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# Water level sensing: state of the art review and performance evaluation of a low-cost measurement system

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**Abstract:** Nowadays, the management of water is of paramount importance for modern societies due to the high water-availability requirements. The application of water management schemes requires the installation of water level data-acquisition systems in multiple, geographically isolated large-scale storage tanks of water distribution networks. Existing techniques for liquid level sensing have either been applied over a relatively small measurement range, or require special scientific equipment of high cost, or they are not convenient for transportation, installation and long-term maintenance in multiple large-scale water storage tanks of water distribution networks in cities, communities etc. In this paper, a review of prior art on liquid level sensing is initially presented. Then, the operational characteristics and performance of a novel capacitive-type water level measurement system are investigated through simulations and experimental tests conducted in two water storage tanks of a city-scale water distribution network. It is demonstrated that the proposed capacitive water level measurement system achieves equivalent performance with that of a commercially-available ultrasound water-level sensing device and simultaneously exhibits a much lower manufacturing cost.

**Keywords:** Sensor, capacitive, water level, data-acquisition, low cost.

## 1. Introduction

Liquid storage tanks are an essential part of vital operations in various industrial applications. Sensors suitable for monitoring the level of many different kinds of liquids are currently available, such as short- or long-range sensors for hazardous or nonhazardous liquids, exhibiting a variety of resolution and accuracy performances [1]. An ideal liquid level sensing system should be able to feature stability, high resolution and be of low cost. Simultaneously, the management of water becomes vital in the rapidly developing modern societies, due to the increase of water availability requirements (e.g. for residential and/or agricultural use etc.). In such applications, it is required to monitor the level of water contained in large-scale storage

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