

### Siemens Transportation Systems

#### About Siemens Transportation Systems

Siemens Transportation Systems offer innovative and efficient products, systems and services for every aspect of rail technology. They offer a broad range of products and solutions for rail automation, electrification, mass transit vehicles, locomotives and turnkey systems as well as trains themselves.

Siemens product portfolio consists of commuter and regional trains like the Desiro® and high speed and intercity trains like the Velaro®, which set standards around the globe for technology and efficiency. Thermal comfort aspects play a significant role in giving passengers an attractive and comfortable travel experience to remember. Reaching this goal requires an optimal combination of mechanical, electrical and electronic components.

During 2004 Siemens Transportation Systems Trains in Krefeld-Uerdingen (D) started to integrate Flowmaster in one of their system engineering departments. The final decision for Flowmaster to be used as the “best-in-class” tool for 1-D fluid flow analysis regarding vehicle thermal management was assisted by consulting work done by experts from Flowmaster GmbH. Consulting results showed that simulation data of an adequate Flowmaster model, which focussed on a complex cooling system for a train, were in excellent agreement with measurements and parametric studies which clearly showed the right way forward for relevant enhancements.

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The use of Flowmaster at Siemens Transportation Systems Trains will be expanded to other system engineering departments and there is an ongoing strategy to implement Flowmaster into the whole product development cycle, from first concept stage to final detail engineering.



## Objectives

A typical cooling system in a Diesel mechanical driven train consists of many components like heat exchanger, valves, orifices, thermostats, pumps, radiators, tanks and lots of pipes including junctions, transitions and bends, which connect those components to build a complete cooling system.

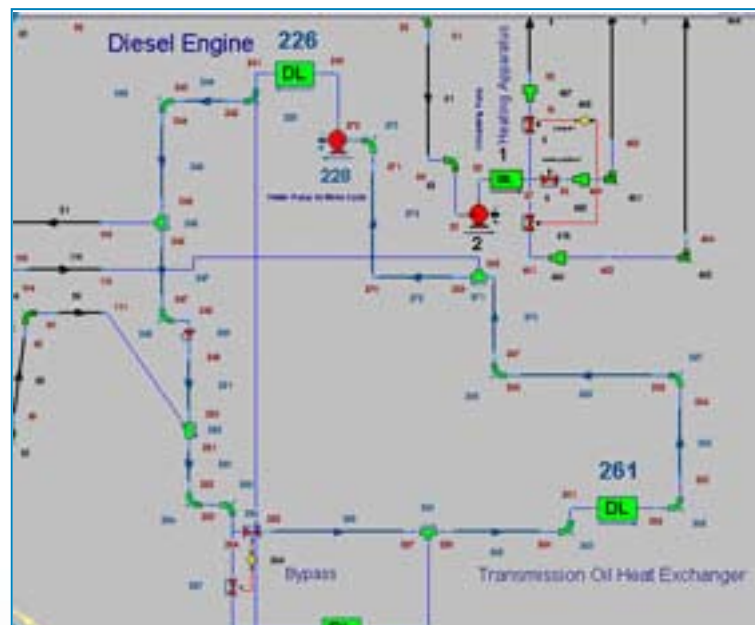


Figure 1: Flowmaster network schematic of a typical cooling system (partly illustrated)

There is a need to understand how components fit together with respect to thermal system behaviour, so that the cooling system is able to fulfil different demands on all relevant drive cycles.

The opportunities gained by using Flowmaster (see Figure 1) for cooling system layout are:

- sizing, analysing and optimising components, individual sub-systems and complex network systems consisting of many sub-systems as a whole, not only in steady state but also in a transient manner
- studying the effects of transient events like engine warm up, opening and closing of valves, filling of expansion tanks and the impacts to other components that are caused by these events
- generating additional simulation data on pressure, temperature and volumetric flow profiles of the whole system by parametric studies to achieve more transparency.

## Benefits

Flowmaster gives companies like Siemens Transportation Systems, the opportunity to shorten their product development cycle by reducing the number of physical tests and enhancing internal and external communication with suppliers. Costs of misconstruction and testing can significantly be reduced by using Flowmaster throughout the whole product development cycle. Flowmaster can assist innovative product development and gives systems engineers the right understanding of their fluid systems.

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