

## DEVELOPMENT OF VORTEX COMPRESSED AIR DRYING DEVICES FOR GROUND LAUNCH COMPLEX SYSTEMS

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**The possibility of using the vortex effect for drying compressed air used in various industrial installations including systems for thermostating ground launch complexes is shown. A mathematical model of the process of reducing the moisture content is presented and a method for calculating the optimal geometric dimensions of the vortex drying device is created. The results presented in this paper allow us to increase the efficiency of production processes that use compressed air as a working fluid.**

**Keywords:** launch complex, pneumatic system, Ranque effect, vortex flow, moisture content, mechanical drying.

### References

1. Belkov V. N., Kraus Yu. A., Lanshakov V. L. Sintez i analiz konstruktivno-komponovochnykh skhem startovykh kompleksov [Synthesis and Analysis of Design and Layout Schemes of Launch Complexes]. Omsk: OmSTU Publ., 2008. 102 p. ISBN 5-8149-0519-0. (In Russ.).

2. Biryukov G. P., Grankin B. K., Kozlov V. V. [et al.]. Osnovy proyektirovaniya raketno-kosmicheskikh kompleksov. Metodologiya obosnovaniya oblika kompleksov [Basics of designing rocket and space complexes. Methodology for substantiating the appearance of complexes]. St. Petersburg, 2002. 320 p. (In Russ.).

3. Tekhnologicheskkiye ob"yekty nazemnoy infrastruktury raketno-kosmicheskoy tekhniki: inzhenernoye posobiye [Technological Objects of Ground Infrastructure of Rocket and Space Technology: Engineering Manual]. In 2 bks. / Ed. I. V. Barmin. Moscow, 2006. Bk. 2. 376 p. (In Russ.).

4. Ripol-Saragosi L. F. Osushka szhatogo vozdukha v pnevmomagistralyakh UZOT PTO vagonnykh depo [Drying of Compressed Air in Pneumatic Lines of DCTB LTE of Car Depots] // Vestnik Rostovskogo gosudarstvennogo universiteta putey soobshcheniya. *Vestnik Rostovskogo Gosudarstvennogo Universiteta Putey Soobshcheniya*. 2008. No. 1 (29). P. 18–22. (In Russ.).

5. Galyuzhin A. S. Povysheniye bezopasnosti pnevmoprivodov putem uvelicheniya stepeni osushki szhatogo vozdukha [Improvement of safety of pneumatic actuators by increasing the degree of compressed air drying] // Vestnik Belorussko-Rossiyskogo universiteta. *Vestnik Belorussko-Rossiyskogo Universiteta*. 2016. No. 2 (51). P. 6–14. (In Russ.).

6. Ripol-Saragosi T. L., Ripol-Saragosi L. F. Otsenka i analiz konkurentosposobnosti razlichnykh metodov osushki szhatogo vozdukha [Competitiveness evaluating and analysis for different compressed air drying methods] // Inzhenernyy vestnik Dona. *Engineering Journal of Don*. 2012. No. 4-2 (23). P. 86. (In Russ.).

7. Suslov A. D., Ivanov S. V., Murashkin A. V. [et al.]. Vikhrevyye apparaty [Vortex Devices]. Moscow, 1985. 256 p. (In Russ.).

8. Nadeev A. A., Barakov A. V., Dubanin V. Yu. [et al.]. Eksperimental'noye issledovaniye protsessa sushki silikagelya v apparate s tsentrobezhnym psevdoozhizhennym sloym [Experimental study of the silica gel drying process in the apparatus with centrifugal fluidized bed] // Vestnik Voronezhskogo gosudarstvennogo tekhnicheskogo universiteta. *Bulletin of Voronezh State Technical University*. 2018. Vol. 14, no 2. P. 44–50. (In Russ.).

9. Smulskiy I. I. Aerodinamika i protsessy v vikhrevykh kamerakh [Aerodynamics and Processes in Vortex Chambers]. Novosibirsk, 1992. 301 p. ISBN 5-02-030300-3. (In Russ.).

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### For citations

Yakovlev A. B. Development of vortex compressed air drying devices for ground launch complex systems // Omsk Scientific Bulletin. Series Aviation-Rocket and Power Engineering. 2020. Vol. 4, no. 2. P. 111–116. DOI: 10.25206/2588-0373-2020-4-2-111-116.

Received March 5, 2020.

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