PRINCIPLES OF TRANSDUCER DEVICES AND COMPONENTS

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Chapter 17

DESIGN OF DIFFERENTIAL RESISTIVE MEASURING SYSTEM AND ITS APPLICATIONS

DEJI ABDULWAHAB, SHEROZ KHAN, JALEL CHEBIL

17.0 INTRODUCTION

Differential resistive systems are easily designed using potentiometric sensors. They usually contain two sensing resistances and a common movable terminal. This circuit can be used to sense a number of scenario; such as the liquid level in a tank, biomedical applications in determining the expansion and contraction of the muscles, the amount of bend in a bimetallic strip, the expansion and contraction in roads and railways, cracks in building for civil application, the penetration of signal in buildings for telecommunication and communication engineering applications, the voltage level in complex circuit. Since sensors with high sensitivity and good resolution are required for industrial applications, hence the need for this cheap and affordable sensor's design. Also, their output must have linear responses, that is, the output produced should be linearly proportional to the parameters of interest [1]. This chapter deals with the design of a differential resistive measuring sensor with low cost, low power consumption, with small size and improved overall performance of the circuit implanted in human body in order to generate voltage, current whose frequency, duty cycle is proportional to the physical parameters of interest.

17.1 SENSED PARAMETER AND THE VARIABLE RESISTOR

Differential resistive sensor works on the principle such that the physical parameter brings about changes in the two resistive elements (R_1, R_2) in a differential manner. One practical example is that of a potentiometer, which has a common point (or a sliding contact) operating over its assigned range. A potentiometer has three terminals: the rightmost end terminal, the leftmost end terminal, and the sliding contact terminal. The total resistive value is equally divided between R_1 and R_2 for a sliding contact in the middle. The neutral point or location for a zero value of physical parameter depends on its application utility. Assuming neutral point in the middle (at B), if the value of R_2 is maximum then that of R_1 is minimum. At the other extreme point (e.g., A), then the value of R_1 will be maximum and that of R_2 will be minimum (e.g., C) [2]. The displacement in terms of the parameter sensed is thus given from a range of -1 to +1. This displacement is dimensionless and its value is plotted against frequency and duty cycle of the resulting signal.