Sweating manikin transforms HVAC design

A Munich based engineering services provider to the automotive industry has developed a virtual manikin with life like physical characteristics – it radiates heat, sweats and shivers – for use in the development of automotive air conditioning systems, writes Roger Bishop.

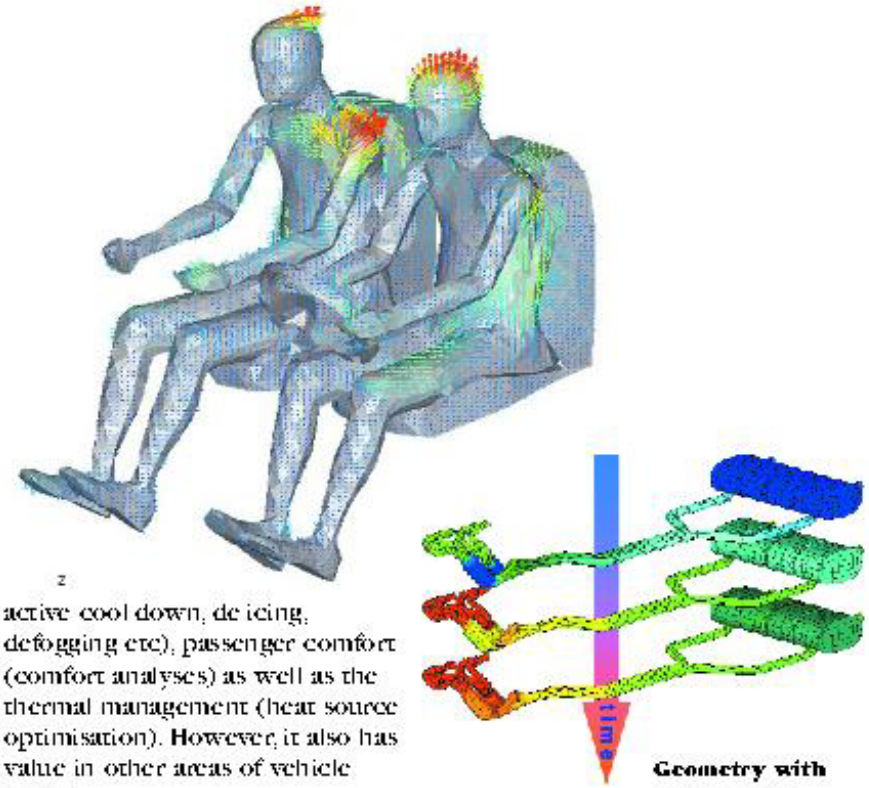
Making a meaningful comfort assessment within the passenger compartment of a vehicle is extremely complex and, until now, only stationary global comfort indices have been available to help engineers make predictions. To address the problem, P + Z Engineering has developed a new thermal solver – THESEUS FE – that includes some powerful tools including the new manikin.

The human body causes a variety of boundary conditions, changing continuously by different activities. For example, we sweat if we feel too hot or shiver if we are cold. On the other hand, humidity conditions are permanently influenced by breathing within our immediate surroundings. Every human being represents a 'heat source' of its own, depending on its activity and clothing. On average, the human body produces between 60W (relaxed sitting) and 500W (wood cutting) and this continues further into the environment, for example as thermal radiation.

Using the virtual manikin alongside THESEUS FE allows, for the first time, full transient local comfort assessment of passengers. The complete metabolic heat balance – including blood circulation, sweating, trembling, air humidity by breathing and its own heat performance – can be considered as well as all other complex environmental parameters.

The number of virtual manikins used within the model to be examined (for example four in a standard passenger car or 60 in a bus prototype) is only limited by the complete element number and available resources.

THESEUS FE has been specially designed for specifying climate control systems (passive heating, active cool down, de icing, defogging etc), passenger comfort (comfort analyses) as well as the thermal management (heat source optimisation). However, it also has value in other areas of vehicle design.



Geometry with about 195k elements
Airflow velocity impacting the passenger.
By use of special thermal bridges the contact of the virtual Manikin to the seat is closed so that heat transport between passenger and interior can be considered completely.

Calculations of exhaust systems and heat shield design are preferential application areas. In combination with CFD calculations, radiation exchange, heat conduction and convective values for inner and outer airflow can be evaluated. And in component optimisation – for example, choosing temperature constant materials for heat shields, instrument panels or interior trims – THESEUS FE can also be applied. Users simply import Nastran file which contains the model's geometry and assign material properties and other boundary conditions. THESEUS FE contains a database containing the most important materials used within the automotive industry and which can be enlarged

Enquire online **Enter**
P + Z **xxx**

Peformance speaks for AC ISA

A science based company in the USA has developed a packaged AC induction integrated starter alternator (ISA) technology that drops into the space normally occupied by the flywheel and is capable, on its own, of accelerating a small car up to 88km/h.

What stands the unit apart from other solutions, writes Roger Bishop, are Raser Technology's claimed performance figures and the ability to deliver high torque density without the use of permanent magnet materials. The motor magnetics are said to have been designed specifically for the company's Symetron controller which has uses proprietary control algorithms.

The water cooled P 50 is only 107mm deep and weighs 30kg. It delivers nearly 50kW of peak power, 210Nm of peak torque and a peak efficiency of 91%. As a generator it generates 20kW of power. Continuous torque and continuous power at rated speed are 120Nm and 25kW respectively. The speed range is 0 6,000rev/min.

Raser says the technology is currently being tested with Tier One suppliers and OEMs in both Europe and he USA. It is said to be reasonably simple to implement the technology into current vehicle designs. Motor controller solutions are said to be 'scalable' so that they can be sized to match the shaft power requirements of the motor design.

Compared with an equivalent permanent magnet motor, the Raser technology is said to have