Industrial Conveyors’ Taxonomy and Its Applications

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INDUSTRIAL CONVEYORS’ TAXONOMY AND ITS APPLICATIONS

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Abstract
In any manufacturing processes includes a material handling equipment that can transport raw material or semi-finished products from the one workstation to another. Material handling equipment are designed based on the type of manufacturing product or the process. Therefore, engineers can easily make decision analysis while the selection of the most preferred type of industrial conveyors among others. This paper focuses on the industrial conveyors that classifies all available conveyor types. In this work is defined a review that covers most of the currently available literatures and conveyors types that describes industrial conveyors, types, characteristics and applications. A taxonomy is developed through reviews.

Key words: Industrial conveyors, Literature review, Taxonomy.

1. Introduction.

The different methodologies are defined to design right material handling equipment in different process of the transportation of raw materials within the manufacturing facility. For instance, depending on the various speed of handling, weight, size, quantity and height of the transportation, production engineers can choose the different methods lifting and handling such as forklifts, overhead cranes and conveyor systems. Conveyor system is a mechanical system used in moving materials from one workstation to another and finds application in most processing and manufacturing industries such as: chemical, mechanical, automotive and food[14].

Conveyor systems are robust, confident in materials transportation, and warehousing. Based on different principles of production process, there are different conveyor systems are utilized such as: gravity, belt, screw, bucket, vibrating, pneumatic/hydraulic, chain, spiral, grain conveyor systems etc. The selection of the most compatible type depends on the volume to be transported, speed of transportation, size and weight of materials to be transported, height or distance of transportation, nature of material, method of production employed[15].

This work propose a taxonomy of the industrial conveyors. The classification of the industrial conveyors in the case of their application in different industries.

2. A brief history of Industrial conveyors.

Primitive conveyor belts were used since the 19th century [17]. Chronological evolution of conveyors as follow:
• In 1892, Thomas Robins began a series of inventions, which led to the development of a conveyor belt used for carrying coal, ores and other products.
• In 1901, Sandvik invented and started the production of steel conveyor belts.
• In 1905, Richard Sutcliffe invented the first conveyor belts for use in coalmines, which revolutionized the mining industry.
• In 1913, Henry Ford introduced conveyor-belt assembly lines at Ford Motor Company's Highland Park, Michigan factory (David, 1984).
• In 1972, the French society REI created in New Caledonia the longest straight-belt conveyor in the world; at a length of 13.8 km., Hyacynthe Marcel Bocchetti was the concept designer.
• In 1957, the B. F. Goodrich Company patented a conveyor belt that it went on to produce as the Turnover Conveyor Belt System. Incorporating a half-twist, it had the advantage over conventional belts of a longer life because it could expose all of its surface area to wear and tear. Möbius strip belts are no longer manufactured because untwisted modern belts can be made more durable by constructing them from several layers of different materials. (Daviddar-
In 1970, Intralox, a Louisiana-based company, registered the first patent for all plastic, modular belting.

3. Methodology of taxonomy.

Taxonomy is the process or system of describing the way in which different living things are related by putting them in groups[16]. In other words making a scientific classification. In this work, we are dealing with a taxonomy of industrial conveyors. Certainly, there are many conveyor types in all around the world. However, this work includes some those conveyors that is used more than other types. The criteria is to define a group of conveyors based on their functional characteristics.

4. Taxonomy and classification of industrial conveyors

After the collecting the set of information about industrial conveyors and their applications, we defined certain classes of conveyors[16]. Classification is done based on the usage of different type of conveyors in different industries. Therefore, we decide to make class of conveyors by industries. In order to identify the industries that has to be included into these classes, the application of the following conveyor systems are selected. They are belt, screw, chain, roller and mesh conveyors. According to investigation of current conveyors systems, we determine interactions of the conveyors with industries. Afterwards, these interactions are lead to the classification of conveyors by industries. The following classification is obtained during this exploration:

- Automobile industry
- Metallurgical industry;
- Pharmaceutical industry;
- Mining industry;
- Food&drink industry;
- Construction industry;

In Figure 1, is given a quantitative representation of the conveyors systems that were used to determine this classification.

Each of these classes are included the several type of conveyors. Conveyors are selected based on frequently usage in different industries. In Figure 2, is given a specific relationship between conveyors and industries. Each type of conveyors can be used in distinct industries. For instance, mesh conveyors are mostly used in food processing, while belt conveyor system is used nearly in all industries. Moreover, we come up with another result of this relationships diagram. It means that belt, screw and roller conveyors’ application is very frequent in each type of industry. Whereas, mesh conveyor systems are used in the specific industries.
5. Conclusion

The summary of this is done through SWOT analysis technique. In order to capture all weaknesses and strength, threats and opportunities of classification, we deal with SWOT analysis. In Table 1, is given SWOT analysis results. Concisely, an overall overview could be concluded briefly that the subject of the research comes with a number of strengths and weaknesses expected during its operational life cycle.

This work has some opportunities: It can be used as a source of learning in the technical educational institutions. It provides the widest range of information in the field of research. This is the first database for scholarly researchers. In addition, those who modernize their production routes can get great offers, as our corporate networks are industry-leading industries that require the most conveyor.

This work come up with some of its weaknesses since it has been done based on the existing information and data from different sources without a real industry related visit and experience. In addition, classification does not cover all industries.

Taking into account all the weaknesses and threats, particularly, classifications are going to be improved to cover more industries, gathering all necessary information also by testing, solving compatible issues and organizing work with several types.

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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<tbody>
<tr>
<td>Guidelines</td>
<td>Only the card used, the production process was not observed</td>
</tr>
<tr>
<td>The benefits of new manufacturers</td>
<td>Classification doesn’t cover all industries</td>
</tr>
<tr>
<td>The most important branches are covered.</td>
<td>Limit of information</td>
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<tr>
<th>Opportunities</th>
<th>Threats</th>
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<tr>
<td>Enlarge data and industry (from the real manufacturing)</td>
<td>May not be compatible</td>
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<tr>
<td>Study book</td>
<td>Shortage of highly skilled manpower for put conveyors</td>
</tr>
<tr>
<td>Helping those who continue this thesis work</td>
<td>Unaccounted protection system</td>
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References