



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

## Budget

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

## 2005 Targets

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

## 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.

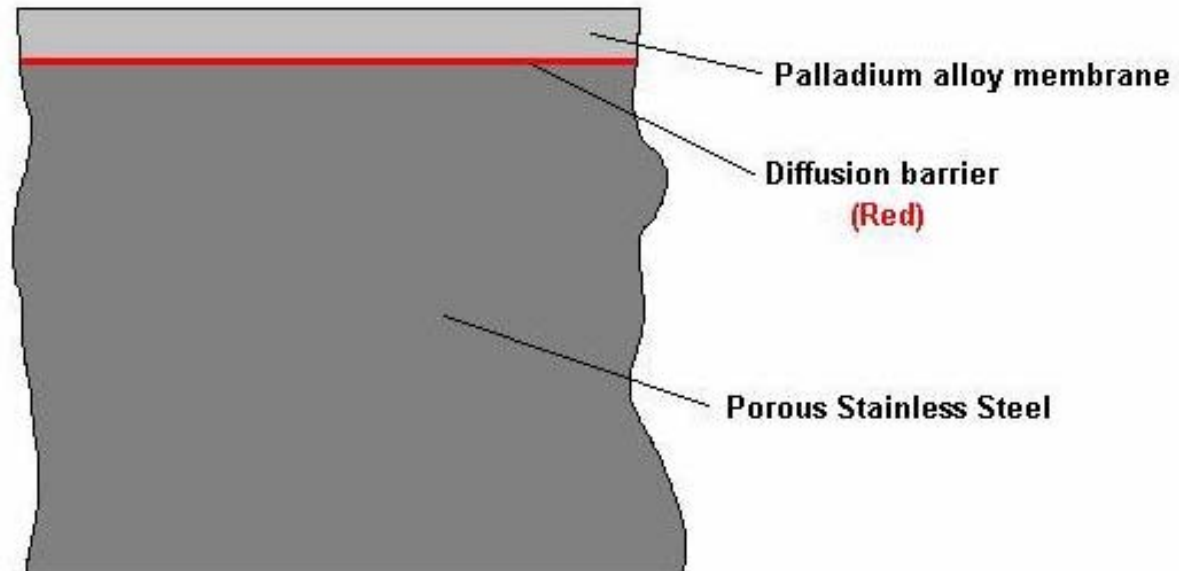
## Approach

- 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

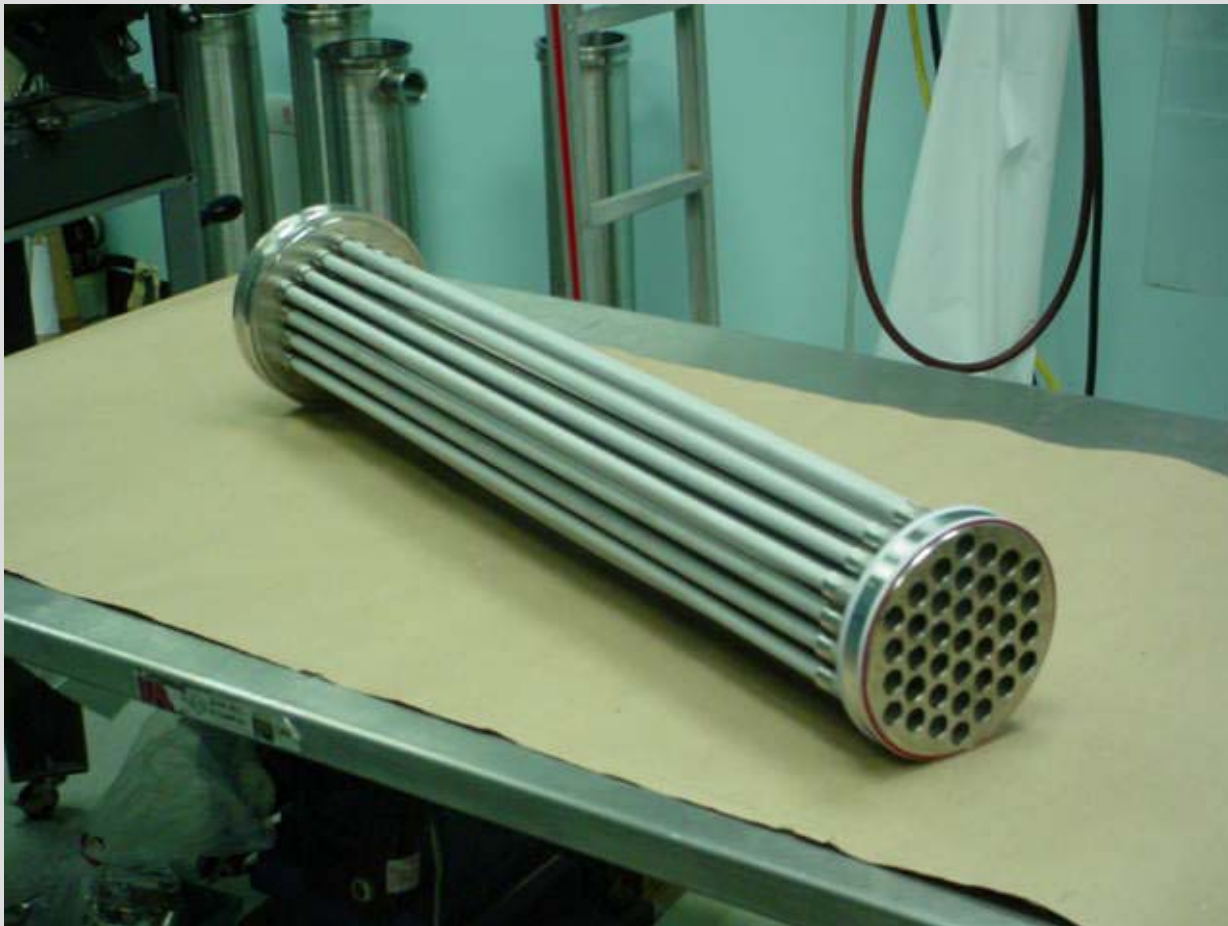
## Future Work

- 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.