

**“Fluid Mechanics” Department**  
**SCIENTIFIC AND INSTITUTIONAL REPORT**  
**for the first half of 2019**

**Project title: Investigation of the influence of boundary layers on unsteady processes in the flow of heterogeneous liquids.**

During the reporting period, research was carried out in accordance with the thematic plan of the division.

**Work 1. Study of mass transfer in boundary layers in the flow and filtration of gas-liquid systems.**

During the reporting period, significant effects arising in contacts during multiphase systems flow were investigated, free convective, adsorption and capillary mechanisms associated with the ratio of media were investigated.

**Work 2.** Study of the characteristics of the effect of electrolyte solutions on a porous medium.

During the reporting period, studies related to the Project were carried out taking into account the internal effects in nonlinear waves in gas-liquid mixtures. The influence of the electric field on the propagation of nonlinear waves in fluids caused by internal currents is studied.

**Work 3.** Study of the static electricity role in the gas expansion during flow in isothermal conditions.

Under the Project study influence of potential difference on the dynamics of gas accumulation in gas-liquid fluids and studied the methods of regulation and a comparison of nucleation due to differential pressure with the process required difference electropotentials.

In the course of the report, the Department employees continued researches within the framework of the “Development of a new hydrodynamic method for optimizing the process of displacement of residual oil in

heterogeneous formations” Project supported of the SOCAR Scientific Foundation.

Corresponding member of ANAS, doctor of technical Sciences Geylani Panakhov and leading researcher Ph.D., associate Professor Eldar Abbasov at the invitation of the scientific center "New Horizon" (Beijing) visited the people's Republic of China on a business trip.

17 - 30 March 2019, employees of the Institute of Mathematics and Mechanics of ANAS, Department head, corresponding member of ANAS Geylani Panahov and leading researcher, Ph.D. Eldar Abbasov were on a scientific trip to the People's Republic of China and the Socialist Republic of Vietnam.

During the visit, the research teams of IMM and GCC conducted joint investigations with the Institute of Advanced Technology in Fencheng (Jiangxi province). Ongoing research in the field of viscoelastic compositions in the oil and gas industry under the leadership of corresponding member of ANAS Geylani Panakhov has become the basis for the search for ways of their application in the fields of China, Azerbaijan, the Russian Federation and other countries.

As a result of experiments conducted by Geylani Panakhov and Eldar Abbasov, new viscoelastic compositions were investigated in the laboratories of the Fencheng Institute, as well as subsequent laboratory and field studies are planned.

25 - 30 March 2019 corresponding member of ANAS Geylani Panakhov and leading researcher, Ph.D. Eldar Abbasov took part in a scientific and practical conference organized by the joint Russian-Vietnamese enterprise “Vietsovpetro” in Dalat (Republic of Vietnam). On March 29, IMM employees, invited by Vietnam's leading oil and gas production company, made a scientific report on the topic " Experience in corrosion control of installations and technological pipeline systems in the offshore fields of Azerbaijan and proposed solutions in connection with corrosion protection of oil pipelines and pipelines in the offshore fields of JV

"Vietsovpetro". Employees of IMM ANAS also demonstrated the importance of corrosion prevention of the inner space of pipelines by cleaning from various accumulations, and presented the developments of the "Fluid Mechanics" Department.

As a result of the discussion, it was noted that the management of Vietsovpetro is interested in cooperation with representatives of IMM on the application of innovative technologies on the Vietnam's oil fields.

Employees of the Department also carried out technological operations at the Binagadi Oil Company to intensify oil production at 7 production wells and change the pick-up profile at one injection well.

During the reporting period, 5 articles were published, 2 articles and 4 abstracts were accepted for publication:

1. Panakhov G. M., Abbasov E. M. process Control of capillary instability under hydrodynamic influence on the formation / / Azerbaijan Oil industry, 2019 (accepted for publication).
2. Panakhov G. M., Abbasov E. M., Yuzbashieva A. O., Balakchi V. D. Features of clay swelling in electrolyte solutions / / Oilfield business, No. 4, 2019 (in press).
3. Geylani M. Panahov, Eldar M. Abbasov, Parviz T. Museibli and Sayavur I. Bakhtiyarov an Effect of Electrokinetic Phenomena on Nonlinear Wave Propagation in Bubbly Liquids / / Fluid Dynamics Research, 2019 (təqdim olunmuşdur).
4. Parviz T. Museibli Mathematical modeling effect of electrostatic field forming in flow on hydraulic characteristics of two phase mixtures / / Advances and Applications in Mathematical Sciences (ISSN 0974-6803) (təqdim olunmuşdur).

5. Geylani M. Panahov, Ali B. Aliyev, Gulnar M. Salmanova, Nazrin B. Naghiyeva Wave flow of viscous fluid in elastic tube / / Transactions of ANAS, issue Mechanics, Vol. 39, No. 7, 2019 (çapa qəbul edilmişdir).

Corresponding member of ANAS Geylani Panahov carries out scientific supervision of 3 PhD students.

Corresponding member of ANAS Geylani Panakhov, professor Yasin Rustamov and associate professor Eldar Abbasov conduct classes in various disciplines in the master's program of IMM.

Department Head Geylani Panakhov and senior researcher Afat Yuzbashieva teach at BSU, Geylani Panakhov takes part in the examination and diploma defense of bachelors in the specialty "Mechanics", being the Chairman of the State examination Commission of BSU.

During reporting period leading researcher Eldar Abbasov supervised the production practice of the IV course of the mechanics and mathematics faculty of Baku state University in the groups M-050 and M-043 in the specialty 050502 "Mechanics".

Department head,

corresponding member of Azerbaijan NAS

Geylani Panahov