

**TURN TABLE MODULE IN CHAIN CONVEYOR SYSTEM**

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## BORANG PENYERAHAN TESIS

Judul: Turn Table Module In Chain Conveyor System

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# **Turn Table Module in Chain Conveyor System**



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the Degree of Bachelor of Engineering (Hons.)**

**Mechanical Engineering and Manufacturing System from the**

**Faculty of Engineering**

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**2002**

Dedicated to my Beloved Family

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# ABSTRACT

The original project is to develop a turn table module in chain conveyor system. The objectives of developed this turn table module, that can be used to expose to student the application of control system in manufacturing. It has been divided into two major tasks, which is the mechanical design and control design. In mechanical design, the task will be carried out are includes designing, fabrication, installation and analysis. By using the prototype built will enable student to study further about the entire system as well as the individual part. Besides that, this prototype will allow them to have hands-on experience during their undergraduate study. In this project report, the process of designing Turn Table Module, which is applied in the chain conveyor system, is presented. The turn table module constructed in this project will apply similar concept as the real module that can be found in the real manufacturing industry but it is far more cheaper. Construction of the entire system includes machining process, set up, alignment and testing. The geometry size of the product, weight of the product and components used were analyzed and implemented according to the detailed design.

# ABSTRAK

Pada asanya, projek ini adalah untuk mencipta satu sistem yang dinamakan sebagai turn table module in chain conveyor system, yang mana ia digunakan untuk mendedahkan pelajar tentang kepentingan applikasi sistem kawalan dalam sektor pembuatan. Ia dibahagikan kepada dua tugas iaitu mereka bahagian mekanikal dan bahagian control sistem. Dalam mereka bahagian mekanikal, tugas yang dilakukan adalah termasuk mereka, mengfabrikasi, pemasangan dan penganalisa. Dengan adanya binaan prototype ini, sistem ini membolehkan pelajar mempelajari lebih lanjut dan memahami keseluruhan sistem termasuk bahagian yang berasingan. Selain itu, prototype tersebut membolehkan pelajar melibatkan diri dengan keadaan industri yang sebenar dan membolehkan mereka mempelajari pratikal sendiri semasa dalam pengajian. Dalam projek report ini, kerja-kerja mereka turn table module dalam conveyor sistem berantai diterangkan. Project Turn table module ini dibina mengikut konsep yang sama seperti mana yang dapat dilihat di sektor pembuatan pada masa kini, tetapi ia adalah lebih jauh murah daripada sistem sebenar. Kerja-kerja membina sistem ini adalah termasuk proses memesin, membina, pembetulan kedudukan dan percubaan. Saiz geometri produk, berat produk dan komponen yang digunakan akan dianalisa serta diimplikasikan mengikut rekaan terperinci..

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## **List of Abbreviations**

P	-	Pressure
F	-	Force
A	-	Cross Section Area
M / S	-	Mild Steel

# CHAPTER 1

## INTRODUCTION

### 1.1 General Overview of Turn Table Module

Turn table module is the subsystem of a conveyor system. In conveyor market, it is used to rotate or orientate the product on it by a variety of angle such as  $90^\circ$ ,  $180^\circ$ , or  $360^\circ$ , before entering right angle transfer. These entire modules are again of cost investment and the customer requirement. But in this type of turn table module, it is able to make an angle of  $0^\circ$  to  $90^\circ$ , and  $-90^\circ$  to  $0^\circ$ . Turn table module is useful for providing directional change in the conveying line, loading and unloading pallets, save valuable floor space and improving the ergonomics of workstations. It is used in horizontal transportation of materials such as food nourishment chemical, mining; saw dust and soil industry, grain silos and grain handling. This subsystem can be seen as part of the materials handling in the conveyor system. Normally it is applied in the roller conveyor system. But in this prototype, the chain as a medium of power transmission displaced the roller conveyor. This is due to the cost saving factor.

A control system is an integral part of modern society. Numerous applications are all around us. The control system is built for primary reasons; power amplification, control, and convenience of input and output. Without having control

system (such as computer, PC card, and PLC) all the systems cannot be operated automatically. Thus, it has been proven that the control system is one of the major support system in the current manufacturing sector.

This project emphasizes on the area of production floor and allows students to expose themselves in real working situation. Through this, they will have a hands-on experience in areas such as the productivity performance, cost and system or machine utilization. This system is suitably applied in batch or mass production.

In Malaysia, manufacturing sector is expanding. It demand various high technology which some are imported from overseas. Of course these usage of high technology require great attention in order to keep it running for a long term. Thus, when there is more research in towards the application of technology in manufacturing is carried out will enable local people to acquire more good findings. The commitment from the Malaysian government in encouraging more local investors to invest in this area is obvious with the implementation of several incentives and taxes exemption.

Control system play important role in the manufacturing nowadays as well as in other applications. Thus, it becomes essential to expose students to the real application in the industry. Thus, by developing this smaller scale system will help the students in their learning process in university and prepare them with some practical background about the application of control system in the manufacturing.

## **1.2 The operation of Turn Table Module**

Basically, the function of this turn table module is simple. The whole system functions automatically. A current supply of 240 V is required for these system

which will be connect with ELCB, AC motor, Programmable Logical Control (PLC) and main control box. The AC Motor will provide the power to the conveyor to transfer the product from a fixed location to a desired location through the other chain support.

The product that is handled by the operator will be transferred through the line. When the product enters the proximity sensor area, the product will be stopped by stopper and will be detected by the proximity sensors and analyze by PLC whether the product direction is correct or wrong. The program according to the task required sets the instruction in the PLC. If the product is in right direction, the AC motor will be activated to make the conveyor run and release the product through the zone and vice versa, if it is in wrong direction, then the PLC will command the turn table module to be actuator.

The turn table module which is below the chain transfer will pop-up by double acting compact air cylinder to elevate it to the height of the chain transfer to enable the table to turn the product on top. It is driven by chain and sprockets, with the power of transmission is given by linear double acting air cylinder control at central command during the operation of turning. After the turning operation, the module will pop-down and cause the product to settle on the chain conveyor and transfers it. The cylinder will retract to home position after the end of cycle and the operation will repeat for the next product. Please refer figure 1.1 as main program of Chain Conveyor System flow Chart, on page 4 and figure 1.2 as the sub-program is shown on page 5.

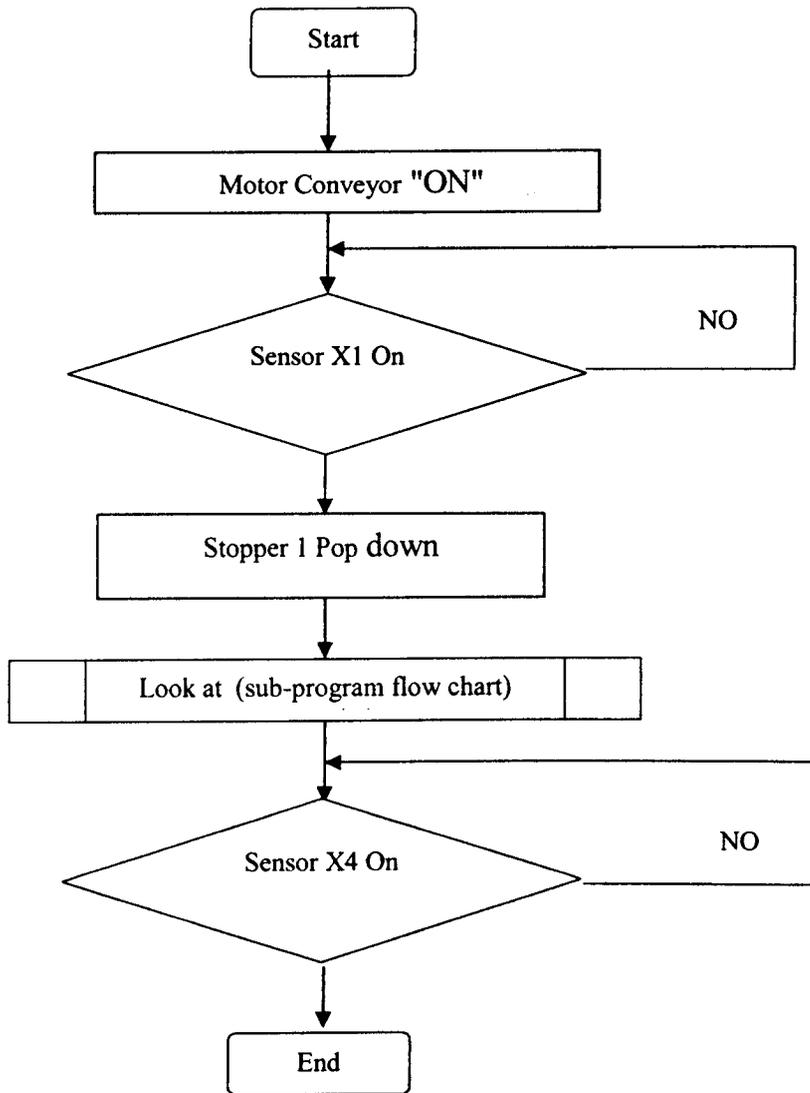
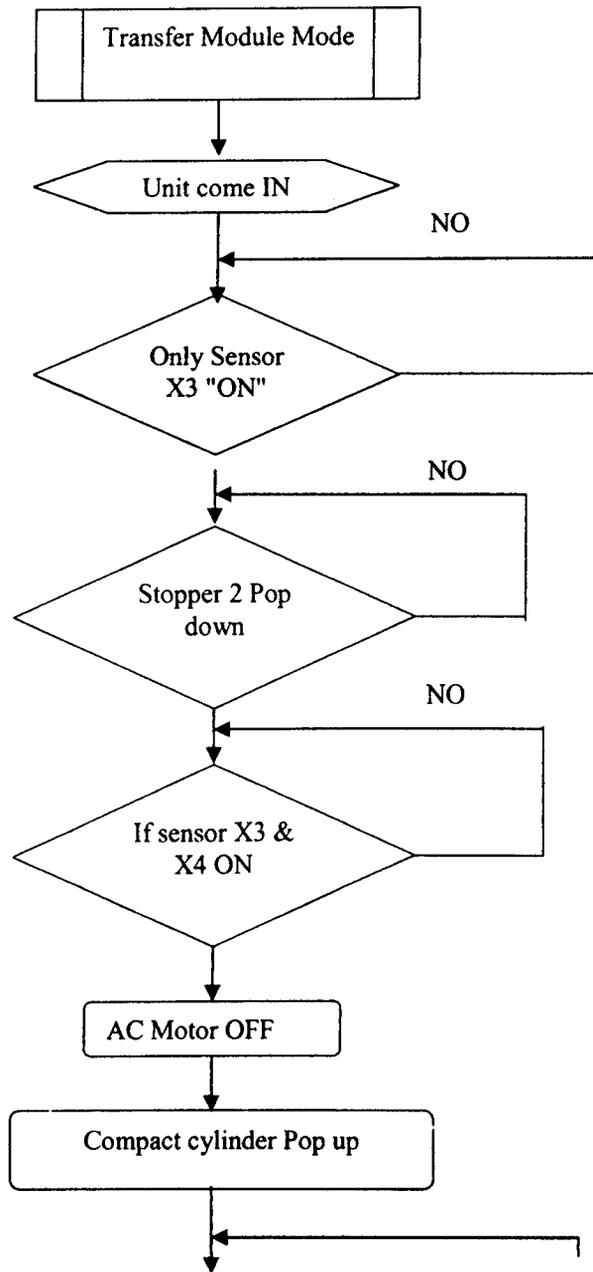


Figure 1-1 Chain Conveyor System (Main Program Flow Chart)



*Continued*

Figure 1-2 A Sub-Program Flow Chart

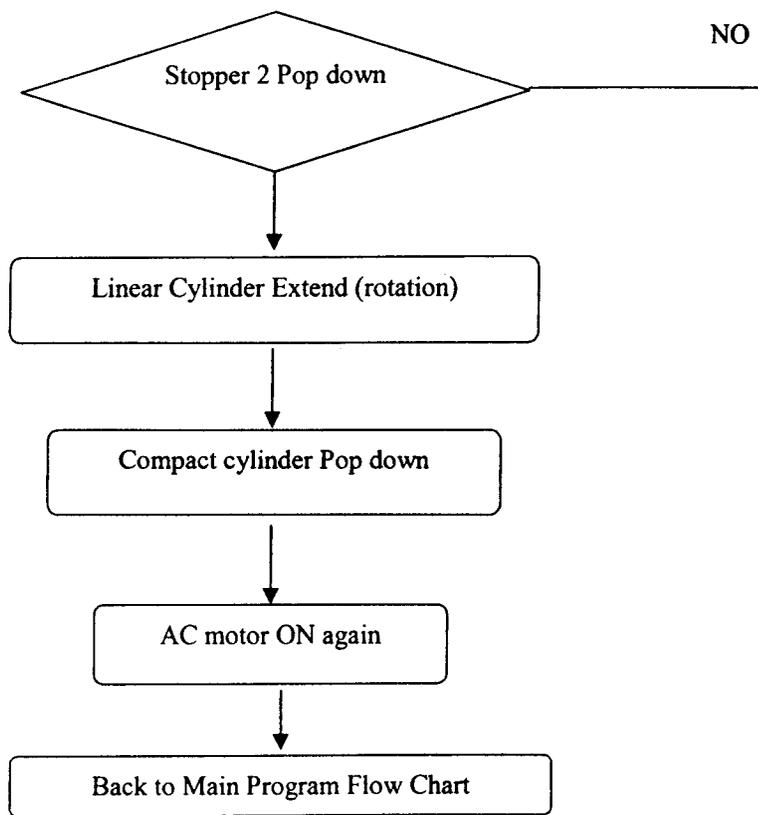


Figure 1-3 A Sub-Program Flow Chart continues from page 5

### **1.3 History of Development of Chain**

Chains have been used to transmit motion to drive machinery and to transport materials along conveyor and up elevators for centuries. In the 1550s, Leonardo Da Vinci sketched a group of chain design, some of which have been modern counterpart of marketable similarity such as modern bar link, leaf and Silent Chain. In 1880s, the cast detachable chain (such as cog chain) was developed to power or motion between the shaft of treadmills to water elevators and harvesting machinery.

About a decade after cast detachable was introduced, a chain made entirely of steel component was introduced for use in driving bicycles and this was the beginning of the Roller Chain. The Roller Chains developed - to meet the need of their era in term of load-carrying capacity, speed of operation, and wear life.

The Engineering Steel Chains were first developed in the 1880s for about same reasons that Roller Chain was developed. The major difference was that Roller Chain was developed to meet drive chain needs; the early Engineering Steel Chains were designed for difficult conveying application. Typical sizes are 4-, 6-, 9-, 12-, and 18-in pitches. An important segment of the Engineering Steel Chain is for unique installation or specialized duplicate where unusual designs are needed.

At the early nineteenth century, Silent Chain was developed. In 1845, Great Britain uses the first ocean-going iron steamer and the first transatlantic screw steamship. Normally, it is used for some very high level of chain speed.

## 1.4 Conveyor

Conveyors are primarily horizontal-movement, fixed-path, constant speed material handling system. However, they often contain inclined, declined or vertical sections to change the elevation of the material as it is moving, switches to permit alternate paths temporary slowing, stopping or accumulating of material. Conveyors include skip hoist, vertical and inclined reciprocating conveyors, but do not include those devices known as industrial trucks, tractors and trailers, cranes, hoist monorail cranes, power and hand shovels or scoops bucket drag lines, platform elevators or highway or rail vehicles.

In manufacturing process, normally conveyor used not only for transporting material, but also for in-process storage and assembly systems. They bring the correct material, at the required rate, to each worker and then to the next operator in the assembly sequence. They may be curves, straight, close-loop irreversible or reversible. Conveyors may be only a few inches in length or they may be integrated systems several miles long. Normally they apply the conveyor according to their need in process and cost consideration. They conveyor has the following attributes:

- a) They are generally mechanized and sometimes fully automated control by software.
- b) They are flexible to form (U-shaped or T-shaped).
- c) They are fixed-in-position to establish the paths.
- d) They can be either overhead or floor mounted.
- e) They generally move continuous loads, or discrete loads.

All the conveyors can be categorized into gravity conveyor and powered conveyor.