Секция 7

Химия и химическая технология на иностранном языке

SOFTWARE FOR CONTROL AND PLANNING THE PRODUCTION OF DIESEL FUELS

A.A. Altynov, I.A. Bogdanov, M.V. Kirgina
Scientific supervisors – PhD, assistant, M.V. Kirgina

National Research Tomsk Polytechnic University
634050, Russia, Tomsk, 30 Lenin Avenue, andrey_altun@mail.ru

Create of new software packages that allow monitoring and planning the quality of the products obtained in the field of oil refining is an extremely topical scientific direction.

This is due to the influence of several key factors. One of these factors is localization, as most software suites in petrochemicals field is the development of the British and American scientists.

If we talk about during production diesel fuels than the most important factors are increase production volumes of the product and using new components in the production.

Manufacturers to involve new components necessary to revise the recipe of diesel fuel production, so that the fuel produced satisfied all environmental and operating requirements.

The most important diesel fuels characteristics are low-temperature properties (cloud point, cold filter plugging point, pour point) and cetane index. These characteristics are correlated together.

Experimental determination of cetane index and low-temperature properties is a lengthy and costly process. Calculation methods for determining the cetane index and low-temperature properties are faster and cheaper. That's why calculation methods included in basis of the developed software suite.

If you want to calculate diesel fuel properties you will need to enter the master data (distillation characteristic and fuel density) in the tab “Initial data” and click the bottom “Calculate”. The dialog box “Initial data” shown in Figure 1.

Cetane index of diesel fuel in the software suite is calculated by dependencies, presented in three standards:

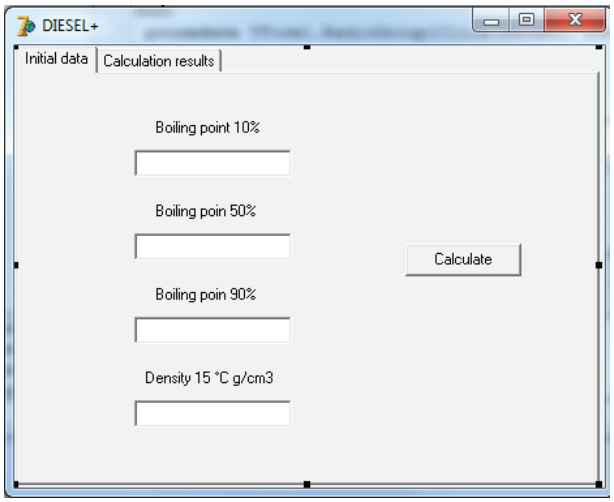

Fig. 1. *The dialog box “Initial data” of program “DIESEL+”*

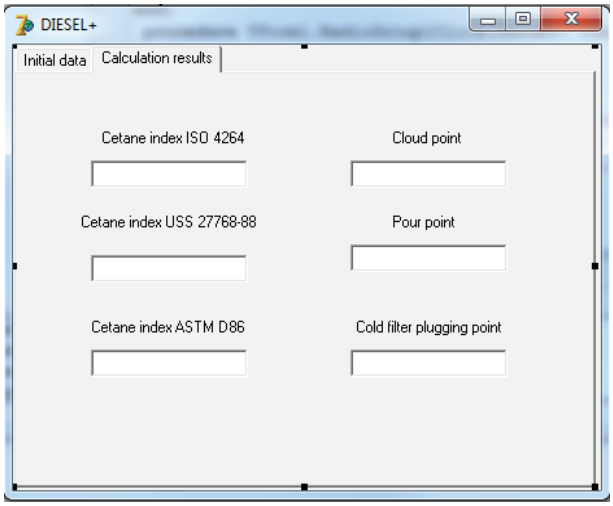

Fig. 2. *The dialog box “Calculation results” of program “DIESEL+”*

1) USS 27768-88 “Diesel fuel. Determination of cetane index calculation method”;

2) ASTM D976 “Standard Test Method for Calculated Cetane Index of Distillate Fuels”;

3) ISO 4264 “Petroleum products. Cetane index calculation of middle distillate fuels by the equation with four variables”.

Diesel fuels low-temperature properties are calculated using formulas developed by the authors. It is based on low-temperature properties dependence on the fractional composition and density of diesel fuels. Fractional composition and density were chosen as the initial parameters, as these indicators are always defined in the factory laboratories.

Created formulas verified using the factory data. These formulas have an average error not exceeding the experimental error in determining these parameters. The results of the cetane index and low-temperature properties calculation are shown in dialog box “Calculation results” (Figure 2).

By this means, the software suite “DIESEL +” can be used for control and planning the diesel fuels production, as it allows to calculate instantly and accurately diesel fuel cetane index and low-temperature properties.

Software suite “DIESEL +” error does not exceed the experimental error in the determination of these parameters.

DEVELOPMENT OF TRADE GASOLINE BLENDS

B.K. Amatova, M.V. Kirgina
Scientific Supervisor – PhD, assistant M.V. Kirgina
National Research Tomsk Polytechnic University, 634050, Russia, Tomsk, 30 Lenin Avenue

The production of automobile gasoline connected with sophisticated complex of different technologies of oil refining. Despite this, the total world consumption of motor fuels is about 1.75 billion tons per year, including automobile gasoline – more than 800 million tons per year. Modern motor gasoline must meet the requirements that ensure an environmentally friendly and reliable engine operation, considering such a wide consumption of motor fuel in the world market [1].

The main property of motor gasoline is the octane number (ON), determined by two methods,

Table 1. «Regular-92», «Mid-grade-95» and «Premium-98» gasoline blends

RON	MON	RVP, kPa	Density, kg/m^3	Content of hydrocarbons, % mass.					
				P	I	N	B	A	O
«Regular-92»									
Reformate (23 % mass.)				FCC_2 (32 % mass.)					
Isopentane (2 % mass.)				n-butane (3 % mass.)					
FCC_1 (23 % mass.)				Isomerizate (1 % mass.)					
Alkylate (7 % mass.)				Straight run gasoline (9 % mass.)					
92.0	84.9	51.5	737.4	9.8	32.5	10.4	1.0	34.8	12.6
«Mid-grade-95»									
Reformate (12 % mass.)									
Isopentane (2 % mass.)				FCC_1 (33 % mass.)					
FCC_1 (30 % mass.)				C_9 aromatic hydrocarbons (10 % mass.)					
Alkylate (13 % mass.)				n-butane (3 % mass.)					
95.1	88.4	51.2	736.1	7.7	35.8	7.4	1.0	34.9	14.2
«Premium-98»									
Reformate (14 % mass.)				FCC_2 (21 % mass.)					
Isopentane (7 % mass.)				n-butane (1 % mass.)					
FCC_1 (35 % mass.)				Toluene (11 % mass.)					
Alkylate (7 % mass.)				MTBE (4 % mass.)					
98.0	90.0	49.3	736	5.7	34.3	7.1	1.0	35.3	13.6

Where P – is n-paraffins; I – is isoparaffins; N – is naphthenes; B – is benzene; A – is aromatic hydrocarbons; O – is olefins; RVP – is Reid vapor pressure