Pall Corporation

High-Performance, Durable, Palladium-Alloy Membrane for Hydrogen Separation and Purification

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Project ID #PDP26

People. Ideas. Solutions.

This presentation does not contain any proprietary or confidential information

Overview

Timeline

- April, 2005 start date
- April, 2008 end date
- 0% complete

2005 Targets

- Flux = 100scfh/ft^2 @20 psi
- Cost = \$1500/ft^2
- Durability = 8760 hrs

Budget

- \$4 million Total
  - \$2.4M DOE share
  - \$1.6M Contractor share
- \$100k DOE share for FY05

Partners

- Chevron Texaco
- Colorado School of Mines
- ORNL

Project objectives

- Apply an effective thermal diffusion barrier on a porous stainless steel tube, over which a defect free, dense palladium alloy membrane is applied.
- Optimize copper/palladium ratios and furnace cycles to form alloys for best overall performance.
- Obtain performance values equal to relevant hydrogen production and cost targets.

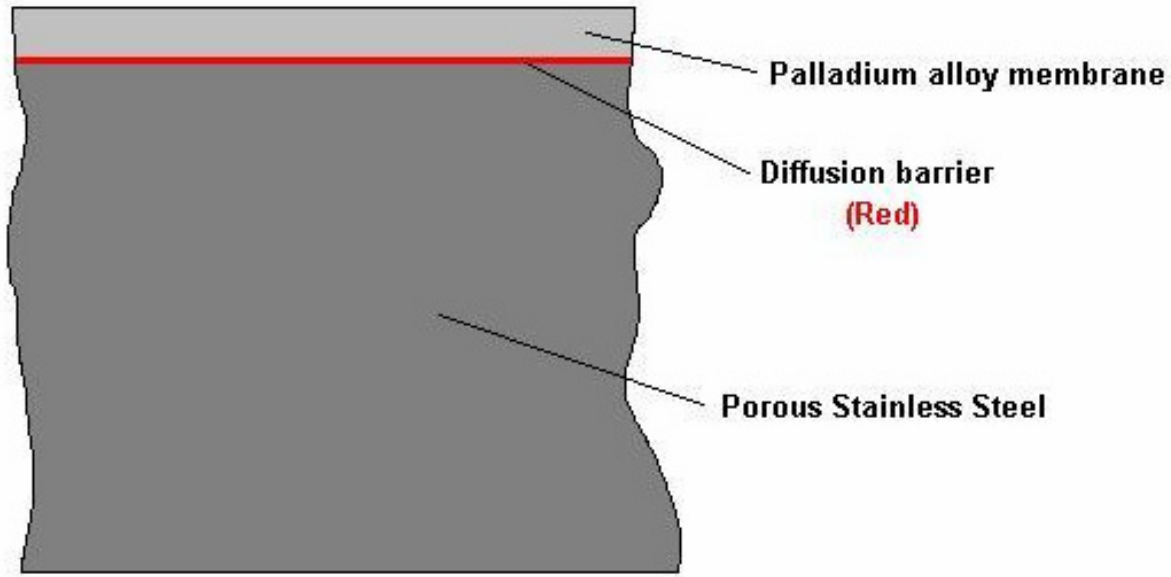
Approach

- Test effectiveness of intermetallic diffusion barrier at operating conditions
- Identify and address the causes of defects to enable production of ultrathin palladium alloy membranes
- Test composite membranes of different alloy compositions to identify best overall performance

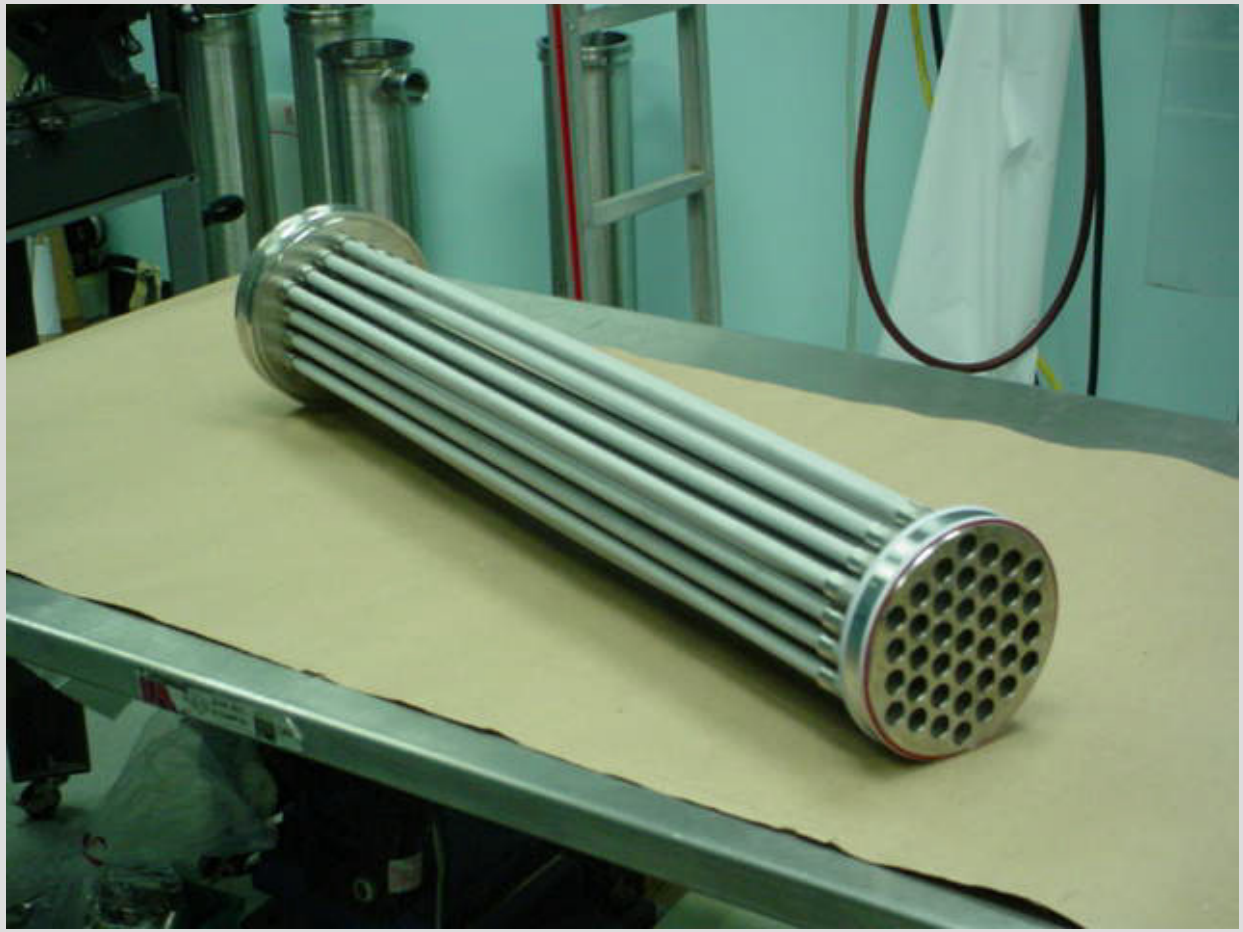
Future Work

- Evaluate the effectiveness, at operating conditions, of various methods used to seal solid metal fittings to the ends of the tubes.
- Begin evaluating samples for long term durability in reformed natural gas stream at Chevron Texaco

Planned Cross section of composite structure



Tubesheet bundle



Hydrogen Safety

The most significant hydrogen hazard associated with this project is when the membrane composite is installed in a housing and placed in a furnace for hydrogen permeation testing at 400°C. If the housing, tubing or fittings fail while under hydrogen pressure, the furnace could ignite the hydrogen.

Hydrogen Safety

Our approach to deal with this hazard is to design the housing, tubing and fittings for hydrogen service at temperature and to do a thorough leak test prior to starting the tests.