OTC 18010

Advances in Glycol Reclamation Technology

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Abstract

Large glycol reclamation plants that recover mono-ethylene glycol (MEG) used for hydrate inhibition typically apply flash vaporisation under vacuum to remove dissolved and suspended solid contaminants. Heat is transferred to the salty rich glycol feed at the lowest possible temperature by direct contact with hot recycled liquid, followed by distillation to recover clean salt-free reconcentrated glycol.

Proprietary technology based on fundamental research into how glycol, water and salt interact has been developed by the authors to improve the design and performance of these plants, resulting in the following refinements to the basic process:

- design of the main separator vessel reduces the population of erosive and fouling salt particles in the recycle circuit by 90+%
- unusually high fluid velocities and heat transfer rates result in a more compact plant with substantially less risk of fouling or MEG thermal degradation
- on-line separation of MEG from the waste salt without the need for large tanks, filter presses, centrifuges or the like, enables safe disposal of the waste salt into the sea without further treatment

The new technology is built into the glycol reclamation package on Enterprise Products Partners LP’s Independence Hub platform about to be deployed in Mississippi Canyon block 920. This plant will process 7,800 bpd of salty rich MEG and is the largest glycol reclaiming plant in the world.

For many small projects other technologies have been applied for reclaiming MEG such as falling film or scraped surface evaporators, ion exchange and electro-dialysis. This paper does not address these technologies but notes that the attractions of superior performance and simple equipment may broaden the range of application of the latest flash vaporisation concepts to include smaller projects.

Introduction

For several decades mono-ethylene glycol (MEG) and methanol have been the primary chemicals injected offshore to inhibit the formation of hydrates in oil and gas production pipelines and related facilities [1]. On projects where inhibition is only required temporarily or sporadically, methanol is well suited because it is a highly effective hydrate inhibitor. The total amount of inhibitor used in such cases is not enough to justify the cost of a recovery plant, and complete loss of the injected chemical is anticipated.

However this is not the case on fields that require persistent inhibition. Today’s cost of replacing hydrate inhibitor chemical that is lost to the gas and hydrocarbon liquid product streams is a determining factor in inhibitor selection. Methanol solubility in gas and liquid hydrocarbon product streams can be two or more orders of magnitude higher than MEG solubility [1]. This creates a strong economic drive to use MEG despite the greater quantity of MEG needed per degree of hydrate temperature suppression.

Furthermore methanol is an unwanted contaminant in hydrocarbon sales products, especially gas and liquids that are destined for high value processing (e.g. to make LNG, ethylene etc). For example, the allowable methanol content in naphtha and light condensate feedstocks purchased by petrochemical manufacturers is typically 50ppm or lower [2]. The use of methanol can therefore devalue a client’s gas and/or light end products resulting in lower netback prices or occasional distressed sales. Discounts of $0.50 to $1.00 per boe are not uncommon. This potentially massive financial penalty is avoided with MEG because of MEG’s much lower solubility in hydrocarbon sales products.

Nevertheless the adoption of MEG over methanol has taken some time to occur, due in part to familiarity with methanol and perceptions of operational difficulties in recovering and recycling MEG. Such perceptions were often well founded in the 1980’s when operators of various fields began to express concern about the detrimental effects that saline formation water had on their conventional MEG reconcentrator units.

This paper describes the basic building blocks of MEG reclamation technology, the history of its development, and recent improvements that can further tip the balance in favour