PALL LIQUID/LIQUID COALESCER APPLICATIONS

Ethylene Processing — Dilution Steam System

PROBLEM

In an ethylene plant, fouling of the Dilution Steam System (DSS) Heat Exchangers can be a source of high maintenance and operating costs. Common problems include:

- Increased steam usage
- Reduced efficiency in low, medium, and high pressure steam systems
- Losses of recoverable pyrolysis gasoline
- Increased wastewater treatment costs
- Reduced energy efficiency due to fouling of steam generator
- High downtime and cleaning costs

Surveys of the Dilution Steam System have indicated these problems occur when significant quantities of pyrolysis gasoline (hydrocarbons) are carried over from the Quench Water system Oil-Water separator. Testing of the pyrolysis gasoline/water dispersion stream indicates the interfacial tension (IFT) values range from 3-12dynes/cm which means the dispersion is very stable and difficult to separate. This low value for IFT accounts for the poor separation efficiency of the oil/water separator. Conventional coalescer and mechanical liquid/liquid separation equipment are typically less efficient when the interfacial tension is lower than 20-25dyne/cm.

As a result, much of the pyrolysis gasoline flows to the Dilution Steam Heat Exchangers causing fouling and resulting in high operating and maintenance costs. There have been numerous attempts to deal with this problem varying from chemical treatment programs, frequently scheduled off-line cleaning of the heat exchangers, and installation of additional heat exchanger capacity. While some of these attempts impact the cost of operation and maintenance, none of them address the cause of the fouling problem.

In addition, downstream of the quench towers are acid gas removal units and gas separations systems. Problems encountered in acid gas removal systems

Figure 1: Ethylene Processing

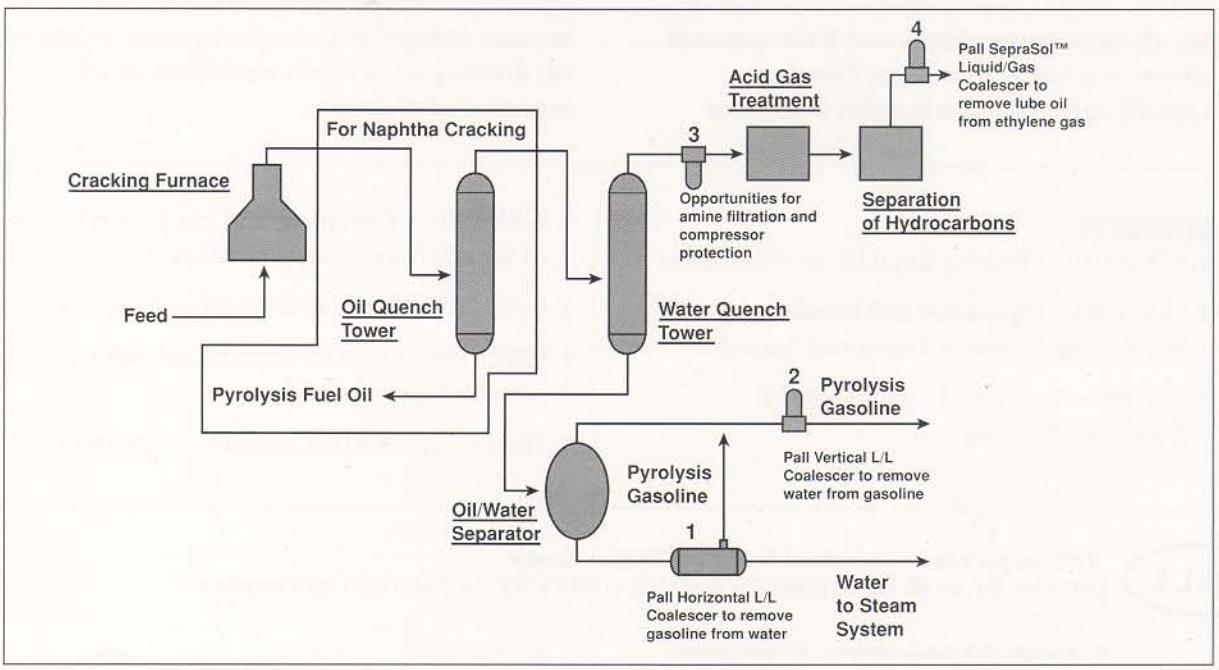

Table 1. HCP Filter Recommendations

Filter Location	Recommended Pall Assembly	Purpose of Separation	Benefits of Separation
1	Pall PhaseSep® Liquid/ Liquid Coalescer: Part #-LCS4H1AH Horizontal Assembly	Removes pyrolysis gasoline from quench water	• Reduces exchanger fouling • Improved efficiency of steam system • Reduced operating and maintenance costs • Improved recovery of pyrolysis gasoline
2	Pall PhaseSep Liquid/ Liquid Coalescer: Part #- LCS4H1AH Vertical Assembly	Removes water from pyrolysis gasoline	• Improved product quality • Reduced corrosion
3	Pall Profile® II Cartridges: 10 µm; Pall SepraSol Liquid/Gas Coalescer	See Application Sheet on Sour Gas Processing	• Improved overall performance of sour gas treating operating
4	Pall SepraSol Liquid/Gas Coalescer: CS604LGH13 CC3LGO2H13 CC3LGA7H13	Remove compressor lube oil from ethylene and other hydrocarbon gases	• Reduced lube oil losses • Improved product quality • Improved equipment reliability

and Pall's solution are described in application sheet HCP-11c. Downstream of the acid gas removal system are a series of hydrocarbon separation processes. Hydrocarbon gases that are separated and compressed. In lubricating compressor systems, the lube oil can discharge into the process gas resulting in fouling of downstream equipment and product quality problems.

PALL SOLUTION

Pall PhaseSep® Liquid/Liquid coalescers can separate the oil/water emulsions even if the interfacial tension is as low as 1dynes/cm. PhaseSep Liquid/Liquid coalescers installed in ethylene plants effectively separate the pyrolysis gasoline/water dispersion minimizing the carryover of hydrocarbons to the DSS Steam Generators and the associated operating costs and maintenance problems. In addition, the carried over pyrolysis gasoline is recovered and blended into a gasoline pool.

The stability of an emulsion containing water and pyrolysis gasoline is very difficult to separate. Most liquid/liquid dispersions with an interfacial tension less than 20dyne/cm cannot be separated in knock-out drums, packed vessels, sand filters, or other conventional coalescers.

REFERENCES

1. GAS4107 – PhaseSep Liquid/Liquid Coalescer
2. GAS4503 – Operations and Installation Guide to PhaseSep Coalescer Horizontal Assemblies
3. PR-900 – Separations Technologies in Petroleum Refining
4. GAS-4501 – Operations and Installation Guide to SepraSol Coalescers Assemblies
5. GAS 4102 – SepraSol Liquid/Gas Coalescer
6. GAS 4104 – SepraSol Liquid/Gas Coalescer-(Double Open Ended Style)
7. H-52 – SepraSol Plus Liquid/Gas Coalescer

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