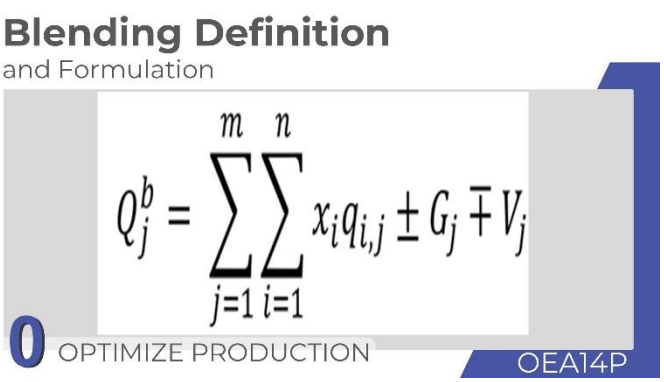

Topic ID	**OEA14T**
Title	**Blending Definition and Formulation**
Category	**O-Optimize Production**
eLearning Level	**Basic**

Introduction

In petroleum refineries, understanding the blending process is very important because different product qualities are blended to achieve the product that has preferred qualities. The blending process mixes components with different qualities to make blend products with specific qualities.

This topic will discuss the mathematical formulation of the fuel blending problem and explain how different constraints can be built in the equations to solve them by the optimizer.

Mathematical Solvability Criteria

Blending can be represented by a simple summation formula. However, this formula can't be easily solved because criteria must be satisfied to solve the equation, which is known as mathematical solvability criteria.

These criteria are a function of the number of qualities (m) and several components (n), which are also known as the degree of freedom, and have three cases, which are case-1 (n=m), case-2 (n<m), and case-3 (n>m). Only case-3 represents the blending problem physically. In reality, this is difficult to achieve since there are uncertainties and real processes of refineries that don't have equalities as expected.

Therefore, slack variables can help solve the blending formula and give an infinite set of solutions. These solutions will be further evaluated to obtain optimum solutions that can satisfy preferred criteria for objective functions such as minimum cost of components, maximum profit, and minimum deviation of the final blend product quality from the desired specifications.

Blending Constraints

In reality, blending has some constraints: component inventory and operational constraints by the planner (limitations imposed on the component usage, restriction on the recipe, pumping capacity of components, and giveaway limits in order of priority).

This course explains component tank volume balance and component tank inventory restriction constraints, including timeline constraints.

Operational Constraints

On-site storage tanks cannot be filled completely due to various operational needs. Therefore, crude oil stocks are kept in tank farms (off-site), oilfield tanks, barges, railroad tank cars, pipelines, etc. The giant cylindrical tanks at tank farms are used for storage. At least twenty percent storage capacity of each tank should be utilized to efficiently help the operation of field equipment and pipes.

However, crude oil must stay in the storage tank for at least 24 hours to separate it from the water. Also, the storage tank cannot simultaneously receive and transfer crude, nor can it be emptied completely.

Summary

These topics teach blending problems and constraints. Blending problems cover the definition of blending and solving the blending formula from a simple formula to satisfying solvability criteria using slack variables to obtain optimum solutions. Blending constraints cover all constraints in blending operations, including component tank volume balance and component tank inventory restrictions.

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