CAE during Product Development in Visteon Lighting

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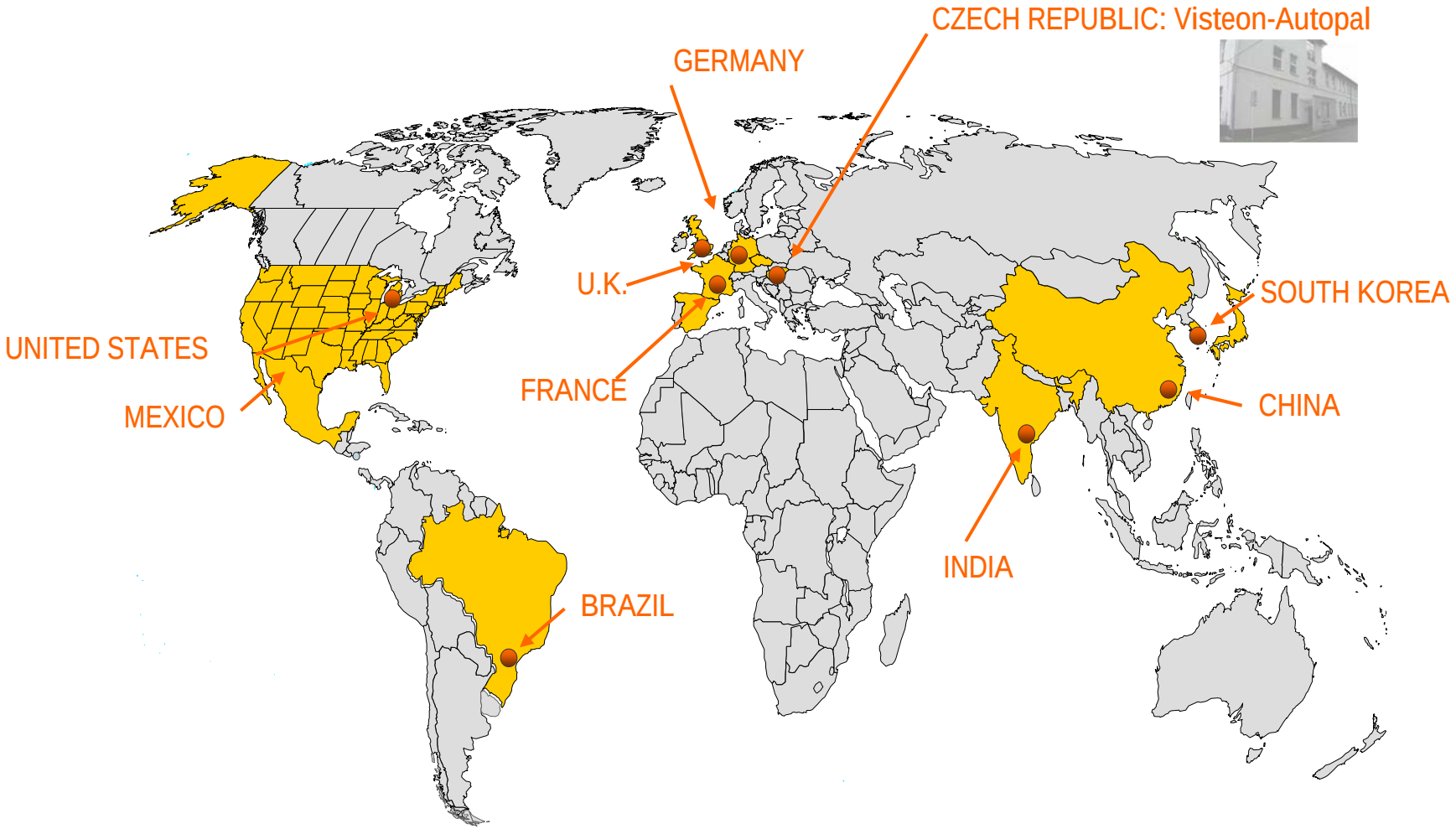
Premium Partners:

Visteon today

- Leading global automotive supplier
- Approximately 50,000 employees worldwide
- Serving the world’s major automakers
- Strong product portfolio:
  - Climate Controls
  - Interiors
  - Electronics
    - Lighting
- Quality aftermarket operations

Visteon worldwide Technical centers

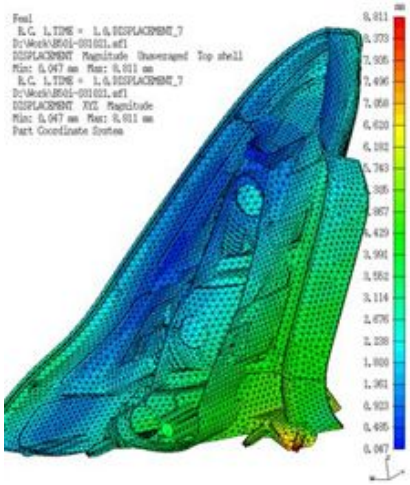


Structural analysis Lighting

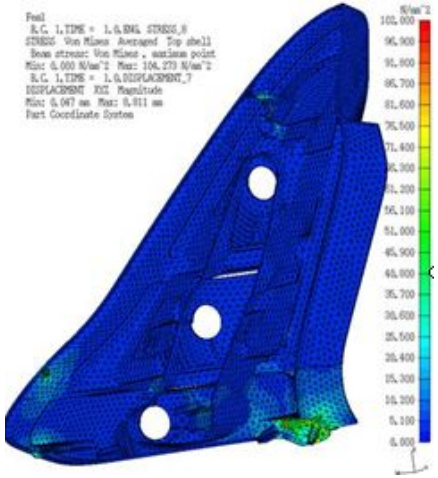
- **Check clips, sealing and assembly**
  - displacement and stress under load

Model

Displacement



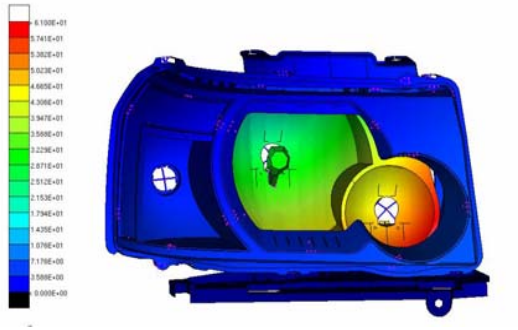
Stress



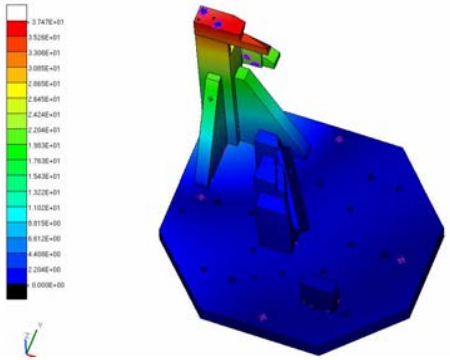
Vibration & Durability Lighting

- **Eigenfrequency and eigenmode**
- **Harmonic excitation, Excitation according specification**
- **Durability**

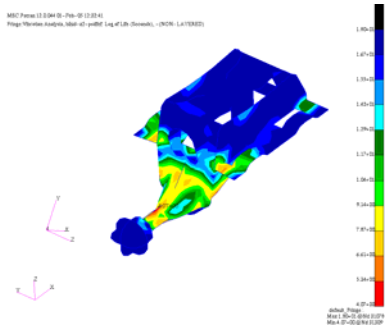
Head Lamp



Vibration Stand



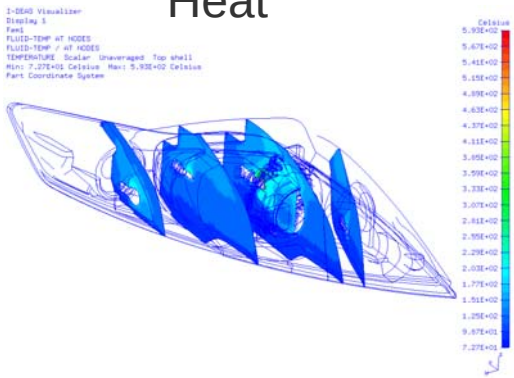
Durability



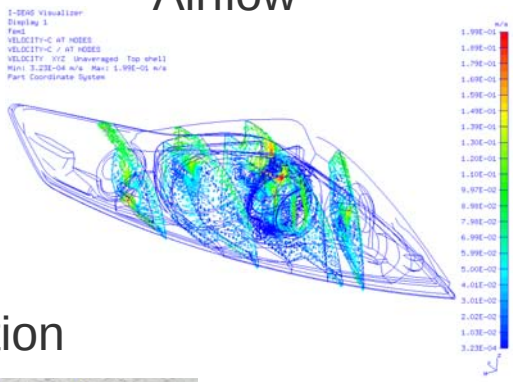
Heat & Condensation Lighting

- **Layout of temperature, airflow and condensation**
  - choice of material, layout of vents and physical testing

Heat



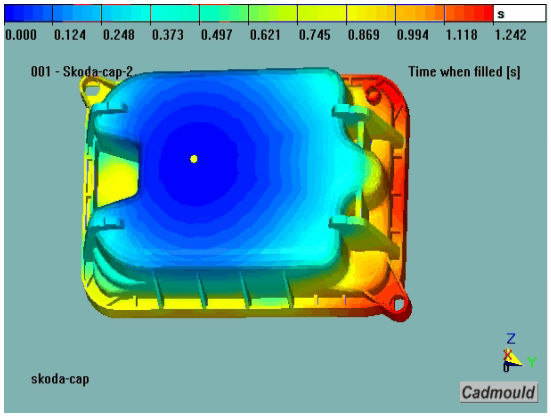
Airflow



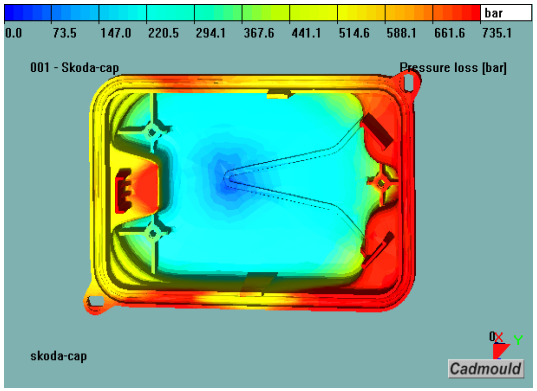
Condensation

- **Time, pressure and quality of filling**
  - filling of cavity in time, layout of pressure, weldlines and sinkmarks

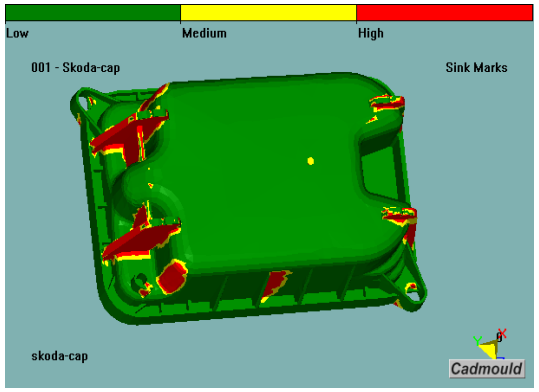
Time of filling



Pressure



Sink marks

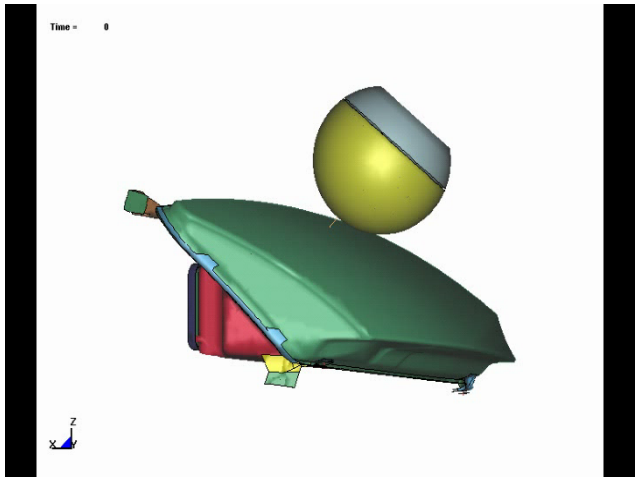


Pedestrian protection Lighting

- **Real testing and virtual simulation**
  - testing according specification impact (from upper leg, child head,…)

Testing-MIRA

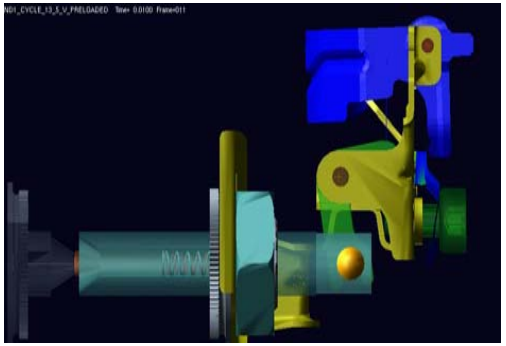
Simulation



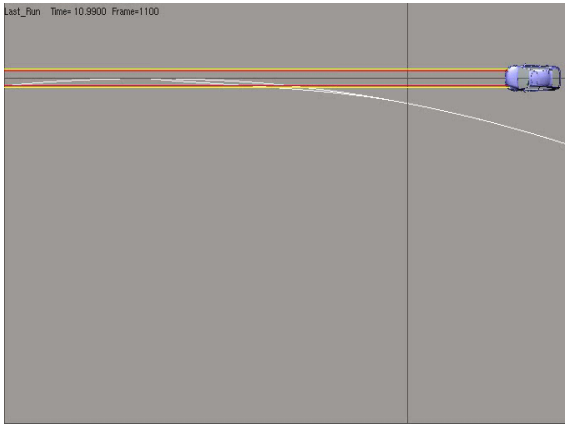
Mechanical systems Lighting

- **Mechanism**
- **Virtual Testing of AFS Systems Response**

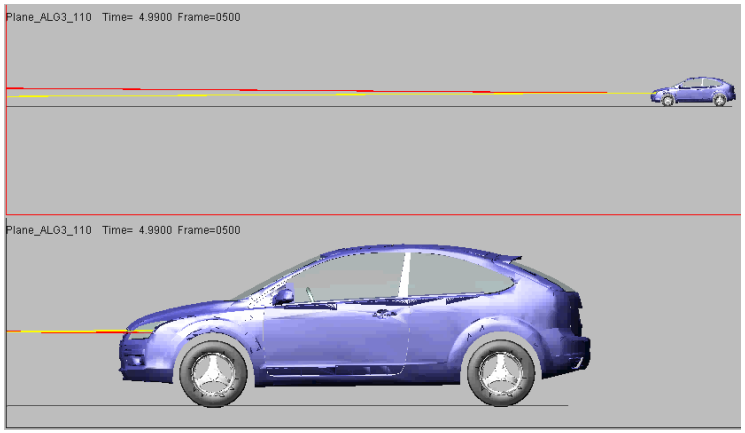
BIHID Mechanism



AFS Swiveling

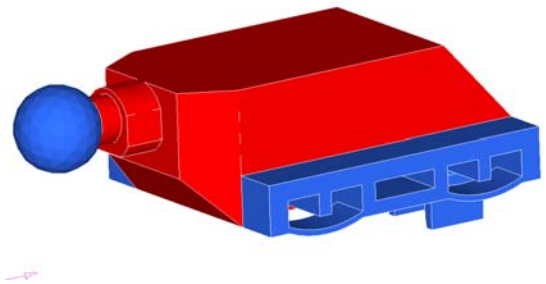


AFS Leveling

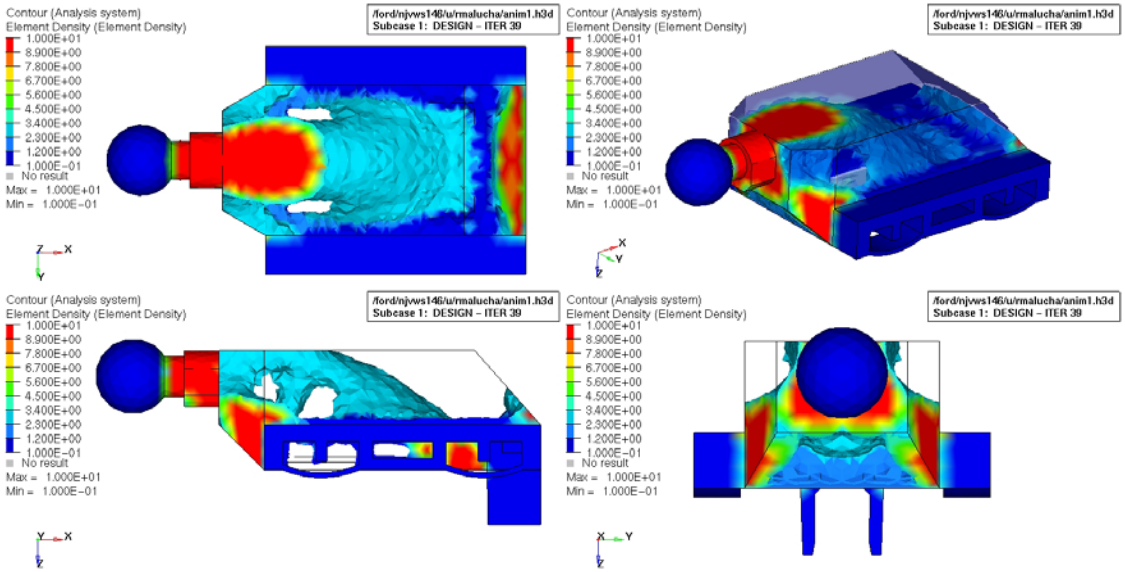


- **Topological optimalization of hardly loaded parts**
  - optimal design mechanical parts under static load,natural frequencies

Design and non-design space

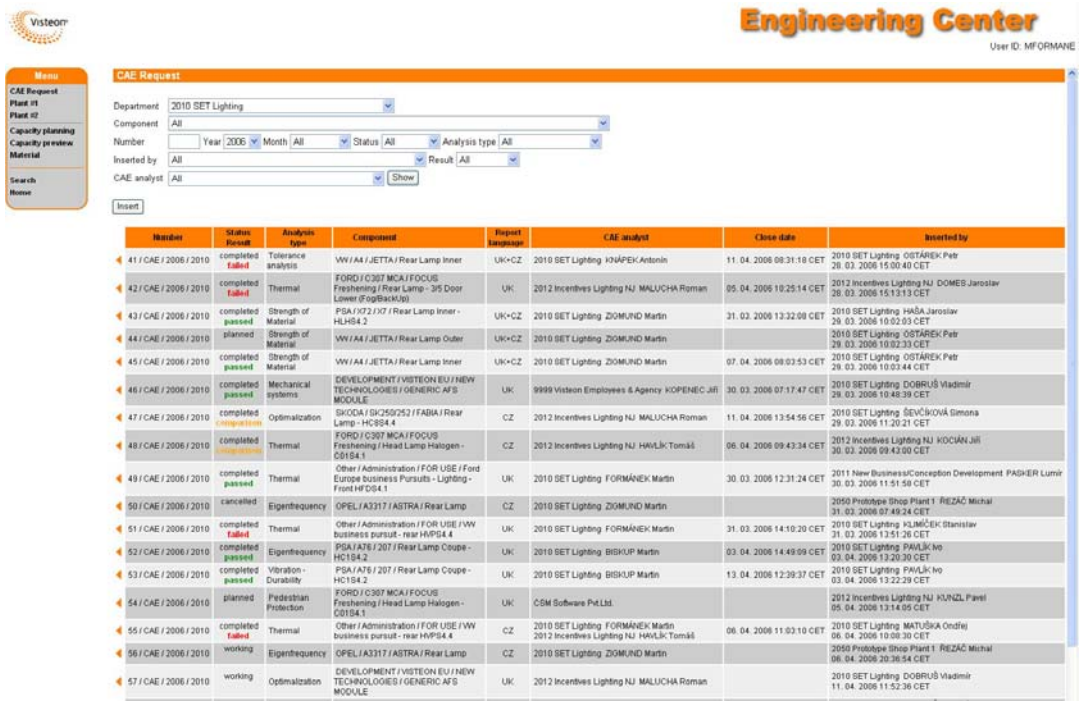


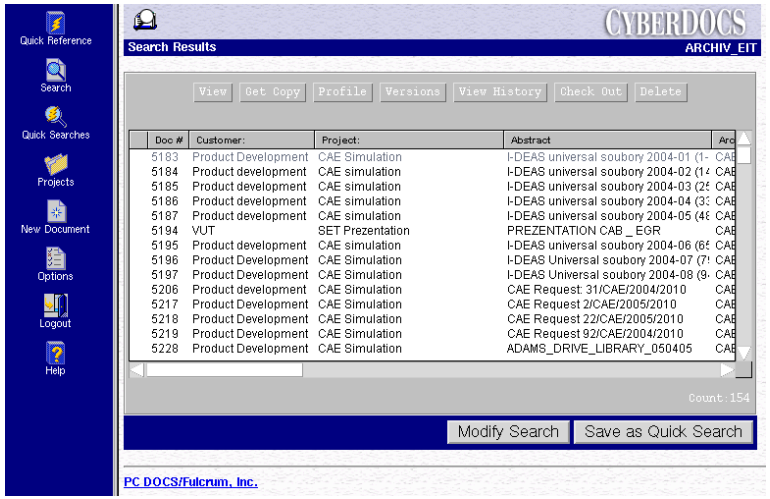
Bracket optimalization



CAE administrative Lighting

- **Engineering portal, CAE requets, report, digital archive**
  - CAE standard procedure, timing, planning of capacity and priority





CAE Hardware & Software Lighting

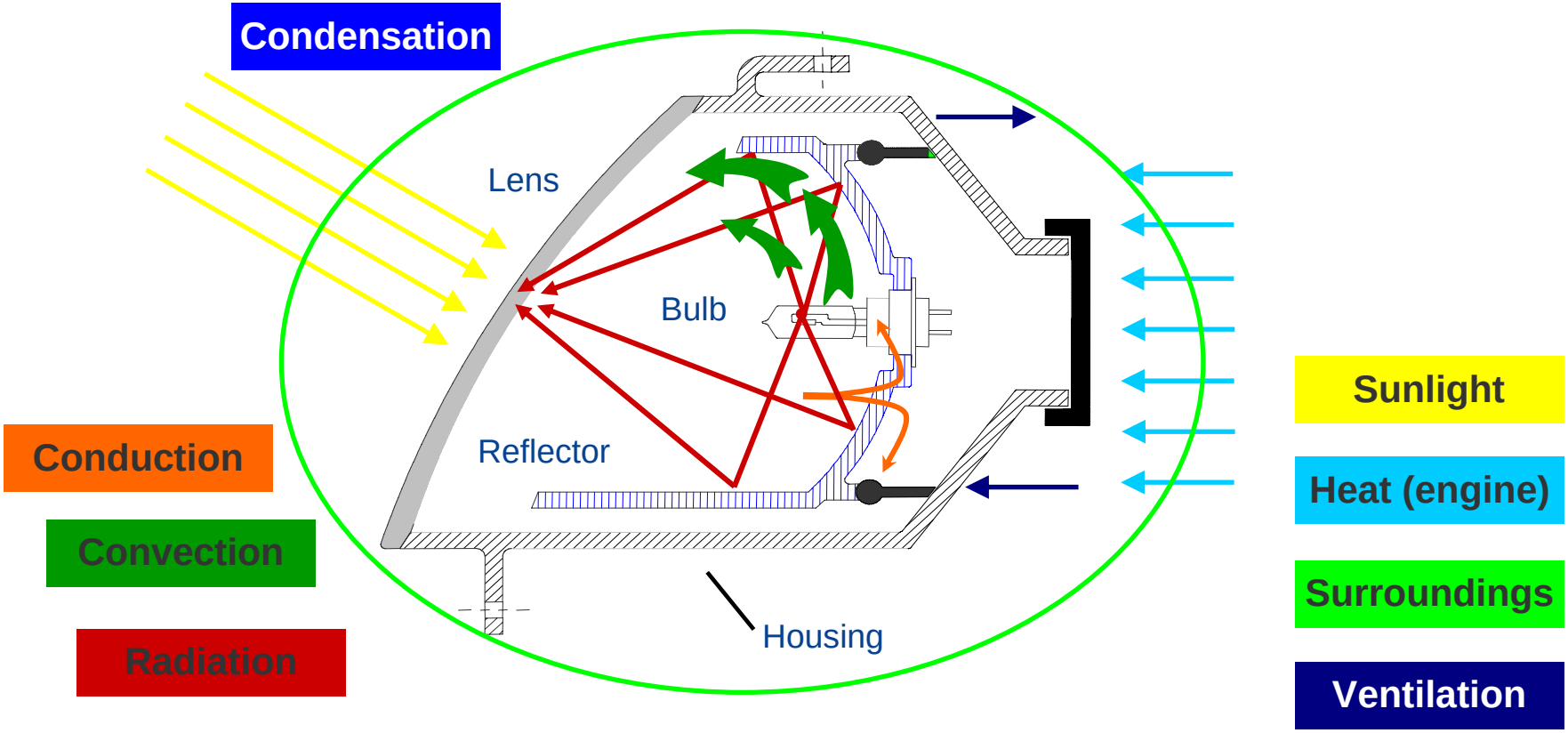
- **current standard is 64-bits hardware**
- **transition of operating system from UNIX to Windows XP platform (we wait for 64-bits Windows XP) = average 50% increasing of performance and related not negligible costsaving**
- **current standard is 64-bis CAE software**
- **we use Central license server for worldwide using CAE software**

CAD workstation

CAD laptop

Heat analysis – description Lighting

- **methodology for heat analysis – incandescent, HID and LED heat source (cooperation with MAYA)**
- **all three parts of heat are calculated: conduction, convection and radiation**

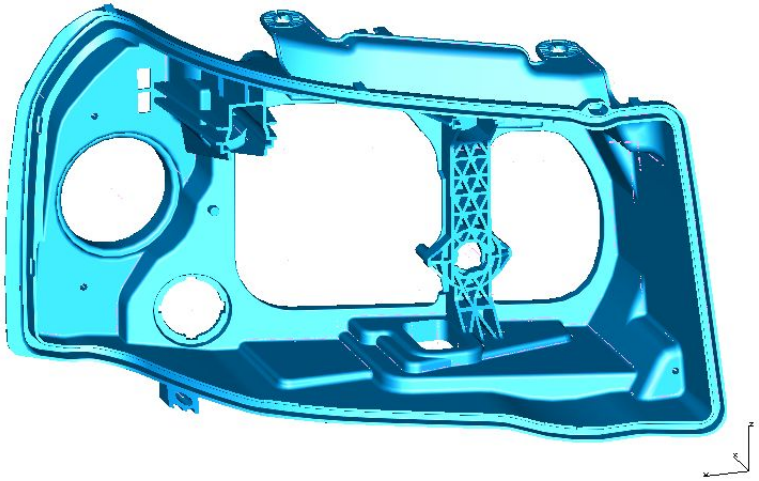


Meshing

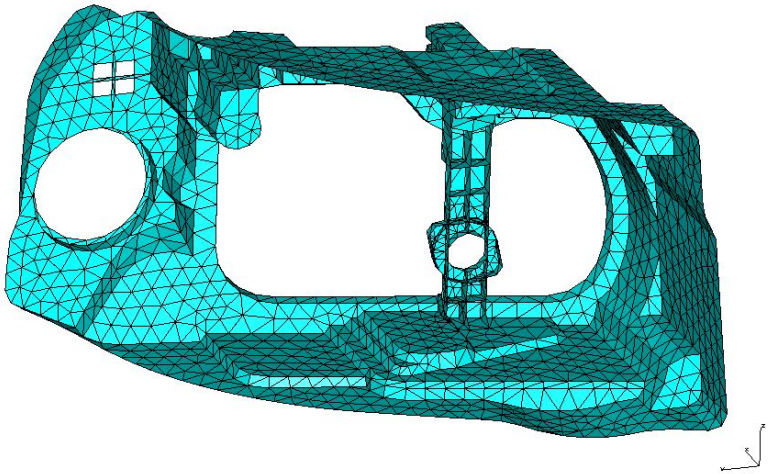
Lighting

- **meshing (shell and solid) we perform in ANSA software**
- **currently our input data are mostly not native I-DEAS data**
- **in past we thought about implementation of I-DEAS meshing – easy re-meshing of new CAD modification (in past nearly all CAD data were native I-DEAS data)**

CAD model



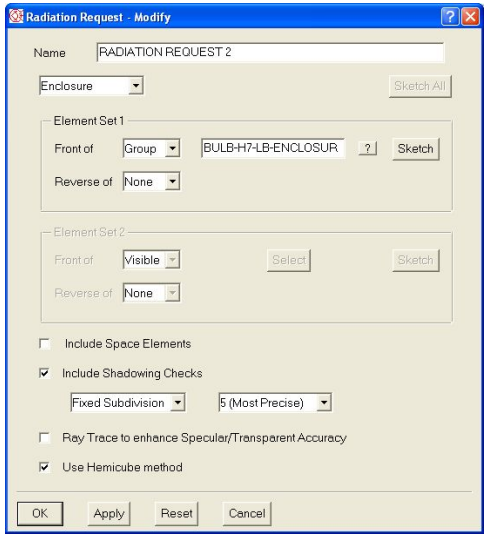
Meshed model



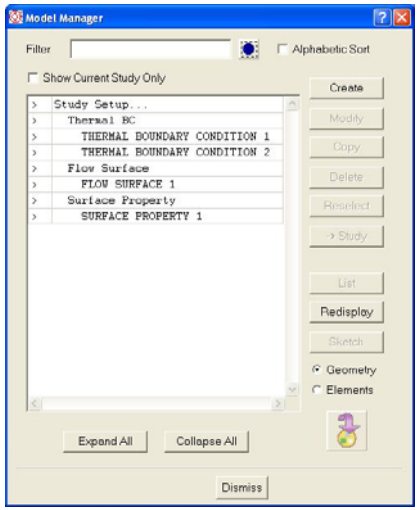
Boundary conditions and solving Lighting

- **setting of material properties and heat boundary conditions we do in I-DEAS TMG/ESC**
- **we developed general macro for this setting (for easy re-meshing of new CAD modifications)**
- **solution we perform in I-DEAS: ESC solver with including TMG settings**

TMG modul



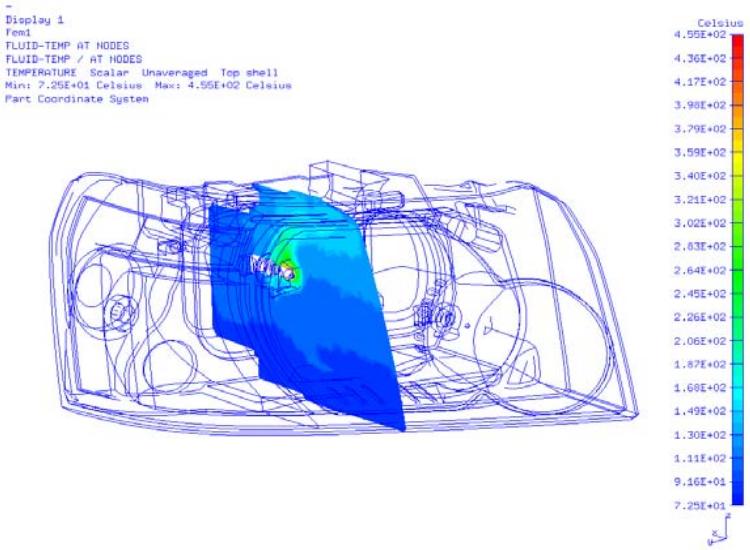
ESC modul



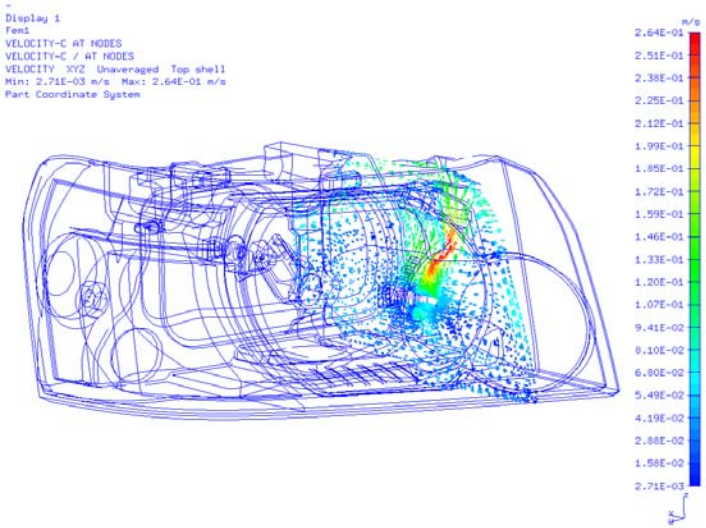
Postprocessing Lighting

- **we do postprocessing in I-DEAS Visualizer**
- **we standardized our final heat report**
- **confirmation of material choosing, checking airflow**

Heat layout



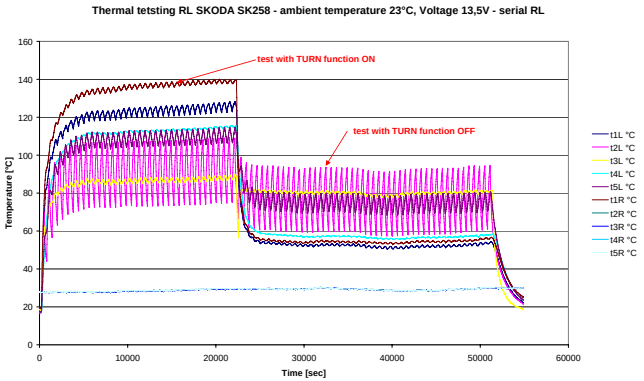
Airflow layout



Validation of results Lighting

- **to convince CAD engineers about CAE results = big costsaving in Product Development stage (the sooner the better)**
- **Table: Comparison of predicted (CAE) and measured temperatures**

Function	Part	Sensor(node)	CAE [°C]	Test [°C]	Difference[°C]	Difference[%]
TURN IS ON						
Turn	Body	**t1L** (7073)	124.0	128.3	**-4.3**	**-3.4**
		t4L (7823)	112.4	115.5	**-3.1**	**-2.7**
Backup	Body	**t2L** (7220)	105.3	109.2	**-3.9**	**-3.6**
		t5L (60714)	103.6	114.8	**-11.2**	**-9.8**
Fog	Body	**t3L** (6105)	91.0	89.7	**+1.3**	**+1.4**
TURN IS OFF						
Turn	Body	**t1L** (7073)	57.1	54.2	**+2.9**	**+5.4**
		t4L (7823)	58.9	58.4	**+0.5**	**+0.9**
Backup	Body	**t2L** (7220)	101.5	94.3	**+7.2**	**+7,6**
		t5L (60714)	75.2	80.8	**-5.6**	**-6.9**
Fog	Body	**t3L** (6105)	78.7	81.5	**-2.8**	**+3,4**



Heat analysis - outlook Lighting

- **fully automatic meshing of complex CAD model**
- **finalize and validation of heat methodology (incandescent, HID and LED source)**
- **to get results difference from measured data: ± 5°C (current situation is ± 15°C)**
- **database of thermal-optics material properties**
- **detail meshed model = fully 64-bits hardware and software**
- **parallel solution (multi CPU's solution)**
- **fast heat predictive tool (checking of important parameters)**
- **simulation of condensation (cooperation with MAYA)**

Feedback

Lighting

- **questions & answers**

Thank you for your attention.