新能源与分布式发电

基于决策融合的直驱风力发电机组轴承故障诊断

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摘要：

基于振动信号时域、频域和包络谱等多源特征，采用决策融合方法构建了直驱风力发电机组轴承故障诊断模型。对直驱风力发电机组主轴轴承经常发生的外圈故障、内圈故障、滚动体故障以及正常运行4种状态进行了实验研究。选取具有较高故障区分度，适合风电机组轴承故障诊断的特征参数。以风电机组振动信号的时域特征、频域特征和包络谱频域特征为诊断样本，使用灰色关联分析方法对机组轴承故障进行初步诊断，然后用证据融合理论对不同证据进行决策信息融合，从而获得最终诊断结果。实验结果表明，该方法能较好地识别风力发电机组轴承故障。

关键词： 多源特征　决策融合　直驱风力发电机组　调心滚子轴承　故障实验　特征提取　故障诊断

Fault Diagnosis of Spherical Roller Bearing of Direct-Drive Wind Turbine Based on Decision Fusion

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Abstract:

Based on decision fusion of multi-source feature of vibration signal in time-domain and frequency-domain as well as its envelope spectrum, a fault diagnosis model of spherical roller bearing of direct-drive wind turbine is built. Experimental research on four states of direct-drive wind turbine including its normal operation and frequently occurred outer race fault, inner race fault and roller fault of spherical roller bearing of main shaft are performed in laboratory. In order to diagnose the faults of wind turbine bearings, some sensitive feature parameters, which possess higher fault discrimination degree and are suitable to bearing fault diagnosis of wind power generation unit, are selected. The vibration signal features of wind power unit in time-domain, frequency-domain and envelope spectrum in the frequency-domain are taken as diagnosis samples, and the preliminary diagnosis of bearing faults of the unit is carried out by gray incidence analysis; then the decision fusion of different evidences are implemented by evidence fusion theory to obtain final diagnosis result. Experimental results show that the bearing faults of wind power generation unit can be well recognized by the proposed method.

Keywords: multi-feature　decision fusion　direct-drive wind turbine　spherical roller bearing fault experiment　feature extraction　fault diagnosis

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