



1 An air-cooled catalytic reactor for aerospace applications manufactured from aluminum. (27 kW heat formation)

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ENERGY TECHNOLOGY FOR AEROSPACE APPLICATIONS

Innovative concepts for energy supply in aerospace applications

We develop microchannel heat-exchangers and reactors for heat management, catalytic combustion, reformers and complete fuel processors for the hydrogen production for fuel cells.

Customized systems

Our customers benefit from over 20 years of experience in delivering customized systems. Our services in the field of aerospace reach from the detailed engineering and manufacture of individual reactors and components to the testing and integration of complete systems for a power range of 50 kW and higher.

We offer catalytic gas phase reactors and heat exchangers for applications such as in tank inerting (Fig. 1) and heat management tasks.

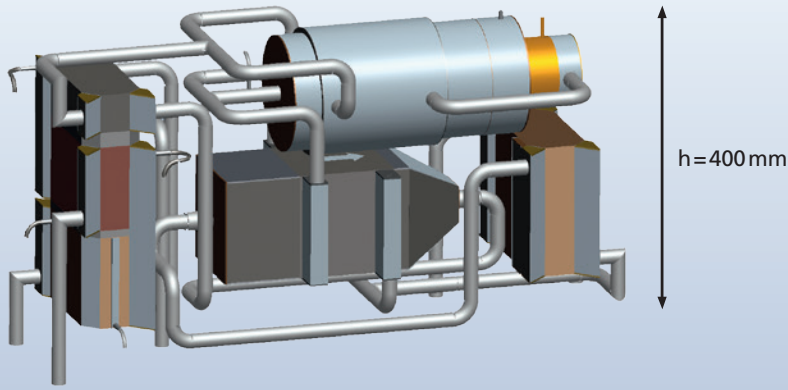
The integration of the individual components to a complete, thermally integrated system is a critical step towards a marketable product. Compactness, maximum efficiency, and low start-up time demand are major targets. Microtechnology offers enormous advantages in size reduction, efficient utilization of heat sources and catalyst as well as start-up strategies.

Moreover, we assist our customers in the proper choice and integration of balance of plant periphery required to move and control the feed flows into the system.

Fuels for fuel processors

(Bio-) Ethanol, Methanol, Propylene glycol, Ethylene glycol, Kerosene, Gasoline, Diesel, Natural Gas, LPG.

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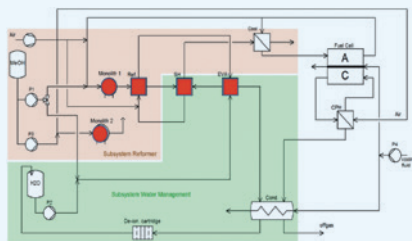
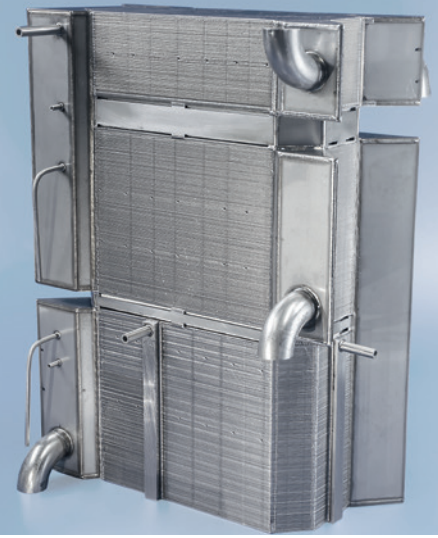


Fig. 4: Flow scheme for methanol fuel processing, Ref = Reformer, SH = Superheater, EVA = Evaporator, P = Pump, CPH = Cathode preheater.

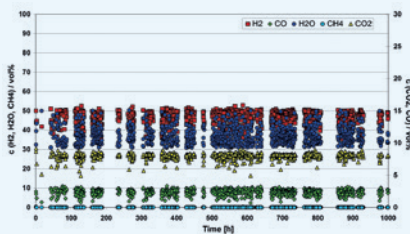


Fig. 5: 1,000 h long term test for a steam reforming catalyst.

Hydrogen for fuel cells

Fuel processor requirements for stationary and mobile applications:

- Operation at partial load + System control issues require a degree of freedom for the system
- Fuel processor has to be self-sustaining after start-up
- Optimum utilization of energy from hot process/off-gases (high efficiency)
- Minimum temperature gradient over reformer length axis
- Start-up time demand limited (preliminary target here: 15 min)
- Minimization of electrical power demand for start-up
- CO content of reformat as low as possible (removes stress from the fuel cell)

Starting from basic engineering, complete ASPEN and CAD models can be developed as shown in Fig. 2.

Liquid fuels e.g. methanol offer numerous advantages for future distributed power generation (portable, mobile and small scale stationary) as methanol is one of the few options for sustainable future fuels. A typical flow scheme for a methanol fuel processor is seen in Fig. 4.

Additionally, and uniquely, we also develop our own catalysts for implementation in our reactors, often with stability of many thousands of hours as shown in Fig. 5.

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- 2 Complete CAD model for a propylene glycol fuel processor.
- 3 Integrated WGS/PROX gas cleaning tower. (5 kW power equivalent)