

• Planning based on sales plan
• Planning based on contract book

• Push control
  – Fixed production program for each production phase

• Pull control
  – Previous production stage give impulse to the next stage
Planning hierarchy

• Strategic (long- & medium-range planning)
  – Sales strategy
  – Ship delivery schedule
  – Production development programs

• Tactical (short-range planning)
  – Block erection schedule
  – Area outfitting schedule

• Operational (short-range planning)
  – Drawing schedule, workshop schedule
  – Work planning
Scheduling objectives

• **Recourse**
  – Shipyard level
  – Department level; the next process phase is a customer

• **Capacity**
  – Machine capacity, setting times, flexibility of workshop-layout (a typical machine shop problems)
  – Human resources, flexibility, additional capacity (problem for outfitting)

• **Material**
  – Demand forecasting
  – Interchangeable
  – Delivery time
  – Delivery confidence (time and amount)
  – Quality shortcoming

• Influence of the price of unfinished work, the use of capacity, and the delivery capability

• Main challenge for outfitting planning
Planning objective

• Good project management, which creates the conditions for productive work
  – Materials
  – Suitable construction
  – Productive building method
  – Adequate resources
  – Progress of other work tasks according to schedule
Partition of the ship project

• Ship project management requires that the work is divided into subtasks using commonly understood approach since
  – Project duration is long
  – Project is a large amount of work
  – Project involves a large number of people, including subcontracting

• Approaches for work partition:
  – Systems, blocks, areas

• Planning levels:
  – Shipyard, ship, area, team
Planning levels

Suunnitelmien laadinta

Toiminnansuunnittelu

- Telakkataso

Toiminnansuunnittelu

- Laivataso

Tuotannon-suunnittelu

- Aluetaso

Tiimin työn-suunnittelija

- Tiimitaso

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Toiminnansuunnittelu

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Product breakdown structure

THREE DIFFERENT VIEWS ON A SHIP

- **SYSTEM division** .................. functional / commissioning view
  ship specification & operation view

- **BLOCK division** ................. hull construction view
  steelwork & block outfitting
  max 450 t, 12 x 32 x 10 m³

- **AREA division** ................... outfitting view
  typical 40 x 32 m² x deck height

MAIN VIEW CHANGING ALONG THE SHIP PROJECT

system basic design ➞ block / area detail design ➞ block hull construction ➞ area outfitting ➞ system commissioning / operation
Ship project planning and scheduling
Work breakthrough structure (WBS)
Concept and preliminary design phase

- Production planning at the sales stage aims to ensure 1) the delivery capability, 2) the reliable cost estimation (work, design, material)
  - Total schedule, hard point for scheduling
  - Preliminary work-hour estimations => workload analysis
  - Preliminary block and area division
  - Schedule for expensive materials
  - Plans for Turnkey and special areas

- Production planning unit is responsible
  - Consultation with other departments
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MASTER SCHEDULE

25.04.1997

P-1688

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Delivery

1997 1998 1999 2000

3 4 5 6 7 8 9 10 11 12

1 2 3 4 5 6 7 8 9 10 11 12

1 2 3

Preliminary Design
Commercial Activities
Contract Review
Design Planning
Procurement Planning
Production Planning
Turnkey Contracting
Quality Plan

PRODUCTION
Hull part Fabrication
Block Assembly
Machinery unit Fabrication
Block Outfitting
Hull Assembly
Machinery space Outfitting
Cabin module Fabrication
Cabin module Installation
Public space Outfitting
Commissioning&Quay trials
Sea trials

ARCHITECTURAL DESIGN
Crew cabins (KMY)
Passenger cabins
Cabin Mock-ups
Public space Concept Des.
Crew Public spaces
Passenger Public spaces
Basic design phase

• Final drawing for block-, area-, space division
• Construction description
  – Needed for design and work planning
• Turnkey delivery plan
• Design schedules
• Hull and outfitting production schedules
• Material purchase scheduling
• Drawing scheduling
Basic design phase

• Nomination of responsibility
  – Persons in charge
  – For each systems, blocks, and areas
• Material budgets
• Hour budgets for design
• Hour budgets for production
• Workload analysis for department and groups
  – Subcontracting plans for design departments
• Production planning unit prepares (Acceptance in cooperation with the departments)
Detail design phase

• Monitoring of design progress
• Target size for working teams
  – Workload analysis
  – Subcontracting plans
• Work planning
Production phase

• Work progress monitoring and reporting
• Status reporting
  – Hour reports
  – Status points for schedules
  – S-curves; actuals, progress → estimation
  – Workload histogram
• Schedule refinements
• Special schedules
## Hour report

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S-curve
Actual, progress → estimation
Workload histogram
After ship delivery

• Summaries for hour data
• Updating of statistical databases
• Collection of feedback from the applied construction method
• Analysis of feedback
Design for production planning

• Operational planning is a big job and it requires scheduling, resources, etc.
  – Operational planning schedule is a tool
Work planning

• Review of workshop drawings and parts lists
  – Guidance of designer in the design stage
  – Error checking of the final drawings and
  – Error reporting to correct the drawings

• Material verification
  – Material and components purchased for the ship project
  – Storage items

• Definition of prefabrications

• Material orders from the workshops or elsewhere (my workshop)

• Material delivery control
Work planning

- Work distribution from the drawing work content
  - Installation in the most suitable work stage
  - Construction description as a guide
- Preparation of work instructions
- Creation of the request for material delivery to the installation place
- Drawing delivery for work supervisors
- Work place scheduling for the hall production stages
Work planning

- Management of hour estimates
  - Revision, forecasting, updating
- Evaluation of capacity needs
- Definition of subcontracting collection
- Monitoring of hour usage and progress
- Reporting of the schedule status and hour usage
- Reporting of work-related interruption and feedback
- Development of productivity indicators and measures
- Development of the design material and working methods
Road map for operational planning