

## Purifying Spent Glycol in PET Manufacturing

### Overview

A large producer of specialty materials manufactures PET homo-polymers and co-polymers suitable for technical textiles, film, and packaging materials from its European facility.

At the site, PET is produced by either dimethyl terephthalate (DMT) or terephthalic acid (TPA) esterification where ethylene

glycol (EG) is mixed with TPA or DMT along with catalysts and slowly introduced to a series of esterifiers to form monomer and oligomer. The oligomer is further polymerized using a series of polymerizers to yield the final PET polymer suitable for fiber, film or bottle grade resin.

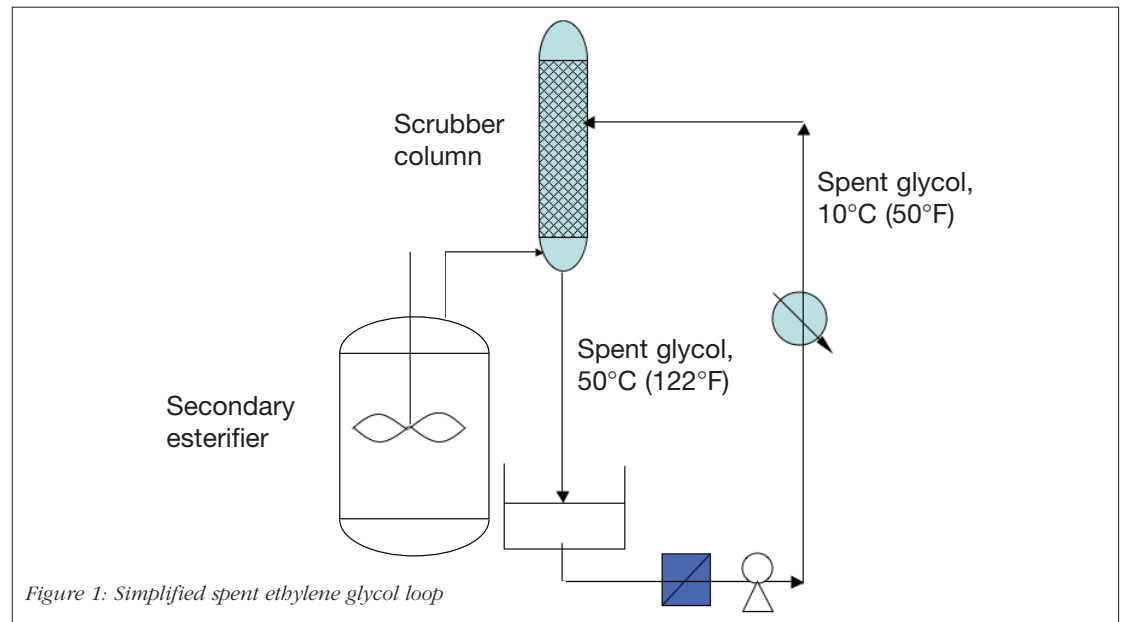


Figure 1: Simplified spent ethylene glycol loop

### The Challenge

The secondary esterifier is operated at atmospheric pressure and at a temperature of 270°C (518°F). The vapors from the secondary esterifier, primarily water vapors, are vented to a spray condenser where they are cooled using ethylene glycol. The resulting hot and spent ethylene glycol is cooled using a heat exchanger and pumped for recirculation.

After cooling the vapors from the secondary esterifier, the spent ethylene glycol contains high amounts of PET oligomer and between 10 and 25 ppm of fatty acids. This glycol is then run through 5 µm Pall cartridge filters before entering the heat exchanger. The

cartridge filters have a life of only 1-2 days due to the fatty acids regularly coating the filter medium. Continuous changing of the filters results in high operational and labor costs, as well as frequent plugging of the pump and heat exchanger. Filtration plays a key role in protecting the pump and heat exchanger from excessive wear or fouling.

The customer asked Pall for a solution to effectively separate the PET oligomer fines and fatty acids from the spent glycol, thus significantly reducing their operational costs and improving pump/heat exchanger protection. The customer's goal was to improve on-stream life to at least 5-7 days.

**Filtration. Separation. Solution.<sup>SM</sup>**

## The Solution

After carefully studying the problem, Pall recommended the use of its SUPRADisc™ depth filtration modules for efficient separation of the PET fines from the glycol. To optimize on-stream life, Pall's Scientific and Laboratory Services (SLS) group conducted multiple lab tests using various micron ratings of the SUPRADisc modules and customer supplied spent EG samples.

To achieve a measurable cake height, SLS appreciably increased the content of fatty acids in the sample and ran the samples for a low dp of 0.1 bard (1.5 psid). Samples were run with Pall's T2100, T1500 and T1000 media. The effluent was sent to the customer for approval of its quality. Upon confirmation of the effluent's quality, Pall suggested the use of its T2100 media and discs and predicted a long on-stream life that would far exceed the customer's original request of 5-7 days.

The customer installed a rental housing with 3x410 T2100 SUPRADisc depth-style modules.

## The Benefits

Pall's SUPRADisc depth-style modules proved to be extremely effective in separating PET oligomer fines and fatty acids from the spent EG.

The customer reported the following benefits:

- The life of Pall's SUPRADisc depth-style modules with T2100 media was greater than six months. This was a significant improvement over the 1-2 day life of the conventional filter cartridges. As a result, the customer's operating costs were greatly reduced by eliminating the frequent filter change-outs.
- The customer realized an annual savings of 80,000 Euros (~ US\$110,000) as a result of increased production, reduced down time, and elimination of labor due to fewer filter changes and cleanings.
- The customer noted improved protection of the pump and heat exchanger as additional benefits.



Figure 2: Filtrate with T1000 media



Figure 3: Filtrate with T2100 media

## SUPRADisc Depth Filter Modules with T Series Media

Pall offers a wide selection of media for use in its SUPRADisc depth filter modules. The T series of media was tested, and the T2100 media was subsequently recommended for use in this customer's application – the purifying of spent glycol. In general, grade T1000 media and higher is designed for coarse filtration. The media is characterized by an open structure and combines very high outputs with long filtration cycles due to the high dirt-holding capacity. The media is ideal for the retention of gel particles and coarse dispersed substances at low differential pressures.



Figure 4: Pall's SUPRADisc depth-style modules



Figure 5: Filter cake shown collecting on the T1000 media



Figure 6: Filter cake shown collecting on the T2100 media



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