PowerTHERM

BENEFITS

Accurate results

Handles highly detailed geometric complexity

Short turn-around time

Access to comprehensive flow and surface data

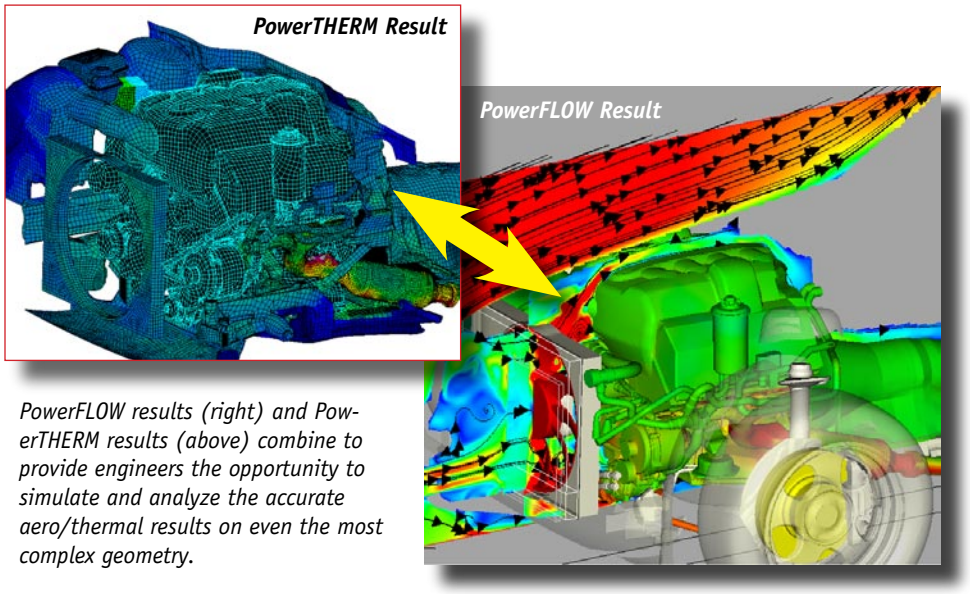
Support decisions in early design stages

Quick and easy design modifications

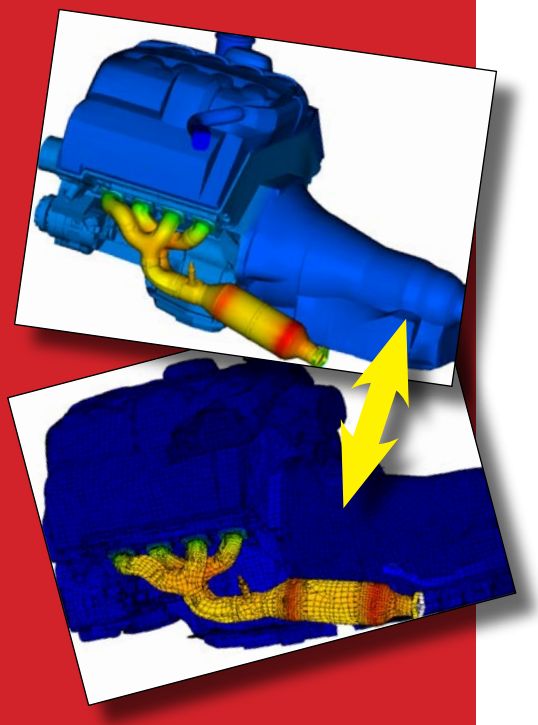
Reduction of physical testing

COMPLETE THERMAL MANAGEMENT SOLUTION

PowerTHERM® is a heat transfer analysis program that predicts surface temperatures and heat fluxes generated by heat radiation, conduction and convection. Convection is calculated by Exa's PowerFLOW® and coupled to PowerTHERM via an integrated coupling interface enabling two-way data exchange. The coupled simulation is easily set up in PowerCASE™ as part of a regular PowerFLOW simulation. The result is a complete flow and heat transfer simulation allowing the thermal engineer to not only efficiently and accurately predict thermal results but also analyze and optimize products for safety, performance, and costs. Common examples might be designing a heat shield, or positioning heat sensitive components in the underhood of a vehicle.



PowerFLOW results (right) and PowerTHERM results (above) combine to provide engineers the opportunity to simulate and analyze the accurate aero/thermal results on even the most complex geometry.



An integrated coupling interface allows users to seamlessly exchange PowerFLOW result data (top, left) with PowerTHERM (bottom, left).

Applications

PowerTHERM was tested for automotive applications:

- Underhood / underbody flows
- Climate control
- Heat shield analysis
- HVAC design
- Brakes & clutches
- Exhaust systems

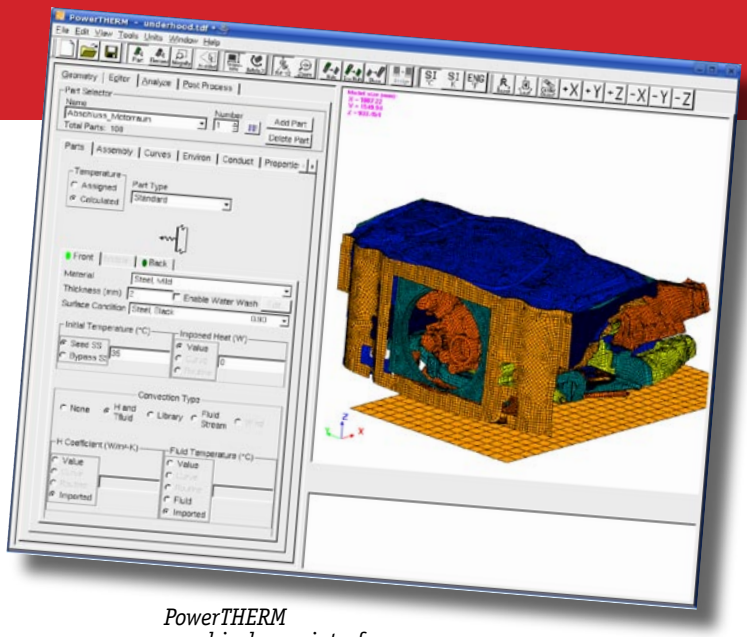
Major Features

- Accurate and complete thermal analysis of: multi-bounce radiation, conduction and convection
- Models for 1-D advection and natural environments
- Steady and unsteady adaptive solution algorithms
- Parallel processing
- Integration in PowerCASE via coupling interface
- Two-way coupling with PowerFLOW
- Integrated simulation process
- Simultaneous flow and surface temperature distributions

PRODUCT SPECIFICATIONS

PowerTHERM Features:

- Multi-bounce radiation
- Conduction
- Convection via internal library or CFD import capability
- 1-D advection and fluid stream models
- Natural environment model
  - Wind & solar loading
- Steady & transient simulations
- Temperature dependent properties
  - *Conduction, specific heat, and emissivity*
- Multi layer parts (up to 20 layers)
  - *Solid, air, vacuum or mixed*
- Import surface meshes from several common data formats
- Parallel processing
- Efficient and robust numerical scheme
  - *Adaptive relaxation*
- Graphical interface for setup and post-processing
  - *Model summary table*



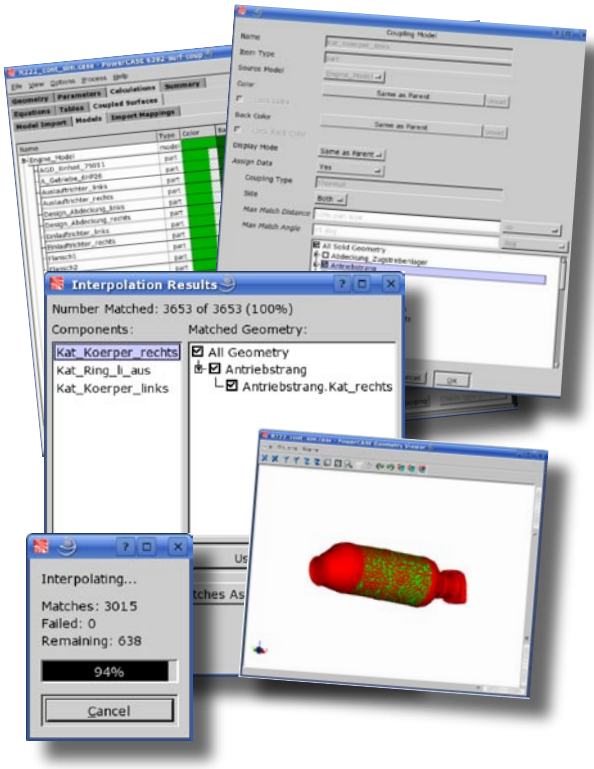
PowerTHERM graphical user interface.

PowerCASE coupling interface:

- Import of PowerTHERM/RadTherm TDF files
  - *Rotate, scale, and translate models*
  - *Couple to multiple and partial models*
- Visualization surface temperature(s)
- Specification of coupling parameters
- Automatic determination of surface matching between PowerFLOW and PowerTHERM required for the data exchange
  - *Option to manually adjust constraints*

Coupled simulations:

- User submits only one coupled PowerFLOW job
- Automatic interpolation and exchange of surface data
  - *Heat transfer coefficients and near wall temperatures*
  - *Surface temperatures*
- Automatic execution of PowerTHERM in the background
  - *Dedicated multiprocessor host can be specified*
- Additional recorded data
  - *Statistics on interpolation*
  - *.TDF file per coupling iteration*
  - *Output of each PowerTHERM simulation*



PowerTHERM coupling interface allows users to define sides, interpolation bounds and geometries to be checked. In addition, interpolation and automatic surface matching is quickly and easily done in PowerTHERM.

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