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ABOUT A BOTTLENECK MODEL FOR MODELING OF GAS NETWORKS

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The bottleneck model of a pipeline network is still an ordinary physical model consisting of sources and sinks which are connected by pipelines, compressors etc. Compared to a full hydraulic model, however, it usually consists of much less unknowns and equations. The purpose of a bottleneck model is to check a given flow pattern for physical feasibility. It is intended to be the simplest model to express potentially critical pressures, up to a predefined error, in terms of inflows, outflows, and the settings of active components such as compressors. There are essentially two kinds of simplifications with respect to a full hydraulic model:

- Sections of the network where pressures are almost the same are assigned a single pressure value. Pressure drop equations between internal nodes of these pressure zones are skipped.
- Only those equations are kept which are needed to determine potentially critical pressures at a predefined accuracy. This is where the name bottleneck model comes from.

Bottleneck models of subnets may easily be linked to a model of the complete network. A bottleneck model is particularly helpful in providing constraints for optimization problems such as computing long run marginal costs (LRMC).

In the talk we will explain how to derive bottleneck models in an objective and systematic way from the full hydraulic model using the ITWM software ANALOG INSYDES, which was originally made for designing analog electronic circuits and combines numerical simulation with computer algebra. The methodology is called automatic symbolic simplification [1]. Up to now, it has been applied only to stationary hydraulic models. To illustrate the procedure we apply it in full detail to the high pressure network of Belgium as described in [2].

REFERENCES

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