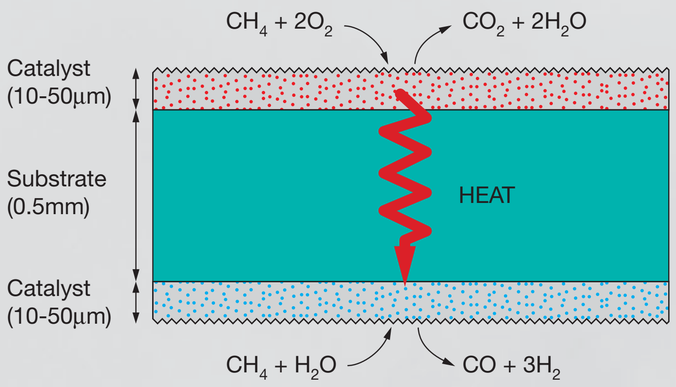
ADVANTICA

Compact Reformer for Hydrogen Production

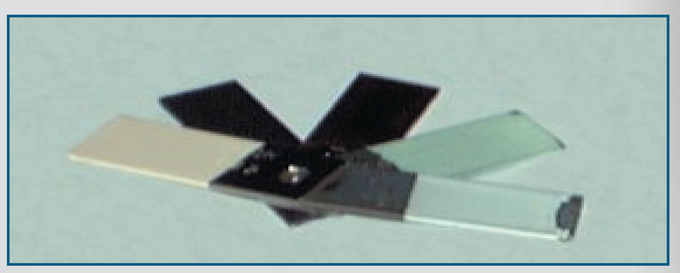
Martin Brown, Robert Judd, Angie Siddle

A natural gas reformer, based upon compact heat exchanger hardware, has been developed by Advantica. Possible applications include fuel cells, gas-to-liquids, and small-scale local hydrogen production.

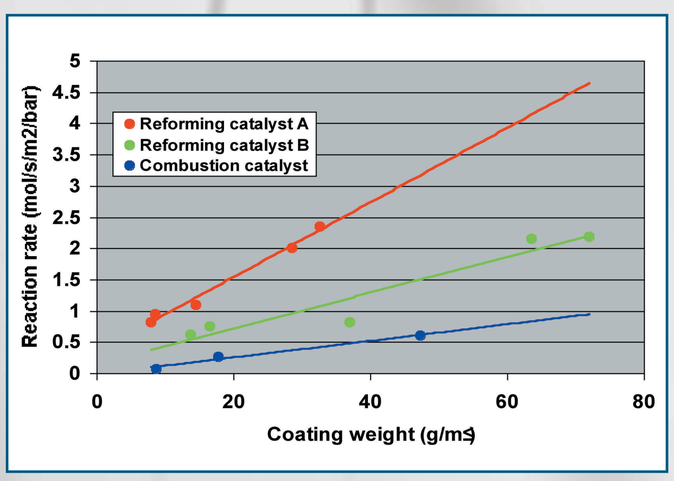
The reformer is extremely small volume and is capable of producing hydrogen at a lower cost than competing technologies



The principle of the Compact Reformer is to enhance heat transfer and catalyst activity using thin catalyst layers deposited either side of the compact heat exchanger.



The key breakthrough has been made in catalyst coatings. After screening more than 500 catalyst types, we have deposited adherent catalysts on stainless steel coupons and heat exchanger material.



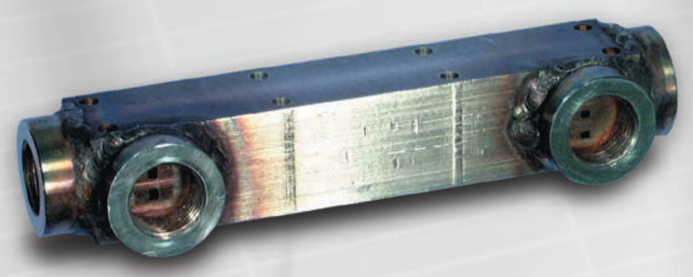
The catalyst thickness controls the reforming and combustion reaction rates.

Catalyst	Power density achieved (kW/m^2 extrapolated from activity tests)
Reforming	23
Combustion	22

Our catalysts display outstanding activity, easily achieving the $10kW/m^2$ target power density.

Operating pressure (bara)	3	3	1.8	1.8	1.8
Reformer temperature (°C)	750	650	650	650	600
Steam:carbon ratio	3	4	3	3.2	4
Net power output (kW)	192	165	187	191	173
Electrical efficiency (%)	**39.5**	**39.2**	**44.3**	**44.7**	**40.9**

System studies indicate that the Compact Reformer is capable of integration in PEM fuel cell systems of high efficiency.



Proof-of-concept Compact Reformers, fabricated by diffusion bonding, have been successfully coated with catalysts and tested under realistic conditions, for extended periods. Extended tests over 500 hours have completed successfully.

The Compact Reformer is a key development in fuel processing offering several advantages, including:

- Miniaturisation of the reformer (up to around 13kWe/litre for fuel cells)
- High system efficiency
- Reduction of the reformer temperature to 650°C, allowing cheaper materials selection and potential durability benefits
- Miniaturisation of other process stages such as water-gas shift using the same concepts
- Application to other hydrocarbon fuels
- Low cost

Advantica is currently working to realise these advantages.

Engineering a Better Return on Assets®

Advantica
Ashby Road
Loughborough
Leicestershire
LE11 3GR
UK

Tel: +44 (0)1509 282659
Fax: +44 (0)1509 283064

Email: info.uk@advantica.biz
www.**advantica**.biz

STONERSOFTWARE