

- modelling and simulation
- control design
- system troubleshooting
- technology transfer and training
- energy efficiency investigation
- software tools

# PumpSim<sup>®</sup>

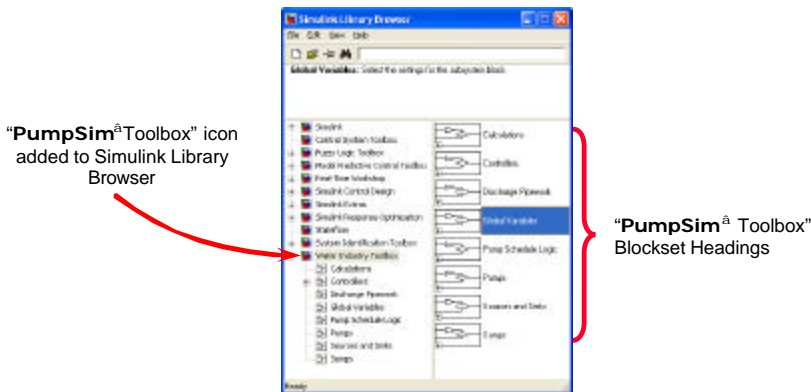
## A Modelling/Simulation Toolbox for Water Industry

Losing sleep over new investment uncertainty?

...then quantify the Energy Savings with PumpSim<sup>®</sup>

The Water Industry has enormous potential for energy savings through changes to pumping equipment and controls. One good example is replacement of ‘on-off’ pump drive controls with VSD technology. Unfortunately, it is difficult to determine in advance whether such an investment will deliver the required financial return. For this reason ISC decided to develop PumpSim<sup>®</sup>.

PumpSim<sup>®</sup> is a PC-based simulation toolbox that gives clients an accurate forecast of energy savings. Developed with water industry professionals, it removes onerous mathematics from the user interface while enabling accurate representation of pumping station behaviour through application-specific parameter entry. Armed with the predicted energy savings, the client is then better placed to decide whether an equipment or control investment is justified.



PumpSim<sup>®</sup> was developed using the Matlab/Simulink numerical tool from MathWorks<sup>®</sup>. The underlying dynamic and static mathematics that together define the behaviour of a plant unit (e.g. water tank, centrifugal pump or discharge pipe) is represented by a library of function blocks. Each block has a drop-down dialogue box that enables entry of all the parameters required to characterise the item of plant represented by the function block.

### Features

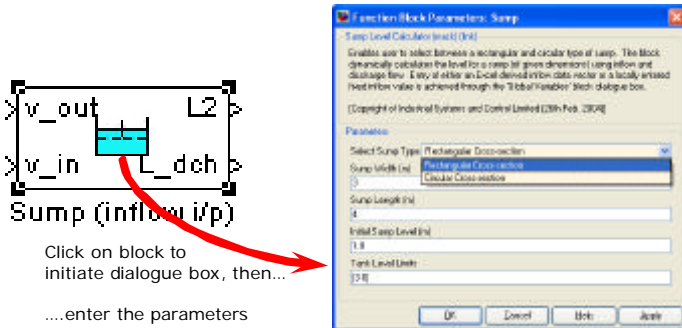
- Matlab/Simulink<sup>®</sup> PC-based dynamic modelling and simulation toolbox
- Function block set based on generic math models of pumping station equipment
- Function block access through Simulink browser
- Dialogue box entry of physical data parameters
- Excel data file input and output
- Direct comparison to plant derived validation data (Excel file) within model

### Key Benefits

- Improved decision making
  - High-fidelity dynamic models
  - ➔ Confidence in predicted energy savings (especially true for complex pumping applications, e.g. multiple sumps/boreholes, multi-objective controllers, operational constraints)
- Improved pump scheduling
  - Alternative pump operation strategy investigation
  - operational optimisation (energy/maintenance cost savings)
- Fast model configuration and parameterization
- No mathematical knowledge required to build models

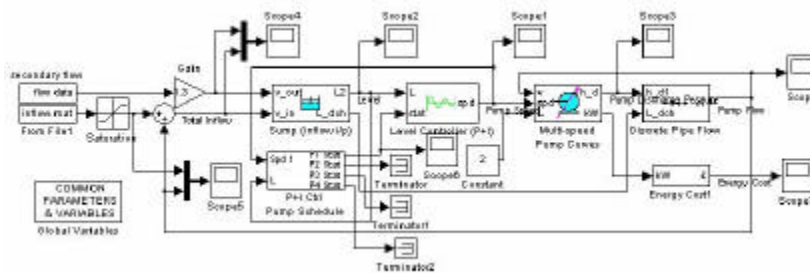
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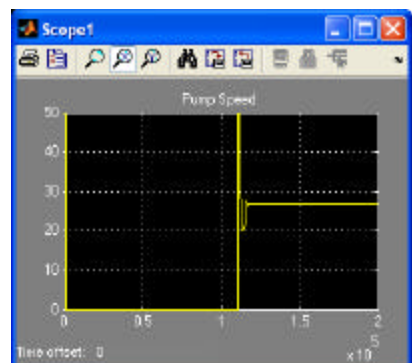
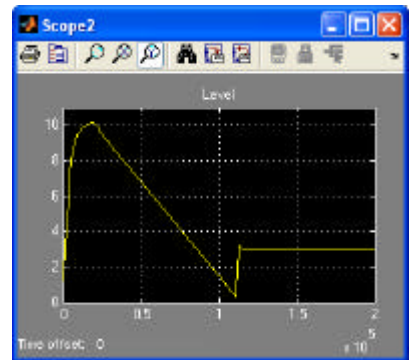
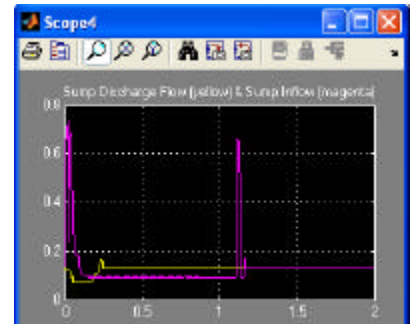
### Sump Block and Dialogue Box

To build the pumping station model, the blocks are simply 'dragged' from the Simulink Browser to a model template and 'wired' together. Parameters are then entered through each block's drop-down dialogue box. Flow data (real or test scenario) can be applied through Excel files. Pump and valve curves are also applied through Excel.



### 'Wired' Blocks of Pumping Station model in PumpSim<sup>®</sup> Simulation Environment

Outputs from the simulation can be plotted, displayed on local 'scopes' or exported to an Excel file. Some local 'scope' trend plot examples are shown (right).



Energy savings predicted using PumpSim<sup>®</sup> models have ranged from 5% to 65%. The savings forecast and actual results matched within 3%. PumpSim<sup>®</sup> models have been used to evaluate alternative Pump types and control strategies as well as to explore different operating options (pump schedules etc.).

**ISC Limited supplies process control consultancy services to utilities and process industries. Services supplied include control design for new plant, process troubleshooting, training and technology transfer.**

For a direct client reference and more information contact:

**Andy Clegg or Andy Buchanan at ISC Limited**