
MULTICRITERIA OPTIMIZATION OF A HIGH-SPEED CENTRIFUGAL PUMP

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Abstract

The cavitation problem is one of the most difficult to solve during development of high-speed centrifugal pumps, since pump cavitation performance decreases with increasing rotor rotation frequency. At the same time, lowering the frequency makes the hydraulic head of a centrifugal pump decrease. We suggest using a search method based on Sobol sequences to plot a compromise curve that would resolve the discrepancy between the cavitation performance and the hydraulic head of a centrifugal pump

Keywords

Runner blades, rotor, positive suction head, mathematical model, hydraulic head, rotor frequency

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References

- [1] Lomakin V.O., Petrov A.I., Kuleshova M.S. Investigation of two phase flow in axial centrifugal impeller by hydrodynamic modeling methods. *Nauka i obrazovanie: nauchnoe izdanie MGTU im. N.E. Baumana* [Science and Education: Scientific Publication of BMSTU], 2014, no. 9, pp. 45–64. URL: <http://technomag.edu.ru/jour/article/view/677> (in Russ.) DOI: 10.7463/0914.0725724
 - [2] Cherkasskiy V.M. *Nasosy, ventilyatory, kompressory* [Pumps, ventilators, compressors]. Moscow, Energoatomizdat Publ., 1984. 416 p. (in Russ.)
 - [3] Lomakin A.A. *Tsentrobezhnye i osevye nasosy* [Impeller and propeller pumps]. Moscow, Mashinostroenie Publ., 1966. 364 p. (in Russ.)
 - [4] Lomakin V.O., Artemov A.V., Petrov A.I. Determining the impact of basic geometric parameters drain pump NM 10000-210 on its performance. *Nauka i obrazovanie: nauchnoe izdanie MGTU im. N.E. Baumana* [Science and Education: Scientific Publication of BMSTU], 2012, no. 8, pp. 71–84. URL: <http://old.technomag.edu.ru/doc/445666.html> (in Russ.)
 - [5] Lomakin V.O., Petrov A.I. Verification of computation results of the AX 50-32-200 centrifugal pump wet part in the software package STAR CCM+. *Izvestiya vysshikh uchebnykh zavedeniy. Mashinostroenie* [Proceedings of Higher Educational Institutions. Machine Building], 2012, no. S, pp. 6–9. (in Russ.)
 - [6] Lomakin V.O., Petrov A.I., Shcherbachev P.S. Development of a side semi spiral Inlet unit with increased fluid velocity at the Impeller entry. *Izvestiya vysshikh uchebnykh zavedeniy. Mashinostroenie* [Proceedings of Higher Educational Institutions. Machine Building], 2012, no. S, pp. 3–5. (in Russ.)
 - [7] Petrov A.I., Martynov N.D., Pokrovskiy P.A., Pashchenko V.I., Ustyuzhanin P.Yu., Korolev P.V., Artemov A.V. The experience of designing test bench for testing large centrifugal pumps. *Nauka i obrazovanie: nauchnoe izdanie MGTU im. N.E. Baumana* [Science and Education: Scientific Publication of BMSTU], 2010, no. 11, pp. 1–6. URL: <http://technomag.bmstu.ru/doc/163848.html> (in Russ.)
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