On the Vacuum Pumps of Gradational Lead Screws with Compressibility

盧芳志、鄭鴻儀

E-mail: 9314617@mail.dyu.edu.tw

ABSTRACT

This paper applying the differential geometry, coordinate system method, and conjugating surfaces meshing theory, the mathematical models of the screw rotor surfaces can be derived, can effective reduce noise when screw rotor revolve in high speed, opened root of screw rotor to enhance manufacturability and tool life, that the working efficiency can be increased and the mechanical loss thereof can be reduced, employ design of non-symmetrical compound curves in screw rotor contour and gradational lead screw, based on kinematic relation between screws, the model of dynamic simulation. Final, make four example of different gradational lead screw, obtain the change of screws rotor geometric characteristic include the air chamber volume and the compress of compress chamber, the length of the sealing, and compare of merit and shortcoming, and optimized design model of the screws for vacuum pumps of gradational lead screws with compressibility will be also proposed at last.

Keywords : Gradational Lead Screw ; Non-Symmetrical Compound Curves ; Vacuum Pump

Table of Contents

REFERENCES

1. Litvin, F. L. and Feng, P. H.,“ Computerized Design and Generation of Cycloidal gearing ”, Mech. March. Theory Vol.31, No. 7, pp. 891-911, 1996. 2. Litvin, F. L. and Feng, P. H.,“ Computerized Design, Generation, and Simulation of Meshing of Rotors of Screw compressor ”, Mech. March. Theory Vol.32, No. 2, pp. 137-160, 1997. 3. Tong, S. H. and Yang, C. H.,“ Generation of Identical Noncircular Pitch Curves ”, Power Transmission and Gearing Conference, Vo1.88, pp. 781-787, 1996. 4. Argyris, J., Litvin, F. L., Peng, A. and Stadtfeld, H. J.,“ Axes of Mesh and Their Application in Theory of Gearing ”, Comput. Methods Apple. Meth. Engrg. pp. 293-310, 1998. 5. Stosic, N., Smith, I. K. and

Kovacevic, A.,“ Optimisation of Screw Compressors ”, Applied Thermal Engineering, pp. 1177-1195, 2003. 6. 朱鋐道，“ 哈華特泵新齒形的探討 ”，機械月刊，第二十二卷，第九期，第271-279頁，1996。 7. 陳峰志與周榮源，“ 乾式真空泵浦魯式及爪式轉子幾何輪廓 ”，機械月刊，第二十三卷，第5期，第298-305 頁，1997。 8. 黃振康，“ 雙螺旋式壓縮機數值模擬與性能分析 ”，國立台灣大學機械工程研究所碩士論文，1997。 9. 蔡潔雯，“ 利用作用線推導螺旋式壓縮機轉子之齒形數學模式 ”，國立中正大學機械所碩士論文，1999。 10. 黃妃釧、蔡潔雯，“ 乾式螺旋式壓縮機轉子齒形設計簡介 ”，機械月刊，第二十六卷，第十一期，第348-355頁，2000。 11. 黃明祥，“ 具非對稱形螺桿螺旋式壓縮機之設計 ”，大葉大學機械工程所碩士論文，2000。 12. 吳召信，“ 利用曲線型作用線推導三維螺旋轉子之共軛齒型數學模式與設計研究 ”，國立中正大學機械所碩士論文，2002。 13. 游育權，“ 雙螺旋式真空螺桿幾何設計及性能分析 ”，大葉大學自動化工程所碩士論文，2002。 14. Astberg, A.,“ Screw Rotor Machine and Rotor Profile Therefor, ” United States Patent No.4435139, Mar.6, 1984. 15. Nagai, T.,“ Rotor for a Screw Fluid Machine ”, United States Patent No.4,915,604, Apr.10, 1990. 16. Nagai, T.,“ Nonlubricated Screw Fluid Machine ”, United States Patent No.4,952,125, Aug.28, 1990. 17. Chen, C. H.,“ Screw Compressor with Rotors having Hyper Profile ”, United States Patent No.5,454,701, Oct.3, 1995. 18. Son, K. Won.,“ Tooth Profile for Compressor Screw Rotors ”, United States Patent No.5,642,250, Apr.29, 1997. 19. Kameya, H., Nozawa, S., Masayuki, U., Hida, and T., Aoki, M.,“ Screw Fluid Machine ”, United States Patent No.6,257,855, Jul.10, 2001.