# CONVEYOR SYSTEM IN TRANSFER LINE

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## ABSTRACT

*Conveyor systems used in the transfer line to help ease the work done. In the process of television production conveyor system is used to facilitate and accelerate the product produced. In production television, rubber belt conveyor are uses for transfer to electronic component's part that is Printed Circuit Board (PCB). This conveyor are uses because component electronic very sensitive because component PCB is used to mechanically support and electrically connect electronic components such as capacitors, resistors or active devices have been manufactured into the board. So, by using conveyors belt system are suitable for this movement component television because conveyor belt move in speed appropriate and this situation save the component television like PC Board from damage. In television production, belt conveyor used due to the ease of movement of the visual inspection station to station assembly. There are advantages obtained when the rubber conveyor belt used in the process to produce a television. However there are also some problems when using the conveyor in production television.*

**Keywords:**
*Conveyor, Transfer line, Television, Process, and Production*

## 1.0 INTRODUCTION

Conveyor system is a common piece of mechanical handling equipment that moves materials from one location to another. Conveyors are especially useful in applications involving the transportation of heavy from one station to other one station or for bulky materials. Conveyor systems allow quick and efficient transportation for a wide variety of materials, which make them very popular in the material handling and packaging industries . Many types of conveying systems are available, and are used according to the various needs of different industries. There are many types of conveyor is used in industry, but automation have six conveyor class types each unique in its features and capabilities. The types is motor driven roller conveyor, live roller conveyor, line shaft conveyor, v-belt conveyor, belt conveyor, and gravity conveyor. While, for belt conveyor have three types such as rubber belt, metal belt and steel cord belt. For process to produce television, rubber belt conveyor is used. Standard Belt Conveyors are generally used on assembly or packing lines, or in clean areas such as the food and pharmaceutical industries. Belt conveyors will utilize either PVC/PU (smooth or gripped) or Modular (plastic) depending on the application but in industries to produce television also used belt conveyor. The belt is the essential ingredient for all belt conveyors and they come in various shapes and forms.

## 2.0 LITERATURE REVIEW

### 2.1 Conveyor system

Layout cell are important to process produce product whereby in this layout have conveyor. Application conveyor commonly used in many industries. In television production, conveyor used to helps components move along assembly line. Belt conveyor types is suitable for process assembly component television from visual inspection station to next station that assembly station. By using conveyor can easier carry component television's part from one station to another station.

Besides that, belts conveyor suitable for assembly television because type these conveyor using the rubber has good strength and productivity because belt conveyor is covered with an adhesive rubber layer is arranged as the core body between cover rubber layers. So, component's television on the conveyor more better and reduced risk damaged to electronic component's part that is Printed Circuit Board (PCB). Belt conveyor located at middle of the station, along PCB travel on the conveyor can hold component (PCB) from shake. These because component electronic very sensitive because component PCB is used to mechanically support and electrically connect electronic components such as capacitors, resistors or active devices have been manufactured into the board. Other than that, component PCB in manufacturing television need more efficiency especially about conveyor that using in production in assembly line (http://en.wikipedia.org/wiki/Printed_circuit_board#Manufacturing)

### 2.2 Reason select the conveyor system

Now, television is the most important for human . It's can delivering the latest news and allows people to take notice quickly and well. Television can also be used as a medium of delivering sports news for those who love sports. Television's also can used to communicate announcements and deliver the message to the community more quickly and easily. This can reduce costs and time. In television production, belt conveyor used due to the ease of movement of the visual inspection station to station assembly. Belt conveyors utilize a friction drive and accordingly, when power is applied to the drive system, one run of the belt will experience a higher tension than the other. This system helps a lot in easing the work of the laborers in carrying the manufactured goods to the relevant areas. A conveyor system usually consists of a metal frame with rollers installed at various intervals along the length of the conveyor belt. Usually these are covered with a smooth or rubbery material that covers the rollers and helps materials move along without being stuck between rollers. Some roller systems are straight and some are curved. Some are flat, and some move materials up or down between floors or even into underground mines.

### 2.3 The use of the conveyor system

Belt conveyor are able to safety transport materials from one level to another which done by human labor would be strenuous and expensive. It is also possible to shorten the distance any part of the installation of the product of the PC Board. Component to produce a PC Board can be moved easily when the conveyor are using. Employee no more spend energy to more the PC Board component. Other than that, they can be installed almost anywhere and are much safer than using a forklift or other machine to move materials to produce this product. Besides that, Belt conveyor can more loads of all shape, sizes and weights, it's also have many advanced safety feature that help prevent accident. If using a component to produce the PC Board only moving on the conveyor and goes on to the proper installation. It can reduce the risk from occur in the workplace.

There are varieties of option available for running conveyor systems, including the hydraulic, mechanical and fully automated systems, which are equipped to fit individual needs. Belt conveyor is the most efficient in its operation than transport equipment such as trucks for long distances because it can bring a material component of more than 2 kilometer's. By using the belt conveyor PC Board components will be delivered smoothly to the other side without any interference during the transmission process. If using transportation equipment such as trucks, it will cause damage to the PC Board is because while in the truck PC Board may be experiencing shock and reduce the quality of products produced.

Television used to disseminate information to the public very faster. Additionally, delivering the latest news and facilitate the community to receive information more quickly. Television production at present more sophisticated than in the past because, with the availability of a variety of cutting-edge technology that can provide every facility in Television production. Now, there are many types television to produce by factory. In television producing, there are many component involved to a get a complete television. In the process to produce a television in a factory, conveyor is used from one station to another station . Conveyor system is very important for the delivery of components PC board for television and facilitate for workers to do their job.

## 3.0 METHODOLOGY

In the production of television, they use several of technique for complete the production. Among of that are technique manual operation and automated system, control system, sensing and technique used in the operation production of television.

### 3.1 Manual Operation And Automated System

Manual assembly line is a production line that consists of sequence of workstation where assembly task are performed by human worker. Product is assembled as they move along the line. At each station, a worker performs a portion of the total on the unit. In the line Television production, each base part travels through successive station and workers add components that progressively to build the Television product. At the soldering electronic components on the PC Board it requires manual operation where human energy needed to solder all the electronic components through a belt conveyor. It makes easy the flow of the process. In addition, the manual production systems are used in the packaging of the product television. At this stage, the manpower required to enter the television from belt conveyor the finished product into a specific box for the packaging process.

Automated production system consist of multiple workstation that are automated and inked together by a work handling system than transfers part from one station to the next station. A raw work part enters one end of the line, and the processing steps are performed sequentially as the part progresses forward. The line may include included inspection stations to perform intermediate quality check. An automated production line operates in cycle, similar

to a manual assembly line next workstation. In this case, automated production system applied during the process of installing the outside of the component television and also during the process of inspection. At the process of the install the outside of component television, belt conveyor delivering Pc board to the process installs the outside component television.

For this process, it uses automatic tools for install the component such as robot tool for combine all the part or component television. While in the inspection process also uses an automated system. In the inspection process it uses sensors to examine the perfect television. While the perfect television moves toward the sensor, it will detect all part appearing in the television. Sensor already advance setting by operator for detects all defect part or component at the television. If the sensor reads, the product automatically will be rejected by operator. Therefore, the automatic system and manual operation system very important in television operation that all the process can be successful.(Mikell P.Groover, 1998).

**3.2 Control System**

Efficiency improvement belt conveyor system can be reached in the equipment or operation. Therefore, control system used in television production process to increase the level of efficiency in making of product and can reduced waste time by using conveyor belt in process. The current implementation mainly focused on the lower control loop conveyor belt level on operational considerations at the system level.

At one time, conveyor is somewhat difficult because the systems remains configured and set in place. Changes in production and standards normally required wide downtime and huge expenses. Often, the transmitter will be replaced with a completely new system significantly previous to the expected loss. So, new configuration and technological innovation have kept the conveyor system with automation systems for material handling. Computers currently control complex applications, and improved automation have helped the system become more efficient by control system.

A control system is a device, or set of devices to handle, command, direct or standardize the activities of other device or system. The control system causes the process to accomplish its defined function, to produce manufacturing operation. The process control systems used in production television whereby setting are automated. In this situation, the trend is towards fully automated systems using digital controllers monitored and operated by computers. The process and control is a critical part in assuring that flow in line is in the desired. This assures that the processes are working with are operating at safe, cost effective, and good performance by automatic control. In the most systems there will be an input and an output. Control system used signals flow from the output, through the system and produces product television. The material will usually be an ideal form of the television by processing using belt conveyor. In a feedback control system, information about performance is measured and that information is used to correct how the system performs.

In television production, if there is something about an automated control process components system will control the movement on conveyor belt from process by process follow by appropriate. The information will to be fed return into the control system. This process of making changes in the process to bring in line with the process variables to detect damage to the installed components and the fed back to the control level of the information is usually referred as feedback control. Loop feedback control is a process that using feedback control is sometimes referred to as the feedback loop. Therefore, it can be offset measured disruption in the loop. Automated control system is that the automated control system using automated control equipment to control the process. The system shown is automated, requiring little for anyone to relate with the process as soon as it is placed in to process.

**3.3 Sensing**

In the production television, they also used sensor for collecting data from the manufacturing process for use in feedback control. A sensor can be defined as a converter that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument. Besides that, a sensor is a device which receives and responds to a signal when detected. Other than that, sensing is sensitivity indicates how much the sensor is output changes when the measured quantity changes.

A sensor is used to measure the output variable and close the loop between one station to another station. Sensing perform the feedback function in a closed loop control system. The sensed value will subtracted from the preferred value to create the error signal, which is amplified by the controller is called as negative feedback. These situation shows are the concept of the feedback loop to control the dynamic behavior of the system.

A sensor also can measure what the controlled system is doing. Besides that, we need the sensor be required the system to measure what the system is doing. The sensing also can be used to measures the output of the system we are controlling. To control the system, we need to use the information provided by the sensor to control movement belt conveyor.

Usually, the output as measured by the sensing is subtracted from the input which is the desired output. That forms an error signal that the controller can use to control the conveyor next step such as about the defect component in making television production process (http://en.wikipedia.org/wiki/Sensor)

### 3.4 Concept And Operation

The fundamental purpose of a conveyors' belt is to carry the loaded material along the length of the conveyor structure, from the feed point at the tail of the conveyor, to the discharge point at the head of the conveyor. Belting has been developed over many years to fulfill this very purpose in the most cost-effective manner and with the highest practical degree of reliability. Conveyor belts are basically very wide belts attached in a loop to two or more turning rotors driven by motors. The loop is the actual conveyor belt, and is generally made of two or more layers of rubber, one layer to give shape and structure to the belt and one to allow it to transport its load safely. This conveyor loop is generally attached to two wheels, called rotors, which are spun by motors. The conveyor belt has enough friction between it and the rotor that it sticks to this rotor.

As a rotor turns, the conveyor belt will turn as well due to the intense friction between the rotor wheel and the belt. This turning motion of the rotor causes one side of the belt to move in one direction, while the other moves in the opposite direction. This means that both wheels must always be moving in relatively the same direction, either clockwise or counter-clockwise. If the two rotor wheels moved in opposite directions, the conveyor belt would not travel at all. The belt control involves the following:

Stop/start: At single or multiple stations.

Start warning: Audible or visual signal for pre-start warning.

Interlock: The sequence control between the master and slave conveyors.

Telemetry: Distribution of belt control and information over significant distance.

Lockout: Physical lockout of the all motive power sources.

### 3.5 Advantages and Disadvantages

Belt conveyors have many advantages over other types of bulk material handling equipment. Some of the advantages are, first is belt conveyors are capable of handling a wide range of bulk materials from very fine to large lump sizes. Second, belt conveyors can be designed to handle capacities for any operation. It is common for belt conveyors to unload ships at capacities up to 10,000 tons per hour. Belt conveyors can also be designed for batching operations or to convey a small amount of material between processes. Belt conveyors can be configured to fit almost any application.

A belt conveyor can convey material horizontally, on an incline or a combination of both. It is common to use a single belt conveyor to transport material horizontally a certain distance, then elevate the material on an inclined section of belt conveyor and then horizontally again. Then, belt conveyors require less horsepower to operate than other types of conveyors. Bulk materials are carried on top of the belt and remain static, therefore requiring much less energy to move. Last, the belt conveyors have proven to be a reliable method of conveying bulk materials. Industry standards for the design of belt conveyors have been developed by the Conveyor Equipment Manufacturer's Association (CEMA). Consequently, belt conveyor appropriately to used in the production of television because capable of handling a wide range of bulk materials of the component television from very fine to large lump sizes like Pc board (http://ckit.co.za/secure/conveyor/troughed/belting/belting_basics.html). The limitation of conveyor belts are the loading and transfer points need to be properly designed, numbers of protective devices have to be incorporated to save the belt from getting damaged by operational problems. The belt needs higher initial tension (40-200% of useful pull), conveying of sticky material is associated with problems of cleaning and discharge causing poor productivity and higher elongation of the belt (4% elongation may take place at the working load).

## 4.0 ANALYSIS AND RESULT

Belt conveyor system is suitable in production television because no damage component of the occurrence of cracks on component television like PC Board. This is because the process of designing a conveyor belt involves approaches with the belt to be moving at an appropriate speed. So, analysis is important is to ensure the correct components have been selected for the conveyor and to confirm the conveyor will operate effectively under normal operating conditions. Important aspect of the analysis is to determine the overall operation of the conveyor belt tension and power requirements and tensions expected throughput the conveyor. So, the designed system in operation production by conveyor belt as a result of over specified equipment being installed. Besides that, conveyors belts has related to materials handling to carry out the right materials in the right quantities to the right locations whereas without give effect to components.

In production, conveyors are use for movement components from one station to other station. Component television is very sensitive toward vibration. So, by using conveyors belt system are suitable for this movement component television because conveyor belt move in speed appropriate and this situation save the component television like

PC Board from damage. Other than that, belt conveyors drive the belt, where roller conveyors drive the load, making belt conveyors easier on more fragile conveyed products. So, conveyor is very suitable to equipment for production television is very small and many components so is very to handle this material to produce television because can moves products along a manual assembly line. The conveyor system can be used to accumulate parts to smooth out effects on components at stations in the conveyors.

Manual assembly line be used at the soldering electronic components on the PC Board it requires manual operation where human energy needed to solder all the electronic components through a belt conveyor. By using conveyor it makes easy the flow of the process. A part of that, manual assembly line also used in the packaging of the product television. At this stage, the manpower required to enter the television from belt conveyors to the finished product into a specific box for the packaging process.

Besides that, automated production system applied during the process of installing the outside of the component television and also during the process of inspection. At the process of the install the outside of component television, belt conveyor delivering PC Board to the process installs the outside component television. For this process, it uses automatic tools for install the component such as robot tool for combine all the part or component television.

Operation is commonly performed on these productions lines whereby transfer line is used when conveyor belt are using to moving the component of television. Other than that, linear transfer system is the most of the material transport system provide a linear motion and some of these are used for work part transfer in automated productions systems. These include belts conveyors to provide continuous movements of parts between stations to another station in assembly lines. The belt conveyer construction significantly affects the durability and reliability of the whole transport facility and even the whole system that includes the belt conveyor. So, the low tension movement is caused by belt conveyor not give effects on component of the along travelling through transfer lines in operation.

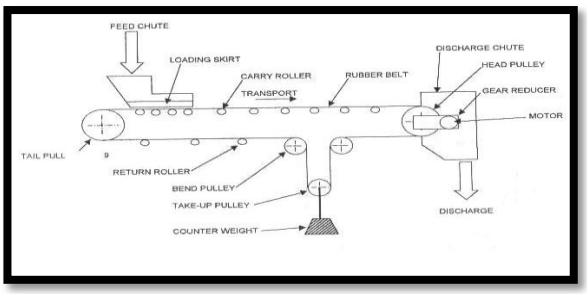


Diagram 1.0 : Rubber Belt Conveyor

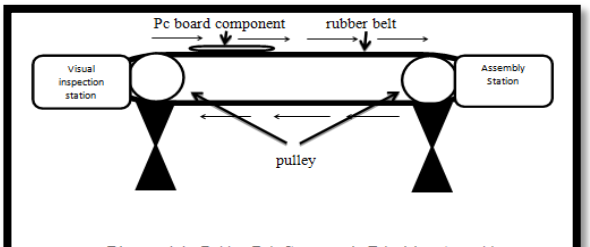


Diagram 1.1 : Rubber Belt Conveyor in Television Assembly.

## 5.0 DISCUSSION AND FINDING

### 5.1 Limitation

The limitations of conveyor belt in television production are first the loading and transfer points need to be properly designed in production lines. Seconds, the numbers of protective devices have to be incorporated to save the belt from getting damaged by operational problems. Thirds, the belt needs higher initial tension (40-200% of useful pull) and last, the use of belt is restricted by the lump size. If the maximum diagonal of a irregular lump is *X* then the belt width (B) is approximately given by:

$$B \geq Xa + 200$$

where, B: Belt width [mm]; X: Longest diagonal of irregular lump [mm];

a: Factor to account for grading. a is taken as 2.5 for graded material and 3 for un-graded material. However, for particular material these values must be properly estimated.

### 5.2 Advantages

The advantages of conveyor belt in television production are available in any required stage of assembly in production lines, pivoting bearing housings for shaft bearings, easy removal of drive motor and gearbox, short assembly times while assembly process of television in lines, and no disturbing contours by belt or frame. Beside, belt conveyors are capable of handling a wide range of bulk materials from very fine to large lump sizes. Very fine materials such as Portland cement are loaded at terminals using belt conveyors. Large lump size materials such as coal are transported from mines using belt conveyors. Belt conveyors also can be designed to handle capacities for any operation. It is common for belt conveyors to unload

ships at capacities up to 10,000 tons per hour. Belt conveyors can also be designed for batching operations or to convey a small amount of material between processes.
Other than that, belt conveyors can be configured to fit almost any application. A belt conveyor can convey material horizontally, on an incline or a combination of both. It is common to use a single belt conveyor to transport material horizontally a certain distance, then elevate the material on an inclined section of belt conveyor and then horizontally again. Then, belt conveyors can be used to stock-pile or reclaim bulk materials. Radial stackers are used for creating large piles of materials such as wood chips, coal or ore. Reclaim belt conveyors are located under the piles to carry the materials into the plant for processing. Belt conveyors also can require less horsepower to operate than other types of conveyors. Bulk materials are carried on top of the belt and remain static, therefore requiring much less energy to move. And lastly belt conveyors have proven to be a reliable method of conveying bulk materials. Industry standards for the design of belt conveyors have been developed by the Conveyor Equipment Manufacturer's Association (CEMA).

**5.3 Problem**

First problem in television production while using the conveyor belt is all portions of the conveyor belt run to one side at a given point on the structure. This happen is caused by one or more idlers immediately preceding trouble not at right angles to the direction of belt travel, conveyor frame or structure crooked, one or more idler stands not centered under belt, and the structure not level and belt tends to shift to low side. Seconds, a particular section of the conveyor belt runs to one side at all points on the conveyor. It cause by a belt which not joined squarely, bowed belt and worn edge.

The third is the conveyor belt runs to one side for long distance along the bed. It is caused by the television was being placed on belt off center and the conveyor frame or structure crooked. Next, the lengthwise gouging or stripping of the top cover where it caused by a skirt board seals too stiff and pressed against belt, excessive space between belt and skirt seals, metal sides of chute or skirts too close to belt and the gap are not increasing in direction of belt travel, belt is spanked down under impact at loading point allowing material to be trapped under skirts and the material hanging under back panel of chute.

**6.0 CONCLUSION**

A conveyor belt must compatible with the system on which it is installed. Specifying a belt without understanding the important characteristics can reduce the efficiency and life of belt. A complete review of the system is the only way to ensure that the belt is used on the system is the right choice. If the belt supplier cannot provide all of the properties that the televisions company wants, then it is probably the suitable time to find another knowledgeable supplier. The belt conveyor is represented here as a complex electro-mechanical system, for example the total calculation routine is composed of the sub-routine 'belt conveyor' and 'electric driving system'. The major electrical and mechanical devices for back-up of starting, such as frequency converter, 'CST-drives', 'step starter', 'fluid starter' and various types of hydrodynamic couplings, are covered by this routine. The mass flow over the belt conveyor has been integrated into the routine, since otherwise the results obtained would be of limited validity only. Further operational conditions can be simulated, too, e.g. generator-type drives with application of load close to reality from a source of masses with stochastic time character, stationary operations, varying distribution of loads in case of dual-pulley head drives or braking.

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