

AMMONIA STRIPPING



BRANCH
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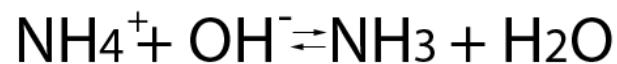
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WATER TREATMENT

- Removal of Ammonia.
- Air Stripping.

HOW DOES IT WORK?

In a waste stream, ammonium ions exist in equilibrium with ammonia.



1. Below pH 7, virtually all the ammonia will be soluble ammonia ions.
2. Above pH 12, virtually all the ammonia will be present as a dissolved gas.
3. The range between 7 and 12, both ammonium ions and dissolved gas exist together.
4. Percentage of dissolved gas increases with temperature and pH. Where temperature and pH favor removal of ammonia from solution.

AIR TO WATER RATIO

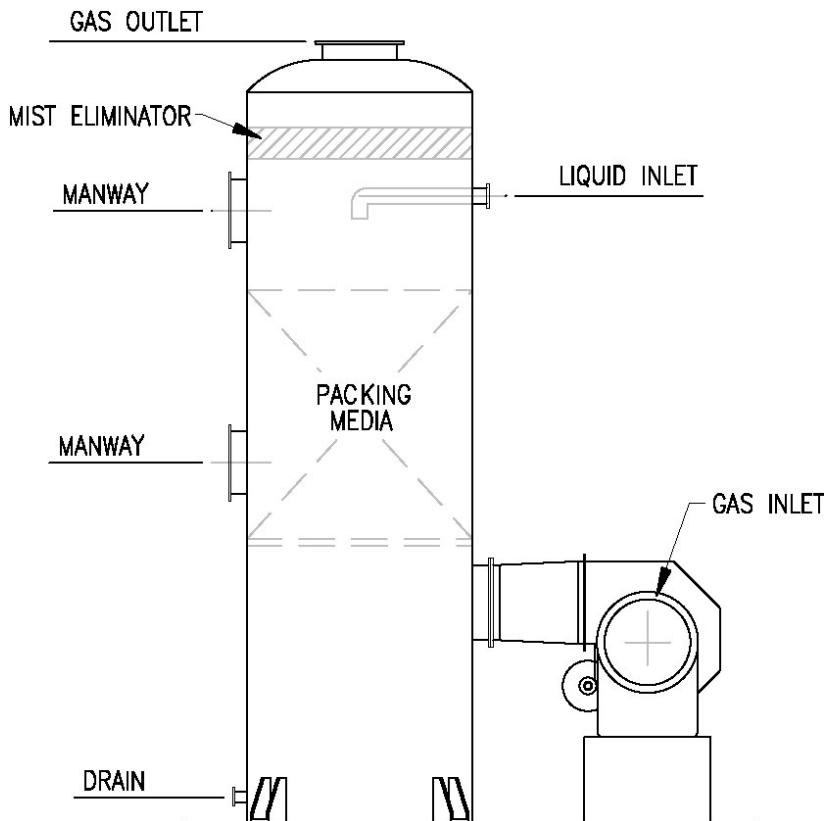
- At any given temperature and pH, we can determine the amount of air necessary to provide an adequate flow for the ammonia.
- Generally, the higher the temperature, the lower the air flow.

STRIPPER DESIGN

In the stripper, the pH and temperature are adjusted before the water enters the stripper.

As the water is distributed over the internal packing media, it is broken up into small droplets which create a tremendous amount of surface.

Air enters the bottom of the tower from a fan and travels upward through the packing. Since the ammonia is partially present as a dissolved gas, some of the ammonia transfers from the water to the air.



FACTORS FAVORING HIGH EFFICIENCY

1. High pH.
2. High temperature.
3. High air flow.
4. Greater packed bed depth.

TYPICAL PACKING MEDIA

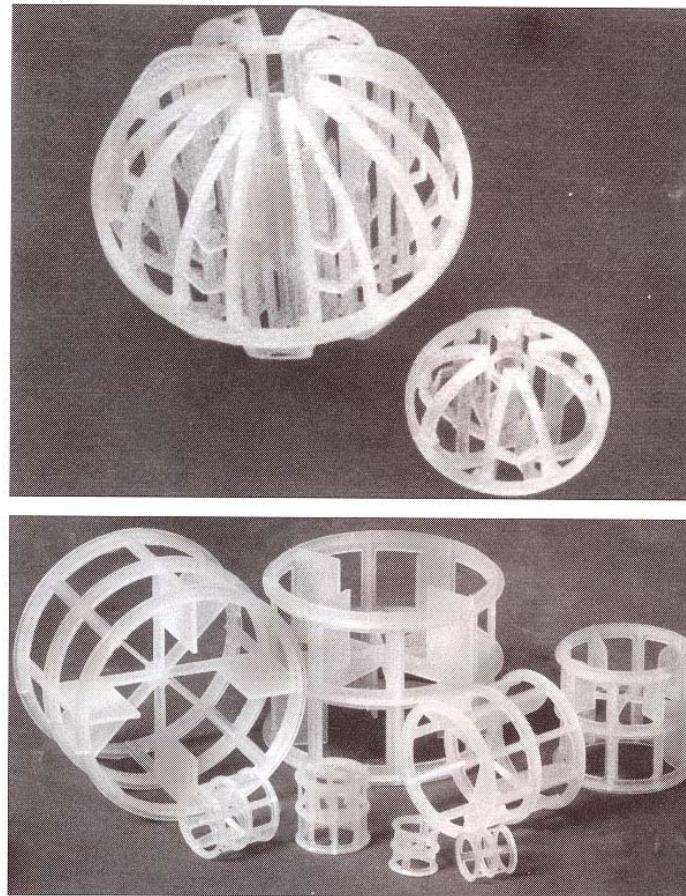
Tower Packing

The selection of tower packing is critical in designing the lowest initial and operating cost air stripper package. While there are many manufacturers of tower packing, some examples of the most commonly used types would be:

1. Jaeger Tri-Pack—The photo shows the range of sizes of Jaeger Tri-Packs. this high surface/low pressure drop packing has been used on virtually all applications involving air stripping.

2. Rauschert Hiflow— The photo shows the variety of sizes of Rauschert Hiflow. this high surface/low pressure drop packing has been used on virtually all applications involving air stripping.

3. Other types of fill including Film Fill— and more conventional packing may be selected depending on the specific operating conditions.



TYPICAL OPERATING CONDITIONS

While a range of operating conditions is possible, the most common designs are either pH 11 with low temperature water or warming the water to approximately 120°F (with heat recovery) and pH as low as 9.5.

WHAT TO DO WITH AMMONIA?

Once the ammonia is removed from the wastewater, there are three possible methods of disposal.

1. Air dispersal.
2. Concentration as ammonium sulfate or equal.
3. Thermal destruction.

AIR STRIPPER ONLY

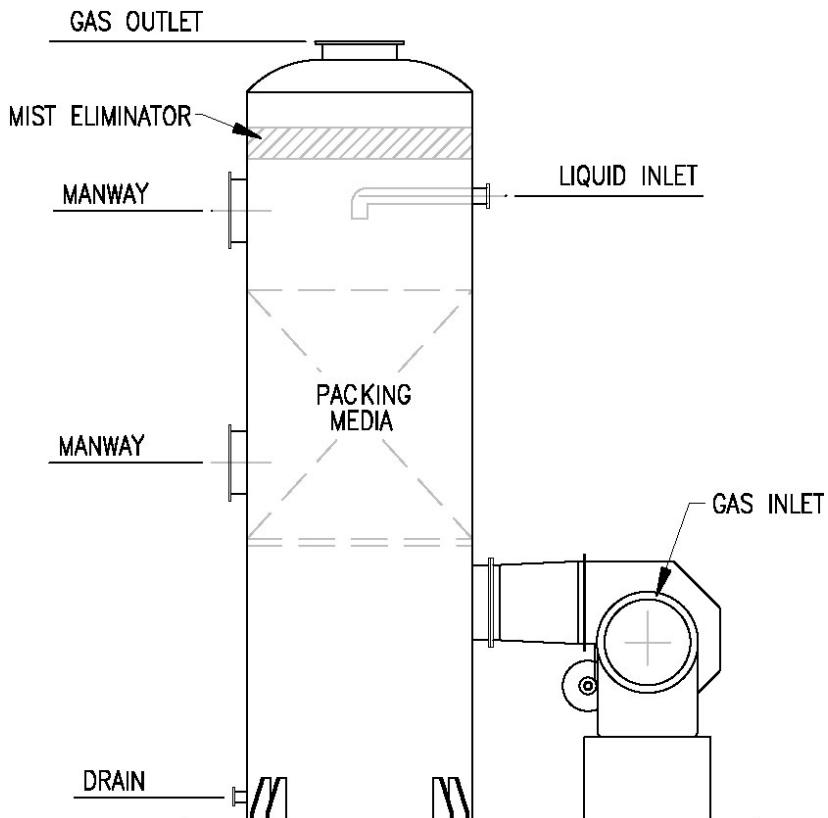
The simplest system involves pH adjustment with air discharged directly to atmosphere.

Advantage:

1. Low initial cost.
2. Low operating cost.

Disadvantage:

Removal efficiency is limited by operating temperature.



CLOSED LOOP

Where higher temperatures are preferred to get better efficiency, a closed loop can be used. In the closed loop, the air is sent to an absorber where concentrated ammonium sulfate is formed. The clean air is then recycled back to the stripper.

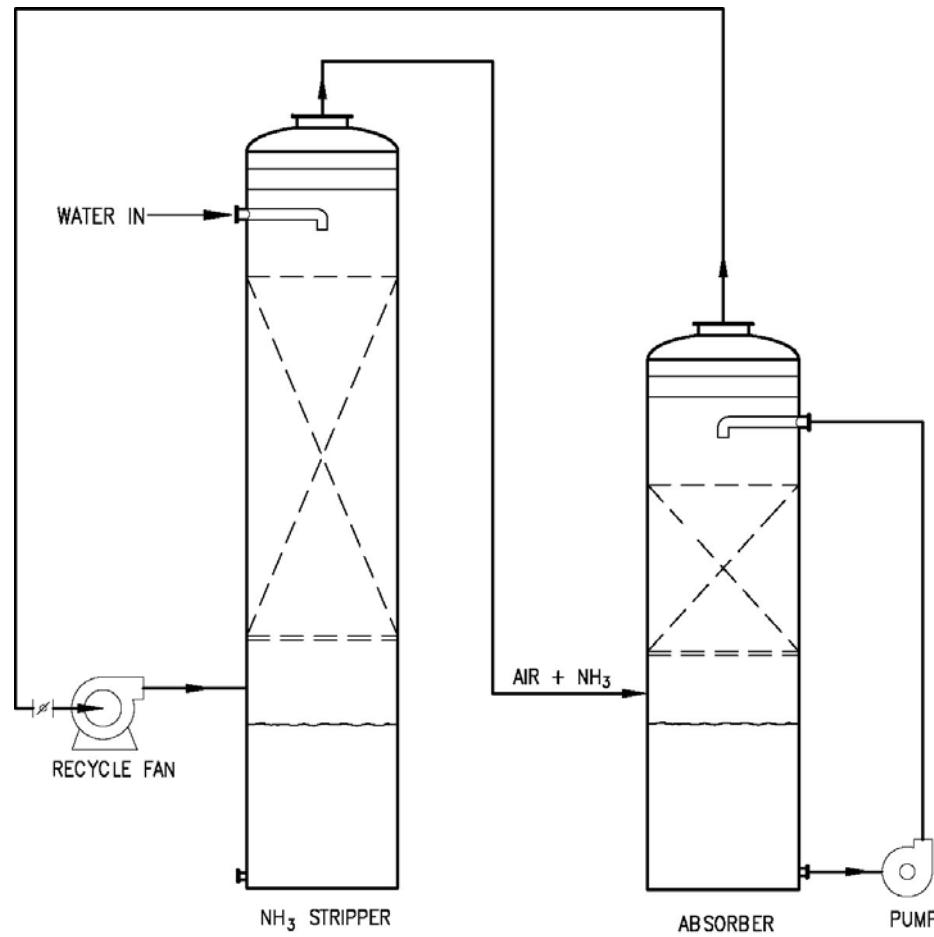
Advantages:

1. No air emissions
2. Conservation of energy.

Disadvantages:

1. Higher initial cost.
2. Higher operating cost.
3. Must dispose of concentrated ammonia sulfate.

Closed Loop Schematic



THERMAL DESTRUCTION

The air containing ammonia can be treated to meet air pollution control regulations if they will not allow the ammonia to be released. One method to do this is our catalytic oxidation system. The air is sent to the catalytic oxidizer where it is heated up to an operating temperature of approximately 550°F. As the ammonia passes over the catalyst, it is converted to nitrogen and water. The exit gas is innocuous and can be released directly to the atmosphere with no difficulty.

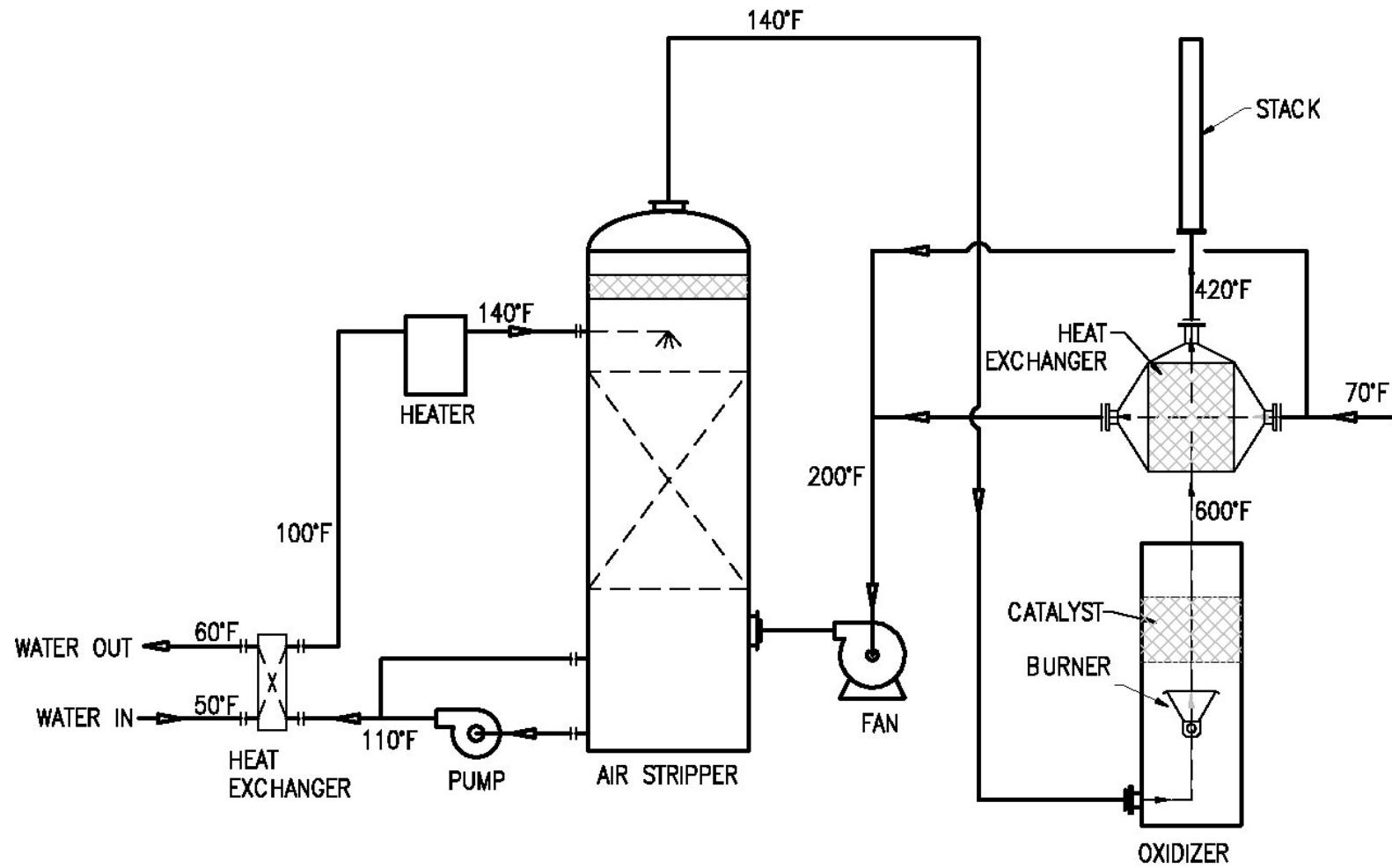
Advantages:

1. If regulations will not allow release of ammonia, oxidizer will provide control.
2. No need to deal with concentrated ammonium sulfate.

Disadvantages:

1. Higher initial cost.
2. Higher operating cost.

Schematic-Stripper with Thermal Destruction



TYPICAL STRIPPERS

