

Investing New or Revamping Existing Polyester Plants?

EPC's new polyester-revamping-technology "PETvantage®" provides answers

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Introduction

After intensive development work and stepwise scale up and introduction of new technology-features to the industrial practice of polyester resin production the company EPC-group is offering complete polyester melt phase revamping packages. Basis of this new technology is the finding, that most of the existing PET melt phase plants possessing enormous capacity potential. Main feature to establish a revamping project of high economical efficiency is a significant capacity boost by utilizing as much as possible of the existing equipment. The new concept is dedicated to bottle resin lines or to textile polyester plants being in operation for more than five years which shall be converted from textile grade to bottle grade production.

The revamping concept exists of three steps:

- Step 1: Feasibility study resulting in a business-technological conception of possible scenarios
- Step 2: Pre-engineering, basic and detail engineering
- Step 3: Construction and commissioning

The first step is considered successful when the potential capacity increase is above 50% and up to 100% and the total investment rate ranges from 0,02 to 0,1 US\$/t based on a capacity increase from for instance 400 t/d fiber grade polyester before revamping to 700 - 800 t/d bottle grade after revamping. A new investment ranges compared to revamping of for instance a 800 t/d bottle grade plant between 0,19 – 0,25 UD\$/t. Out of this one can easily conclude the potential advantage of revamping compared to new investments.

PETvantage® – The Technology

One of the most important innovations of PETvantage® is the newly developed forced heat transfer system of esterification. About 90% of the conversion from paste made of PTA and MEG to the precursor "esterification product" is taking place in the first esterification reactor which is making this process to the most important step in the process chain. Here the solid PTA and the liquid MEG are undergoing chemical conversion and physical changes in state of aggregation under significant consumption of energy. Therefore, wetting of solid PTA particle surface by MEG, solution of PTA in esterification product and removing of the generated water steam are boosted by forced mixing under high turbulence at highly efficient heat transfer. Besides improved reactivity in esterification the prepolymer undergoes a special heat treatment to accelerate polycondensation reaction. Together with an active process model EPC succeeded to control the whole melt phase process in a way that even significant fluctuations of PTA quality like for instance particle size and particle size distribution are equalized successfully.

This deep understanding of the esterification and polycondensation process is enabling EPC on the one hand boosting line capacity of existing PET plants by more than 100% and on the

other hand offering melt phase technology for target IV > 0,45 dl/g in a capacity range of 2000 t/d and higher out of one single melt phase plant.

Practical results

EPC started remarkable polyester plant revamping projects in 2002. One of the early examples was renewing, capacity increase and melt distribution for direct spinning of special TREVIRA CS® fiber production line. Trevira GmbH, later a member of the Indian Reliance Group, underlines its leading market position through this successful revamping project. One major issue was the capacity increase from operating capacity from 120% to 175% (based on name plate capacity).

Core of the VPI (Selenis-Hellas Greece) plant revamping was lifting name plate capacity of 56.000 t/a PET resin to 84.000 t/a PET resin and process optimization of PET polycondensation which also included the need exchange of the complete finisher internals (see picture).

Picture: Lifting the new agitator of the finisher



The project contained further process- and mechanical re-design and supply of a new finisher agitator including sophisticated hydraulic drive system, vacuum system upgrade, polymer pumps and heat distribution. To improve resin quality EPC implemented its predictive polycondensation process control for molar ratios, intrinsic viscosity and improved throughput control.

EPC executed recently a project of significant size in the Kingdom of Saudi Arabia where four existing polyester filament, staple fiber and bottle resin plants have been revamped. Original name plate capacity of these lines was 440 t/d. This job contained the de-bottlenecking, conversion to bottle grade PET production of four lines PET production establishing a capacity 1000 t/d PET bottle resin. Included in the project was the new installation of an additional 900 t/d SSP plant. Core of increased PET production capacity was the implementation of EPC's technology package PETvantage®.

The service of EPC

In comparison to any new investments revamping needs the detailed knowledge of the existing plant including maintenance history and process changes during elapsed live time. During the first step of the revamping project the process team of EPC is analysing the actual condition of building, process equipment and utility supply at site of the customer. At the same time the team is keeping detailed records of the operational conditions as they are. The outcome of this first step is the base to elaborate a detailed feasibility study. Dependent on the plant owners need this study will be the basis for the pre-engineering with detailed offer and could contain tailored stepwise phases which are fitting exactly to financial conditions and market behaviour of the customer. Accordingly the second step incorporates

all activities to establish the final revamping project. Especially during this step EPC is supporting its customer to select the tailored concept. The third step mainly consists of the realization from plant stop and vessel cleaning until restart and guarantee run. But utilizing full EPC services finally also marketing and resin sales support could be included.

Summary and outlook

Today, enormous changes of our industry structure are going on especially during the current time of economic uncertainty. Polyester producers who have grown too fast or who are concentrated on a market which is converting tremendously are forced to rethink their future position in the market. These circumstances are forcing plant owners to define their strategy for the time after the current crisis. Polyester plants being built in the eighties and nineties of the last century are becoming step by step inefficient mainly because of low productivity. The revamping technology PETvantage® which has been introduced successfully by the EPC-group to the polyester industry during the last five years offers interesting solutions and supports those who like to make their existing plants significantly more efficient.