Type of Conveyor System: A Review
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Abstract— Conveyor equipment selection is a complex, and sometimes, tedious task since there are literally hundreds of equipment types and manufacturers to choose from. The expert system approach to conveyor selection provides advantages of unbiased decision making, greater availability, faster response, and reduced cost as compared to human experts. Conveyor types are selected on the basis of a suitability score, which is a measure of the fulfillment of the material handling requirements by the characteristics of the conveyor. The computation of the score is performed through the Weighted Evaluation Method, and the Expected Value Criterion for decision making under risk. This paper discusses the work done by the different researchers for the development of conveyor system for industrial purpose.

Key words: Conveyor selection, Decision making, Rolling contact, Rolling friction

I. INTRODUCTION
A 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 or 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 kinds of conveying systems are available, and are used according to the various needs of different industries. There are chain conveyors (floor and overhead) as well. Chain conveyors consist of enclosed tracks, I-Beam, towline, power & free, and hand pushed trolleys. Industries that use conveyor systems:

Fig. 1: conveyor system
A line shaft roller conveyor conveys boxed produce at a distribution center

Fig. 2: line shaft roller conveyor

A Conveyor belt conveys papers at a newspaper print plant

Fig. 3: Roller conveyor
Roller conveyor for carton transport in the apparel industry

Fig. 4: Types of conveyor systems

Conveyor systems are used widespread across a range of industries due to the numerous benefits they provide.

- Conveyors are able to safely transport materials from one level to another, which when done by human labor would be strenuous and expensive.
- They can be installed almost anywhere, and are much safer than using a forklift or other machine to move materials.
- They can move loads of all shapes, sizes and weights. Also, many have advanced safety features that help prevent accidents.
- There are a variety of options available for running conveying systems, including the hydraulic, mechanical and fully automated systems, which are equipped to fit individual needs.

Conveyor systems are commonly used in many industries, including the automotive, agriculture, computer, electronic, food processing, aerospace, pharmaceutical & chemical, bottling and canning, print finishing and packaging. Although a wide variety of materials can be conveyed, some of the most common include food items such as beans and nuts, bottles and cans, automotive components, scrap metal, pills and powders, wood and furniture and grain and animal feed. Many factors are important in the accurate selection of a conveyor system. It is important to know how the conveyor system will be used beforehand. Some individual areas that are helpful to consider are the required conveyor operations, such as transportation, accumulation and sorting, the material sizes, weights and shapes and where the loading and pickup points need to be.

Types of conveyor systems:
Belt driven roller conveyor for cartons and totes

Fig. 5: Belt driven roller conveyor for cartons and totes.

- Flexible conveyor
- Gravity roller conveyor
- Gravity skatewheel conveyor
- Belt conveyor
- Wire mesh conveyors
- Plastic belt conveyors
- Bucket conveyors
- Flexible conveyors
- Vertical conveyors
- Spiral conveyors
- Vibrating conveyors
- Pneumatic conveyors
- Electric Track Vehicle Systems
- Belt driven live roller conveyors
- Lineshaft roller conveyor
- Chain conveyor
- Screw conveyor aka Auger conveyor
- Chain driven live roller conveyor
- Overhead conveyors
- Dust proof conveyors
- Pharmaceutical conveyors
- Automotive conveyors
- Overland conveyor
- Drag Conveyor

1) **Heat Resistant Conveyor Belt:**
The heat resistant conveyor belt is designed with high temperature resistant compound to convey heat materials. Its excellent heat resistant function makes the belt still remain good rubber properties and retardant aging under heat transportation and severe condition hence the product service life is increased.

2) **Oil Resistance Conveyor Belt:**
For all transportation process or materials containing oil including machine oil, heavy oil, mineral oil, or animal and vegetable oil, such as the grain, the mineral, the environmental protection recovery plant, the extract of petroleum, the production line of oily parts or the place where needs to prevent from the rubber deterioration by the oil.

3) **Flame Resistance Conveyor Belt:**
Flame resistant conveyor belt conforms to the standard of above ground and provides better abrasion and longer service life. For handling flammable materials or the environment with potential risk to cause conveyor belt burning, such as coal mine and power plant, etc.

4) **Abrasion Resistance Conveyor Belt:**
Abrasion Resistance conveyor belt provides different abrasion of compound to meet different efficiency.

5) **Seal Conveyor Belt:**
A special reinforced layer is used to increase cross rigid, make the belt surface flat and tough withstand man weight 60-100 kg and allow the people walking on the belt for working or maintenance, and avoid material dispersing around, also it can provide dust-proof, wind-proof, rain-proof, and sunlight-proof. It's suitable to use in the movable loading station, such as the loading equipment to the wharf.

6) **Pipe Conveyor Belt:**
Pipe conveyor belt is made with special carcass, combined with high properties of compound, suitable for handling powder and granular materials which pollute the environment easily.

7) **Bucket Elevator Belt:**
The bucket elevator is designed for the vertical transportation and is mainly used in handling powder or granular materials. It can shorten the distance of transportation by using the buckets fixed on the belt for vertical transportation.

8) **Rip Stop Conveyor Belt:**
Rip stop conveyor belt is mainly used to prevent the belt from penetrating or cut due to outside force during the conveying that cause risk of belt damage or broken. Rip stop conveyor belt provides a special rip stop breaker inserted in top cover, this rip stop breaker has different material and specification that meet various conveying design requirement.

9) **Cold Resistance Conveyor Belt:**
Cold resistant conveyor belt is designed for conveying in refrigerator storage or outdoor cold area; the belt can keep normal operation under the environment of -40°C.

10) **Chemical Resistance Conveyor Belt:**
Acid & Alkali resistant belt is designed to convey corrosive or acid & alkali material in order to prevent the ingredient of rubber from being extracted and pollute the conveying material, also can reduce the corrosion of cover rubber so as to extend the belt life. Suitable for chemical plant, paper mill, fertilizer plant, mine, port and other environment with acid & alkali material.

11) **Side Wall conveyor Belt:**
Side wall conveyor belt is technically cooperated with Yoshino Rubber in Japan, it provides good cross rigidity and special side wall design that make large angle conveying have excellent transportation performance and longer service life, 45°~90°angle conveyor belt length and save conveying area.

12) **Non-Stick Conveyor Belt:**
Avoiding sticking belts or down capacity of belts. Saving clean cost Prevent belt damaged Working Smoothly from return roller

II. LITERATURE REVIEW

A. Daniel J Fonseca, Gopal Uppal & Timothy J Greene (2004):
The major objective of this paper is to illustrate how Conveyor equipment selection is a complex, and sometimes, tedious task since there are literally hundreds of equipment types and manufacturers to choose from. The expert system approach to conveyor selection provides advantages of unbiased decision making, greater availability, faster response, and reduced cost as compared to human experts. This paper discusses the development of a prototype expert system for industrial conveyor selection. The system, which was developed on Level V Object, provides the user with a
list of conveyor solutions for their material handling needs along with a list of suppliers for the suggested conveyor devices. Conveyor types are selected on the basis of a suitability score, which is a measure of the fulfillment of the material handling requirements by the characteristics of the conveyor. The computation of the score is performed through the Weighted Evaluation Method, and the Expected Value Criterion for decision making under risk. The prototype system was successfully validated through two industrial case studies.

This paper presents a simplified approach to modeling the rolling contact phenomena that occur at the surface of a wheel driven rubber belt. The main aim of this approach is to determine the rolling friction due to hysteresis and the relationship between traction and slip in wheel driven belt conveyors. The resulting model is an expansion of an existing linear viscoelastic model consisting of a three parameter Maxwell model combined with a Winkler foundation that is used to determine the rolling friction due to hysteresis in a conventional conveyor with a flat belt. Adaptations are introduced to incorporate a curved belt surface and to analyze the relationship between traction and slip. Attention is also paid to matching the model parameters to the viscoelastic properties of an actual rubber sample and subsequently the usefulness of more complex Maxwell models regarding rolling friction and traction is investigated.

C. Chun-Hsiung Lan (2003):
This study is deals with The design of a multi-conveyor system in supporting machine loading and unloading has become crucial to management. However, through the mathematical model proposed in this paper, this issue becomes realistically and concretely solvable. This study not only mediates the concept of balancing the number of parallel machines, the conveyor speed for adjacent pallets, the overall relevant costs and the determination of the number of conveyors into the objective, but also develops a two-staged method to optimise the combined problem to reach a maximum profit. Additionally, the versatility of this study is exemplified through a numerical example. Moreover, the computerised sensitivity analyses are discussed in this study. This paper contributes an applicable scheme for production design in manufacturing, and provides a valuable tool to conclusively obtain the optimal profit of a given production quantity for operations research engineers in today's manufacturing with profound insight.

The major objective of this paper is to tell us that Over the years a lot of work has done and is still continuing with great effort to save weight and cost of applications. The current trend is to provide weight/cost effective products which meet the stringent requirements. The aim of this paper is to study existing conveyor system and optimize the critical parts like roller, shafts, C-channels for chassis and support, to minimize the overall weight of assembly and material saving.

E. Tadeusz Opasiak, Damian Gaśka, Grzegorz Perun & Bogusław Lazarz (2014):
The paper presents a study of new design of rollers. The study focused on the measurement of static and dynamic resistance of rotating rollers and the impact of new construction on the power consumption of the belt conveyor. Rollers have been modified through the use of class C4 bearing seals and labyrinth seal U4Exp 62/65 with a cover 2LU4 of runner construction. Measurements of static and dynamic resistance of rotating rollers were made on a universal rollers stand and power measurements were carried out on a belt conveyor power supply system Gwarek 1200 No. TW in mine KWK Mysłowice–Wesoła.

III. CONCLUSION
Now a day, we are coming in contact with conveyors in all walks of life, specifically conveyors are making movement of raw material, heavy goods, assembly of ready products, truck loading etc. easy. We are customizing the use of conveyor system according to our convenience, so we can say that this is the right time to avail this opportunity to benefit your business. Now, realize your business has one of the efficient resources you could take a good benefit of is found with investment into a conveyor system. These resources will enable you to expand business efficiently and also provide your associates with the greatest resources.

REFERENCES