The title of the project topic is: IRN №AP19679802 "Development of working bodies for forced crushing and grinding of feed from waste of plant and animal origin".

Relevance: Many feed processing lines provide for preliminary crushing and final grinding. Carrying out crushing and grinding in a step-by-step sequence of destruction of raw materials is often associated with limiting equipment overloads. At the same time, in the process of destruction of processed raw materials, the working parts of the technological equipment, through which the raw materials are divided into parts, are of primary importance. The idea of the project is to develop intensive working bodies that can eliminate the cases of unused areas (empty zones) of the surfaces of the working bodies, and increase the efficiency of the working bodies for coarse, medium and fine grinding, while taking into account the possibilities for improvement through engineering ideas and theoretical justifications. The project complies with the principles of the "Green Economy", with a focus on waste processing and is a solution to the current problem of feed preparation processes.

Purpose: development and construction of various working bodies for crushing feed ingredients from waste of plant and animal origin with the rapid production of feed products of various fractions.

Expected results: science-based hypotheses will be found based on existing theories of cracking, impact, brittle fracture, deformation, shear, wave theory, engineering ideas and up to 7-10 main factors affecting the mechanical processes of crushing and grinding in the production of feed from plant and animal waste will be identified. Applications will be filed for 3 (three) patents of National Institute of Intellectual Property. Simulation of the mechanical processes of crushing and grinding will be carried out with the construction of a mathematical model, which will make it possible to intensify the action of the working bodies for crushing and grinding feed to obtain a fraction of the required size from the resulting plant and animal waste. The results of research will be published in 1 (one) article or review in a peer-reviewed foreign or domestic publication recommended by the Committee for ensuring control in the field of science and higher education, as well as in 2 (two) articles and (or) reviews in peer-reviewed scientific publications indexed in the Science Citation Index Expanded Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 35 (thirty-five). A number of structures of the working bodies of devices for crushing and grinding to obtain coarse, medium and finely ground feed will be designed and constructed. Scientific and technical, design documentation will be developed. Research results will be published in 2 (two) articles and (or) reviews in peer-reviewed scientific journals indexed in the Science Citation Index Expanded of the Web of Science database and (or) with a CiteScore percentile in the Scopus database of at least 35 (thirty-five). The results of the project will be reported at scientific conferences, seminars, forums.

The results obtained: the scientific, technical and patent-licensing information in the field of research is systematized, attention is paid to the comparative characteristics of the constructions of working bodies for crushing and

grinding. Advanced developments on the design of working bodies for crushing and crushing are summarized, basic information and factors affecting the mechanical processes of crushing and crushing feed from waste of plant and animal origin are established, shortcomings in the constructions of hammer crushers, screw shredder with knives, disc crusher are identified, hypotheses are put forward on the development and design of working bodies for crushing and grinding of feed. The purchase of components and equipment has been carried out. The design features of breaking discs, cutting tapes, knives, hammers, impact-destroying devices have been studied. It has been established that one of the promising ways to improve crushing and grinding is to combine cutting, breaking, splitting, and abrasion methods in one device with a series of working bodies. A feed shredder has been developed, the cutting functions of coils with a combined impact of an impact device have been improved, a hammer for crushing and crushing has been developed. Drawings of a general view of the shredder, impact organs, turns for cutting, grooved hammers, devices for crushing, cutting, working surfaces for crushing, crushing and destruction, hinge holes, combined devices have been developed. Applications have been submitted for 3 (three) patents of the National Institute of Intellectual Property.

Research team members:

Ruslan Maratbekovich Iskakov - Candidate of Technical Sciences (PhD), Associate Professor, Project Manager

(Scopus Author ID: 55965285900, Researcher ID: P-7436-2017, ORCID: 0000-0002-5948-2636, https://www.scopus.com/authid/detail.uri?authorId=55965285900; https://publons.com/researcher/2045750/ruslan-maratbekovic-m-iskakov/; https://orcid.org/0000-0002-5948-2636*);*

Toktar Abilzhanuly - Doctor of Technical Sciences, Professor, Senior Researcher

(Scopus Author ID: 57193110431, ORCID: 0000-0002-9513-1702, https://www.scopus.com/authid/detail.uri?authorId=57193110431, https://orcid.org/0000-0002-9513-1702);

Aleksandr Alexandrovich Gulyarenko - PhD, Associate Professor (Associate Professor), Researcher

(*Scopus Author ID: 57201112442, ResearcherID: P-5862-2017, ORCID: 0000-0002-4562-367X,*
https://www.scopus.com/authid/detail.uri?authorId=57201112442,
https://www.webofscience.com/wos/author/record/P-5862-2017,
https://orcid.org/0000-0002-4562-367X);

Aru Zhalgasbaykyzy Ukenova - Master of Agricultural Sciences, Junior Researcher

(Scopus Author ID 57730406100, ResearcherID: GYV-3924-2022, ORCID: 0000-0002-2797-672X,
https://www.scopus.com/authid/detail.uri?authorId=57730406100,
https://www.webofscience.com/wos/author/record/35034142,

https://orcid.org/0000-0002-2797-672X).

Information for potential users: the target consumers of the expected results of the developed working bodies for forced crushing and grinding are design bureaus, higher educational institutions, farms, feed preparation shops.

Additional information: scope - agricultural engineering.