Study on the effectiveness of dual complementary Hall-effect sensors in water flow measurement for reducing magnetic disturbance

ABSTRACT

In this study, an angular motion sensing unit using dual complementary Hall-effect (HE) sensors and interface circuit to reduce the effect of disturbance signals has been developed. The applied technique reduces the effects of disturbance signals such as strong electromagnetic field and temperature. The consequence of this technique provides a good widespread applicability in industrial and domestic applications. The unwanted disturbance signals are eliminated by analog processing to obtain a clean signal. The proposed method is based on four HE sensors in two couples with 180° distance, where the outputs of the each complementary sensor are applied to a differential amplifier. Then, the signal is changed to the logic level. An artificial turbine has been employed to revolve rotating disc in the developed angular motion sensing unit and a common magnet has been used to generate magnetic disturbance. The experimental results show that the proposed angular motion sensing unit is immune to the magnetic disturbance and able to measure the required information such as speed of rotation, direction of rotation and detect the occurred error. The power consumption is also reduced by 95.68% as compared with conventional readout circuits due to the implementation of negative logic and pulse switching technique.

Keyword: Electronic water flow meter; Hall-Effect sensor; Rotary encoder; Magnetic disturbance