基于混沌-分形理论的往复式活塞隔膜泵磨损故障分析 Wearing Fault Diagnosis of Reciprocating Membrane Pump Based on Chaos and Fractal Theory

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关键词： 往复式活塞隔膜泵 磨损 故障诊断 分形 混沌

摘 要： 针对往复式活塞隔膜泵磨损故障，采用混沌理论和分形技术，对隔膜泵不同连接处磨损时的系统非线性表现形式加以研究。通过对不同故障类型振动信号的分析，绘制了相应的庞加莱截面图，并计算了各种磨损故障的最大李雅普诺夫指数和关联维数。研究表明当没有磨损故障时，系统为准周期态；而隔膜泵的各种磨损故障信号呈现混沌性态，且不同故障状态的最大李雅普诺夫指数和关联维数有着较大的差别，可以用作其状态监测和故障诊断的特征参数。 The non-linear behaviour for wearing fault of reciprocating membrane pump was investigated with chaos theory and fractal technology. The vibration acceleration signals of the wearing in different joint were collected to analyse. Poincare sections were drew to study the status of the system. Correlation dimension and the largest Lyapunov exponent were calculated to recognize the different wearing. The results showed that non-abrasion pump system is in quasi-period state, while the fault status is in chaos. The research also indicated that different wearing fault has different largest Lyapunov exponent and different correlation dimension, which can be used as the characteristics for the pump’s monitoring and fault diagnosis.

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