

Absorption Heat Pump/Refrigeration Unit



Advanced Water Ammonia Absorption Cooling Finds Profitable Application in Refinery Operations

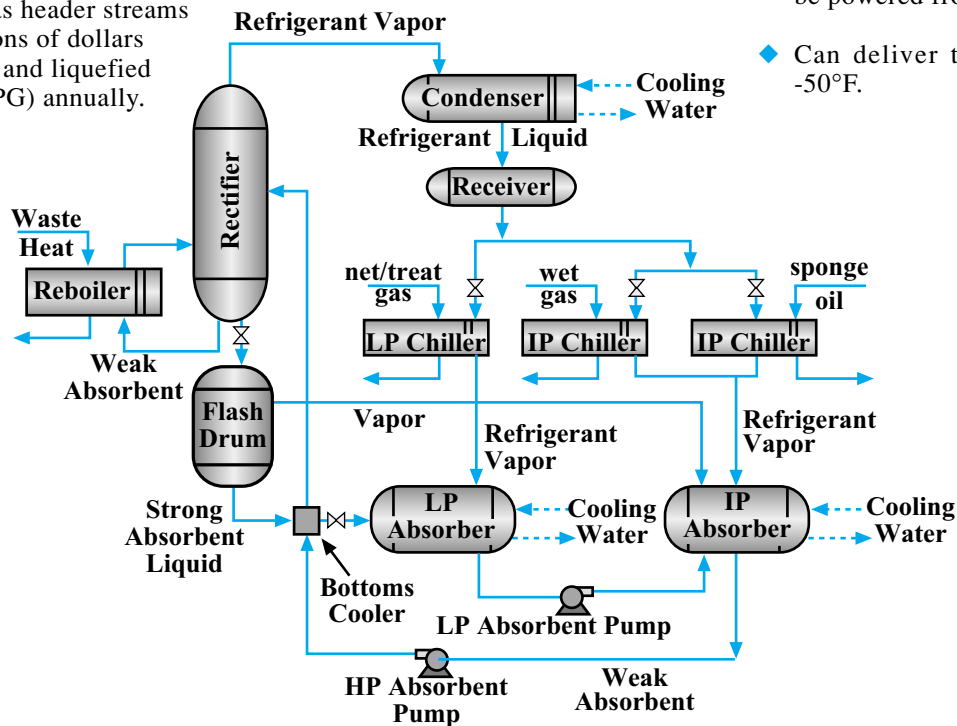
Refineries usually prefer ambient cooling with cooling towers for cooling refinery columns because refrigeration systems cost more initially, create headaches in operating and maintaining compressors, and significantly increase the demand for electricity. With assistance from ITP and a grant from the Inventions and Innovation Program, the Energy Concepts Company developed an advanced ammonia refrigeration unit powered by waste heat. It overcomes the disadvantages of a refrigeration system by recovering fuel from a reformer wastegate and raising the column capacity of a cracker. The unit debottlenecks the compressors in a cracker that operate with the wet-gas process. Their inlet vapors are cooled, and their salable liquid products are condensed out from the fuel or flare-gas stream.

A commercial unit operating in Commerce City, Colorado, is providing 265 tons of capacity to refrigerate gas/treat gas streams and is recovering a net 45,000 barrels/year of gasoline and LPG. The 290°F waste heat content of the reformer reactor effluent powers the unit. The absorption cooling system is directly integrated into the refinery processes and uses enhanced, highly compact heat and mass transfer components. The refinery's investment was paid back in less than 2 years as a result of increased recovery of salable product from fuel. It is important to note that an increase in fuel prices can lower this system's payback considerably.

Benefits

Profitability

Reduces energy intensity for a refinery and increases throughput for fluid catalytic crackers that have a bottleneck due to an overloaded wet-gas compressor. Applying refrigeration to refinery fuel gas header streams can recover millions of dollars worth of gasoline and liquefied petroleum gas (LPG) annually.



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Overview

- ◆ Developed by Energy Concepts Company
- ◆ One commercial unit installed at a refinery in 1997

Energy Savings

(Trillion Btu)

Cumulative through 2003	2003
1.93	0.306

Emissions Reductions

(Thousand Tons, 2003)

Particulates	SO _x	NO _x	Carbon
0.002	0.178	0.047	6.66

Applications

- ◆ Resource recovery in the petroleum refining and chemical industries
- ◆ Refrigeration and space conditioning for commercial and industrial facilities

Capabilities

- ◆ Water/ammonia absorption cycle can be powered from any heat source.
- ◆ Can deliver temperatures as low as -50°F.