The implementation of e-course technology in TPU allows expanding the range of educational services of the university and improving their quality. This will contribute to the growth of academic staff and students' satisfaction from the conditions and results of their activity. As a result, this will strengthen the position of TPU among the leaders of modern engineering education. In addition, the use of the suggested technology is not limited to the e-courses proposed: the number of courses can be increased or reduced depending on the requirements of the relevant educational programs. In particular, the course "Resource efficiency" can be implemented as a supplementary educational unit within the modules "Environment", "Media", "Inventors and Inventions", "Education", and "Work".

The e-course is characterized by a number of features, which make it different from the other courses taught in TPU. E-learning aims at the development and accumulation of the educational materials (both for vocabulary and grammar improvement) assigned for student self-study within the scope of curriculum learning modules. The e-courses have clear structure and composition unity. Every section includes the following elements: background information (information about the unit, teacher, grade rating schedule, and glossary); educational resources (Wordlists; Use of English, Reading, and Writing blocks; Essential items for grammar and grammar tasks/activities); tests; supplementary resources (Internet links to the recommended educational resources and course books).

The e-courses, being available for foreign students during the whole semester, allow them to choose an individual learning pathway, which makes it possible to acquire the knowledge independently and progressively, either simultaneously with the course being taught in TPU or after its completion. The volume of the proposed educational resources is sufficient not only to view (scan) a topic but also to study it thoroughly. It obviously contributes to development of individual learning path (learning strategy) stipulated by student's individual needs and academic progress results.

The e-courses are considered particularly contributive, as they not only provide the students with knowledge but also develop their personal qualities, which are of great significance in the system of modern education. For example, every section includes peer-review assignments and implies assessment of students' written work, which is supposed to develop student's autonomy, responsibility, self-esteem, and self-assessment. The e-courses also develop creativity (assigning such tasks as making a presentation) and individual responsibility for the educational outcomes and research results.

In general, English language teaching in TPU is based on blended learning. This approach focused on information technologies, and consequently e-learning has become quite efficient today, as it combines online learning with traditional face-to-face learning and allows improving the educational process of the students who are busy studying their majors and preparing their project works. Teaching languages at technical higher education institutions is traditionally connected with the lack of academic hours, and e-courses do possess the potential to solve this problem. Providing students with the freedom in relation to the subject curriculum and learning intensity, e-courses stimulate student's motivation to education and responsibility for academic results. Moreover, the implementation of blended learning makes it possible to avoid the disadvantages essential for e-learning, such as lack of human interaction (which is particularly important for the disciplines that involve practice) and communication (which is essential for language learning).

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MONITORING OF INDUSTRIAL HYDRODEWAXING PLANT IN THE CONTEXT OF CETANE NUMBER AND LOW TEMPERATURE CHARACTERISTICS OF DIESEL FUEL

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High speed diesel is liquid fuel that is used most abundantly in Russia in a variety of vehicles and appliances, such as cars, buses, tractors, lorries, barges, speed boats, railway engines, irrigation pumps, and generator sets. Diesel is a mixture of hydrocarbon compounds, boiling in the range of (250–360) °C [3].

The cetane number is a measure of the ignition quality of the diesel fuel. The ignition quality is quantified by measuring the ignition delay, which is the period between the time of injection and the start of the fuel combustion (ignition). A fuel with high cetane number has a short ignition delay period and starts to combust instantly after it is injected into an engine [1].

The cetane number is expressed in terms of the volume percent of cetane ($C_{16}H_{34}$) which has high ignition (CN = 100) in a mixture with alpha-methyl-naphthalene ($C_{11}H_{10}$) which has low ignition quality (CN = 0).

According to commercial diesel fuel specifications the cetane number of diesel fuels for cold and arctic climate must be more than 47.

It is known that cetane number depends on hydrocarbonic and fractional composition of mixture. There are some computational correlations of cetane number and fractional composition of different oil fractions. Application of these formulas for calculation of one type of fractions gives the sufficient accuracy of cetane number prediction, however when they used for calculation of other types of fractions, the result has a high error. Therefore it is necessary to carry out updating by well-known formulas for cetane number calculating for a specific faction.

In this work the formula of cetane number calculation depending on fractional composition and density of mixture is modified for calculation of cetane number (CN) of the diesel fuels received on the hydrodewaxing plant. The received dependence has the following appearance:

$$CN = 40,9 + 0,0892T_{10N} + \left(0,131 + 0,901B_N\right)T_{50N} + \left(0,0523 - 0,42B_N\right)T_{90N} + 0,00049\left(T_{10N}^2 - T_{90N}^2\right) + 107B_N + 60B_N^2 \quad (1)$$

$$B_N = e^{-3,5(d-0,85)} - 1 \quad (2)$$

d – density, g/l; $T_{N10} = T_{10} - 215$; $T_{50N} = T_{50} - 260$; $T_{90N} = T_{90} - 310$; T_{10}, T_{50}, T_{90} – temperature at which 10, 50, 90 % of the mixture is distilled off, °C.

Cetane number calculation by formula (1) has high precision, the relative error of calculation does not exceed 1% in comparison to experimentally certain values (Table 1).

Table 1

Error of cetane number calculation of diesel fuel

Cetane number of diesel fuel (calculation)	Cetane number of diesel fuel (experiment)	Relative error of calculation, %
52,61	52,20	0,8
49,84	49,72	0,2
51,07	51,60	1,0

Formula (1) is implemented as module of the computer modeling system of diesel fuels hydrodewaxing process [2]. With the help of this system monitoring of industrial hydrodewaxing plant in the period from 2013 to 2015 was conducted (Table 2).

Table 2

Monitoring of cetane number on hydrodewaxing plant of diesel fuel

Date	Cetane number of diesel fuel
14.11.13	54,3
15.11.13	54,1
15.12.13	53,5
15.07.14	52,9
15.09.14	52,4
15.10.14	52,1
15.05.15	51,0
15.06.15	51,1
15.07.15	51,4

The cetane number of diesel fuel received at the hydrodewaxing plant decreased by 3,3 points from 54,3 to 51,0 which indicates gradual catalyst deactivation.

Hydrodewaxing of middle distillates (diesel fractions, atmospheric gasoil) is the main process of components production for diesel fuels for cold and arctic climate [3]. Decrease of cloud point and pour point of diesel fuel in this process is reached due to decrease in content of high-molecular paraffins of an unbranched structure that leads to decrease of diesel fuel cetane number because paraffins of unbranched structure have the highest cetane number (Table 3).

As it can be seen in the table, decrease of cloud point and maximum filtration temperature in hydrodewaxing process for diesel fuel production for cold and arctic climate leads to decreasing cetane number of diesel fuel.

By reducing the cloud point on 33 points from -5 °C to -38 °C and maximum filtration temperature on 37 points from -7 °C to -44 °C cetane number of diesel fuel decreases by 4.9.

Thus, it is necessary to optimize the technological mode of hydrodewaxing plant for low-temperature properties and cetane number for diesel fuel complying with quality standards with minimum cost of resources and the maximum yield of the desired product.

Table 3

The correlation of cetane number and low-temperature properties of diesel fuel

Cetane number of diesel fuel	Cloud point, °C	Maximum filtration temperature, °C
46,2	-38	-44
47,0	-24	-27
48,1	-20	-22
49,7	-17	-20
50,5	-12	-13
51,0	-6	-8
51,1	-5	-7

Optimization of complex multicomponent processes of deep oil refining is effectively performed with application of a mathematical modeling method and the computer modeling systems of oil refining processes [5].

Developed computer modeling system allows calculating the composition, low-temperature properties and product yield depending on feed composition and technological conditions at the industrial plant, to monitor industrial units, to calculate the cetane number depending on the fractional composition of the product and its density.

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GOREVSKOE PB-ZN DEPOSIT AS THE REFERENCE OBJECT OF SEDEX-TYPE DEPOSITS WITHIN THE ENISEY RIDGE

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In 2014, the world production of Zn and Pb was 13.3 Mt, and 5.46 Mt respectively. Sulfidic Pb-Zn deposits have known reserves of Zn – 230 Mt, and Pb – 87 Mt. Estimated resources are 1900 Mt for Zn and 2000 Mt for Pb. Also, these deposits gain 31.7 % of the world’s Ag production. They are an important source of Cu, Au, Cd, In, Sn, Sb, Be, Se and Te as a by-product. [8].

In general, all Pb-Zn sulfidic deposits can be divided into two groups: Volcanogenic hosted massive sulfide deposits (VHMS) and Sediment-Hosted Deposits.

VHMS deposits are associated with and created by volcanic-associated hydrothermal events in submarine environments within the oceanic crust.

Sediment-Hosted deposits occur within the continental crust and can be divided into three major subtypes, sedimentary exhalative (SEDEX), Irish-type, and Mississippi Valley type (MVT) [2].

SEDEX-type deposits are hosted in shale, sandstone or siltstone. SEDEX deposits could be found in passive margins, back-arcs, continental rifts and sag basins.

Deposits of the Mississippi Valley Type (MVT) are hosted mainly by dolostone and limestone in platform carbonate sequences. They are usually located at flanks of basins, orogenic forelands, or foreland thrust belts inboard of clastic rock-dominated passive margin sequences. They have no spatial or temporal relation with igneous rocks, which distinguishes them from skarn or other intrusive rock-related Pb-Zn ores [4].

Irish-type deposits represent a distinctive sub-class of the carbonate-hosted zinc-lead deposit family, having geological features and genetic models that are hybrids between SEDEX and MVT deposits [4].

Russia holds the second place of the world's Zn reserves (9%) - 60.3 Mt as well as the second place of the world's Pb reserves (6%) – 19.3 Mt. There are 150 known Zn-deposits, 27 of them are producing or preparing for production as well as 102 Pb-deposits with 17 of them are producing or preparing for production..

The biggest part of Russia’s Pb (65.9%) and Zn (74.5%) reserves belong to the SEDEX-type deposits, like Gorevskoe, Kholodninskoe, and Ozernoe [5]. Many other Pb-Zn deposits mainly from Ural and Nowaya Zemlya region belong to the VHMS type like Pavlovskoe, Komsomolskoe, Yubileynoe and Tarn'erskoe [3]. In the Dalnegorsk region