



VenPure® AC

Improving the Efficiency of Caustic Scrubbing Towers in Olefins Manufacturing

Technology Description

Rohm and Haas Company offers a convenient technology that will increase the efficiency of caustic scrubbing towers in Olefins manufacturing. The technology involves the **inhibition of polymer formed from the aldol condensation reaction.**

The Olefins cracking process generates acid gas impurities (CO₂ and H₂S), as well as carbonyls (aldehydes and ketones). The acid gases are removed by passing the cracked gas through a caustic scrubbing tower. The alkalinity of this tower also affects the carbonylic compounds: they readily polymerize via aldol condensation. Polymerization will continue until the polymer has reached a molecular weight that make it insoluble in the alkaline scrubbing water – it will then deposit as the so-called Red Oil Polymer on processing equipment. As a result, the following processing problems may incur in the caustic scrubber and/or downstream spent caustic equipment :

- decreased throughput
- increased equipment downtime
- reduced efficiency, higher pressure drop
- increased maintenance
- hazardous waste disposal

VenPure™ AC (Anti-Carbonyl) is an aqueous anti-fouling formulation. It acts as a Carbonyl Scavenger, and thereby inhibits the formation of Red Oil Polymer. It contains +20% of NaOH, and is therefore perfectly miscible with the caustic scrubbing water. It is dosed to wash towers in the weak or the strong caustic section of the caustic scrubber. Dosages may vary based on the properties of the unit feedstock, the plant's and/or tower's design and the desired effect. VenPure AC is used as a carbonyl scavenger in a number of industrial applications and is patented for use in this application under US patent nr 5,582,808

VenPure™ AC benefits

VenPure AC will NOT react with the cracked gas. It will react with carbonyl impurities, and possibly with alcohol and heavy metal cations. Excess VenPure AC will be disposed of in the spent NaOH and may release some hydrogen gas.

VenPure is very efficient at low dosage concentrations – the magnitude of order is : grams of VenPure™ AC per MT cracked gas. Its efficiency can be monitored by various indirect parameters :

- less filterable solids
- less filter cleanings
- less discoloration of spent caustic recirculating liquid
- less methylene chloride extractibles
- less carbonyls in the cracked gasless polymer build-up in downstream spent NaOH equipment

VenPure AC – product properties

VenPure AC is a aqueous formulation, which contains min. 20% of NaOH

Specific Gravity: 1.4 (11.5 lb/gal)

Appearance: Off-white liquid

Viscosity: 79 cps @ 23 °C

Toxicity and First Aid

1. VenPure AC has dermal LD₅₀ of 100-500 mg/kg and, like 50% caustic soda, (NaOH) solutions can cause skin burns and irritations. The acute oral LD₅₀ of VenPure AC is 500-1000 mg/kg.
2. VenPure AC is *very corrosive to the eye* and should be handled according to generally accepted procedures for corrosive chemicals. In case of accidental contact, flush eyes with water and *seek immediate medical attention*.
3. Precautions should be taken to avoid direct skin contact or ingestion. In case of accidental contact, flood the affected area with copious amounts of water and then wash skin with soap and water.

Product Handling

1. *Personal Protection:* Protective rubber gloves, clothing, face shield or safety (splash) goggles should always be worn when handling VenPure AC .
2. *Handling:* In general, VenPure AC should be handled in the same manner as 50% caustic soda. It is classified as a non-flammable, corrosive liquid, and it is stable to shock. Due to the presence of NaOH, VenPure AC absorbs CO₂ forming insoluble carbonates. Consequently, it should not be unnecessarily exposed to air for extended periods.

VenPure AC will decompose and evolve hydrogen if overheated, subjected to neutral or acidic pH conditions, or brought into contact with oxidizing agents, metal salts or fine metallic precipitates of Ni, Co, Cu or Fe. VenPure reactions should always be carried out in adequately vented vessels with standard provisions for pressure relief. A nitrogen atmosphere is also recommended, as well as explosion proof equipment with proper grounding.

3. *Storage:* Accepted storage procedures for VenPure AC are the same as those for 50% liquid caustic soda.

Under normal storage conditions, the decomposition of VenPure AC is less than 0.01% per year. During extended storage under adverse conditions, H₂ pressure may develop over the solution. All closed containers should have at least 10% free volume and be checked periodically. Under these conditions, pressure build-up will be less than 1 psi per year at normal storage temperatures.

Storage

VenPure AC can be stored in stainless steel, mild steel, or approved fiberglass vessels. Stainless steel (316 SS or 304 SS) is recommended for piping, valves, pumps, etc. VenPure AC must NOT be stored in vessels which react with caustic soda, such as aluminum. Storage tanks should be adequately vented to minimize hydrogen gas build-up.

VenPure AC should be stored at *temperatures* above 65° F (18° C) to improve handling. The solution becomes viscous below 60° F (16° C) and can crystallize at temperatures below 55° F (13° C). To liquify, warm slowly to 70-90° F (21-32° C), making sure the container is vented; do not use live steam. The warmed material should then be agitated by rolling the container, or recirculated with a high volume pump until a homogeneous solution is obtained.

If piping used to transfer VenPure AC is exposed to temperatures below 55°F (13°C), it should be heat traced to improve handling. However, precautions should be taken to avoid excessively high temperature since VenPure AC may decompose resulting in the evolution of hydrogen gas and possible excessive line pressure.

Shipping and Waste Disposal

VenPure AC has been classed as a 'corrosive liquid' under US DOT regulations.

1. VenPure AC is a corrosive material (EPA hazardous waste #D002) and must be disposed of accordingly. VenPure AC can be disposed of (hydrolyzed) by initial dilution with a large excess of water, followed by slow addition of a dilute solution of acetic acid or acetone to the mixture. This procedure should be performed in a well ventilated area.

Provisions should be made to safely vent hydrogen gas given off during neutralization. VenPure AC should not be flushed to the sewer.

2. In case of accidental spillage, absorb the VenPure AC with an inert material such as sand or dolomite. Absorbed material should be hydrolyzed as described above.
3. Any vessels which have been used for reactions or storage of VenPure AC should be carefully vented, drained, washed, and adequately flushed with nitrogen and air before any repair operations are undertaken. Exposure to an open flame (e.g., welding torch) should be avoided.

Please feel free to contact us via ... Hvenpure@rohmbaas.com

Updated information can be found at : [Hhttp://www.venpure.com/](http://www.venpure.com/)

Find your local Rohm and Haas Representative : [Hhttp://www.venpure.com/contact.htm](http://www.venpure.com/contact.htm)