gPROMS Modelling Platform

Models, Libraries and Applications as Digital Twin in Water

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Objectives

- Experience the plant in a virtual environment
- Test new logic off-line
- Reduce startup cost → Commissioning without tying up plant resources by using simulation
- Access to the (simulated) process for multiple disciplines
- Validate new / modified SOPs (Batch, MES, manual)
- Emulate plant occupation and timing
- Replay of process data
gPROMS – Advanced Process Modelling Capabilities

Capture knowledge …

- Physical property data
- Equipment configuration
- Experimental data
- Catalyst information
- Control information
- Operating procedures

Model validation from data

... Create value

- Simulation
  Enhance understanding of complex processes

- Global System Analysis
  Rapidly explore decision space, uncertainty, risk

- Optimization
  Maximize economic performance

- Cost data

Custom models

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High-Fidelity Predictive Models for Water treatment Plants

- Enable rapid exploration of the process decision space for optimizing of water treatment process design and operation
- Provide accurate information for reducing energy and chemical consumption
- Support informed decision making about current and future plant capacity and minimizing capital and operational costs
**Flowsheets and libraries** also for complex water treatment plants involving processes like

- Aerobic process, especially aeration basin or activated sludge process
- Anoxic / aerobic selector
- Clarifier / Thickener, sludge decanter, anaerobic solid / sludge digester
- Biogas treatment, e.g. scrubber and utilization e.g. boiler, CHP
- Membrane filtration, membrane bio reactor (MBR)
- Sludge thermal hydrolysis
- Flotation / coagulation / flocculation
- Ion exchange
- Granulated sludge
- Anaerobic reactor (UASB or similar high rate anaerobic WWT processes)
- SBR

**Optimizer** includes integer / discrete decisions on how to operate different treatment / many lines towards maximum efficiency
gPROMS Software Suite
User Interfaces for Process Developers and Planners / Engineers
gPROMS Software Suite
Digital Twin: Application for Operator Support

• gPROMS Web Applications Plattform (gWAP) allows to publish a model behind an easy-to-use web interface
• Enables 'non-modelling users' across the organization (e.g. operating personnel) to use the information in high-fidelity models for decision support and continuous optimization
• Easy-to-use interface
gWATER Application I
Basic Wastewater Treatment Plant (ASM, gPROMS Example)
gWATER Application II
Plug Flow Reactor Treatment Lines with Sludge Treatment

Waste water treatment plant
Parallel PFR nitrifying lines

PROCESS
gWATER Application III
Ultrafiltration (gPROMS Example)

Ultrafiltration example
No control

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<th>UF</th>
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<tr>
<td>Mass of acid</td>
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<tr>
<td>Mass of caustic</td>
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<tr>
<td>Service efficiency</td>
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