

## 基于介电常数法的高精度油品含水率检测仪

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摘要：

油品含水率影响潜艇和飞机等装备的液压系统、燃油系统、滑油系统的可靠性和安全性，要求含水率小于0.01%。基于介电常数法建立了采集油水混合乳液介电常数变化的电容传感器的数学模型，并经过温度补偿修正。采用S3C2410 ARM9作为控制核心，以WinCE作为操作系统管理多个任务，通过AD7745实现介电常数与电容量的数字转换，设计实现了0.01级精度的油品含水率检测仪。实验表明：在-5℃~+60℃温度条件下和0~0.35%含水率范围内，润滑油和轻质成品油的含水率精度达到了0.01，且具有重复性好、可靠性高、设备简单等优点。可应用在舰艇、电力、航空航天等对油品含水率要求严格的领域，以保证装备的可靠性和安全性。

关键词：潜艇与飞机油品；含水率；介电常数；电容传感器模型；可靠性；ARM

## Oil Water Content Detector Based on Dielectric Constant Method With High Accuracy

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**Abstract:**

The military equipment reliability of hydraulic system, fuel system, lubricating oil system in submarines and aircrafts are greatly influenced by the water content of the oil, so the water content of the oil is often required less than 0.01% (0.01 Level). In order to develop such an instrument for detecting water content, this paper based on the dielectric constant principles to design a capacitance sensor for collecting the dielectric constant changing of the oil-water mixture and established the related mathematical model which is revised by temperature compensation for improving the measuring accuracy to 0.01. The S3C2410 ARM9 was used as the controller and WinCE as an operating system to manage multiple tasks, AD7745 for digital conversion of capacitance. It can be concluded from the experiments results that under the condition of -5 ~ +60 °C and 0 ~ 0.35% water content for detecting lubricating oil and light oil products, both of the accuracy reached 0.01 level, and has good repeatability, high reliability, etc. It can be used in the fields strict for oil water content such as military ships, electric power, and aerospace, to ensure the high reliability of military equipment.

**Keywords:** Oil of submarines and aerospace; Water content of oil; Dielectric constant; Capacitance sensor model; Reliability; ARM

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