

Air Liquide

A ceramic-metal sealed connection

Air Liquide's new milli-structured heat exchanger reactor, which operates at very high temperatures in a corrosive environment, uses ceramic plates connected to Inconel piping. A sealing challenge that has met with success - carry on reading to find out how!



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OUR CUSTOMER

Company Name
Air Liquide SA

Turnover in 2010
11 billion 886 million
Euros

Workforce
43,600 employees
in 104 countries

Area of Business
World leader in gas
production in the field of
industry, health and the
environment.

Air Liquide was looking to develop a new solution for steam methane reforming so that it could optimise hydrogen and carbon monoxide production. Based on the use of a milli-structured heat exchanger reactor, this approach was investigated as part of the Loki R (Low Oxidation Kinetics Reactor) project that has been given the seal of approval by the French General Directorate for Competitiveness, Industry and Services (DGCIS).

Severe operating conditions

The exchanger, which consists of stacked ceramic plates connected to Inconel inlet and outlet pipes, is required to

operate in smokes at very high temperatures (600 to 900°C) and in a potentially corrosive environment ($H_2/CO/CO_2/H_2O/CH_4$).

Given the complexity of implementing a sealing solution between the ceramic exchanger and the metal tubes, and owing to the critical nature of this function, Air Liquide entrusted Cetim with solving the problem.

Laurent Prost, R&D project manager at Air Liquide, explains: "As the ceramic and metal have very different expansion coefficients, we needed to find an assembling solution that would compensate for this differential expansion in order to avoid any risk of the

heat exchanger reactor being ruptured".

Developed, tested and qualified

The experts at Cetim then carried out a functional analysis and a "benchmarking" of the assembling technologies and sealing systems compatible with this industrial application. Next, the choice of the seal was determined and validated by several test campaigns that were undertaken in a special assembly, in a press, at a very high temperature (650°C).

The sealing configuration that gave the best results was then tested and qualified on a fully-dismountable prototype assembly that was representative of the final equipment.

On completion of the work, the technology was ready to be integrated into the actual equipment.

Cetim's advantages



Cetim makes its entire range of system design skills available to

manufacturers in order to meet customer requirements; it also provides its specific test resources and its expertise in the full characterisation of sealing systems at very high temperatures and controlled seal tightening forces.

Question and Answer Service

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