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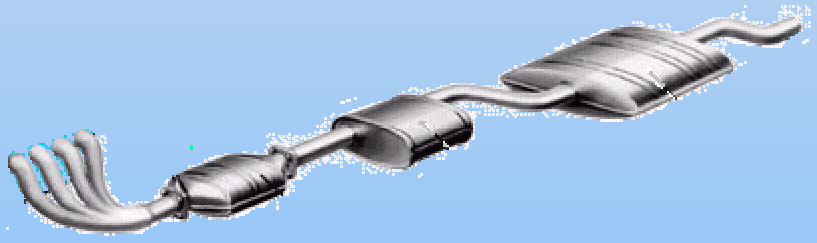
Automotive Exhaust Aftertreatment CAE

HEATRAN



Exhaust System Heat Transfer Modeling

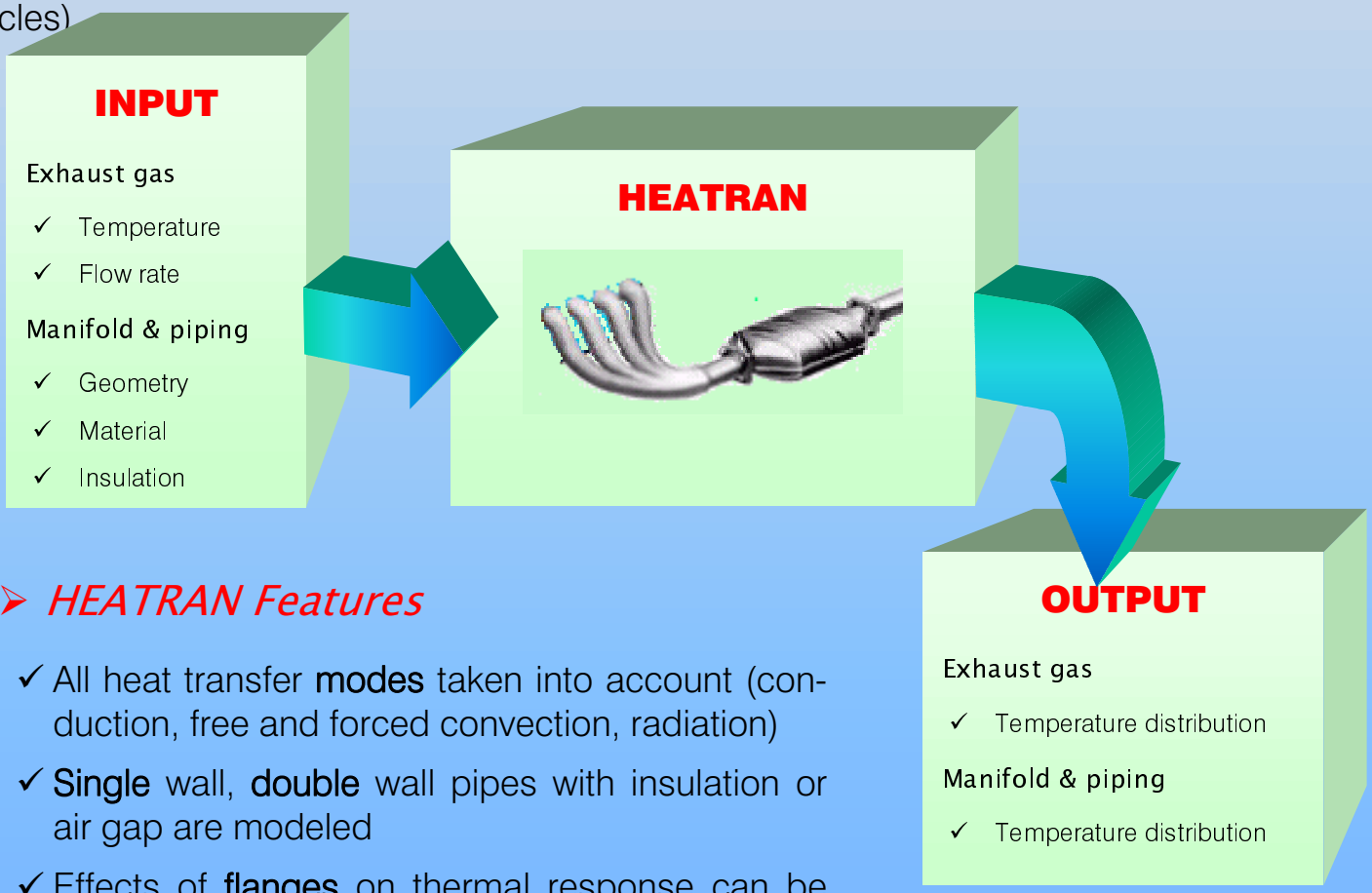
Optimization with Computer-Aided Engineering

HEATRAN

Mathematical Modeling of Exhaust System Heat Transfer

➢ *Heat Transfer & Exhaust System Performance*

The efficiency of emission control devices is seriously affected by the design of exhaust system upstream them. *HEATRAN* computes exhaust component and gas temperatures during steady state and transient operation (driving cycles)



➢ *HEATRAN Features*

- ✓ All heat transfer **modes** taken into account (conduction, free and forced convection, radiation)
- ✓ **Single** wall, **double** wall pipes with insulation or air gap are modeled
- ✓ Effects of **flanges** on thermal response can be assessed by 2-D temperature field computations

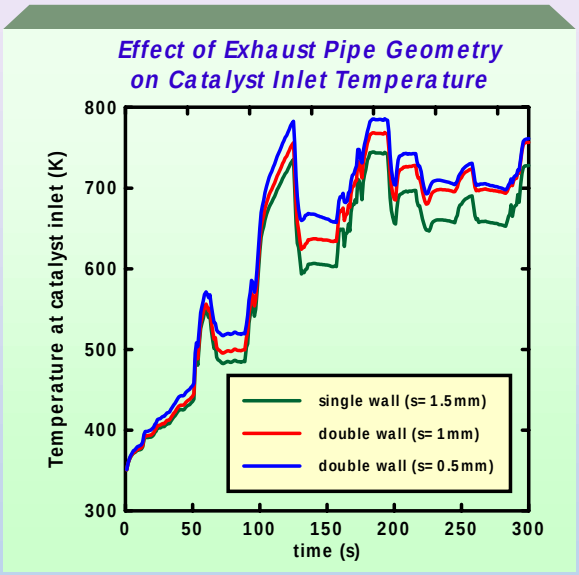
➢ *Application range*

Computational evaluation of the following exhaust system design parameters :

- ✓ manifold geometry (4-2-1, 4-1, etc.)
- ✓ downpipe geometry(length,thickness)
- ✓ manifold and connecting pipe material
- ✓ insulation material
- ✓ insulation or air-gap thickness
- ✓ flanges

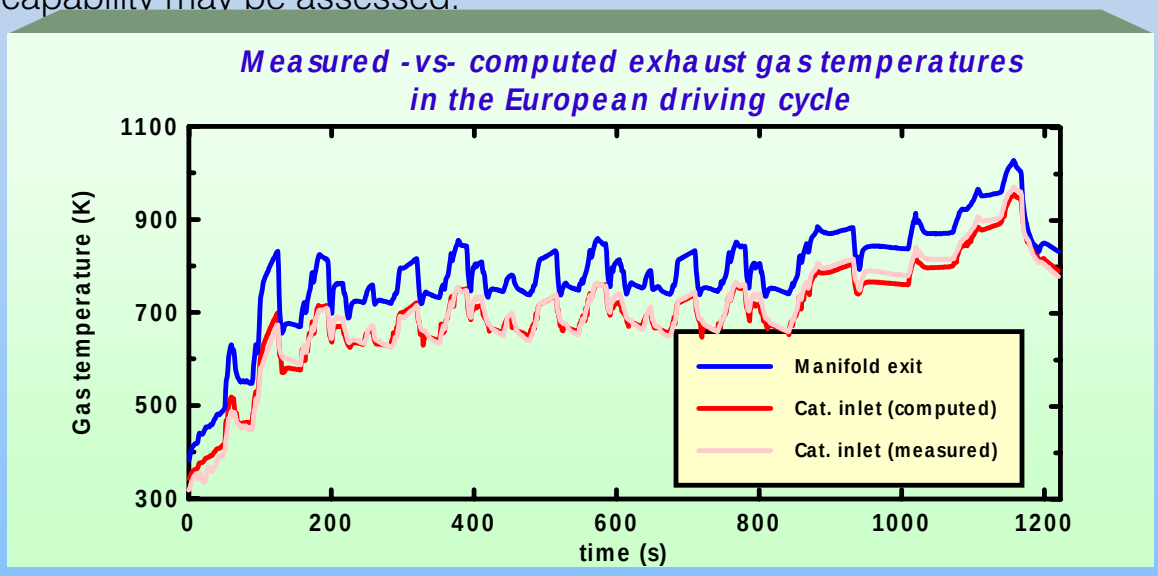
➢ *Faster Catalyst "Light-off"*

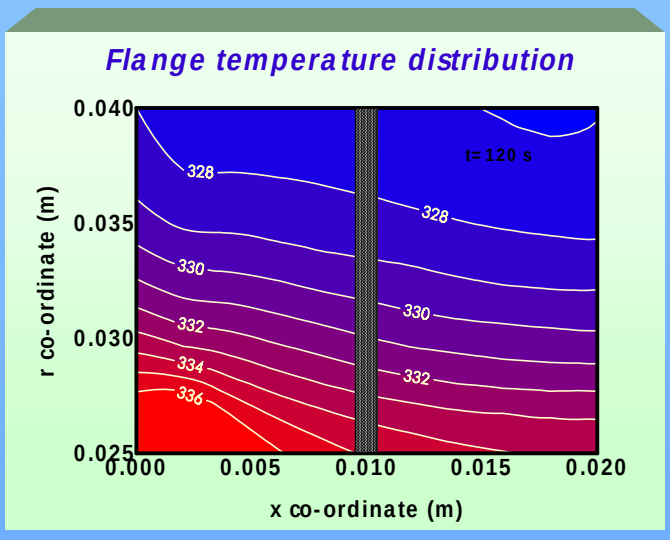
Faster converter warm-up can be achieved by optimized manifolds and downpipes. The effect of inner and outer wall thickness of double-walled pipes, air gap distance, converter position etc, can be evaluated.



➢ *Particulate Filter Regeneration*

The effect of filter positioning and exhaust system design on filter regeneration capability may be assessed.





➢ *Component Durability*

Study of thermal ageing effects on the converter efficiency, is assisted by this type of modeling. Study of Diesel filter thermal loading too.

➢ *Acoustics*

Mathematical models predicting the acoustic behavior of exhaust systems require knowledge of the exhaust gas temperatures along the system. This information can be provided by *HEATRAN*.