

Study of Advance Manufacturing Through Power and Free Conveyor System

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Abstract:- An inverted and over head power free conveyor utilizes a single enclosed track combining the power chain and the free trolleys. The power and free system uses fixed chain dogs that engage the pivoted free trolleys to move them through the system. Disengaging the free trolley from the chain dog allows for free trolley accumulation. Area of use include production areas or delivery systems that require accumulation such as general assembly, body shop, painting and oven drying.

Keywords - Smart supply chain Smart manufacturing Planning model Supply chain performance Flexibility.

INTRODUCTION

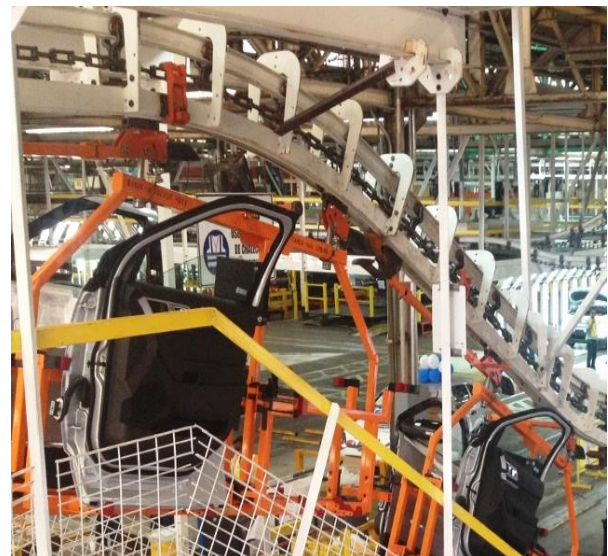
With the fast change of information and communication technologies and global economics, manufacturing industry faces the challenges in both market and supply sides. The challenges in the market include short product life cycle, demand uncertainty, and product customization. Accordingly, supply challenges are the dramatic increase of flexibility in productions and complexity in the supply chain, which result from the changes in the industry and rapid development of ICPT (Information, Communication, and Production Technologies). In this study, we consider a supply chain converged with ICPT, called Smart Manufacturing Supply Chain (SMSC). By investigating the attributes of SMSC, we identify the functional and structural characteristics of SMSC. Tactical supply planning in SMSC recognizes the ability of a real-time decision-making constrained by the planning horizon. In order to take advantages of SMSC, this study develops a profit-effective and response-efficient tactical supply planning model to find an optimal trade-off between profit and lead time. The model determines the optimal supply throughput during a planning horizon, called Smart Supply Chain Performance (SSCP) as a performance measure for SMSC. The proposed model is investigated and validated using comprehensive numerical experiments and managerial insights are addressed.

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. They also have popular consumer applications, as they are often found in supermarkets and airports, constituting the final leg of item/ bag delivery to customers. 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.

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.



POWER AND FREE CONVEYORS

Power and free conveyors are the workhorse of the overhead conveyor product family. Ultimation's systems are exceptionally flexible and easy to maintain. We integrate Jervis Webb Power and Free Conveyor components in our overhead conveyors. They are ideally suited to demanding industrial environments that require a high degree of versatility and production accuracy. Ultimation's range of Webb power and Free Conveyors

can handle loads from as light as 5 pounds per unit to 20,000 pounds. Unlike basic continuously moving overhead monorail conveyor systems, these systems provide the unique ability to stop individual loads without stopping the entire production line. Webb Power and Free Conveyors offer a wide range of features designed to maximize your production capacity including:

- Variable chain speeds
- High-speed indexing
- On-line storage
- Adaptability to changes in elevation

HOW DO POWER AND FREE CONVEYORS WORK?

Power and Free conveyors have two tracks, with one track located above the other. On one track which is known as the “power” track, a rivet less conveyor chain is attached. This conveyor runs continuously when the overhead conveyor is in operation. On the second track, the loads that the conveyor will carry are attached to the conveyor system via load bars and trolleys. This second track is known as the “free track” of the conveyor. Small mechanical devices called “pusher dogs” are located at regular increments along the moving chain. The purpose of the pusher dog is to push the free trolleys along the conveyor track. Provided the track in front is free from either other trolleys or mechanical stop locations, the free trolleys are pushed along by the pusher dog at the same speed as the power chain. When a trolley comes up against another carrier in front, the free trolley system automatically disengages the trolley. This allows the power chain to continue running. In this way, the free trolleys can stop and start at various points within the conveyor system. The loads on the conveyor can also accumulate (i.e. bunch together) when necessary, or alternatively, they can be separated to travel one by one by means of a pneumatically operated stop which stops the free trolleys.

Power and free trolleys can therefore allow each of the individual conveyor loads to stop and to start. They are able to accumulate together, and then to be separated again in a controlled manner. The system can include horizontal turns, vertical turns (changes in elevation) and switches to send some trolleys in one direction and others in a different direction. Many power and free conveyors also feature two or more chains pulling the free trolleys around the conveyor system. In the production areas, the chain may move slowly on a “production speed chain”, and then the free trolley can then transition to a high speed. This high speed chain can quickly move the conveyor loads to the required delivery areas. The graphic below shows how the pusher dogs interact with the free trolleys:



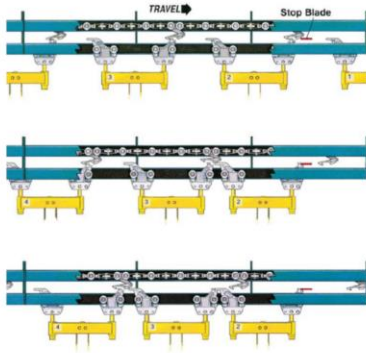
ADVANTAGES OF POWER AND FREE CONVEYOR SYSTEMS

Because Power and Free Conveyors combine many of the advantages of other conveyor types and conveyor systems with relatively few disadvantages, they have long been the first choice for the automotive industry and other industries where high volume, durability and high reliability are very important. Compared with other overhead conveyor technologies, power and free systems generally have far fewer motors and far fewer moving parts that can go wrong. Electrical systems for power and free conveyors are typically much simpler than for friction conveyors or for electrified monorail systems. Simple pneumatic devices (air cylinders) can be located along the line at any location where carriers need to be stopped and then released when ready to move again. These pneumatic stops can be relocated fairly easily as required if the customer’s needs change. The Webb “Dog-Magic” system which allows trolleys to accumulate and the disengage provides a mechanical intelligence un-matched by many other conveyor types.

On-Line Accumulation

On-line accumulation allows both main and spur lines to be used for in-process (live) storage. This is particularly important in applications where the rate of production varies between workstations. Accumulated carriers can be returned to the production line for completion. The accumulation process consists of three basic steps:

1. Stop blade moves into position between carriers (1) and (2). Pusher dog moving carrier (2) encounters stop blade and pivots up, releasing carrier from power chain.
2. Pusher dog moving carrier (3) encounters rear trolley of carrier (2), releasing carrier from power chain.
3. The sequence is repeated for all trailing carriers (4, 5, etc.) until the stop is released, allowing the front trolley of the lead carrier to be picked up by a pusher dog and moved along the free track.



POWER AND FREE CONVEYOR SYSTEMS: USE IN HARSH OR SPECIAL ENVIRONMENTS

Power and Free Conveyors are routinely used in harsh environments, including paint ovens, above dip tanks and throughout paint pre-treatment facilities. Where necessary,

special shrouding and carrier design can be used to prevent any drips from the chain from landing on the product. For food safe power and free conveyor systems, Ultimotion and Webb’s overhead conveyor systems may be used in food-safe environments with appropriate component and lubrication selection. This includes conveyors utilizing H1 category food safe lubricants.

CONCLUSION

Power and free conveyor systems are built on a two-track system and can help optimize and improve your available space through automation and expert systems, Power and free conveyors are called “power and free” because one track is operated by a powered.