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Chapter One

Introduction

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1.1 Overview

The process of product weighing is an essential part of modern industry. There is a constant need for knowing the exact weight of many items, e.g. food, ingredients for production, pharmacology, chemistry, technology, etc. The type and the number of products that require weight control are increasing. According to that, the legal requirements of government bodies need developing to guarantee the exact weight. In production, this means high accuracy and efficiency of weighing. Continuation of this trend brings benefits for both the customer and the producer. That is, manufacturing efficiency is increased; hence, profitability whilst package quality and quantity are assured to the customer's satisfaction.

1.2 Background

A weighing scale is a measuring instrument that is used for determining the weight or mass of an object. Many traditional instruments are used as weighing scales such as scale spring and balance spring. Weighing scales are used in many industrial and commercial applications, and products such as loaded tractor-trailers and medical scales.

In the area of mass production, products are weighed using industrial weighing systems, which are machines that weigh a package dynamically. The weight of the package is estimated while the product has been carried over a load cell weigh by a transport system. Normally the transport system is of a conveyer belt type. The weigh is mounted on a load cell, which is the uncontrollable weighing device capable of weighing an item. A Signal Processing Module (SPM) acquires the electrical signal from weighing device and estimates a value of weight for the passing product as its output.

The checkweigher is one of the most common dynamic weighing system used in almost all modern production lines, different types of products will be passed on the conveyor with different infeed velocities to collect enough data for analysis and simulation. A digital weight indicator is required to interface the weight transducer.

1.3 Objectives

The overall objective is to design, implement a load cell based dynamic weighing system with improved productivity and accuracy. This work is undertaken in the following developments stages: first, analyse the main factors that affect the accuracy of the dynamic weighing system. Then derive and present the exact model of the load cell based dynamic weighing system. The next stage is studying different approaches to identify, minimize or extract error signal from weighing signal. The fourth stage monitoring the value of weight on the (HMI).

1.4 Block Diagram

In generally a checkweigher dynamic weight system incorporates a series of conveyor belts. Checkweighers are known also as belt weighers, in-motion scales, conveyor scales, dynamic scales, and in-line scales. In filler applications, they are known as check scales. Generally, checkweigher has three belts or chain beds:

- **Infeed Conveyor**: An infeed belt that may change the speed of the package and bring it up or down to a speed required for weighing. The infeed is also sometimes used as an indexer, which sets the gap between products to an optimal distance for weighing. It, sometimes, has special belts or chains to position the product for weighing.

- **A Weigh Belt**: This is typically mounted on a weight transducer which can typically be a strain-gauge load cell or a servo-balance (also known as a force-balance), or sometimes known as a split-beam. Some older machines may pause the weigh bed belt before taking the weight measurement. This may limit line speed and throughput.

- **Outfeed Conveyor:** That provides a method of removing an out of tolerance package from the conveyor line. The reject can vary by application. Some require an air-amplifier to blow small products off the belt, but heavier applications require a linear or radial actuator. Some fragile products are rejected by "dropping" the bed so that the product can slide gently into a bin or other conveyor.

The following figure shows the checkweigher in production environment.

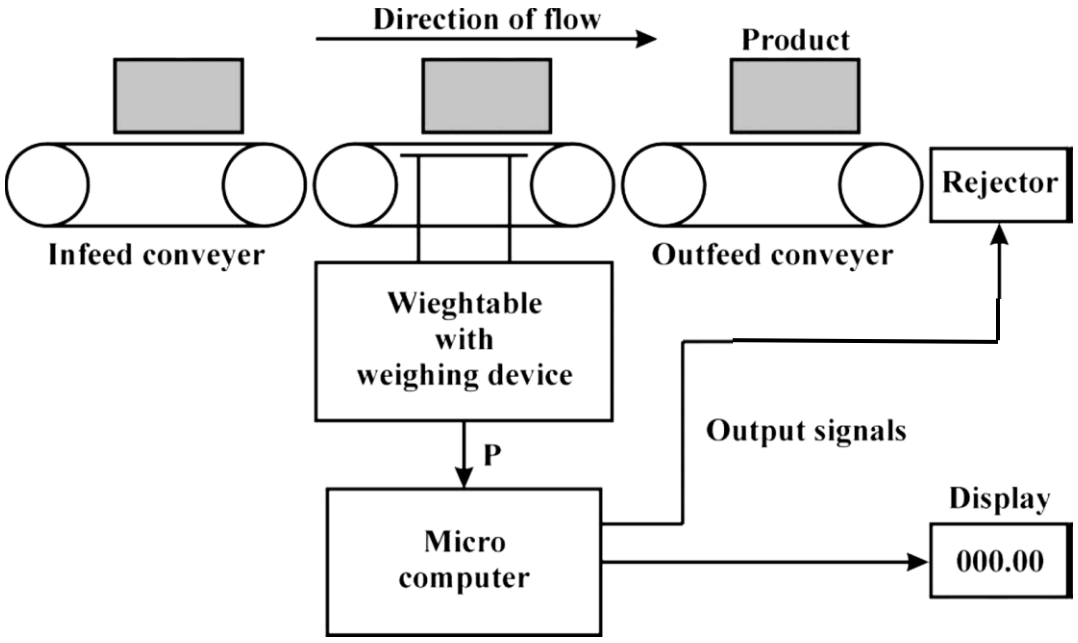

Figure 1.1: Product Flow in Typical Checkweigher

1.5 Time Table

Weeks / Tasks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Identification of Project Idea															
Drafting a Preliminary Project Proposal															
Introduction Chapter (1)															
Weighing System Chapter (2)															
Theory Chapter (3)															
Electrical Design Chapter(4)															
Mechanical Design Chapter (5)															
Testing and Evaluating Chapter (6)															

Table 1.1: Time Table