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«MODERN EOR TECHNICS», 5 days

COURSE OBJECTIVE:

improvement of professional competencies in sphere of:

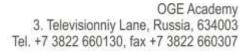
- EOR technics;
- Physical and chemical, reservoir and gas EOR technics application;
- Application of flow deviation technologies in terms of infected water filtration pathway and flooding mechanism.

ACQUIRED ABILITIES:

- Plan, implement and analyze results of physical-chemical and gas EOR technics;
- Consider flooding mechanism and apply technologies of waterproofing sealant design;
- Apply modern gas EOR technics according to design and modeling requirements;
- Analyze results of gas technics implementation;
- Estimate technical-and-economic efficiency of EOR technics.

COURSE CONTENT:

Module Name	Content
Overview of EOR in Russia and the world	Modern classification of EOR technics and oil reserves. EOR – past, present, future. Application of EOR in Russia, CIS countries, USA, Canada and China. Development trends, leading scientific centers for EOR development.
Polymer waterflooding	Polymer waterflooding evolution: from classical to ASP. ASP waterflooding as the most efficient method of physical-chemical effect. World practice. Geological and technological criteria of polymer waterflooding (PW) applicability. Lab control and monitoring of polymer mixture injection. Hall method. Fixed and mobile PW equipment. Foreign case studies. Periodic and continuous units for treatment and injection of polymer mixtures. Offshore polymer waterflooding. Example of PW application for high-viscosity oil field.
Water-soluble polymer and its cross-linked forms for formation EOR	Applied polymers, leading polymer producers. Acrylamides polymer. Flow characteristics dependence on molecular property and water salinity. Mechanical, thermal and chemical destruction of polymer macromolecule in water solutions. Hydrogels on the basis of acrylamides polymer. Waterproofing properties of different





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	hydrogels. Examples of injected amount calculation for conformance control. Modern polymer technologies (Bright Water, etc.)
Physics of conformance	Flow deviation technologies (FDT) as a modern analogue of
control under the influence on	conformance control. FDT application with respect to waterflooding mechanism. Injected water filtration patterns, targeted design of
formation through injection wells	hydrogel location. Engineering design algorithms. Matrix of
wens	hydrogels application depending on waterflooding pattern. Methods
	of waterflooding mechanisms identification. Tracer analysis.
	Realization examples with assessment of operational benefit for each filtration pattern.
Potential of low-capacity	Dependence of FDT efficiency on level of reservoir depletion.
physical-chemical EOR	Analysis of systematic FDT application results by mathematic
technics while development of	modeling. The impact of reservoir depletion level on physical- chemical exposure parameters. Classification of reserves in view of
unhomogeneity terrigenous	EOR. Including of various reserves categories in production
rock	depending on depletion level. The advance of production liquid
	waterflooding over reservoir depletion dynamic as EOR application
	criteria. Identification of highest expectable FD EOR efficiency period. Regular change of technological and economical parameters
	of FDT application at different stages of field development.
Selection and verification of	Prompt systems analysis of geological structure features and current
affected objects and areas for	level of depletion. Identification of zones for EOR application on the basis of map analysis matching (maps algebra). Priorities in
EOR technics application	selection of physical-chemical affected areas. Geological and
	technological criteria for areas selection. Step by step development
	of wellwork and EOR program on the basis of operational analysis. Post-event analysis of EOR application. Example of complex
	wellwork and EOR program application.
Selection and verification of	Classification of waterproofing technologies and compound
affection technics	depending on material formation, chemistry and strength properties of backfill composition. Expert review of optimum application
	conditions of various compositions. Step-by-step selection of base
	technology and composition for EOR application in design
	documentation. Practice of Russian petroleum companies. Particular
	cases of method, basic technology and its modification selection for conformance control and EDT based on the geological-physical
	profile of development object.
Hydrodynamic EOR technics	Physics of the methodology. Injectivity criteria. Non-stationary and
	cyclic waterflooding. World and Russian experience. Recommended reading.
Gas EOR technics	Injectivity criteria, results, modern Gas EOR (G-EOR) variations.
	Associated gas challenges and utilization ways. Temporary
	utilization of associated gas at oilfield gas-holders. Physics of EOR technics by hydrocarbon gases, CO2, nitrogen and combustion gases
	injection. Injection technics depending on reservoir geological
	features. Different hydrocarbon gas injection technics: water-
	alternated-gas (WAG), cyclic and alternate water and gas injection. G-EOR dependence on injected gas composition and technics. The
	matrix of injection technics applicability. G-EOR trends in Russia



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	and the whole world. Injection modeling, evolution of modeling
	from simple three-phase to compositional simulation. Compositional
	modeling issues. Case study of WAG modeling. Well construction
	requirements. Compressor technics and production well operation
	requirements. Case study, feasibility study.
Modeling of Physical-	Problems of low-capacity EOR simulation. Models hierarchy:
chemical EOR technics	engineering design of low-capacity EOR, quasione-dimensional
	model, 3D model (polymer waterflooding, G-EOR). Modeling
	concepts, technological parameters and target cost-performance
	ratio optimization. Updating of data while modeling.
Algorithm for assessment of	Technical approaches of EOR technical-economic efficiency
technological and economic	assessment. Definition of base and analyzed periods, desaturation
efficiency of EOR and	characteristic, production decline curve. Principles for selection of
wellwork	desaturation characteristics or production decline curves. Software
WCIIWOIK	for technological efficiency of EOR and wellwork. Principles of
	EOR economic efficiency assessment, uncertain part of oil
	production cost. Discounts application while EOR economic
	efficiency calculation.