Business from technology

OpenProd – Demonstration Video for Dynamic Maintenance Service Model

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SysDynTool demonstration

- Overall structure of the model is viewed on the main view
  - Modules and interdependences
    - Production
    - Equipment condition
    - Preventive maintenance and maintenance services
    - Workforce
    - Finance
- Model browser shows the structure in other format

Closer look at the modules: Installed Base Condition and Spare part inventory

- Equipment condition is, naturally, focal element of dynamic maintenance model,
  - and thus, modeled with high resolution and many details (looks a bit messy)
- Components can be
  - Intact (preventive maintenance can be applied)
  - Worn-out (preventive maintenance can be applied)
  - With incipient failures (preventive maintenance can be applied)
  - Degraded failures (corrective maintenance must be applied)
  - Critical failures (corrective maintenance must be applied)
- Components are replaced with components from spare part inventory (either from customer's own or service provider's inventory)

Closer look at the modules: Preventive maintenance and maintenance services

- Preventive maintenance and maintenance services are essential too
  - Modeled partially with easily created customized functions (this is not easily done in Vensim for example)
- Services are
  - Loop monitoring service (automatic condition monitoring and process control monitoring)
  - Field device monitoring (automatic condition monitoring)

Closer look at the modules: Workforce module

- Workforce can be allocated to
  - Preventive maintenance tasks
  - Inspections for condition monitoring
  - Corrective maintenance
  - Training
  - Idle

Closer look at the modules: Production module

- Production module is rather simple. It consists of following state variables
  - Work in Process inventory
  - Inventory
  - Customers' order backlog
- Production is highly dependent on the condition of the installed base
  - Production speed, quality, and availability decreases as the condition degrades depending on the equipment segment what has been degraded

Closer look at the modules: Finance

- Financial performance meters are calculated only for service provider's customers (i.e. the production plant which is served) and not for the service provider itself

Functions

- Customized functions are easily created in modelica language
  - E.g. Exponential probability density function and cumulative distribution function
  - Factorial
  - Gamma probability density function and its cumulative distribution function

Customized Charts

- Use and creation of customized graphs is also intuitive and easy to learn

Example simulation

- As an example simulation, a situation in which at time step = 2000, a new maintenance policy is introduced
  - Maintenance policy is more concentrated on preventive policies from that time on
- Results
  - Maintenance costs increase immediately
  - Production losses due to poor quality and low availability are decreased in short period of time
  - As a final result, annual profit in the long term is increased (i.e. higher maintenance costs are well covered by benefits of the decreased production losses

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