MATERIALS AND CHEMICAL REAGENTS IN OIL AND GAS PRODUCTION

Lecture classes – 22 hours

Practical classes – 36 hours

Form of control – EXAM.

"Materials and chemical reagents in oil and gas production" is a discipline that studies characteristics, mechanism of action and application technology of materials and chemical reagents in oil and gas production, the physical and chemical properties and parameters of reservoir fluids, gases and condensate mixtures and their filtering in the rocks, reservoirs, wells and pipelines. Knowledge of this discipline is necessary for petroleum engineer specialist (researcher) while studying such disciplines as "Technology and equipment of oil and gas fields",

“Technology of oil, gas and gas condensate fields development”, “Technology and engineering techniques to enhance oil and gas production”, “Gathering and treatment of oil and gas on fields”. The development and exploitation of oil, gas and gas condensate fields closely related to laws of hydrocarbon, water, various reagent solutions filtering in rocks the productive formations are composed of. Therefore knowledge of the properties of rocks and reservoir fluids and reagents used in the development and operation of productive formations, patterns of interaction between them defines rational technology of development of oil and gas accumulations as well as economic indices from the depths of their removal and subsequent transportation to customers. In studying this discipline are used in complex important provisions on geology, physics, chemistry, physical chemistry of oil and gas reservoir, underground hydro-mechanics, oil and gas mechanics and thermo-dynamics of rocks, drilling technology and operation of wells and production.

Purpose of the discipline. Purpose of the discipline is to provide the knowledge by students of reagents used in drilling and exploitation of wells, the intensification of industrial production and preparation of hydrocarbons and application of methods to increase oil and gas production, their properties and parameters that characterize them.

The main kind of check on student attestation is exam.

The curriculum is calculated on an hourly basis in accordance with the following grid.

№	Form of study	Normative data						
		Course	Semester	Classroom work		Indepen-dent work	Indivi-dual work	Total
				Lectu-res	Prac-tical			
1	Full-time	4	7	22	36	92		150
2	Part-time	4	7	6	6	146		158

STRUCTURE OF LECTURES

MODULE 1		MODULE 2	
Materials and chemicals used during drilling, formation exposing and well completion	**Materials and chemicals used during operation of wells**	**Materials and chemicals used for increasing oil and gas recovery**	**Environment protection during drilling and operation**

– drilling muds; – cementation materials, washing and plugging-back reagents; – formation exposing and well completion chemicals.	– reagents for intensification of oil and gas recovery; – chemicals for repair-isolating works; – reagents used in gathering and treatment systems.	– chemicals for hydrodynamic and thermal methods of increasing recovery; – reagents for physico-chemical methods of increasing recovery.	– environment protection during drilling processes; – environment protection during operation processes; – environment protection during gathering and treatment processes.

THEMATIC PLAN OF THE DISCIPLINE

№	Module names	Volume (hours) of forms of educational activity of students			
		Lectures	Practical	Independent work	Individual work
1	**2**	**3**	**4**	**5**	**6**
M1	Characteristics, mechanism of action and application technology of materials and chemicals in oil and gas production	18/5	36/5	80/110	
ЗМ1	Materials and chemicals which are used during well drilling, formation exposing and development of productive formations (well completion)	8/1,5	12/2	30/40	

3M2	Materials and chemicals used during wells operation for the increase of their pro-ductivity and in the system of treatment	6/2,5	14/2	30/50	
3M3	The methods of increasing oil-, gas- and gas condensate recovery from formations and reagents used in these processes	4/1	10/1	20/20	
M2	Environment protection during drilling and operation of wells	4/1	4/1	12/36	
3M4	Environment protection during drilling and operation of wells, in wells repair work and during treatment and storage of field production	4/1	4/1	12/36	

	Total	22/6	36/6	92/146	

Consequently, the structure of the discipline "Materials and chemical reagents in oil and gas production" includes 2 modules and 4 content modules.

CONTENTS OF PRACTICAL CLASSES

M1. Characteristics, mechanism of action and application technology of materials and chemicals in oil and gas production

3M1. Materials and chemicals which are used during well drilling, drilling in of formations and completion of productive formations (well completion)

The main technological parameters and values characterizing materials and chemicals used in drilling and operation of wells and their dimensions.

Solving calculation tasks on determining the required volume of reagents for the preparation of drilling fluid under different geological and field conditions.

Solving calculation tasks on the choice of fluids for productive formations drilling in and their completion.

ЗМ2. Materials and chemicals used during wells operation, for the increase of their productivity and in the system of treatment

Solving calculation tasks on determining the parameters of productive formations which characterize filtration properties of them.

Solving calculation tasks on the inflow of liquid and gas into hydrodynamically imperfect wells.

Solving calculation tasks on determining the required volume of reagents for preparing acid solutions in acid action carrying out.

Solving calculation tasks on determining the required volume of reagents during carrying out thermal acid and thermo-chemical treatments.

Solving calculation tasks on determining the required volume of reagents during hydraulic fracturings of formations and hydraulic jet perforation.

Determining the required volume of materials and chemicals for the preparation of plugging-back solutions.

Determining the required volume of inhibitors for corrosion protection of oil and gas field equipment and the required volume of hydrate inhibitors.

Solving calculation tasks on the preparation of surfactant solutions, micellar solutions, alkali solutions and polymers.

Determining the required volume of demulsification agents in oil field treatment.

3M3. The methods of increasing oil-, gas- and gas condensate recovery from formations and reagents used in these processes

Determining the factors of oil-, gas- and gas condensate recovery for different drives of the operation of oil and gas deposits and different shapes of them.

Determining the required volume of reagents while implementing the methods for increasing oil-, gas- and gas condensate recovery for specific examples.

Solving calculation tasks on determining the additional hydrocarbon production while implementing the methods for increasing oil-, gas- and gas condensate recovery using the characteristics of displacement.

M2 Environment protection during drilling and operation of wells

3M 4 Environment protection during drilling and operation of wells, in wells repair work and during treatment and storage of field production

Solving calculation tasks on the safe conducting the geological and technical measures during the operation of wells and the increase of their productivity.

Assessment and evaluation of student knowledge

Type of work	Code of the control	Maximum points amount
1. Lecture colloquiums		60
2. Practical classes		40
TOTAL		100

The assessment forms of the discipline can be a test or a written test. A rating system evaluation is given below.

90 – 100 points – excellent (A)

75 – 89 points – good (BC)

60 – 74 points – satisfactory (DE)

35 – 59 points – unsatisfactory, with possibility of reexamination (FX)

1 – 34 points – unsatisfactory, with obligatory review of the course.

LECTURE № 1: WELL DRILLING AND REAGENTS USED FOR PREPARATION OF DRILLING MUDS

Drilling fluid (mud) performs the following functions:

1) clears well from drilling rocks;

2) cools the drilling bit;

3) establishes back pressure in disclosed in borehole production layers;

4) blocks showings of oil, gas and water from production layers;

5) prevents landslides of rocks from borehole walls;

6) when turbine hydraulic drilling a source of energy;

7) reduces the absorption of fluid from the wellbore in porous, permeable layers through the formation of a crust on the walls of the well.

Several functions of drilling mud are associated with drilling geological conditions. So before choosing of drilling mud for the specific drilling conditions one must carefully study the geology of the area and especially the lithological and chemical characteristics of rocks, reservoir pressure and temperature.

Drilling mud **is a complex multicomponent dispersed system of suspensions, emulsions and aerated liquors used for drilling wells.**