

FLUID MECHANICS

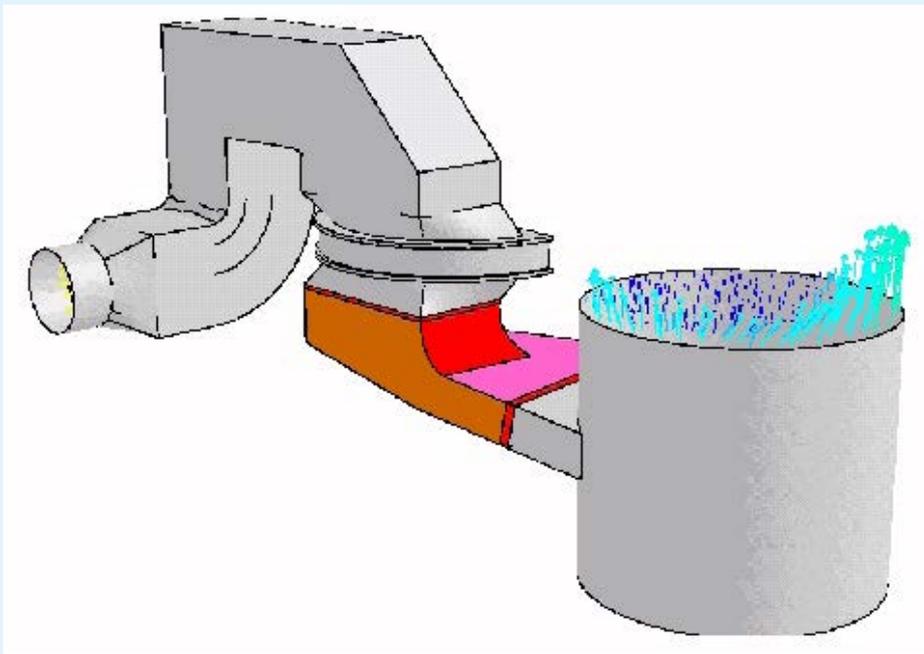
Damages at a compensator in a flue gas duct of a desulfurization plant

Analysis of damages by means of a 3D-flow simulation (CFD)

In a desulfurization plant in a power station, a compensator was installed after the regenerative preheater to compensate the extension. However, this compensator leaked after a relatively short time of operation. A crack occurred in the compensator bellow. Further compensators in the flue gas duct did not show those defects. Therefore, we assumed that the flow guidance downstream of the regenerative preheater led to an additional load of the compensator.

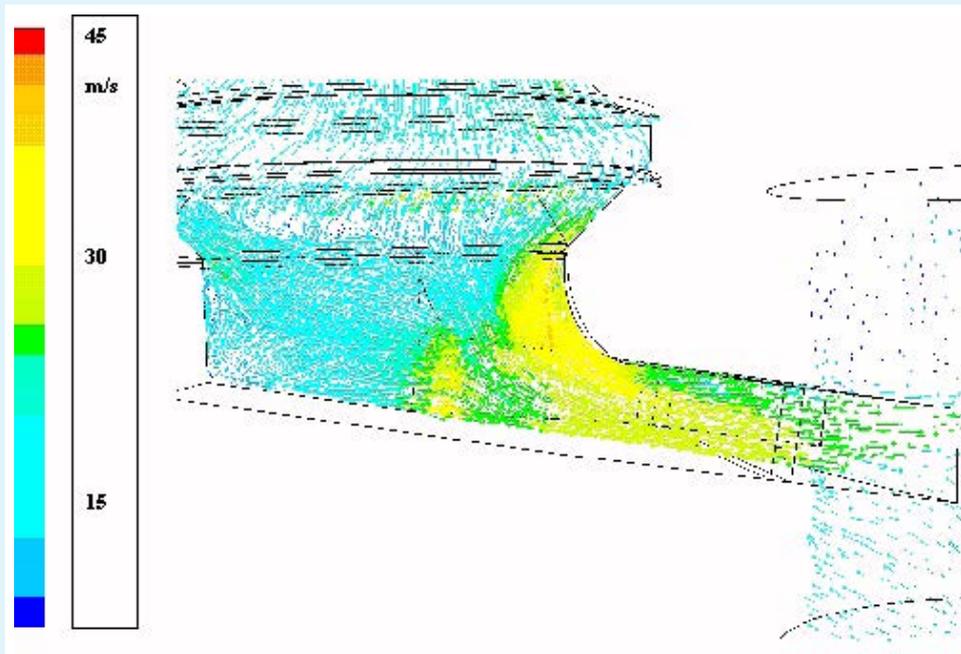
To analyse the problem, a 3D-flow simulation was carried out. It illustrated that significant overspeeds occurred near the compensator at the downstream side (level 1: area of the crack). This resulted in falling static pressures (fig. 1 and 2). At the same time, the flow at the compensator at the side of the crack formation detached due to a sharp-edged deflection.

By means of a CFD-calculation a periodical change between over- and underpressure within the duct near the compensator could be analysed as possible cause for the damages. The bellow dented in and out permanently so that it finally cracked. To eliminate this cause, the flow guidance had to be optimised in this area.

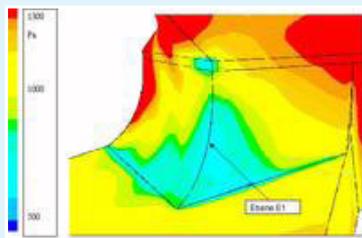


Overview of the calculated duct section near the regenerative preheater.

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Velocity vectors near the regenerative preheater.



Static wall pressure distribution near the damaged compensator.



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