AU J.T. 10(1): 23-28 (Jul. 2006)

Automated Industrial Load Measurement System

Seshanna Panthala, Nashtara Islam[1], Sajed Ahmed Habib[2]

Faculty of Engineering, Assumption University
Bangkok, Thailand

Abstract

Load measurement is an integral part of many process industries. Thus it is essential to have a competent system for this measurement purpose. This paper deals with the design and fabrication of a Personal Computer (PC) based, industrial load measurement system. The main sensor used in this case is a commercially available load cell and custom-made signal conditioning hardware and a data acquisition system. The distinct advantage of this system is its cost effectiveness when compared with conventional DAQ-based measurement systems frequently employed by industry. Design, construction and testing of an innovative load measurement system are discussed in this paper, along with some suggestions for further improvement.

Keywords: *Strain gauge, load measurement, analog-to-digital converter, assembly language programming, personal computer.*

Introduction

Measuring load is an important and essential part of many industrial and commercial operations. It is crucial to have accurate measurements of load, as small errors, occurring repeatedly, can lead to substantial loss of revenue.

One very common way to acquire load measurements is to use the load cell, which is quite effective and accurate; even though the idea is relatively simple (Johnson 2003). The load cell provides an output voltage depending on the load placed on it. This cell is one of the most important applications of a strain gauge (SG) in an industrial environment.

The main theme of this research work is to display how much load is placed on the cell. Figure 1 gives the overall schematic idea of the load measurement system.

The load cell output is a differential voltage, which is dependent on the transfer function of the cell itself. According to this transfer function, the load cell provides a certain voltage for a certain load level. The output of the load cell is then amplified using a differential instrumentation amplifier. Then the instrumentation amplifier output signal is fed to an Analog-to-digital converter (ADC) that will provide digital output. Finally, this digital information is sent to a Personal Computer (PC) directly via the standard parallel port.

Sending information to a PC using a parallel port is easily done, with the advantage that there is no need for special circuitry and algorithms to make the necessary changes to achieve this operation. The standard parallel port can be configured in several ways- to send data, to receive data, and both i.e., bi-directional operation (Hall 1992). In this case data is being sent from an external device to the PC. [1 2]

The display area is the monitor of the PC, which shows a screen with a prompt to place a load. Then the load value is displayed in kilograms. A program has been written to manipulate the incoming digital information from the ADC to show the correct load. The software program to display load data can be

[1] Mechatronics Research Center, Loughborough University, Leicestershire, United Kingdom

[2] Department of Mechanical and Manufacturing Engineering, University of Calgary, Calgary, Canada