Introduction to Gasoline and Diesel Fuel Technology

Course Description

This course provides a thorough introduction to gasoline and diesel fuel technology and how fuels are refined and blended to meet fuel specifications including the use of additives.

What you will learn

- Gasoline and diesel fuel: chemical and physical properties, performance characteristics, applications.
- Pretreatment and distillation of petroleum.
- Petroleum refining processes for gasoline components production: naphtha catalytic reforming, light naphtha isomerization, sulphuric acid-catalyzed alkylation of isobutane by olefins.
- Petroleum refining processes for diesel components production: catalytic cracking, hydrocracking and hydrodewaxing of distillates.
- Technology of commercial gasoline and diesel production (blending process).
- Gasoline and diesel improver additives.
- Computational methods for prediction of chemical and physical properties and performance characteristics of gasoline and diesel.
- Procedure of blending formulation development for commercial gasoline production.
- Procedure of catalytic dewaxing process optimization for diesel components production.

Course Content

№	Topic	Type of lesson	Duration in hours	Instructor
Fundamentals				
1	Gasoline: chemical and physical properties, performance characteristics, applications, technology of commercial gasoline production (blending process)	Lecture	2	M. Kirgina
2	Diesel fuel: chemical and physical properties, performance characteristics, applications, technology of commercial diesel production (blending process)	Lecture	2	N. Belinskaya
Refining processes				
3	Pretreatment and distillation of petroleum	Lecture	2	N. Belinskaya
4	*Petroleum refining processes for gasoline components production:* naphtha catalytic reforming (purpose of the process, feedstock, products, process chemistry, catalysts, equipment, the influence of operation conditions, process flow diagram)	Lecture	2	M. Kirgina
5	*Petroleum refining processes for gasoline components production:* light naphtha isomerization (purpose of the process, feedstock, products, process chemistry, catalysts, equipment, the influence of operation conditions, process flow diagram)	Lecture	2	M. Kirgina
6	*Petroleum refining processes for gasoline components production:* sulphuric acid-catalyzed alkylation of isobutane by olefins (purpose of the process,	Lecture	2	M. Kirgina

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	feedstock, products, process chemistry, catalysts, equipment, the influence of operation conditions, process flow diagram)			
7	*Petroleum refining processes for diesel components production:* catalytic cracking (purpose of the process, feedstock, products, process chemistry, catalysts, equipment, the influence of operation conditions, process flow diagram)	Lecture	2	N. Belinskaya
8	*Petroleum refining processes for diesel components production:* hydrocracking and catalytic dewaxing (purpose of the processes, feedstock, products, processes chemistry, catalysts, equipment, the influence of operation conditions, process flow diagrams)	Lecture	2	N. Belinskaya
Fuel Additives				
9	Gasoline improver additives	Lecture	2	M. Kirgina
10	Diesel improver additives	Lecture	2	N. Belinskaya
Calculation of fuel characteristics, blending				
11	Computational methods for prediction of chemical and physical properties and performance characteristics of gasoline, procedure of blending formulation development for commercial gasoline production	Lecture	2	M. Kirgina
12	Computational methods for prediction of chemical and physical properties and performance characteristics of diesel	Lecture	2	N. Belinskaya
Computer simulation				
13	Computer simulator: development of hydrocarbon streams blending scheme for production of planned commercial gasoline volume with required quality	Practical	2	M. Kirgina
14	Computer simulator: catalytic dewaxing process optimization for diesel components production	Practical	2	N. Belinskaya
ИТОГО			**28**	

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Instructor
The course is presented by Dr Maria Kirgina and Dr Nalaliya Belinskaya.

Dr Maria Kirgina, B.Sc., M.Sc., Candidate of Engineering Sciences

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Research interests	Fuels, Mathematical modeling and optimization of petroleum-refining industrial processes, Gasoline blending
Scopus author ID	52163909100
Major publications	**1)** Kirgina, M.V., Ivanchina, E.D., Chekantsev, N.V., Sakhnevich, B.V., Sviridova, E.V., Romanovskiy, R.V. **Complex modeling system for optimization of compounding process in gasoline pool to produce high-octane finished gasoline fuel.** Chemical Engineering Journal. Volume 282, 2015, pp. 194-205. DOI: 10.1016/j.cej.2015.03.014. **2)** Kirgina, M.V. , Ivanchina, E.D., Dolganov, I.M., Chekantsev, N.V., Kravtsov, A.V., Fu, F. **Computer program for optimizing compounding of high-octane gasoline.** Chemistry and Technology of Fuels and Oils. Volume 50, Issue 1, 2014, pp. 17-27. DOI: 10.1007/s10553-014-0486-4. **3)** Kirgina, M., Sviridova, E., Sakhnevich, B., Chekantsev, N., Ivanchina, E. **Correction of gasoline blending recipes with the use of computer modelling system.** IOP Conference Series: Materials Science and Engineering. Volume 93, Issue 1, 2015, Article number 012014. DOI: 10.1088/1757-899X/93/1/012014.

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Research interests	Thermodynamics, kinetics, mechanisms of reactions occurring in petroleum-refining processes; Mathematical modelling and optimization of petroleum-refining processes; Development of computer modelling systems for petroleum-refining processes
Scopus author ID	55543027000
Major publications	**1)** N.S. Belinskaya, E.D. Ivanchina, E.N. Ivashkina, V.A. Chuzlov, S.A. Faleev. **Mathematical modeling of the process of catalytic hydrodewaxing of atmosheric gasoil considering the interconnection of the technological scheme devices** // Procedia Engineering.– 2015 –

	Vol. 113. – p. 68–72. (DOI: 10.1016/j.proeng.2015.07.292) **2)** Belinskaya N.S., Ivanchina E.D., Ivashkina E.N., Frantsina E.V., Silko G.Y. **Mathematical model of straight run diesel catalytic hydroisomerization** // IOP Conference Series: Earth and Environmental Science. – 2014 – Vol. 21. – Issue 1. - p. 1–7. (DOI: 10/1088/1755-1315/21/1/012030) **3)** Belinskaya N.S., Ivanchina E.D., Ivashkina E.N., Frantsina E.V., Silko G.Y. **Optimal technological parameters of diesel fuel hydroisomerization unit work investigation by means of mathematical modelling method** // Procedia Chemistry. – 2014 – Vol. 10. – p. 258–266 (DOI: 10.1016/j.proche.2014.10.043)

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