IMPLEMENTATION OF CAPACITIVE SENSOR IN ETHANOL CONCENTRATION CONTROL SYSTEM

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ABSTRACT

Alcohol is one of the most common solution that is used both in medical and pharmacy support. The usage of ethanol is based on its concentration, which can be made by mixing amount of absolute ethanol (96%) into the aquadest solvent. Ethanol will vapor to thin air if exposed to some level of temperature, which is called flash point. Storing ethanol above its flash point would reduce its concentration.

In this final project, a device has been designed to control ethanol concentration in aquadest solvent. The ethanol concentration is measured using the output frequency of square wave oscillator, acquired from a cylindrical aluminium capacitive sensor. Thus the output frequency is inserted into a microcontroller, programmed as a digital PID controller, to produce output control value which is used to operate two peristaltic pumps connected to absolute ethanol and aquadest reservoir. Magnetic stirrer is added to speed up reaction.

According to test sequence has been acquired that capacitive sensor and oscillator is capable to identify various amount of ethanol concentration with frequency ranging from 135kHz – 205kHz for a certain aquadest solvent also controller system is capable to maintain ethanol concentration for set point ranging 0%-50% within 90% of success rate. Controller utilize digital PID with constants of proportional, integral and derivative are respectively 7,42, 0,45 and 0,55 for ethanol pump; 5,63, 0,17 and 1,45 for aquadest pump. Total dissolved substance (TDS) of aquades as solvent affects sensor’s capacitance with ratio of 1200Hz for each 0.1ppm.

Keywords: Capacitive Sensor, Concentration Control, Digital PID, Ethanol
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