Systematic Control Configuration Selection of Secondary Heating Systems - A Case Study.

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PROMOVIS — PROCESS MODELLING AND VISUALISATION
sourceforge.net/projects/promovis

Motivation

- The recovery of energy from secondary sources is essential for the operation of modern pulp & paper mills.
- An efficient secondary heating system reduces the dependency on primary heating with fossil fuel.
- Secondary heating has important influence on costs and the environmental impact.
- The topological complexity of such a process hinders the achieving of control goals, being operation often far from optimal.

## The secondary heating system at BillerudKorsnäs Karlsborg AB

- The system exhibited oscillations in certain operating conditions where the root cause was hard to identify.
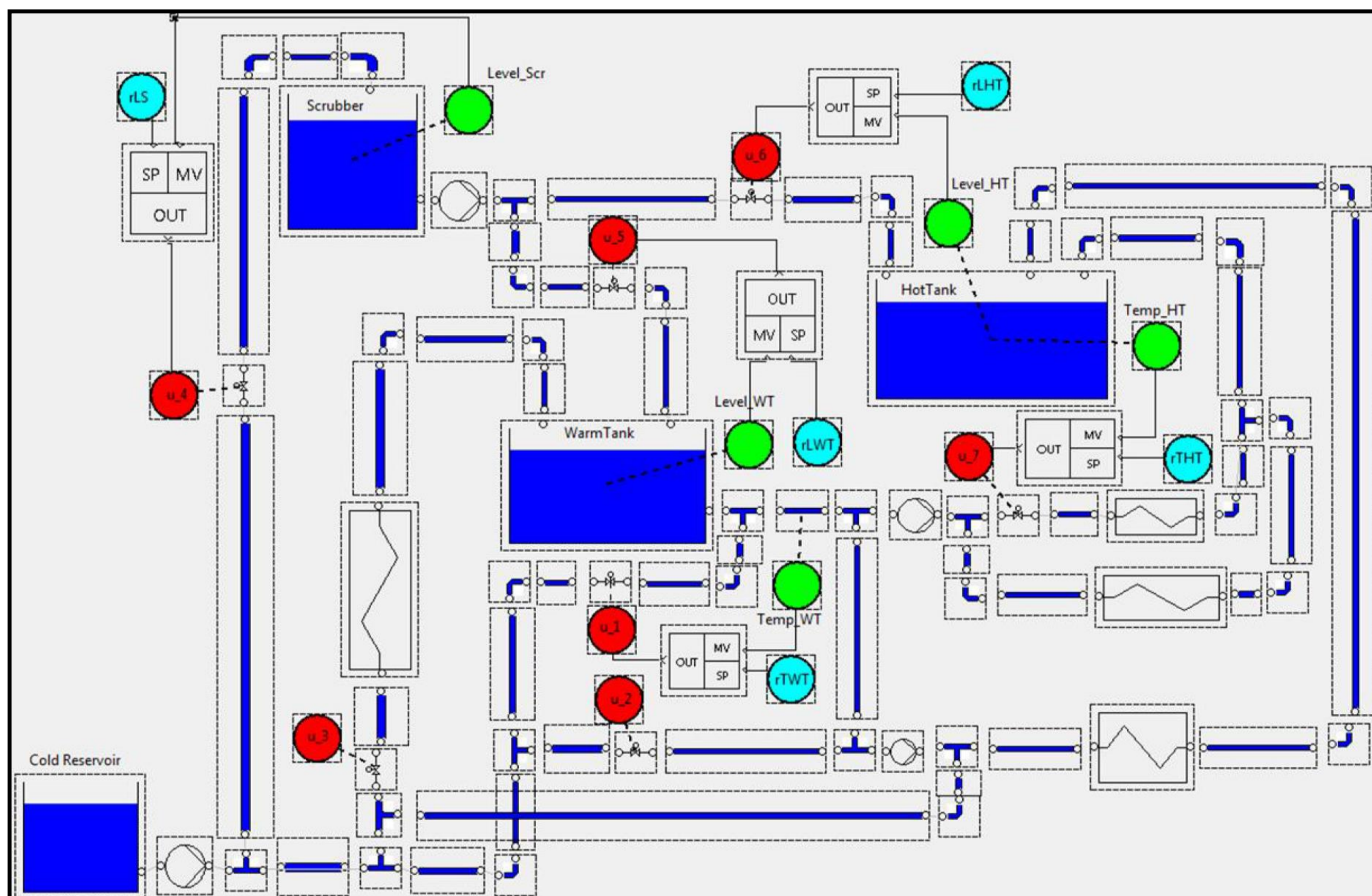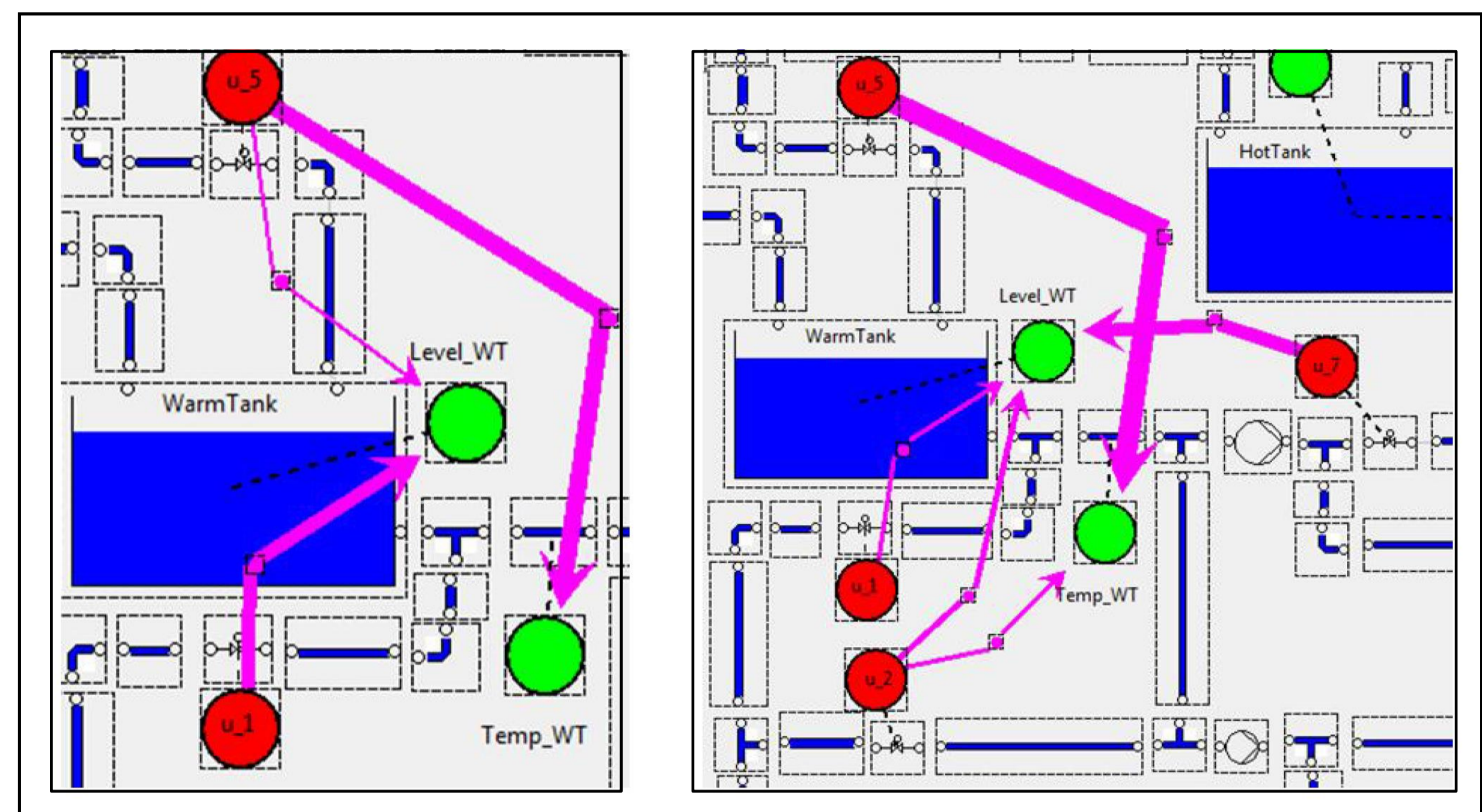

Control structure at the secondary heating system prior to the studies.

Analysis of the secondary heating system

- The methods introduced in [1] for the structural analysis of complex processes have been used.
- These methods are integrated in the software tool ProMoVis, recently introduced in [2].
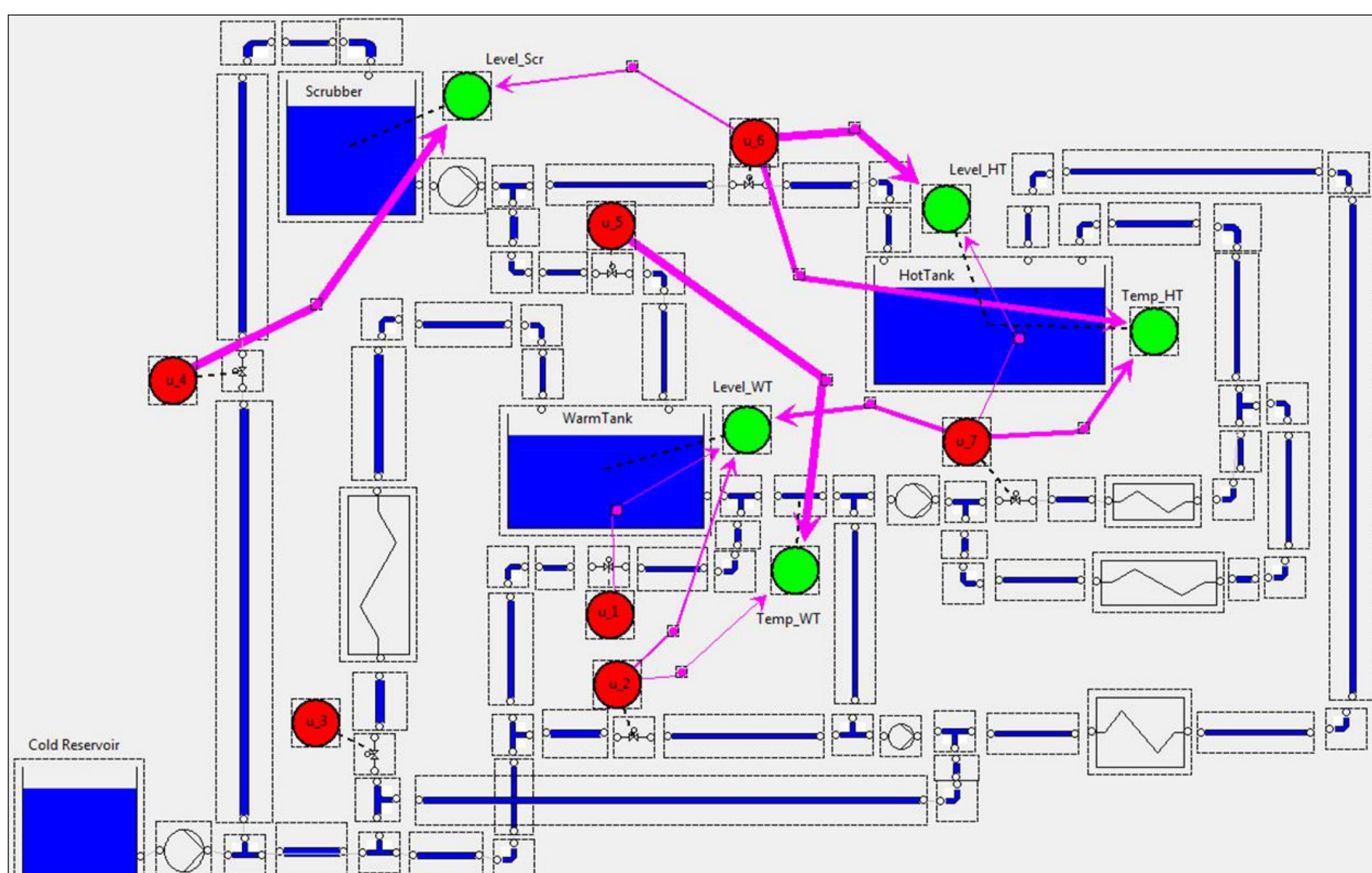

Analysis of the subsystem formed by the tank of warm water

- Conclusions from the analysis:
  1. The level at the tank (Level_WT) should be controlled with the valve u_1.
  2. The temperature at the exit of the tank (Temp_WT) should be controlled with the valve u_5.
  3. There are significant perturbations coming from the loops which are using the valves u_2 and u_7.

Validation of the analysis with plant experiments

- The change of certain setpoints in the plant revealed loop interaction predicted by the analysis.
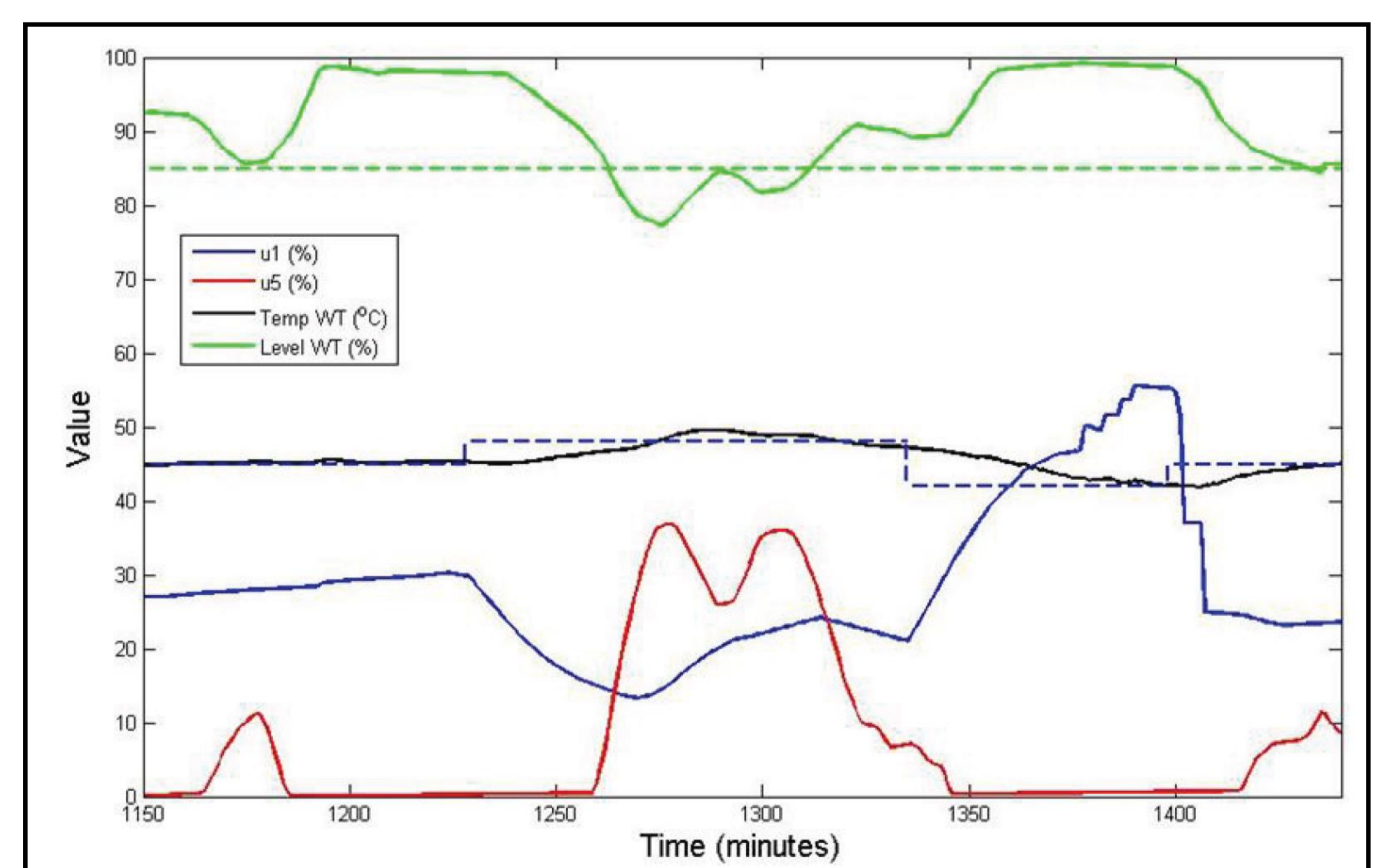
Conclusions

- The cause of the oscillations exhibited by the system were found, and the control structure was redesigned.
- This case-study validates the analysis methods introduced in [1].
- This study illustrates the potential of the software tool ProMoVis, introduced in [2].

[1] M. Castaño, W. Birk, New methods for interaction analysis of complex processes using weighted graphs, Journal of Process Control, Volume 22, Issue 1,
[2] W. Birk, M. Castaño, A. Johansson, An application software for visualization and control configuration selection of interconnected processes, Control Engineering Practice, Volume 26, May 2014, Pages 188-200.