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A Novel Model for Multi-plant Mixed Heavy Crude Oils Refinery Planning

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Abstract: In this paper, multi-refinery using the same heavy crude oils as raw materials is studied, while a new nonlinear model for mixed heavy crude distillation is proposed. In practical crude distillation operation, the distillate yield and product distribution of distillation units are different due to their various equipment and operating parameters, even the same ratio of raw materials is provided, so different process models for multi-refinery planning is therefore required. For process modelling, the relationships between total yields and mixing ratio of different refineries were determined, which is combined with process simulation using production data. Then, the yields and properties of crude distillation unit (CDU) fractions were calculated with the use of true boiling point (TBP) curves and property curves respectively when the initial cutting temperatures were given. Finally, in order to maximise the economic benefit of distillation, the optimal product distribution and the best mixing ratio of crude oil were calculated under the constraints of different properties of fractions. Comparing to previous models, the proposed model takes the influence of different refinery parameters on production process into account, while avoiding the complex process for determining the cutting points, which is considered more efficient and more accurate with respect to heavy crude refinery. Model was successfully verified by a case study, allowing a significant improvement of the refinery profit to be achieved.

Keywords heavy crude, mixing ratio, multi-plant, optimization, planning

1. INTRODUCTION

Process modeling is the basis for refinery optimizing planning, which includes two types of models: rigorous and empirical models [1]. In rigorous methods, crude oil is divided into dozens of pseudo-components [2]. Each pseudo-component is considered as a pure component. The CDU is modeled thereafter by solving material equations, phase equilibrium equations, normalization equations and enthalpy balance equations. Although accurate results

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