

Brewing temperature controler

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Temperature sensor DS18B20

The DS18B20 temperature sensor is used in a sealed version. The fact that the sensor is placed inside a sealed container increases the temperature response time. The step response of the temperature sensor has been measured and the corresponding first order system has been identified :

$$s_s(t) = 1 - e^{-\frac{t}{11.3568}}. \quad (1)$$

This means that more than 33s is necessary for the sensor to recover 99% of the final temperature. This sensor is only suited to measure very slow processes, such as a room temperature for example. It is necessary to account for this slow transfer function from real to measured temperature in order to improve the controler abilities.

The corresponding indicail response is :

$$s_i(t) = H(t)e^{-\frac{t}{11.3568}}, \quad (2)$$

where $H(t)$ is the Heaviside function. The measured temperature T_m is obtained from the real temperature T via the following convolution :

$$T_m(t) = \int_{-\infty}^{+\infty} T(\tau)s_i(t - \tau)d\tau \quad (3)$$

$$(4)$$