Use of Conveyors - Vibratory, Belt, & Chain

Material: Wood Waste

Issue: *A wood waste processing facility requires that conveyor systems efficiently transport material between different machine centers, screening systems, and contaminant removal systems. The appropriate equipment for handling basic material depends on wood waste materials specific characteristics. Since wood waste is usually not uniform in size, and since the material characteristics change after different stages of processing, a given processing facility will use several types of conveyor equipment. Selecting the appropriate type of conveyor is essential in order to:*

- *balance material flow through machine centers and systems;*
- *avoid back-ups, spill-overs, and resulting clean-up requirements;*
- *avoid unnecessary equipment maintenance or plant down-time;*
- *maintain appropriate orientation of the material;*
- *operate compatibly with other process equipment and systems;*
- *accommodate the abrasive properties of wood.*

Best Practice: This Best Practice recommends the consideration of a number of issues in selecting a conveyor equipment

Types of Conveyors

Vibrating Conveyor. A vibrating conveyor consists of a flat-bottomed metal trough which transports material through controlled vibrations. Vibrating conveyors tend to be the cleanest and most reliable conveyors, though they are limited in length and require fairly high maintenance. Proper design of the support structure and foundations is important to ensure smooth operation and to reduce vibration into surrounding areas. Counter-balanced vibrating conveyor designs run the smoothest by eliminating nearly all dynamic forces, thus reducing the need for expensive foundations.

Belt Conveyor. A belt conveyor consists of a tautly stretched synthetic rubber belt which carries material as it travels over a series of rolls. The belt may be flat or troughed depending on the design of the supporting rolls. Belt conveyors are the best system for handling small sized, dry or semi-dry finished material at high speeds and they are well-suited for use on picking lines. Belt conveyors are inexpensive and require minimal maintenance, though they may require belt brushes and skirting to avoid major clean-up problems. Proper chuting into the conveyor is also necessary to avoid clean-up problems on bottom discharge chippers and hogs.

Chain Conveyor. A chain conveyor consists of a flat-bottomed metal trough that carries a 'flighted' chain or box chain which catches material and pulls it along the conveyor. Chain conveyors work well with large, wet, or dry material. They may not produce as even flow of material as belt or vibrating conveyors. Chain conveyors are also noisy and require excess maintenance.

Implementation: ***Selection Considerations.*** The primary issues to consider in selecting conveyors are: operational issues (such as effectiveness, compatibility with other process equipment, capability to handle targeted production throughput), capital cost, maintenance, and safety issues.

Operational. Conveyor equipment should be able to supply material at a rate that effectively matches the processing capacity of the machine center or system. The conveyor should be sized to meet or exceed the capacity of the processing machine center or equipment it is servicing. An effective method of balancing material flow between processing centers is to drive the conveyors with variable speed motors. Variable speed motors allow plant operators or process logic control (PLC) systems to better smooth out fluctuations in material flow. Some processing systems require an even, steady flow of material in order to operate most efficiently. Belt and vibrating conveyors are capable of providing the steadiest flow of material.

Other processing systems require a particular orientation of the incoming wood waste material. For example, a chipper will operate most efficiently and produce the highest quality chips when the wood material is oriented with its length parallel to the direction of flow. Vibrating conveyors are effective in maintaining this orientation of the material in transport. When handling varying sizes of wood, the vibrating conveyor needs to be carefully sized to maintain adequate production volume capacity and to accommodate the full range of anticipated material dimensions. Excessively large material can jam a relatively small conveyor and disrupt production. (At the same time, excessively large conveyors can require unnecessary capital expenditures and decrease profit margins.) In some cases, the manufacturer of processing machinery will indicate the appropriate type of in-feed and out-feed conveyors that will allow the equipment to operate most efficiently. The selected conveyor must meet their compatibility requirements.

Cost. Although cost comparisons among the different types of conveyors will vary from application to application, belt conveyors tend to be the least expensive.

Maintenance. When properly equipped with skirts and brushes, belt conveyors generally require less maintenance than chain and vibrating conveyors. However, nails and other metal contaminants can wear belts excessively. Vibrating conveyors and chain conveyors may require high maintenance, but installation of well-built equipment and preventative maintenance will avoid most problems.

Safety. As long as conveyor systems are properly installed and the drive components are adequately guarded, operation is relatively safe for all equipment types.

Benefits:

Proper selection of conveyor equipment will lead to improved operations of a wood waste processing facility by maximizing process efficiency, reducing operational labor requirements, and maintaining high product quality.

Application Site:

This Best Practice applies to other processing facilities.

Contact:

For more information about this Best Practice, contact CWC (206) 443-7746, e-mail info@cwc.org.

References:

1. International Resources Unlimited, Inc.; Eugene, OR
2. Lyman , Mark; West Salem Machinery; Salem, OR
3. Sherman , Raymond; General Kinematics; Barrington, IL
4. “Vibrating Process Equipment for Resource Recovery”; Albert Musschoot, Raymond Sherman, and William Guptail; ASME; Proceedings from National Waste Processing Conference - 1992.
5. West Salem Machinery equipment brochure.

See Appendix for an Equipment Manufacturers List.

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