
磁栅式相位转矩测量系统设计

摘 要

在机械传动系统中，转矩是十分重要的特征参数。对于各种机械加工设备，转矩是其主要的载荷形式，它直接关系到动力机械的工作能力、能源消耗、效率、运转寿命及安全性能等因素。因此，对设备进行转矩测量便显得十分重要。在实际的机械产品研发中，转矩测量是功率检测、安全强度校核及系统稳定性分析的关键步骤。通过实时检测转矩、转速，可以获知设备的运行状况，保证其安全运行。

随着科技生产力的进步，转矩测量技术已经在很多领域得到应用。目前，传感器种类繁多，鉴于磁栅具有结构简单、成本低、工作寿命长、耐油污以及具有一定的抗干扰能力等优点，利用传递法与相位转矩测量原理，设计一套磁栅式相位转矩测量系统。该系统具有较好的动态测量精度和测试范围，其传感器部分结构简单，以一根弹性扭轴作为转矩敏感元件，轴两端各安装一套磁栅式信号发生器，当施加转矩后，两套信号发生器便会输出两路同频不同相的信号，而两信号之间的相位差是转矩的函数，传感器将两路信号传递至信号调理电路，经信号调理后进入单片机比相处理，测得其转矩、转速。

关键词：转矩传感器 转矩测量 磁栅技术 相位差测量 单片机

ABSTRACT

In mechanical transmission systems, torque is a very important characteristic parameter. For all kinds of machining equipment, torque is the main form of load. It is directly related to the working ability, energy consumption, efficiency, operation life and safety performance of power machinery. Therefore, torque measurement for equipment is very important. Torque measurement is a key step in power detection, safety strength checking and system stability analysis. Through real-time detection of torque and speed, it can be informed of the operation of the equipment and ensure its safe operation.

With the progress of science and technology, torque measurement technology has been applied in many fields. At present, there are many kinds of sensors. In view of the advantages of simple structure, low cost, long service life, oil resistance and anti-interference ability, the transmission method and the principle of phase torque measurement are adopted. A magnetic grating phase torque measurement system is designed. The system has good dynamic measurement accuracy and test range. Its sensor part is simple in structure, with an elastic torsion shaft as the torque sensitive element, and a magnetic grating signal generator installed at both ends of the shaft. When the torque is applied, the two sets of signal generators will output two signals with the same frequency and different phases. The phase difference between the two signals is a function of the torque. The sensor transfers two signals to the signal conditioning circuit. After adjusting the signal, the sensor enters the single-chip microcomputer and processes the torque and speed.

Key words : Torque transducer Torque measurement Magnetic grid technology
Phase difference measurement single-chip microprocesso

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