

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

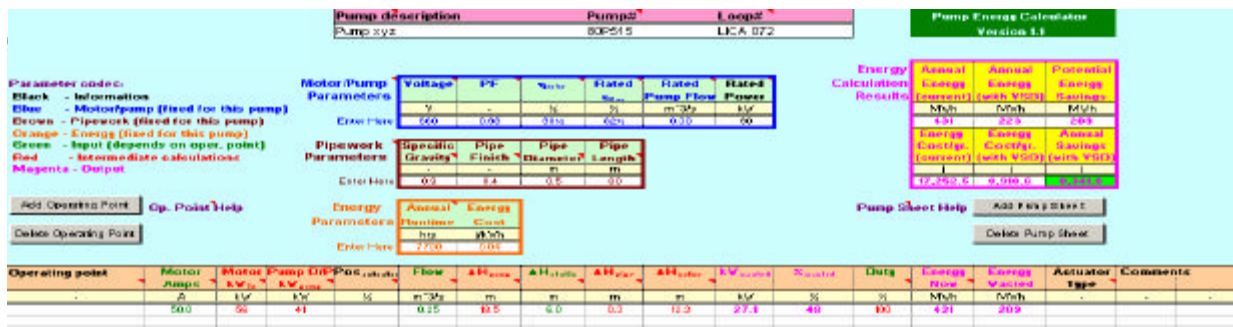
## Estimating Energy Saving and Return on Investment

ISC was asked by a leading paper mill to provide help in quantifying potential energy savings. Replacement of fixed-speed fans and pump drives by variable-speed drives (VSDs) can lead to significant energy savings under partial-load conditions. In many systems, this means most of the time! The payback time of a VSD installation depends on the savings in energy costs relative to the VSD investment cost.

ISC engineers worked with mill staff to establish standard operating conditions, and how these affect current and projected energy use. To get true energy saving opportunity, the following need to be taken into consideration:

- Current energy usage
- Annual duty
- Operating points and their distribution
- Non-removable losses – static, pipe losses

Since it was not viable to conduct a detailed analysis of each motor/pump combination in a paper mill where many hundreds of such combinations exist, ISC developed a spreadsheet for our client to enable rapid assessment of good candidates for VSD retrofit, based on realistic estimated energy savings.



The screenshot shows a spreadsheet interface for 'Pump Energy Calculator Version 1.0'. It includes sections for 'Motor/Pump Parameters', 'Pipeswork Parameters', and 'Energy Parameters'. A table at the bottom shows operating points with columns for Motor Amps, Motor kW, Pump HP, Flow, and Energy used.

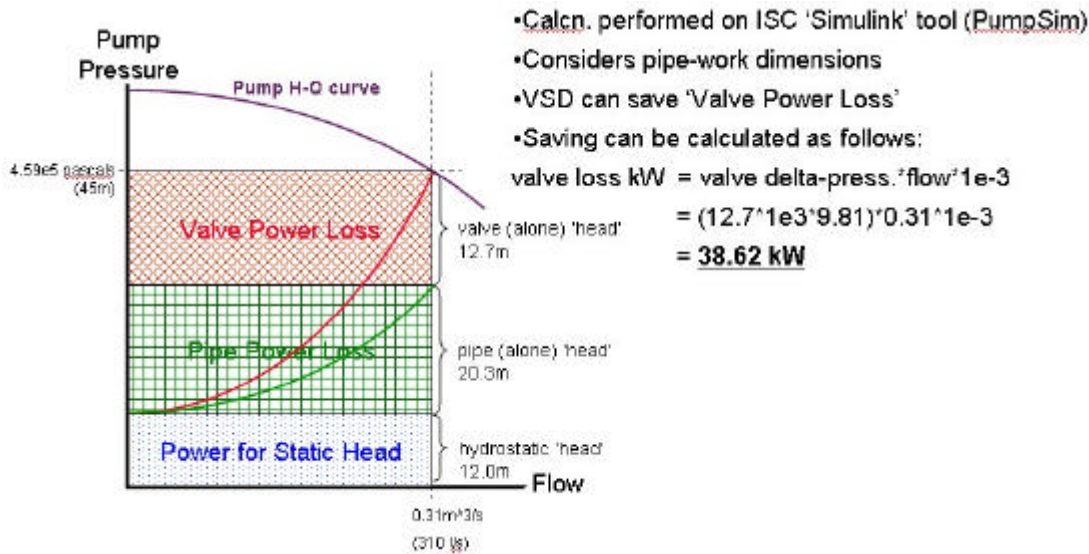
Operating point	Motor Amps	Motor kW	Pump HP	Flow	Energy used	Actuator type	Comments
1	500	50	41	15 m <sup>3</sup> /hr	12.5	0.3	

Two specific scenarios were investigated during the study: an air fan and a thick stock pump. **For the air fan, projected energy savings were 30-40%, depending on actual load conditions.** This is likely to provide sufficient savings to justify VSD investment with a 2-3 year payback.

The thick stock pump was found to be running at nearly full load most of the time, meaning that energy savings with a VSD would be very small. **The study thus saved the paper mill from potentially making an uneconomical investment.** However, the fact that the pump usually runs at full load also indicates that it is **a bottleneck in the production process.** If production capacity was increased and the pump drive replaced, a VSD is likely to provide sufficient energy savings to justify its installation.

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Comparison of the results of the study against the results of a tool provided by a VSD supplier showed lower projected savings in the ISC study. Checking the data requirements of the two methods against each other showed that the supplier tool ignored certain essential characteristics of the process and predicted energy savings that were too optimistic. The study therefore showed that this supplier tool, and others like it, should only be used with great care in the interpretation of their results.



**ISC Limited supply process control consultancy services to all of the major process industries. The services supplied include control design for new plant, process troubleshooting, training and technology transfer.**

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