Courtesy of

Dahlman Filter Technology
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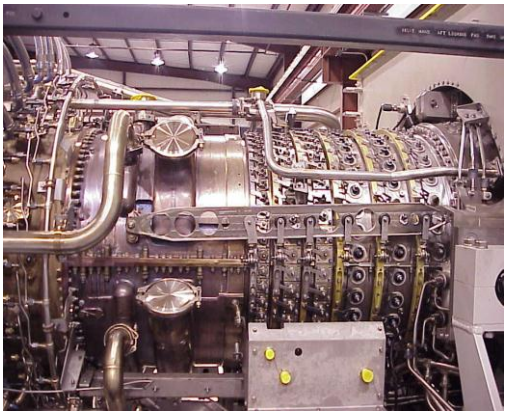
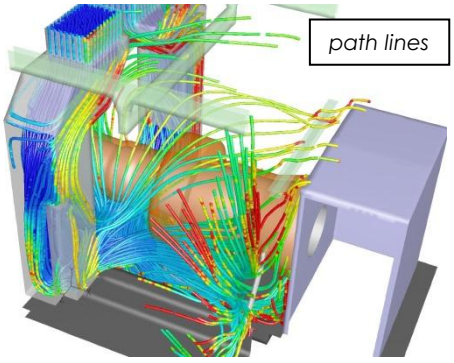
Explosion in a Box

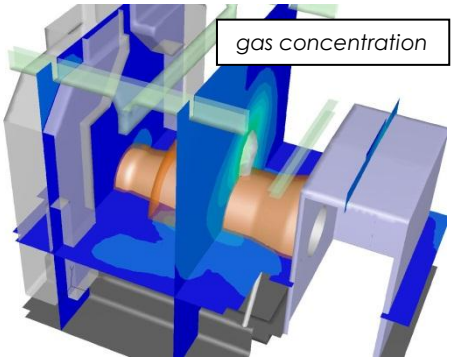


Since 1885, Dahlman has been providing industrial filtration solutions to clients worldwide. All their products for the refining, oil & gas, petro chemical and power generation industries are designed, developed, engineered and produced in-house at Maassluis, near the busy port of Rotterdam.

For the power generation industries Dahlman also designs and produces equipment for gasturbine (GT) packages, consisting of combustion air inlet and exhaust systems (incl. silencers and filters), acoustical enclosures and ventilation/anti-icing systems.

The design of the ventilation system of a GT enclosure is particularly complex, because many different requirements have to be fulfilled. In the first place the enclosure, which is barely larger than the turbine itself, protects the surroundings from the enormous heat and noise level emitted from the turbine. The amount of thermal energy can exceed 1 MW for certain gas turbines.





However this insulation keeps the temperature in the enclosure high, which may lead to overheating and mal functioning of the turbine and finally to a cost intensive shut-down. Therefore the ventilation system of the GT enclosure has to guarantee a sufficient cooling of the turbine. Furthermore the ventilation system is also used to transfer potential explosive gases out of the enclosure. The presence of explosive gases (caused by for example leakages in gas piping) is a seriously hazard for fire/explosions which should be minimized as much as possible,. It has to be proven that the region, in which the local gas concentration exceeds 50% of the lower explosion limit (LEL), is only a small fraction of the total air volume within the enclosure.

As the air flow requirements for cooling and leak dispersion can be rather contradictive Dahlman has asked FlowMotion to study the air flow of a GT enclosure, which has currently been in the design phase. For this study the air flow through the enclosure has been simulated with the help of CFD (Computational Fluid Dynamics). In this simulation a virtual model of the turbine, the air ducts and the inner enclosure geometry have been developed. The influence of the piping of the turbine on the flow along the turbine and thus on its heat transfer (including thermal radiation) has been modelled by porous blocks. a reduction of the production costs.

By analysing the distribution of the velocity, the temperature and the leakage gas concentration the complex structure of the flow in the en-closure could be shown. It could be proven, that Dahlman‘s design of the ventilation system for the GT enclosure fulfils all requirements (ATEX). The project underlines, that the coo-ling and the leak dispersion of a GT en-closure can be simulated before it is actually build. The results of the simulations do not only reduce the development risks to a minimum, but also give the opportunity to optimize the ventilation system, which lead to a reduction of the production costs.

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