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热能工程

电容法测量湿蒸汽湿度的可行性研究

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摘要： 由于在同温度、同压力下，水和水蒸气的相对介电常数存在很大差异，当一定压力的湿蒸汽通过电容传感器时，湿度的变化会引起传感器电容的变化，且相对变化只与湿度有关，与电容器的结构无关。以平板电容器为例，计算湿蒸汽通过时由于湿度变化引起的电容相对变化量，并探讨了含盐量的影响。蒸汽压力小于15 MPa范围内的计算结果显示：在同一湿度下，电容传感器电容量相对于湿度的变化率随着饱和蒸汽压力的增大而增大；在同一压力下，电容传感器电容量相对于湿度的变化率随湿度的增大而增大。根据计算结果并结合湿度测量的具体应用，分析了电容传感器用于测量湿蒸汽湿度的可行性。

关键词： 蒸汽湿度 介电常数 电容法 测量

Feasibility Study of the Capacitance Method for Wetness Measurement

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Abstract: At the same temperature and pressure, the dielectric constant of water is much greater than that of steam. When the wet steam flows by the capacitive sensor, the sensor capacitance changes with the steam wetness. The relative capacitance change is related to the steam wetness, regardless of the sensor geometry. The relative capacitance change caused by the steam wetness change was calculated, the effect of the salts contained was discussed. As manifested by the results of calculation with the steam pressure lower than 15 MPa, the derivative of the sensor capacitance with respect to the steam wetness increases with the constant steam wetness and the increasing steam pressure, and increases with the constant steam pressure and the increasing steam wetness. According to the calculation results and several application backgrounds of steam wetness measurement, the feasibility of the capacitance method for steam wetness measurement was studied.

Keywords: steam wetness dielectric constant capacitance method measurement

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