Multi-Product Single-Period + Inventory

Topic ID	**OEA43T**
Title	**Multi-Product Single-Period + Inventory**
Category	**O-Optimize Production**
eLearning Level	**Basic**

Introduction

Multi-product manufacturing takes place at refineries. Diesel, gasoline, aviation fuel, and many other products are produced due to continuous processes during refinery operations. A final refinery product is obtained by blending many intermediate products to achieve the desired quality, quantity, and schedule specification. Planning, scheduling, and optimization are crucial to meet the availability of quality products in sufficient quantity at the right time.

This topic will discuss component volume balance for all blend grades, limits imposed on the tank inventory by the planner, recipe constraints by the planner, equipment limits, blending constraints, component tank inventory restriction, volume balance of components, taking into account all in and outflows, etc.

Constraints and Decision Variables for Blending Optimization

Different types of constraints for blend optimization include inventory constraints (volume limits on feed components) and quality/operational constraints. Quality constraints include analyzer limits as well as tank property specifications. Operational constraints restrict equipment concerning component flow. Considering the minimum giveaway optimization mode, the minimum cost (in the cost-mode calculation) should be less than the cost function value.

In the context of blending optimization, there are many decision variables such as rundown total flow, feed component property, blend volume, segregation flow, total flow to the blender, product property variables, etc. In the destination tank, blend volume refers to predicted volume. Here, the product is supposed to meet prescribed specifications. The segregation tank receives flow from the rundown stream. This flow is called segregation flow.

All problems are formulated, keeping in view that blending optimization is multi-objective optimization. To keep products as per specification by controlling the blending process is the primary objective, whereas cost minimization is a secondary objective. The giveaway mode or minimum distance mode may also be the secondary objective. There may be a combination of objectives.

The control mode keeps a product on specification, while the cost model minimizes the cost of the feed component. The giveaway mode minimizes quality giveaway, i.e., helps produce the high-quality product so that the quality of the product is better than the specification. The giveaway mode is crucial as the money lost (in achieving quality better than the specification) is reduced by this mode. Finally, the minimum distance mode helps in reducing the distance between the current value and target value.

Summary

This topic walks through the blend constraints and decision variables for blending optimization. In addition, it gives a brief overview regarding primary, secondary, and combo objectives.

Options for eLearning This Topic

Mode of eLearning	Available?
Free Course	No
Refresher Course	Yes
Pick N Choose (Custom Curriculum)	Yes
Advanced Level Course	Yes
Structured MCOR Curriculum	Yes