

PIC BASED ANTI-TIE DOWN MODULE

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PROJEK SARJANA MUDA II

Tajuk Projek : PIC BASED ANTI-TIE DOWN MODULE
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To my beloved mom and dad

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ABSTRACT

Automation machine is very useful in industry. These automation machines are very useful to reduce man power, increases the quality of product, and make the operation faster. However, the human carelessness makes them in unsafely when their conduct the hazardous machine especially during to turn ON the machine. To overcome this problem, Anti-tie Down Module had been introduced. The Anti-tie Down Module is designed to make sure the operator places both hands on a set of switch buttons. Anti-tie down logic requires the user to place their hands on the input device until the condition is safe to remove their hands. The anti-tie down module system is control by using programmable microcontroller (PIC) rather than PLC as usually used in industry. The PIC is program by using Ldmicro software that makes .hex file to program into PIC microcontroller.

ABSTRAK

Mesin automatik kini sangat berguna di dalam industri. Mesin ini sangat berguna untuk mengurangkan tenaga manusia, meningkatkan kualitas produk, dan operasi akan lebih cepat. Namun, kecuaiian manusia membuat mereka terdedah kepada bahaya ketika mereka mengendalikan mesin yang berbahaya terutama ketika ingin mengaktifkan mesin tersebut. Untuk mengatasi masalah ini, Anti-tie Down Modul telah diperkenalkan. Down Anti-tie Modul ini direka untuk memastikan pekerja meletakkan kedua-dua belah tangan pada satu set butang suis. Anti-tie menghendaki pengguna untuk meletakkan tangan mereka pada peranti input sehingga keadaan selamat untuk melepaskan tangan. Anti-tie Down Modul menggunakan PIC berbanding PLC seperti biasanya digunakan dalam industri. PIC diprogram menggunakan perisian Ldmicro untuk menghasilkan .Hex fail untuk diprogram ke dalam PIC.

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CHAPTER I

INTRODUCTION

1.1 Project Introduction

Anti-tie down module is normally designed by using PLC logic in a semi-automatic machine. Using anti-tie down insures safety by making sure the user hands are in a safe position during a potentially hazardous motion. The PLC designs has a several disadvantages such as too much work required in connecting wires, difficulty in component changes or replacements, difficulty in finding errors; requiring skillful work force and when the problem occurs, hold-up time is indefinite, usually long.

This idea of PLC logic in anti-tie down system will upgrade to PIC system. The anti-tie down module system is control by using programmable microcontroller (PIC). The circuit using PIC will make the hardware circuitry compact and easy with change or replacement the components.

The idea behind anti-tie down is to make sure the operator places both hands on a set of input feedback such as a set of swith buttons. Anti-tie down logic requires the user to place their hands on the input device at the same time and not release until the condition is safe to remove the hands. In the case of a rotary index table, the user hands must remain on the switch buttons until the index table has cycled one complete index and stopped motion. If this user releases their hands before the motion is complete, the index table should stop.

1.2 Objective

The objective of this project is to design and build a system to insure safety for worker during conducts a machine at working area and design and build a prototype of anti-tie down module using PIC microcontroller to make the hardware circuitry compact and easy with changes or replacement the components and also user frendly.

1.3 Problem Statement

In industrial, there are a lot of hazardous machine that have high dangerous risk to the worker. Using anti-tie down system insures safety to the operator, especially their hands in a safe position during a potentially hazardous motion.

1.4 Scope

Firstly, do some researches about a anti-tie down system.

For the simulation part:

- a) Anti-tie down module is target to be operated by using Microchip PIC as a microcontroller implement the input function into the closed loop system.
- b) Simple switches are use as an input.
- c) The output will be connect to a simple machine module.
- d) Using software to produce .hex file for interface to the hardware.

For the Hardware Part:

- a) Finding and design the desired circuit.
- b) Finding the suitable components that suitable for the project.
- c) Finding the simple machine module as the output.

After finish build up the hardware, testing and troubleshooting should be done to check wheter the hardware is in good condition.

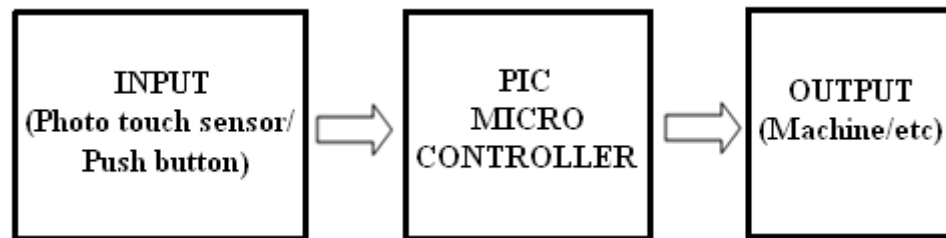


Figure 1.1: Block diagram of the Anti-tie down module System

1.5 Research Methodology

There are 4 phases of methodology in order to achieve the objective of the project. The first phase is project planning, second phase is literature review, third stage hardware design and final phase is performance test.

1.6 Report Structure

These reports obtain five chapters that explain details about this project. The first chapter is introduction of the project. This chapter contains project introduction, project objective, project scope, problem statement and research methodology.

The second chapter is literature review about the Anti-tie down system. This includes to makes system woks by using PIC as a controller. For example, in order to receive input from the IR sensor. Therefore, brief information about IR sensor also include in this chapter. It is important to understand the concept involves and how this system works.

The third chapter is Research Methodology. This chapter will decide the selecting from literature review of figure out a few technique and approach that been conducted. This is to make sure that all data and other technique will involve. The factor, procedures, devices and method used to generate the expected results will include in this chapter. This chapter also gives information about a circuit and the main components used. The components are PIC (microcontroller).

The fourth chapter is focused on to build a few programming during attend the PIC class and laboratory. The purpose of the test, expected result, procedures and result for each test will be detailed out in this report (PSM 2).

The last chapter is about project application of the project, discussion, project improvement and suggestion and also conclusion.

CHAPTER II

LITERATURE REVIEW OF PROJECT

This chapter will discuss precisely about the project, which includes the Anti-tie down system, overview of the major component involved and overview of the project. This chapter also will discuss about industrial accident, accident cause and safety system.

2.1 Industrial Accident

2.1.1 Definition of Industrial Accident

An accident can be defined as an unplanned, undesirable, unexpected, and uncontrolled event. An accident does not necessarily result in an injury. It can be in term of damage to equipment and materials and especially those that result in injuries receive the greatest attention [1]. All accidents, regardless of the nature of the damage or loss, should be of concern. Accidents that do not cause damage to materials or equipment or injury to personnel may foretell future accidents with less desirable results.

2.1.2 Accident Causation Models

Accident causation model is not a new model to identify the root problem of safety in construction and other industry. The objective of this model is to provide tools for better industrial accident prevention program (Abdelhamid and Everett, 2000). As described by Heinrich (1980) accident prevention is an integral program, a series of coordinate activities, directed to the control of unsafe personal performance and unsafe mechanical conditions, and based on certain knowledge, attitudes, and abilities. The famous models that were developed that relate to accident causation are namely domino theory that was invented by Heinrich in 1930 and multiple causation theory that was developed by Petersen in 1971.

2.1.3 Causes of Accident

Accident don't just happen, they are caused. According to Ridley 99 percent of the accident are caused by either unsafe acts or unsafe conditions or both (Ridley, 1986). As such, accidents could be prevented. The unsafe act is a violation of an accepted safe procedure which could permit the occurrence of an accident. The unsafe condition is a hazardous physical condition or circumstances which could directly permit the occurrence of an accident. Most accident results from a combination of contributing causes and one or more unsafe acts and unsafe condition. Accident theories have evolved from merely blaming workers, conditions, machineries into management roles and responsibilities. Nowadays, accident models are being used to better explain the causes of accident so that appropriate actions could be taken to make improvement. However, in order to effect permanent improvement, we must deal with the root causes of accident.

A review of the literature indicates that finding the factors and causes that Influence construction accidents has been the passion of many researchers. Kartam and Bouz (1998) did a study in Kuwaiti construction and noted that the causes of accidents were due to worker turnover and false acts; inadequate safety performance; improper cleaning and unusable materials; destiny; low tool maintenance; supervisory fault; and misplacing objects. Abdelhamid and Everett (2000) conducted

a more comprehensive study in the USA and classified the causes into human and physical factors. Human factors were due failed to secure and warn; Failed to wear personal protective equipment (PPE); horseplay; operating equipment without authority; operating at unsafe speed; personal factor; remove safety device; serviced moving and energized equipment; took unsafe position or posture; used defective tool or equipment; and other unsafe action. While, physical factors were due to; unsafe act of another person(s); disregard known prescribed procedures; defects of accident source; dress or apparel hazard; environmental hazard; fire hazard; hazardous arrangement; hazardous method; housekeeping hazard; improper assignment of personnel; inadequately guarded; public hazard; and other unsafe conditions.

Lubega et al (2000) did a study in Uganda and concluded the causes of accidents were mainly due to lack of awareness of safety regulations; lack of enforcement of safety regulations; poor regard for safety by people involved in construction projects; engaging incompetent personnel; non-vibrant professionalism; mechanical failure of construction machinery/equipment; physical and emotional stress; and chemical impairment. Pipitsupaphol and Watanabe (2000) did a study in Thailand construction sites and classified the causes into the most influential factors i.e. unique nature of the industry; job site conditions; unsafe equipment; unsafe methods; human elements; and management factors. They further concluded that major immediate causes were due to failure to use personal protective equipment; improper loading or placement of equipment or supplies; failure to warn co-workers or to secure equipment; and improper use of equipment.

Toole (2002) also did a study in the USA and suggested that the causes of accidents were due to lack of proper training; deficient enforcement of safety; safety equipment not provided; unsafe methods or sequencing; unsafe site conditions; not using provided safety equipment; poor attitude toward safety; and isolated and sudden deviation from prescribed behavior. Tam et al (2004) did a study in China and noticed that the causes of accidents were due poor safety awareness from top leaders; lack of training; poor safety awareness of project managers; reluctance to input resources for safety; reckless operation; lack of certified skill labor; poor equipment; lack of first aid measures; lack of rigorous enforcement of safety

regulation; lack of organizational commitment; low education level of workers; poor safety conscientiousness of workers; lack of personal protective equipment (PPE); ineffective operation of safety regulation; lack of technical guidance; lack of strict operational procedures; lack of experienced project managers; shortfall of safety regulations; lack of protection in material transportation; lack of protection in material storage; lack of teamwork spirits; excessive overtime work for labor; shortage of safety management manual; lack of innovative technology; and poor information flow.

2.2 Anti-Tie Down System

Anti-tie down module is a safety system product normally used in a semi-automatic machine. Using anti-tie down insures safety by making sure the user hands are in a safe position during a potentially hazardous motion. [2].

2.2.1 Anti-tie Down Logic using PLC

Anti-tie down module is a normally a design using PLC logic in a semi-automatic machine. However, The PLC designs have a several disadvantages like too much work required in connecting wires, difficulty with changes or replacements, difficulty in finding errors; requiring skillful work force and when a problem occurs, hold-up time is indefinite, usually long.

The idea behind anti-tie down is to make sure the operator places both hands on a set of input feedback such as a set of switch buttons. Anti-tie down logic requires the user to place their hands on the input device at the same time and not release until the condition is safe to remove the hands. In the case of a rotary index table, the user hands must remain on the switch buttons until the index table has cycled one complete index and stopped motion. If this user releases their hands before the motion is complete, the index table should stop.

Operators' placing their hands on the push buttons at the same time is a safety issue. If a false input on one of the buttons were sensed, then it would only take the other input to start the machine cycle. Some past causes of the false input conditions could be a person laying a rag on top of one of the buttons. However these types of false input considerations must be taking into account so your logic can be written to prevent false cycle starts and possibility prevent bodily harm.

Table 2.1: The advantages of PIC than PLC.

Specification	PIC	PLC
Size	The circuit is simple and easy with changes or replacements	too much work required in connecting wires, difficulty with changes or replacements,
Troubleshoot circuit	Easy in finding error.	difficulty in finding errors; requiring skillful work force and when a problem occurs
Price	More cheap than PLC components	The value of components for PLC circuit normally is an expensive.

2.3 Overview Of Major Component Involved

2.3.1 Infrared Proximity Sensors

Infrared proximity sensors work by sending out a beam of IR light, and then computing the distance to any nearby objects from characteristics of the returned (reflected) signal. [3]