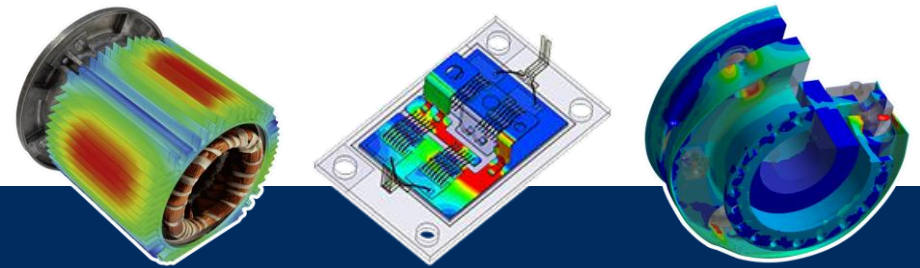


CADFEM®



Simulation is more than Software®

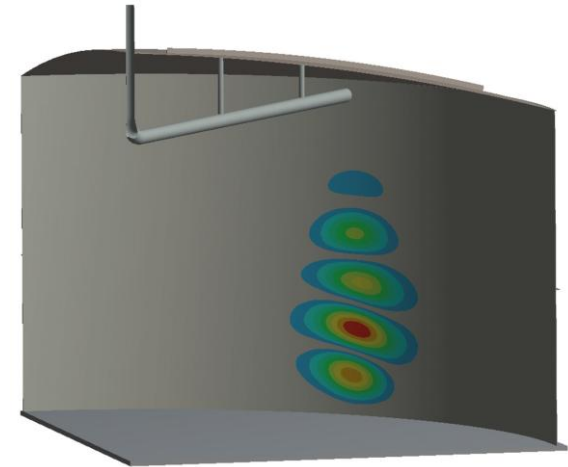


VDI- Heat Atlas inside ANSYS

VDI Heat Atlas inside ANSYS



Heat transport in technical equipment for the process industry, thermal power engineering and related subjects and thereby is a powerful tool for design purposes.



Prallströmung einer erwärmten Flüssigkeit auf eine kalte Behälterwand:
FE-Temperatur- und Beulanalyse basierend auf Wärmeübergangskoeffizienten aus dem VDI-Wärmeatlas, bestimmt über LV-ATLAS

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4 4 Heat Transfer in Turbulent Flow Tl

4.1 4.1 Nusselt Number for Fully Developed Tl

Transition from laminar to turbulent flow starts at $Re = 2100$ to $Re = 2300$. 1 at $Re \geq 10^4$. If the flow is turbulent, almost the same Nusselt number apply conditions: "constant wall temperature" and "constant heat flux."

An equation put forward by Gnielinski [14] for heat transfer during turbulent flow through pipes is:

in smooth pipes may be calculated from Eq. (2/7).

Explanations and ranges of validity are as follows:

$$Nu_{int} = \frac{\alpha d_i}{\lambda} ; Re = \frac{w d_i}{\nu} ; 10^4 \leq Re \leq 10^6 ; 0.1 \leq Pr \leq 1000 ; d_i/l \leq 1$$

The physical properties of the fluids are referred to the mean temperature \bar{T} .
Section 4.4 deals with the effect of the temperature dependence of the phys

Heat transfer in pipe flow
VDI-Wärmeatlas, 11. Auflage 2013

1 L1.2 | 2 H20 | 3 E1.2 | 4 01

Mass flow per pipe M 28799 kg/h
Velocity w 1 m/s
Reynolds number Re 350661 -
Heat transfer coefficient α 6306 W/(m² K)

Balance $Q = Mg \cdot cp (\theta_s - \theta_e)$

Results Constant wall temperature

$$\alpha = \frac{Nu \cdot \lambda}{dh} = \frac{959.5 \cdot 0.6776 \text{ W/(m}\cdot\text{K)}}{0.1031 \text{ m}} = 6306 \text{ W/(m}^2\cdot\text{K)}$$

$$Re = \frac{w \cdot dh \cdot \rho}{\eta} = \frac{1 \text{ m/s} \cdot 0.1031 \text{ m} \cdot 958.2 \text{ kg/m}^3}{0.2817 \text{ mPa}\cdot\text{s}} = 350661$$

$$Nu_{int} = 902.1 \text{ (turbulent flow } Re > 10000)$$

Correction factor k

Liquids

$$K = \left(\frac{Pr}{Pr_W} \right)^{0.11} = 1.064$$

$Nu = Nu_{int} \cdot K = 959.5$

LV Heat Atlas (11th edition)
Software based on the calculation sheets for heat transfer and pressure drop