

"Fluid Mechanics" Department
SCIENTIFIC and ORGANIZATIONAL REPORT
for 2016

Subject: Research of the influence of boundary layers on transport processes under the flow of heterogeneous fluids.

Scientific activity of the "Fluid Mechanics" Department is dedicated to theoretical, experimental and industrial research in the field of nonstationary and nonequilibrium transport processes under the flow and filtration of heterogeneous fluids in heterogeneous medium, as well as the development of methods of their control in field technologies.

In the Department, there are working 1 correspondent member of NAS of Azerbaijan, 1 Candidate of Sciences, 3 PhDs and 1 lab technician.

During the reporting period, Department staff carried out research as part of the approved topic, by publishing scientific results in specialized and industry journals, participating in international and national conferences. Developed innovative methods and techniques brought up to the industrial implementation.

The following researches realized in the current year:

Research work #1. The study of transient processes under the fluids flow in pipes.

Researchers: corresponding member of NAS of Azerbaijan, prof. Geylani Panahov, Dosent, Cand.of Sci. Eldar Abbasov, PhD Gulshan Aghayeva.

The processes of heat transfer during fluid flow with consideration of temperature drop on the pipe wall of circular cross-section pipes was investigated. The algorithm for the calculation of the thickness of insulation layer, providing efficient transport of hydrocarbon fluid by taking into account of gas evolving.

In the framework of the research work the following articles published:

1. Панахов Г.М., Аббасов Э.М., Агаева Г.Р., Гусейнов В.Г.
Практические расчеты тепловой изоляции трубопроводов // Azərbaycan Neft Təsərrüfatı, № 11, 2015. – С. 32 – 35.

2. Bakhtiyarov S.I., Dennis Siginer, Panahov G.M., Abbasov E.M. The effect of gas evolution on hydraulic characteristics of fluid flow in the pipeline // ASME/IMECE International Mechanical Engineering Congress & Exposition, Phoenix, Arizona, November 11 – 17, 2016. **Thomson Reuters**

3. Панахов Г.М., Аббасов Э.М., Юзбашиева А.О., Расулова С.Р., Гусейнов В.Г. Реологические свойства структурообразующих дисперсных систем // Нефтегазовое дело, Т. 2, № 14, 2016. – С. 133 – 140. **Scopus, Science Index**

4. Geylani M. Panahov, Eldar M. Abbasov Wall effects under non-Newtonian fluid flow in a circular pipe // Transactions of NAS of Azerbaijan, Issue Mechanics, 36 (7) (2016).

5. Панахов Г.М., Аббасов Э.М., Исмаилов Ш.З., Гусейнов В.Г. Реологическое поведение структурообразующих дисперсных систем при течении в трубах // Материалы международной научной конференции, посвященной памяти академика А.Х. Мирзаджанзаде Уфа, 16-18 ноября, 2016.

6. Gadjiyev T.S., Aliyev S.A., Panahov G.M., Abbasov E.M. Well Placement as a Method of Oil Field Development Control // Вестник Львовского национального университета им. Ивана Франко. – 2016.

7. Шахвердиев А.Х., Панахов Г.М., Аббасова Н.Н. Влияние физико-химических свойств и обводненности пластового флюида на эффективность газлифта // Нефтяное хозяйство, №12, 2016. **Scopus, Science Index**

Research work #2. Study of pulsating flow and filtration on the flow characteristics of liquids.

Researchers: corresponding member of NAS of Azerbaijan, Professor Geylani Panahov, Phys.m. Yuzbashieva A. O., P. T. Museibli

In the research work the process of vibrational perturbations and its effect on the flow parameters determining the kinetics of structure changes and averaged hydrodynamic characteristics has been studied.

On the outcome of this research the following papers were published:

1. Geylani M. Panakhov, Eldar M. Abbasov, Sayavur I. Bakhtiyarov and Dennis A. Siginer *A Note on the Two-Phase Gas-Oil Flow in a Pipeline* // Journal of Energy Resources Technology, ASME, USA, 2016. **Thomson Reuters**
2. Rafael Yu. Amenzadeh, Geylani M. Panahov, Eldar M. Abbasov, Parviz T. Museibli Pulsating flow of two-phase viscous bubbly fluid in an elastic semi-infinite cylindrical tapering tube // Transactions of NAS of Azerbaijan, Issue Mechanics, 35 (7), 22-31 (2016).

Research work #2. Study of the effect of boundary layers on transient processes.

Researchers: corresponding member of Azerbaijan NAS; Dr. Geylani Panahov, Dr. Eldar Abbasov, PhD in Math. Sevinc Rasulova.

The study subjects assessed the effect of boundary layers in the flow of hydrocarbon fluids.

According to the research results the following articles has been published:

1. Шахвердиев А.Х., Панахов Г.М., Аббасов Э.М., Абдул Насер Омрани // Теоретические и прикладные аспекты регулирования процессов переноса в пористой среде с целью повышения нефтеотдачи пластов и интенсификации добычи углеводородов // Материалы международной научной конференции, посвященной памяти академика А.Х. Мирзаджанзаде Уфа, 16-18 ноября, 2016.
2. Гаджиев В.Д., Расулова С.Р., Джафаров Х.Г. Свободное колебание прямоугольного участка неоднородного трубопровода, лежащего на двухконстантном основании // Нефтегазовое дело, Vol. 13 (4). 2016. - С. 137-141 (çap olunub). **Scopus, Russian Citation Index.**
3. Расулова С.Р., Юзбеков Р. Учет влияния накопленных повреждений на деформативные свойства материала // Маşınşünaslıq – Machine Science – Машиноведение, 2015, Vol. 4, №1 – С. 42 – 46.

Organisational report: Department Head, corresponding member of ANAS, Dr. Geylani Panahov was awarded the silver medal of the Academy of Natural Sciences named after academician Azad Mirzajanzade. The medal was first established in memory of the academician Mirzajanzade and is awarded for outstanding achievements in the field of natural sciences.

Dr. Geylani Panahov and Dr. Eldar Abbasov prepared for publication the second issue of the journal "Transactions of Azerbaijan National Academy of Sciences (Mechanics issue)".

During the reporting period the joint work with SOCAR to implement innovation technology on in-situ generation of carbon dioxide CO₂ to recover residual oil reserves on the Company's oil fields was continued.

Continued study of unsteady effects under development and exploration of oil, gas and gas condensate fields in the framework of the project "Theoretical and experimental complex interdisciplinary problems of geomechanics". Interim results of the research were presented at the scientific workshop "Geomechanics" at the Institute of Geology and Geophysics.

Research project via the research grant "Scientific bases of development of new methods of enhanced oil recovery deep-seated hydrocarbon deposits with complicated geological and physical characteristics" has been completed. Results submitted to the relevant departments of SOCAR and National Academy of Sciences of Azerbaijan.

Department head, corresponding member of the Azerbaijan NAS Dr. Panahov Geylani presented a report speech on the workshop of Institute of Mathematics and Mechanics entitled "Problems and methods for control of mass transfer in heterogeneous porous media".

Dr. Geylani Panahov and Dr. Eldar Abbasov participated in the international scientific conference held in Ufa State Petroleum and Technical University, Ufa (Russian Federation).

The corresponding member of NAS of Azerbaijan Geylani Panahov is the head of the technical workshop at the Dissertation Councils at the Institute of Mathematics and Mechanics, Baku State University (BSU), a member of the Diss. Council at the IMM of NAS of Azerbaijan. Dr. Eldar Abbasov is a member of the Diss. Council FD.02.016 of BSU and D01.081 in the Institute of Geology and Geophysics of NAS of Azerbaijan.

Applied research: During the reporting period, the innovative technology of Improved oil recovery was implemented at the oil fields operated by "Global Energy" company. On the 4 producing wells the technological effect of increasing oil production after the introduction has been achieved.

Head of Department,

Corresponding member of Azerbaijan NAS

Dr. Geylani Panahov