

Name of the project: IRNAP09058149 «Investigation of electro-discharge demolition of reinforced concrete products and solid waste for the development of a mobile complex for their recycling and utilization».

Relevance: The relevance of the project is due to the growing need for the destruction and utilization of hard concrete and reinforced concrete structures during repair, dismantling and subsequent utilization at the decommissioning of buildings and structures. This is especially true for the objects of the residential and industrial complex of Kazakhstan and in particular the Akmola region during the construction period of the 60s of the last century. Reinforced concrete, which is the main building material of these objects, has practically exhausted its resource. Currently, the only way to eliminate construction waste is to take it to a landfill. From an environmental and economic point of view, this approach cannot be called effective.

Aim: Development of physicotekhnical foundations of electro-discharge method for destruction of reinforced concrete to increase the efficiency of its utilization and recycling, reduce the environmental load by minimizing the volume of man-made waste and introduction of energy-saving environmentally friendly technologies in the course of dismantling and repairing buildings and structures.

Expected and achieved results:

The project results will be used to prepare a technical proposal and a draft technical specification for a mobile installation for the destruction of large-sized reinforced concrete products with the possibility of recycling steel reinforcement and concrete stone.

Recommendations for the possibility of using the research work results will be developed in the real sector of the economy: for the utilization of large-sized reinforced concrete products with the possibility of reusing steel reinforcement and concrete stone, for the destruction of oversized and building foundations.

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- The applied generators, the parameters of the voltage pulse applied to the sample, the optimal geometry of the electrode system, working fluids, hardware design, prototypes and analogues are analyzed.
- The phenomenology of the process of electric-discharge destruction of reinforced concrete has been developed, monitoring and analysis of the current state of research and achievements in the scientific field of the project have been carried out.
- A phenomenological model of electric-discharge destruction of substandard concrete of different grades and composition has been developed.
- A phenomenological description of the electrical impulse softening of concrete structures is given: initiation and development of discharge channels, their development in concrete, the dynamics of expansion of a plasma monochannel during breakdown, generation and propagation of shock-wave disturbances, taking into account the physical and mechanical properties of concrete, the kinetics of its cracking and destruction.
- The main physical processes occurring during shock-wave action on concrete and the features of its destruction are considered.
- A phenomenological model of electric-discharge destruction of reinforced concrete has been developed, taking into account the geometry of the reinforcement cage and the depth of the reinforcement.
- The data obtained from measurements of physical and mechanical characteristics and the presence of defects in samples of substandard concrete of different grades (V 7.5; V 20; V 30), the degree of their fracturing and defectiveness.
- Accepted for publication 1 article "Experimental Measurements on a Concrete Destruction Volume for the Electric Explosion Model Verification" at Enbekter University - Proceedings of the University (Karaganda Technical University) recommended by Committee for Control in the Sphere of Education and Science.

Project Manager: Sarsikeyev Yermek Zhaslanovich, PhD. H-index Scopus – 5, Web of Science – 4. Scopus Author ID – 56252099900, Web of Science Researcher ID – I-9900-2016, ORCID [0000-0002-7209-5024](https://orcid.org/0000-0002-7209-5024).

Research team members:

1. Kuznetsova Natalia Sergeevna - executive, PhD in Physics and Mathematics, specialty "Condensed matter physics".

2. Akimzhanov Temirbolat Baltabaeyevich – executive, PhD in the specialty "Electrical Power Engineering"

3. Suleimenova Gulmira Orazbayevna - executive, engineer specializing in Electrotechnological Installations and Systems, Master's degree in Electrical Power Engineering.

4. Atyaksheva Anastasia Dmitrievna - executive, master's degree in Environmental Management.

5. Mekhtiev Ruslan Alievich – executive, master's degree in " Heat power engineering".

6. AmzinaAdemaKusainovna – executive, doctoral student.

Information for potential users:

Recommendations will be developed on the possibility of using the results of the research work carried out in the real sector of the economy: for the utilization of large-sized reinforced concrete products with the possibility of reusing steel reinforcement and concrete stone, for the destruction of oversized and building foundations.