

# POWDER & BULK SOLIDS

The Source for Dry Processing and Bulk Handling Technology



## Transforming Waste Tires into Sustainable Carbon Black

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### When Considering a Dryer, Remember Material Must Go Somewhere

To select a dryer, we must know something about our material. To select a dryer that will work well we must know a great deal about our material.

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### Prioritizing Safety in Heavy Industrial Environments

An effective dust collection system is an essential part of keeping an industrial facility clean, safe, and compliant with regulatory standards.

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### Getting Measurable Results from Conveyor Training

Companies that prioritize safety, training, and updating equipment enjoy fewer safety incidents, less regulatory oversight, higher productivity, and greater long-term profits.

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### Scale Integrator

The WeighPoint 7200 integrator is a dual-processor, touchscreen-enabled solution designed for continuous operation in harsh environments. The field-mountable or panel-mountable standalone unit with HMI provides an easy-to-use interface to the company's library of algorithms and functions. It is available in four configurations for flexible installation planning. It has an 8-in. bright touch-screen display providing high visibility even in harsh environments with an operating temperature range from -20 to 60°C.

Thayer Scale, Pembroke, MA 855-784-2937  
www.thayerscale.com



### Digital Valve Controller

The Fisher FIELDVUE DVC7K digital valve controller features Advice at the Device technology with embedded computing and analytics that convert raw data into actionable information locally with Bluetooth capability, within the device. This means maintenance personnel can receive the data via their phone, tablet, or computer wirelessly without having to be in a control room at the plant location. The new valve controller technology improves the performance, reliability, and uptime of both on-off and control valves.

Emerson, St. Louis, MO 314-553-2000 emerson.com

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# Getting Measurable Results from Conveyor Training

By R. Todd Swinderman, Martin Engineering

Are you just checking the boxes by doing required training hours, or is your goal to get a return on your investment? There can be huge improvements in production, maintenance labor, risk avoidance and cashflow by training employees on how to safely control fugitive materials in bulk material handling and then implementing changes. Unfortunately, half measures don't get half results, so training alone won't be sufficient. Following through on what has been learned is the key.

Training should be robust enough to break the "we've always done it that way" mentality and encourage creativity in problem solving with safety at the forefront of the design. Companies that place a priority on safety -- and address fugitive material problems seriously -- benefit from fewer safety incidents, less regulatory oversight and higher productivity and profits.

**85% of conveyor maintenance is a result of fugitive materials escaping from transfer points.**  
2014 Pit and Quarry Conveyor University Handbook – MSHA quote in chapter 10

**60% of all safety incidents occur during maintenance.**  
Pulp and Paper Safety Organization 2004 IDCON/Safety/Reactive Maintenance Survey

**30% of serious or fatal accidents occur when cleaning near a moving conveyor.**  
A User's Guide to Conveyor Belt Safety: Protection from Danger Zones, IRSST and CNESST

Statistical research on conveyor safety

## Basic Training

Everyone operating, cleaning, or maintaining conveyors should be trained in the hazards of belt conveyors

and bulk material handling. Operators and cleaning crews should have a basic understanding of what is normal conveyor operation and what the common problems are, so they can be aware that there are ways to reduce day-to-day problems such as spillage and belt wander.

Basic training includes topics such as guarding, identifying problems, and safe work practices. Appropriate safety training emphasizes how the belt can store elastic energy even when lock-out tag-out procedures are followed and why additional securing of the belt is required. Further, with the retirement of many experienced operators and mechanics -- and the difficulty in finding new workers -- it becomes critical that new employees understand the basics of conveyor design and operation.

## Advanced Training

The engineering and maintenance staff should be additionally trained in fundamental conveyor design concepts, so they can analyze cause-and-effect relationships. Quite often the visible signs of poor conveyor operation are not the root cause of the problem. For example, using guide rollers to force the belt to track does not address the fundamental reason for the belt mistracking and usually results in belt edge damage.



Maintenance personnel should receive advanced conveyor training so they can analyze cause-and-effect relationships.



Sometimes training is on a specific piece of equipment with the goal of creating trainers who can educate the rest of the maintenance department. This approach works well with certain types of equipment but ends up with one or two motivated and well-versed technicians who can troubleshoot.

A mechanic trained in installing problem solving components will run into a myriad of physical constraints. First, the original conveyor design and subsequent modifications can make it impossible to install equipment according to the manufacturer's instructions without a complete redesign. Second, often structural obstructions or conveyor arrangements don't allow enough room for installation, clear views for inspection or access for safe and easy maintenance access according to industry standards.

Conveyor design training for engineers and mechanics is critical so they can diagnose problems with an understanding of fundamental design methods. Systems are incrementally modified over time to minimize problems when belt speed and capacity exceed the original design specifications. No two conveyors are identical and even twin conveyors side by side can act differently. So, adhering to standard design methods allows one technician to make these slight adjustments and another technician to recognize the intentions even without the prior technician present.

## Training for Results

Training alone rarely results in meaningful actions to improve conveyor performance. When management understands the clear links between safety, cleanliness, and productivity, it is much easier to turn training into results. There are many variations of how this can work, but most success stories have common threads:

- Basic training in conveyor hazards and the methods for controlling fugitive materials.
- Training in conveyor design fundamentals and the root causes of common problems.
- Management participation in the training to show support.
- A pilot program and measured results.
- A long-term plan implemented from a successful pilot program.

## Where to Start

A walkdown of one or two "problem belts" and a review of goals the day before the training help the instructor focus on site-specific problems and management's expectations. The survey and interview usually take a few hours to half a day. The goal is for the instructor to have actual examples to show the class their problems are not necessarily unique. An experienced teacher will most likely have examples showing similar problems and their solutions.

The first day typically starts with reviewing the typical problems and getting the class to talk about their specific challenges. The class identifies a couple of problem conveyors and the class splits into small teams. Each team can look at the same problem or select different ones. Photos and videos of the issues are taken to be used in the problem-solving discussions.

The rest of day one and the start of day two review basic design principles that relate to the problem conveyors. The discussion centers on possible root causes and solutions. Once the teams reach an agreement on a way forward, they prepare a short presentation with the help of the instructor, using their actual conveyor problems and the knowledge they gained. The presentations may also include an estimate of the cost of the proposed solutions.

## Management's Role

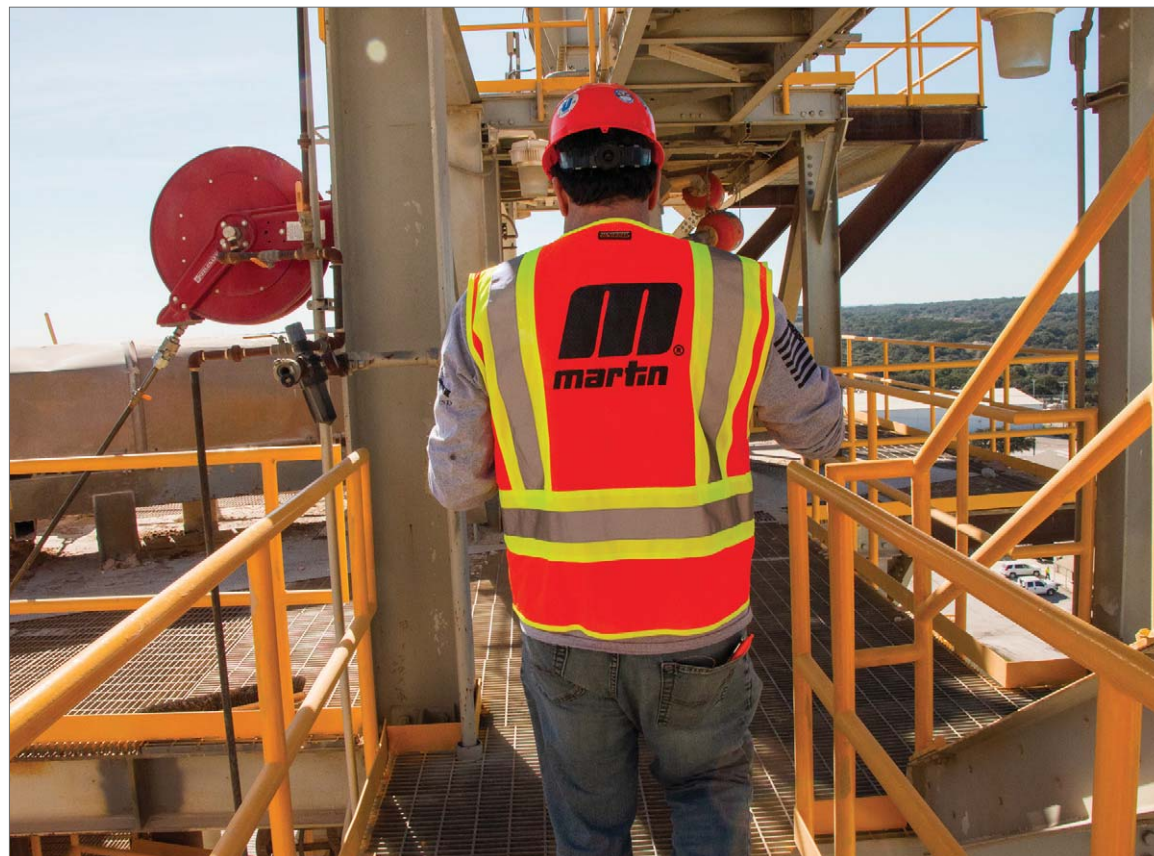
At the end of day two, management is invited to listen to the team presentations and solutions. By participating in the class presentations, management shows a commitment to making improvements and has an opportunity to ask questions. The trainees, by making the presentations, show the knowledge they gained and support for the proposed solutions. The photos, videos and inspection sheets help shed light on issues and solutions crews experience every day. It is critical at this step that the manager(s) who attend the presentations have the authority to act on the proposals and are willing to commit to a pilot program to prove the theoretical results can be turned into reality.

## Pilot Program

One or more conveyors are selected for a trial program. While it is normal to select the "worst" conveyor, keep in mind that half measures do not get half results, so consider the project's scope. Once a conveyor(s) has been selected, detailed proposals for retrofit can be obtained. An experienced person from the selected equipment supplier should overview the designs, offer feedback, and supervise the installation. Either outside contractors or in-house personnel can be used. Sufficient downtime must be allocated to properly modify the conveyor.



The Martin conveyor belt carryback gauge is a patented tool for estimating carryback on the return side of a conveyor belt.



A professional safety inspection takes a third-party perspective of aspects that workers often overlook.

Measuring results from improvements is important but relatively easy to do. Photos and videos of before and after must be taken. Dust levels are measured using common instrumentation, spillage can be measured by placing buckets or trays in appropriate locations and carryback is measured by placing a tarp under several return idlers close to the discharge pulley. The collected fugitive materials are weighed for comparison after the conveyor has been modified. Dust and spillage sampling locations should be marked so the tests can be accurately repeated after retrofitting and an improvement percentage can be calculated.

The length of time for collecting samples can vary from a day to a week and should give a good representation of the average or typical operating environment and weather conditions. It is important to keep the dust monitor running even if the conveyor is running empty, as maximum fugitive dust levels are often de-

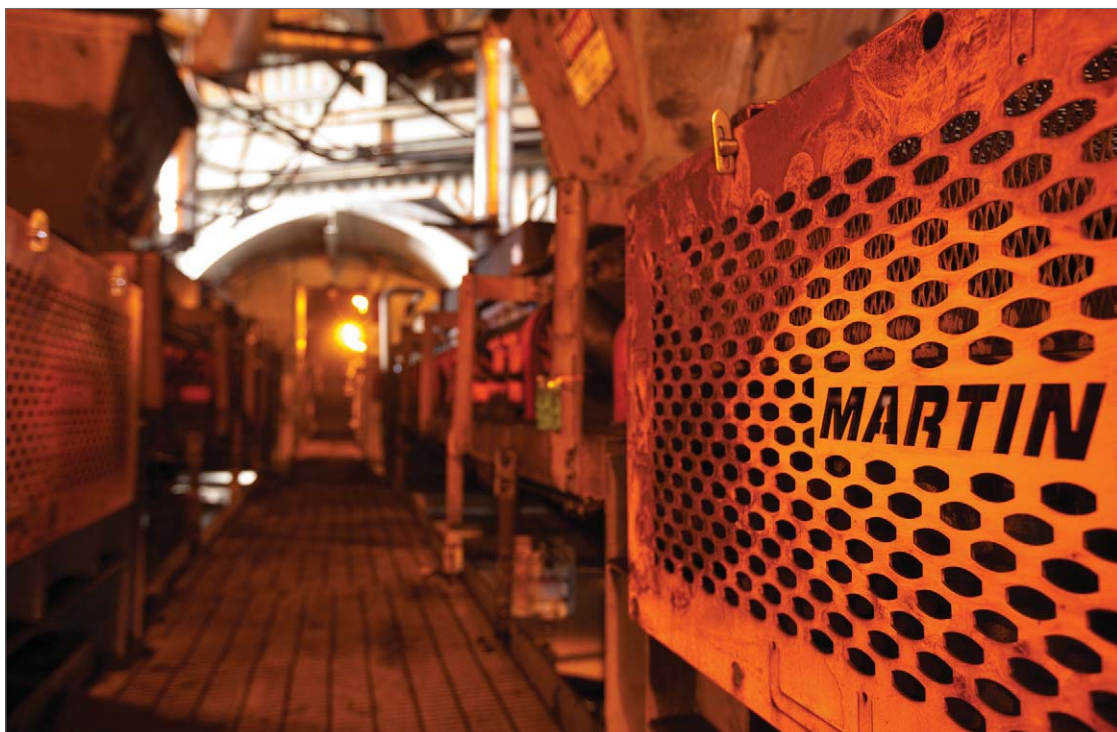


tected when running conveyors empty long enough that the carryback dries out and becomes airborne.

Usually, the results of the pilot program are immediately noticeable, but there is a temptation to assume the problem has been fixed and to revert back to delaying maintenance without follow-up maintenance, causing the results to deteriorate. Therefore, the test period should extend to the next scheduled maintenance shutdown with periodic inspections and adjustments made by the equipment supplier in the interim to ensure optimum efficiency.

### The Payback on Training

To demonstrate the benefit of safety to a company's bottom line, the U.S. Occupational Safety and Health Administration (OSHA) created the online tool, 'Safety Pays,' which uses company-specific economic information to assess the potential economic impact of occupational injuries on that firm's profitability. The program estimates direct costs (claim cost estimates provided by the National Council on Compensation Insurance) and indirect costs (provided by the Stanford University Department of Civil Engineering) and weighs them against financial details supplied by the company.



A properly engineered conveyor system will maximize both productivity and safety.

<b>OSHA \$afety Pays Tool</b>  To calculate an accident's impact on profitability, the company's profit margin is used to determine the sales required to pay for the total cost.	<b>Average Direct Costs</b>	<b>\$56,557</b>	<b>The \$afety Pays tool estimates the cost of a single crushing injury.</b>  <hr/> Assume that the company in this example has annual sales of \$10,000,000 with a 3 percent pre-tax profit margin.  Input your company's annual profits and the OSHA \$afety Pays tool assesses the total cost of the injury.  OSHA draws direct costs from claim cost estimates provided by the <i>National Council on Compensation Insurance</i> .  Indirect costs are provided by the <i>Stanford University Department of Civil Engineering</i> .
	<b>Average Indirect Costs</b>	<b>\$62,212</b>	
	<b>Estimated Total Cost</b>	<b>\$118,769</b>	
	<b>Additional Sales Necessary:</b>		
The results can be staggering.	<b>To Cover Indirect Costs</b>	<b>\$777,658</b>	
Presented by 	<b>To Cover Total Costs</b>	<b>\$1,484,612</b>	

### Conclusion

Experience has shown that the motivation to take action developed in the classroom often defaults back to prior habits. Sometimes it is a lack of funding, an understaffed maintenance department or a "run-till-broke" mentality. The pressure to get back into production overwhelms the training that emphasizes the understanding of the root causes of inefficiency and injuries such as fugitive materials. A production-at-all-costs approach means the problems and safety concerns never go away, and employees just have to accept the poor performance and added risks, which demoralizes them.

It is incumbent upon management to take the safety and maintenance training as seriously as the staff, listen to the concerns of employees and fix the problem correctly the first time. As research has shown, companies that prioritize safety, training, and updating equipment enjoy fewer safety incidents, less regulatory oversight, higher productivity, and greater long-term profits.

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### References

1. The Swinderman Scale of Fugitive Materials, Martin Engineering, R. Todd Swinderman. Aug, 2004. <https://foundations.martin-eng.com/learning-center/learning-center/measuring-fugitive-materials-from-belt-conveyors-part-2>