NORIT Granular Activated Carbon for Glycerin Treatment

Commissioning, Intake of Spent Carbon and Reactivation

1. Introduction

NORIT Granular Activated Carbon (GAC) can be used for glycerin purification. Typically, the GAC is supplied in big bags but it can be supplied in a tank car as well. Depending on the supply method (big bags or in bulk by tank car) and the preferred commissioning method (using water or using glycerin without water), the recommended GAC commissioning steps for new column fillings are different. These different commissioning methods are described below.

2. Commissioning with water

- First fill the columns with water first for about 1/3rd.
- After filling in the carbon from big bags dry or hydraulically e.g., from a tank car, submerge the new GAC bed in water for about 30 minutes, and drain.
- Leave the drained bed exposed to air to de-aerate the carbon pores for a couple of hours, for instance overnight.
- Back-wash the drained bed after static de-aeration with at least 10 – 15 % bed expansion to remove carbon fines and air trapped in the carbon bed.
- After back-washing is completed, keep the carbon bed submerged in water until the impure glycerine feed can starts.

If the carbon bed cannot be back-washed with bed expansion because of insufficient back-wash flow capacity, do not back-wash but apply the method used under chapter 3. To judge whether there is sufficient back-wash flow and which back-wash flow to apply, please consult Technical Bulletin TB 079 Hydrodynamic properties of NORIT GAC grades. After the GAC columns there should always be a safety (police) filtration e.g., a bag filter and a cartridge (candle) filter in cascade. The first bed volumes of carbon treated glycerin may contain carbon fines, which must be retained by the safety filtration step.

It may take a couple of bed volumes of glycerin till all water in the GAC bed has been displaced by glycerin and the carbon treated glycerin meets the requirements for purified glycerin.

3. Commissioning with glycerin without use of water

- First fill the columns for about 1/3rd with glycerin.
- After filling in the dry carbon from big bags, submerge the new GAC bed in glycerin and preferably keep under glycerin overnight to de-aerate the carbon pores.
- Fill up the column slowly, in up-flow, to remove any gas bubbles from the carbon bed, and pass the exiting glycerin through a bag filter and back to the glycerin feed tank. Make sure there is no carry over of GAC granules. If GAC granules are carried over, immediately slow down the glycerin upwards flow.
- When the glycerin on the filter outlet is free of carbon fines, the upwards flow of glycerin can be stopped, and the carbon bed can be left submerged in glycerin till feed of the impure glycerin is started.

After the GAC columns there always should be safety (police) filtration, e.g., a bag filter and a cartridge (candle) filter in cascade. The first bed volumes of carbon treated glycerin may contain carbon fines which must be retained by the safety filtration step.

4. MONG (Matter Organic, Non-Glycerin)

The glycerin feed to the adsorbent should be free from dispersed MONG.

Sometimes the glycerin feed to the GAC columns contains traces of dispersed MONG (Matter Organic, Non-Glycerin). This dispersed MONG, being immiscible with glycerin, may be FAME (Fatty Acid Methyl Ester) or fatty acid which has not been completely separated from the glycerin fraction after the distillation step.
Dispersed MONG in the glycerin feed is usually present as a fine emulsion, giving the glycerin a cloudy somewhat turbid / opaque appearance.

This type of dispersed MONG can be detected when a sample of feed glycerin shows separation in two phases during storage: the dispersed MONG layer floats on top of the glycerin fraction while the dissolved MONG is in the glycerin fraction. GAC is designed to adsorb the dissolved MONG from the glycerin, GAC is not designed to separate the dispersed MONG from the glycerin fraction.

This small fraction of dispersed MONG being emulsified in or separated from the glycerin fraction, tends to polymerize, and form an oily sticky fraction, inhibiting part of the activity of the GAC bed. A recommended method to ensure a transparent glycerin feed to the adsorbing GAC bed is to “sacrifice” GAC in the lead column to serve as a deep bed filter. This this only works when there are sufficient adsorbers respectively sufficient Empty Bed Contact Time (EBCT) to allocate part of the GAC as deep bed filter media. Another method is to put a bag filter with dedicated cellulose fiber up stream to filter out any immiscible dispersed MONG to clarify the glycerin feed to the GAC beds downstream

5. Taking a spent GAC bed out of service for disposal or take in for reactivation

- Drain the GAC bed.
- Feed hot water to the drained bed, wait for 30 minutes and drain.
  Note: This sweet water at the column exit is very sensitive to microbial infection, and should either be kept hot for sweetening-on a new GAC bed or should be disposed of.
- Repeat the step above till the GAC bed is sufficiently de-sweetened and virtually all glycerin has been removed from the spent carbon.
  The carbon should no longer be sticky nor contain lumps of agglomerated carbon granules when filling big bags, containers, or tank cars with the spent and de-sweetened GAC.

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