Concurrent Engineering (CE)

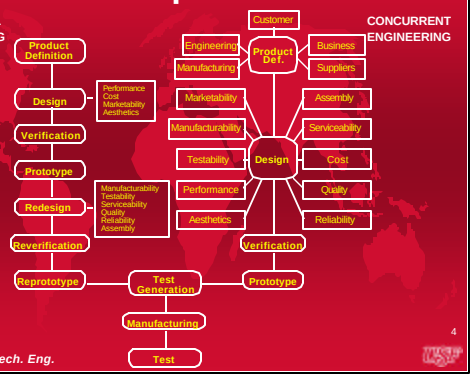
Outline

- Introduction
- Rationale For Implementation
- Benefits
- Teams
- Communication Models
- Implementation
- Tools
- Misconceptions & Pitfalls
- Summary

Introduction

- Concurrent Engineering
  - Loosely: Using A Multi-Disciplinary Team To Conduct Conceptual Thinking, Product Design, & Production Planning All At One Time
  - Simultaneous Or Parallel Engineering
  - Broadly: A Team Of Specialists Who Simultaneously Design & Develop A Product To Ensure Ease Of Producibility & Customer Satisfaction
- Sequential Engineering
  - "Throw-It-Over-The-Wall"

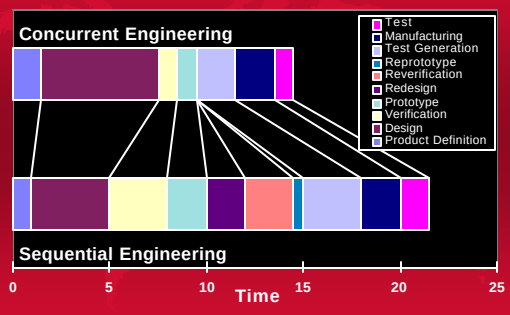
Product Development Flowchart



Rationale For Implementation

- Decrease In Time-To-Maket
  - Design Changes Increase Lead Times
  - Shorter Lead Times Respond To Customers
  - Shorter Lead Times Increase Cash Flow
  - Change During Testing Costs 10 Times More Than During Design
- Designs Product Within Prod. Capabilities
  - Lower Reject & Scrap Rates
  - Customer Returns & Rework Costs Decrease
- 60-95% Of Cost Determined During Design

Product Development Time Line



Benefits

- Significant Decrease In Time To Market
- Faster Product Development
- Better Quality
- Less Work In Progress
- Fewer Engineering Change Orders
- Increased Productivity

Teams

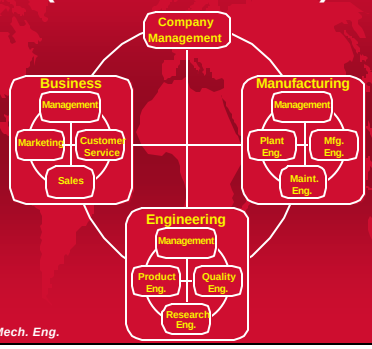
- Goals From Conceptual Design To Sales
  - Prior Experience
  - Emphasize Early High Quality Decisions
  - Support Fulfillment Of Customer Req.
- Members
  - R&D, Design, Production, Testing, Quality, Service
  - Marketing, Finance, Logistics, Sales
  - Suppliers, Customers

Communication Models

- Sequential Engineering
  - Communication In Series
- Concurrent Engineering
  - Communication In Parallel
- Information Flows Up & Downstream
- Communication Paths Are Open
- Employees Are Empowered

Traditional Organizational Structure (Information Paths)

CE Organizational Structure (Information Paths)



Implementation

- Dedicated Project Teams
  - Stays Together Project-To-Project
  - Liability - Develop Stableness & Settling
- Co-Locating Team Members
  - Engineering, Business, Production
  - Liability - Taken Out Of Functional Unit
- Computer Network Technology

Tools

- Chronology
- Organizational
- Product Development
- Production
- Statistical
- Pitfalls Of CE Tools

Chronology Of CE Tools

- Prime Mover
  - Computer Technology (Desktop)
- Typing To Word Processing
- Drafting To CAD
  - Aircraft Manuf. (1970s)
  - Desktop (1980s)
- Finite Element Analysis
  - Aircraft Manuf. (1970s)
  - Desktop (1990s)

Organizational Tools

- Total Quality Management (TQM)
- Computer Networks
- ISO 9000
- Quality Function Deployment (QFD)

Product Development Tools

- Computer-Aided Drafting (CAD) Software
- Solid Modeling Software
- Finite Element Analysis (FEA) Software
- Rapid Prototyping Techniques
- Design For Manufacture & Assembly(DFMA)

Production Tools

- Computer-Aided Manufacturing (CAM)
- Computer Numerical Control (CNC) Tools
- Continuous Process Improvement (CPI)
- Just-In-Time (JIT) Production

Statistical Tools

- Design Of Experiments (DOE)
- Taguchi Methods
- Statistical Process Control (SPC)

Pitfalls Of CE Tools

- No Negatives To Implementing CE Tools
- Employees Need
  - Experience With Tools
  - Expertise With Tools
- Proper Training & Education
  - Avoids Dangerous Mistakes
- Resources & Time Needs To Be Allocated
  - Start-Up Costs & Time Can Be Prohibitive

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Misconceptions Of CE

- Not simultaneous Design & Production
  - Just The Opposite
- Not A Quick Fix Or Magical Formula
  - Way Of Thinking
- Does Not Require Multiple Tests
  - One-Pass Design
- Not Inspection Techniques
  - Designed Within Process (SPC)

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Pitfalls Of CE

- Employees Assigned To Departments
  - Loyalty To CE Team
- Do Not Eliminate Sequential Eng.
- Avoid Unobtainable Schedules
- Avoid Tight Tolerances To Obtain One-Pass
- Avoid Changing Product Definition & Specs.
- Avoid "Business As Usual"
- Simply Product Development
  - Avoid Automating Product Development

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Summary

- Eliminates "Throw-It-Over-The-Wall"
- Communication Paths
- Decreases Time-To-Market
- Multi-Disciplinary Teams
- CE Tools

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