



Catalytic Reformer and Refinery Hydrogen System

PROBLEMS

Hydrogen produced by a catalytic reformer is a mixture of condensable hydrocarbons and hydrogen. The purity of the hydrogen is typically between 75–90%, which means that there is a high percentage of components which may condense resulting in reliability problems in downstream equipment. These liquids are in a fine aerosol form, very difficult to separate with knock-out drums or packed vessels. Because the “net” hydrogen produced at a reformer unit is distributed throughout the refinery, the problems are widespread. Common problems observed in a refinery hydrogen system include:

- Fouling and performance loss of the reformer hydrogen recycle compressor
- Failure of reciprocating compressor valves
- Imbalance of centrifugal compressor rotors
- Premature fouling, plugging, poisoning and regeneration of reforming catalyst
- Frequent replacement of absorbent at Pressure Swing Absorption (PSA) and hydrogen purification units

In addition, compressors with lube oil systems often discharge small quantities of lube oil into the process gas. The lube oil mixes with the feed and can coke up the catalyst resulting in frequent catalyst regeneration.

PALL SOLUTION

A Pall SepraSol™ Liquid/Gas coalescer in the hydrogen lines will remove virtually all of the entrained liquids in the hydrogen. SepraSol coalescers can remove both hydrocarbons and aqueous aerosols and are efficient at removing aerosols as small as 0.1 micron. Most aerosols smaller than 5 micron are not separated in knock-out drums or packed vessels.

All of Pall's SepraSol coalescer products contain a patented oleophobic/hydrophobic treatment, which allows the coalescer to recover quickly and capture more efficiently slugs of liquid that result from the upset conditions that can frequently occur in the hydrogen system. The installation of a Pall SepraSol coalescer can dramatically improve the reliability and maintenance of compressors and other downstream equipment.

Figure 1: Catalytic Reformer and Refinery Hydrogen System

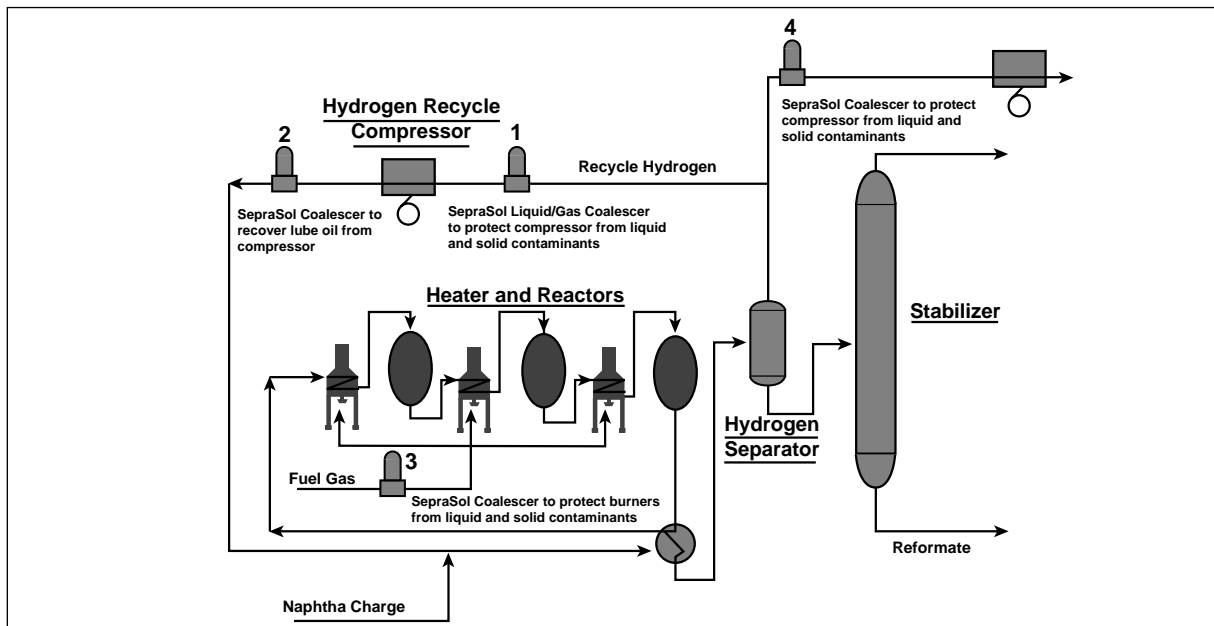


Table 1. HCP Filter Recommendations

Filter Location	Recommended Pall Assembly	Purpose of Separation	Benefits of Separation
1	Pall SepraSol Liquid/Gas Coalescer: CS604LGH13 CC3LGO2H13	Remove condensable hydrocarbons from recycle hydrogen	<ul style="list-style-type: none"> • Lower compressor maintenance cost • Improved reliability • Reduce catalyst contamination • Improved energy efficiency
2	Pall SepraSol Liquid/Gas Coalescer: CS604LGH13 CC3LGO2H13 CC3LGA7H13	Remove lube oil from compressor discharge gas	<ul style="list-style-type: none"> • Reduced lube oil losses • Improved reactor operations
3	Pall SepraSol Liquid/Gas Coalescer: CS604LGH13 CC3LGO2H13 CC3LGA7H13	Protect heater/furnace burner nozzles from liquid and solid contaminants	<ul style="list-style-type: none"> • Longer service life of burners • Improved furnace efficiency and operation • Lower maintenance costs
4	Pall SepraSol Liquid/Gas Coalescer: CS604LGH13 CC3LGO2H13 (Note: Systems can either be installed before each compressor or on the net gas line)	Remove condensable hydrocarbons from "net" hydrogen	<ul style="list-style-type: none"> • Lower compressor maintenance cost • Improved reliability • Improved energy efficiency
4	Pall SepraSol Liquid/Gas Coalescer: CS604LGH13 CC3LGO2H13 CC3LGA7H13	Remove liquids from feed to PSA or Hydrogen Purification Unit	<ul style="list-style-type: none"> • Improved separation efficiency • Reduced absorbent costs

REFERENCES

1. GAS 4102 – SepraSol Liquid/Gas Coalescer
2. GAS 4104 – SepraSol Liquid/Gas Coalescer (Double Open Ended Style)
3. H-52 – SepraSol Plus Liquid/Gas Coalescer
4. PR-900 – Separations Technologies in Petroleum Refining
5. GAS-4501 – Operations and Installation Guide to SepraSol Coalescers Assemblies

OTHER APPLICATIONS

Applicable throughout the entire hydrogen system in the refinery



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