AP19675518 "Creation of a prototype of an innovative passenger pneumolift for buildings and structures" – p.m. Taranov A.V.

Relevance

The market for light passenger elevators needs to be modernized. In Kazakhstan, there are 5,000 elevators in operation that have reached their standard service life (according to the National Association of Elevator Engineers of Kazakhstan). A similar situation is observed in other CIS markets.

Domestic development of passenger pneumatic lifts solves this problem, providing the safest equipment on the market.

The significant advantages of pneumatic lifts , compared to rope and other types (hydraulic, rack, etc.), are:

- simplicity of design;
- reliability and safety in operation;
- unlimited lifting height;
- reduction of costs for manufacturing, installation and operation;
- a small required excess pressure of compressed air in the subvascular cavity of the shaft creates favorable dynamic conditions for the operation of the pneumatic lift.

The project methodology is based on the theoretical foundations of mechanical engineering and electrical engineering, pneumatic devices and systems, mathematical statistics, methods of measuring and processing experimental results and methods of specialized software for design work.

As a result, a package of design documentation will be developed and a prototype of a pneumatic passenger lift will be manufactured . Potential consumers of the project are residential buildings of medium and high floors, business centers and other administrative buildings. The basic operating principle and technical capabilities were successfully developed by the research group and tested on a serial pneumatic cargo lift.

The development of pneumatic lifts for passengers allows us to offer the market a domestic export-oriented solution that surpasses foreign analogues in terms of characteristics.

Project goal

The purpose of this project is to create a pilot industrial model of a passenger pneumatic lift, as well as design and technological documentation.

Expected results

1. Design, engineering and technological documentation for a passenger pneumatic lift for residential buildings.
2. Application for a Eurasian patent.
3. Experimental industrial model of a passenger pneumatic lift for residential buildings.
4. At least 3 (three) articles and/or reviews in peer-reviewed scientific publications indexed in the Science Citation Index Expanded of the Web of Science database and/or having a CiteScore percentile in the Scopus database of at least 35 (thirty-five).
5. At least 1 article or review in a peer-reviewed foreign or domestic publication recommended by COXONE.
6. At least 3 (three) reports at international conferences.

Results achieved

1. The technology and technical specifications for designing the structure of a passenger pneumatic lift have been developed
2. An application for a Eurasian patent has been filed
3. Equipment and software purchased
4. Submitted article V magazine Scopus database " International review of mechanical engineering "

5. An article was published in the journal “Proceedings of the University” recommended by KOKSON

6. 3 reports presented at international conferences

7. 3D models of elements of a multi-story passenger pneumatic lift have been developed to implement a functional scale model using additive technologies.

8. The boundary conditions and requirements for the characteristics of the sealing elements and their design were determined.

9. Materials have been selected to produce a reliable seal.

10. Laboratory tests of the selected materials were carried out for final validation of their compliance with the established requirements.

11. Published article V in the International Journal on Technical and Physical Problems of Engineering, part of V Scopus database , percentile 40.

12. Laboratory tests of elevator bumpers and vibration isolators were carried out .

Figure 1 – Pilot industrial model of a cargo pneumatic lift for buildings and structures

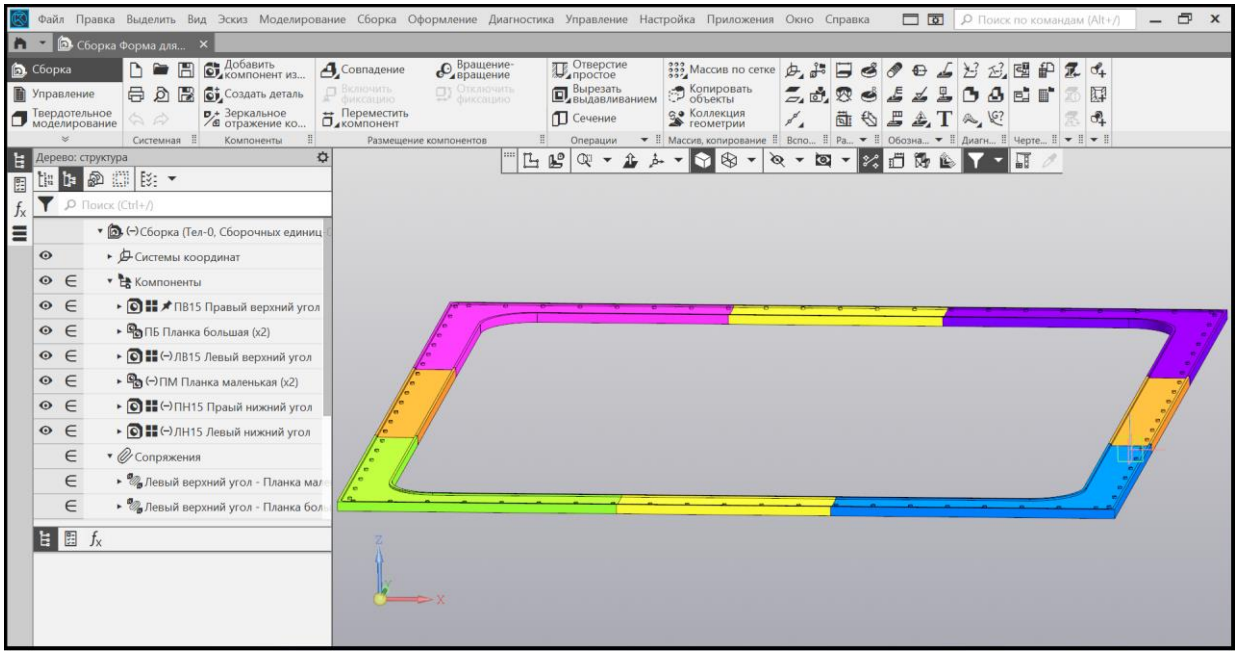

Figure 2 – Mold for sealing devices

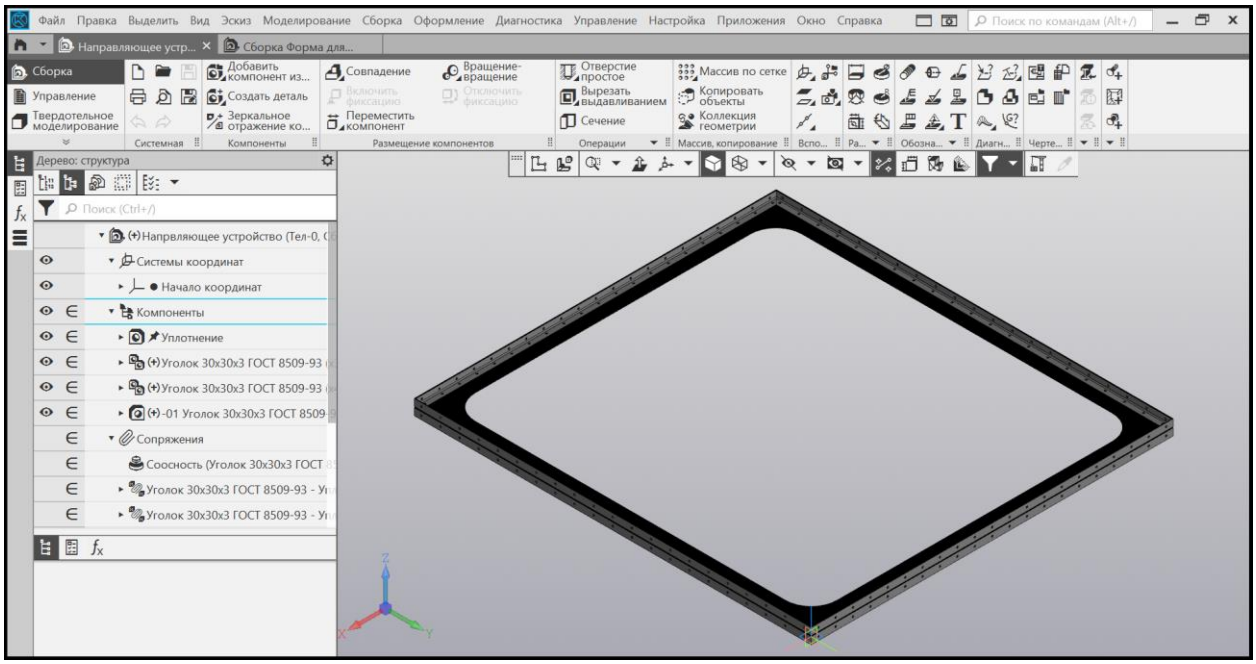

Figure 3 – Sealing device

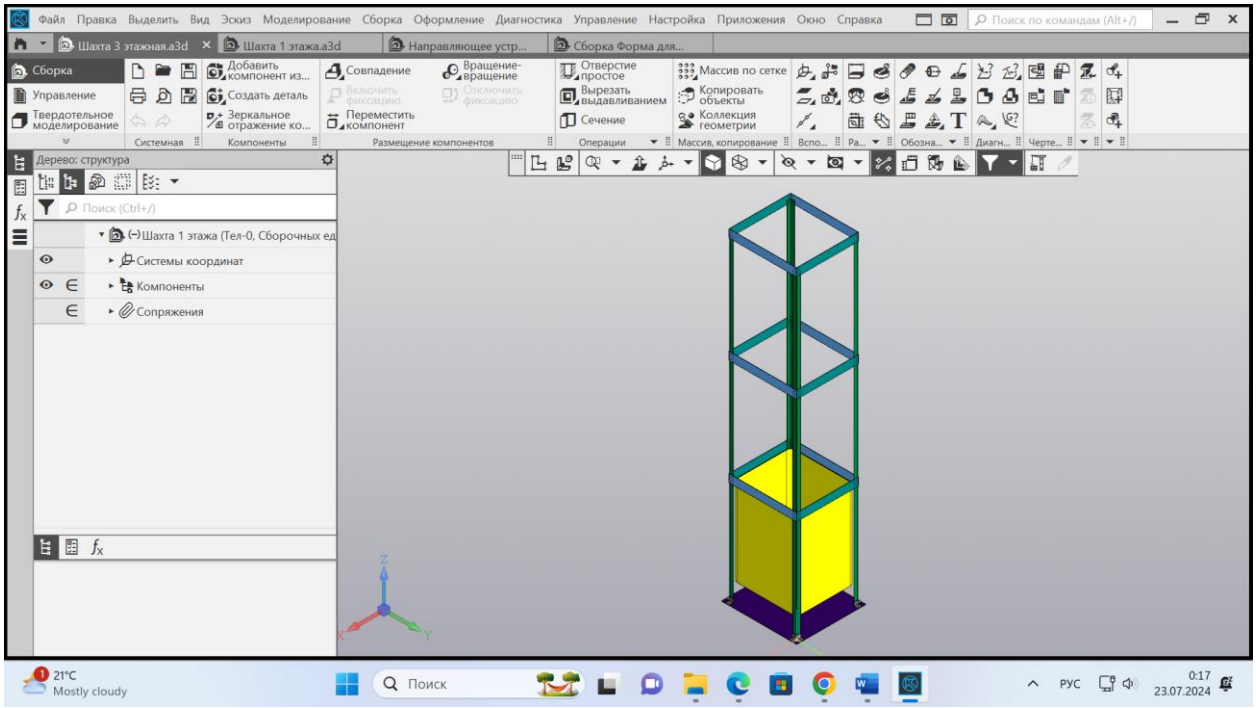

Figure 4 – Elevator shaft

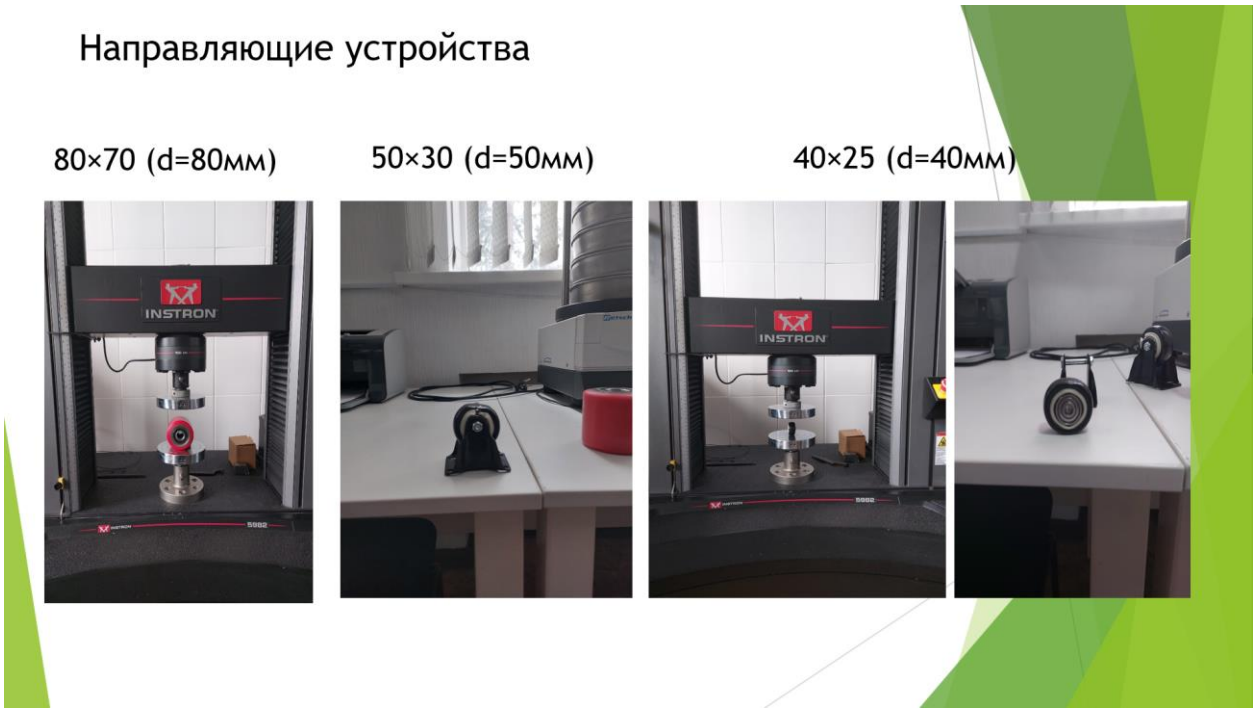

Figure 5 – Tests of guiding devices

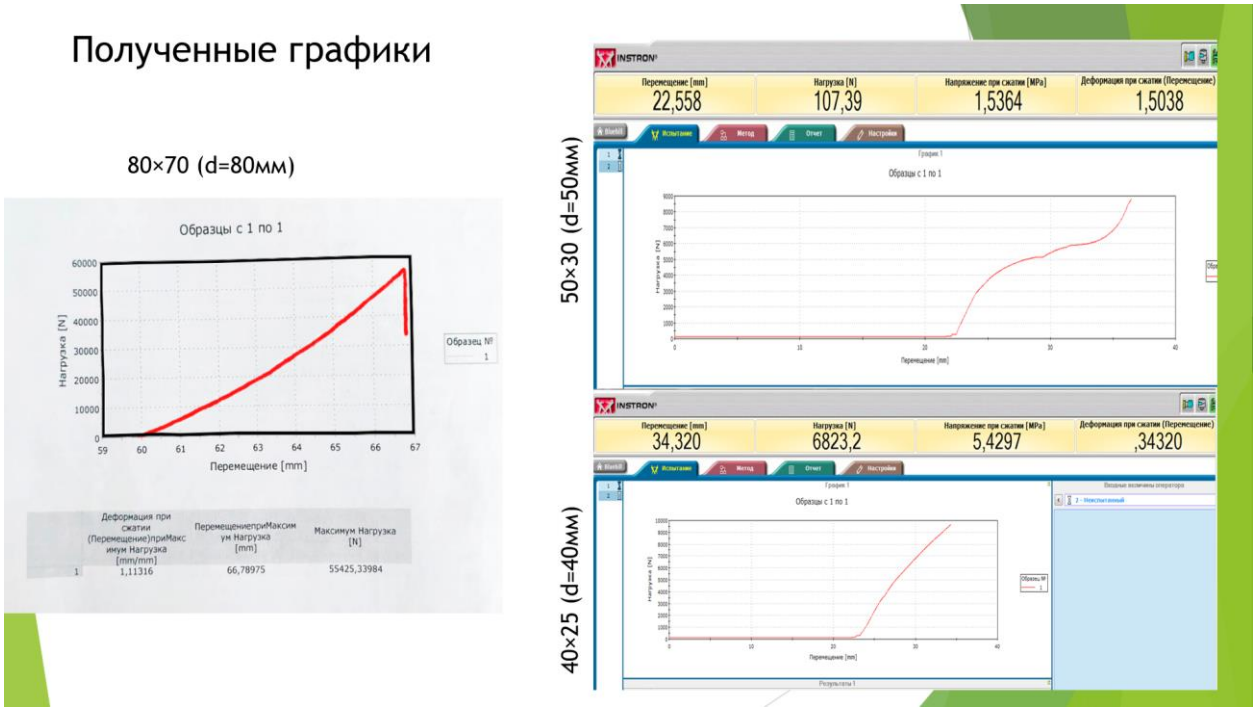

Figure 6 – Load graphs of guide devices

Figure 7 – Fans manufactured by Tyra

Figure 8 – VFD500 frequency converters	**Figure 9 –** Manual laser welding machine

Figure 10 – Testing of elevator bumpers and vibration isolators

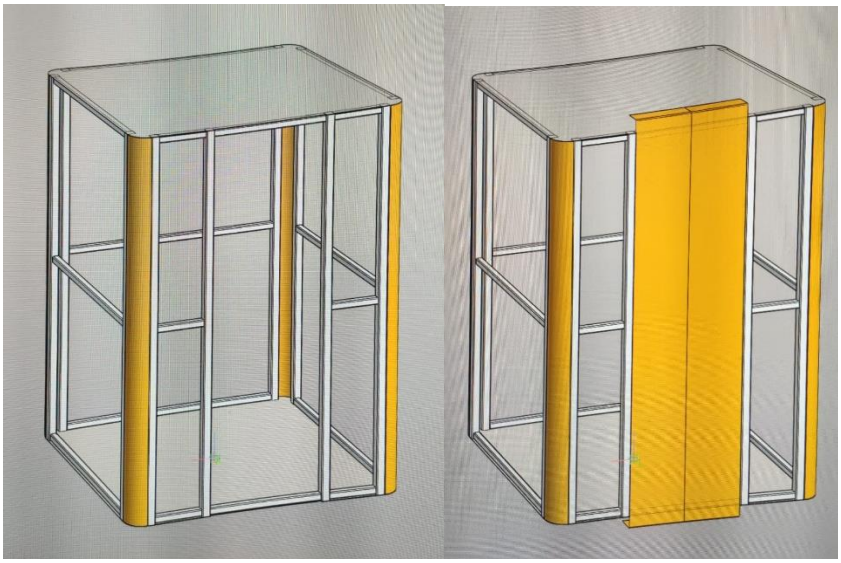

Figure 11 – Elevator cabin frame

Figure 12 – Construction of the pit

Research group

The composition of the research group for conducting scientific research:

Item No.	Full name (if any), education, degree, academic title	Main place work , position	Index Hirsch , identifiers ResearcherID , ORCID, Scopus Author ID (if available)	Role in the project or program and the nature of the work performed	Brief justification participation
1	Taranov Alexander Viktorovich, Candidate of Technical Sciences, no	Non-profit joint-stock company "Karaganda Technical University named after Abylkas Saginova , Associate Professor of the Department of Energy Systems	Index Hirsch 3, ORCID - 0000-0002-1534-9737, Scopus Author ID - 56669560400	Scientific Director General management, strategic planning. Managing the progress and analyzing the results of project decisions	24 years of research experience. Experience in creating cargo pneumatic lifts three modifications.
2	Suleimanov Seidamet Rishadovich, postgraduate study, no	Limited Liability Partnership " Kaztekhavtomatika ", project manager	Index Hirsch 1, ORCID - 0000-0001-5753-3789, Scopus Author ID - 56669831600, ResearcherID - ADZ-1365-2022	Responsible executive. Development of technology, its adaptation to market needs, participation in the preparation of patents and publications.	15 years of research experience. Experience in developing and commercializing innovative technologies. Understanding needs market . Was leader successfully realized project commercialization
3	Bulatbaev Felix Nazimovich , Candidate of Technical	Non-profit joint-stock company "Karaganda Technical	Index Hirsch 7, ORCID-0000-0002-3574-1189,	Executor Development of technology, preparation of publications and	23 years of research experience. Experience in

	Sciences, Associate Professor	University named after Abylkas Saginova , Professor of the Department of Energy Systems	Scopus Author ID - 56669831600	patents, implementation of theoretical and practical research.	developing mining machines.
4	Kaydanovich Olga Yurievna , Master of Technical Sciences	Non-profit joint-stock company "Karaganda Technical University named after Abylkas Saginova »		Executor Participation in all stages of the project. Preparation of reports, articles, patents, preparation of technical documentation.	Master
5	Baidyusenov Galym Nurzhanovich , master	Non-profit joint-stock company "Karaganda Technical University named after Abylkas Saginova , senior lecturer	h-index 0, ORCID 0000-0001-6145-7117, Scopus Author ID 57541025100	Executor Participation in all stages of the project. Preparation of reports, articles, patents. Mathematical, computer modeling, preparation of technical documentation	He completed his doctoral studies at AUES and has 5 years of experience in studying thermal insulation and heating network operating modes. He is the author of 7 scientific articles .
6	Balandin Vitaly Sergeevich , master	Non-profit joint-stock company "Karaganda Technical University named after Abylkas Saginova , senior lecturer	ORCID - 0000-0002-6593-1864, Scopus Author ID - 57215332448	Executor Participation in all stages of the project. Preparation of reports, articles, patents. Mathematical, computer modeling, preparation of technical documentation.	Engineer specializing in "Electric Power Engineering". Scientific and teaching experience of 17 years. Published more than 50 scientific papers .

List of publications for 2023:

1) Taranov A.V. // Methodology of factory testing of pneumatic lifts for buildings and structures // International scientific and practical conference "XV Toraigyrovskie readings", Pavlodar, 2023, pp. 203-207

2) Taranov A.V. // The influence of compressed air leaks on the operation of a skip pneumatic lifting unit // International scientific and practical conference "Integration of science, education and production - the basis for implementing the National Plan" (Saginovskie readings No. 15), Karaganda, 2023, pp. 525-526

3) Taranov AV // Experimental study of the skip pneumatic hoisting plant model // Proceedings University , No. 3 (92), 2023, pp . 513-518 (DOI 10.52209/1609-1825_2023_3_513)

List of publications for 2024 :

1) Testing of guide devices of passenger pneumatic lifts . Taranov A.V., Lukin D.A. International scientific and practical conference "Integration of science, education and production" (Saginovskie readings No. 16), Karaganda, 2024, pp. 699-701

2) Taranov , A.D. Mekhtiyev *, FN Bulatbayev , YG Neshina , VS Balandin // Pneumatic Load Hoists For Mineral Transportation From Mines // NEWS of the National Academy of Sciences of the Republic of Kazakhstan, No. 5(466), 2024, pp. 167-177.

3) Taranov A.V., Suleimanov S.R., Bulatbaev F.N., Brazhanova D.K., Isaev V.L., Kyzyrov K.B., Isaev I.V., Kalytka V.A. // Piston pump // Application for Eurasian patent No. 298471 dated 01.07.2024

4) Taranov A.V., Suleimanov S.R., Bulatbaev F.N., Brazhanova D.K., Isaev V.L., Kyzyrov K.B., Isaev I.V., Kalytka V.A. // Gear hydraulic motor // Application for Eurasian patent, 2024

Information for potential users

Technical and economic calculations have shown that the simplification of the pneumatic lift design has led to a reduction in the costs of its manufacture, installation, maintenance, operating costs, and the elimination of costs for construction, installation, and adjustment work by 2-3 times (depending on the type of lift). This, in turn, makes the pneumatic lift competitive with existing rope and other types of freight elevators, and eliminates Kazakhstan's dependence on foreign suppliers of such equipment.

Scope of application

Field of Science - Hoisting and Transport Machinery. Potential consumers of the project are residential buildings of medium and high storeys, business centers and other administrative buildings. Development of pneumatic lifts for passengers allows us to offer the market a domestic export-oriented solution that surpasses foreign analogues in characteristics.

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