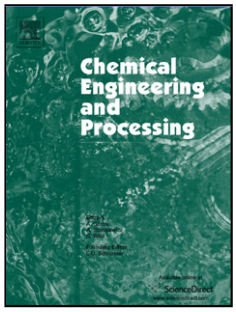

Title: Intensification of flow blending technology in the production of motor fuels by the method of mathematical modelling

Authors: E.D. Ivanchina, I.M. Dolganov, V.A. Chuzlov, N.S. Belinskaya

PII: S0255-2701(16)30691-2
DOI: http://dx.doi.org/doi:10.1016/j.cep.2017.07.015
Reference: CEP 7034

To appear in: *Chemical Engineering and Processing*

Received date: 29-12-2016
Revised date: 14-7-2017
Accepted date: 15-7-2017

Please cite this article as: E.D.Ivanchina, I.M.Dolganov, V.A.Chuzlov, N.S.Belinskaya, Intensification of flow blending technology in the production of motor fuels by the method of mathematical modelling, Chemical Engineering and Processinghttp://dx.doi.org/10.1016/j.cep.2017.07.015

INTENSIFICATION OF FLOW BLENDING TECHNOLOGY IN THE PRODUCTION OF MOTOR FUELS BY THE METHOD OF MATHEMATICAL MODELLING

E.D. Ivanchina, I.M. Dolganov, V.A. Chuzlov, N.S. Belinskaya

1. Ivanchina Emiliya Dmitrievna - doctor of Engineering Science, professor, Tomsk Polytechnic University, Lenina avenue, 30, 634050, Tomsk, Russia;
2. Dolganov Igor' MIhajlovich - candidate of engineering sciences, senior lecturer, Tomsk Polytechnic University, Lenina avenue, 30, 634050, Tomsk, Russia;
3. Chuzlov Vjacheslav Alekseevich - assistance lecturer, Tomsk Polytechnic University, Lenina avenue, 30, 634050, Tomsk, Russia;
4. Belynskaya Nataliya Sergeevna - candidate of engineering sciences, assistance lecturer, Tomsk Polytechnic University, Lenina avenue, 30, 634050, Tomsk, Russia.

Highlights

- The optimization of high-octane gasoline production.
- The optimal recipes for hydrocarbon streams blending were calculated.
- Accounting changes in catalytic reforming and cracking feedstock.
- Continuous on-line calculation of commercial gasoline recipes.
- The optimal technological regimes in the production of motor fuels.

Abstract

The article reports the results of intensification and prediction of the motor fuel production processes with the use of mathematical model, developed on the basis of chemical interaction of the reagents at the blending stage taking into account feedstock composition change in the processes of reforming, isomerization, alkylation, and catalytic cracking. The mathematical model makes it possible to quickly and accurately define the optimal ratio of the components, which ensure production of commercial gasoline meeting all modern fuel specifications.

Key words: blending, octane number, dipole moment, mathematical modelling, motor fuel production, computer system.

1 Introduction

Analysis of mechanisms, regimes, conditions, and macrokinetic laws of the gasoline production processes constitute a fundamental problem. The existing technology of motor fuel production (such as gasoline and diesel fuel) does not consider chemical interaction between the individual components of the mixture (such as hydrocarbon streams, antiknock additives, oxygenates, etc.). It leads to a gap between the calculated and experimental characteristics (such as octane number, pour point, etc.) [1-4]. The essential consequence of this is product quality degeneration (such as commercial gasoline and diesel fuel) as well as an economic indicator decline due to overspend of expensive components used in blending. When producing a large amount of commercial product, economical indicators reach enormous value.

This multi-factorial problem can be solved using the method of mathematical modelling based on the physical-chemical laws, that take into account thermodynamics and kinetics of hydrocarbon transformation on the catalyst surface, as well as unsteadiness of the processes due