



DRY CARGOTM *international*

20th
anniversary

WWW.DRYCARGOMAG.COM

ISSUE NO. 225 JUNE 2019



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Maintenance service contracts: optimizing conveyor uptime and reducing costs

Likely, there is a coffee machine in the break room and no matter how automated it is, at some point, someone has to add the beans, writes *Daniel Marshall, Product Engineer, Martin Engineering*. As mundane as that seems, the same goes for service on industrial conveyors. Technological advancements in bulk handling equipment over the last few decades have increased throughput and reduced downtime, while limiting worker exposure to hazards. However, at some point the system always requires a real person to assess issues, make decisions and implement proper solutions. The question is, who adds the beans?

In many industries, operators are increasingly turning to outside contractors to take advantage of consistent maintenance schedules and ongoing service that's conducted safely by an experienced and well-trained technician from a specialty contractor to better improve safety and control costs. Many of these specialty firms also design and produce bulk handling components which are actually superior to the standard parts provided by Original Equipment Manufacturers (OEMs). Specialty contracting may be a better choice for service than contracting with the OEM, since the specialty technicians are fully trained on the newest equipment



Expert maintenance teams are trained to recognize possible trouble spots.

designs, able to implement solutions that adhere to the warranty and ensure a Production Done Safely™ approach. Moreover, specialty contractors may be able to secure replacement equipment more quickly during periods of unscheduled downtime due to their industry-wide contacts.

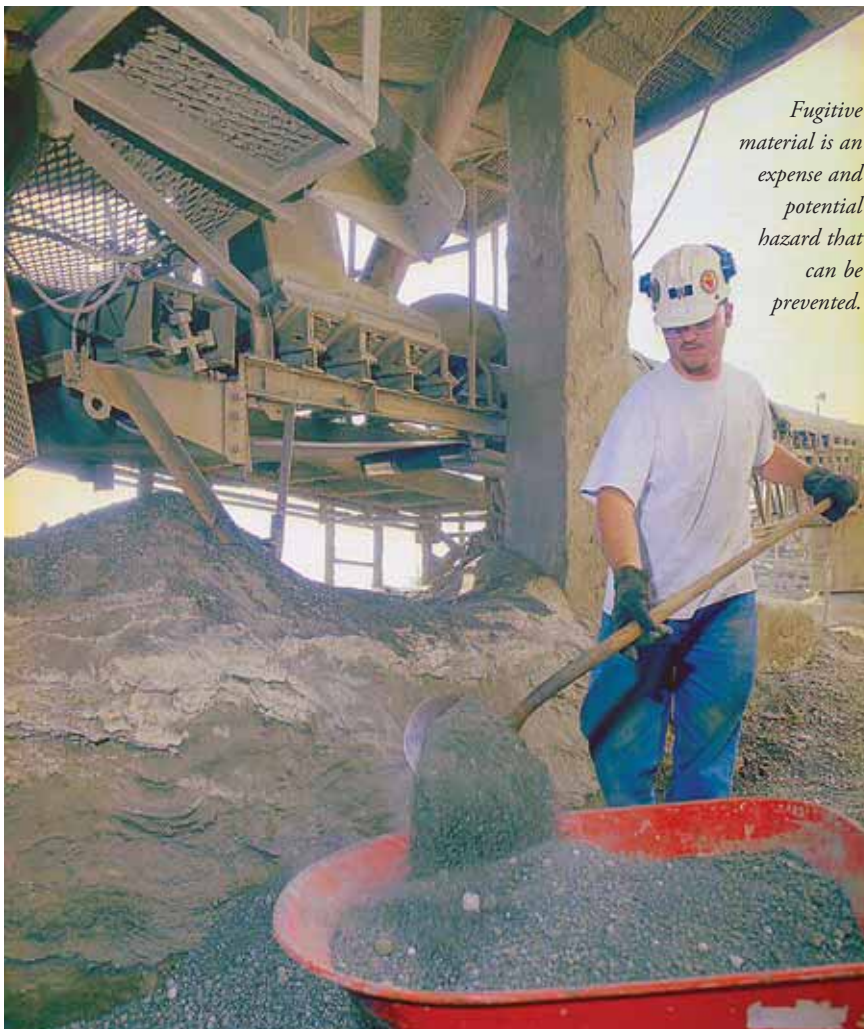
Although internal resources can be used as support, it's recommended that the component manufacturer or contractor install the equipment on both new and retrofit applications. Many performance problems with new components and systems are due primarily to improper

installation. A second leading cause of serious performance problems is lack of proper maintenance. Using a specialty contractor for installation and ongoing maintenance contributes to safer and more efficient production — with less unscheduled downtime — and in the long run saves money and lives. (Another term is 'certified contractor' for the same thing)

REGULATIONS, TRAINING AND RETENTION

According to the U.S. Occupational Safety and Health Administration (OSHA) and most global government safety organizations, a safe and compliant workplace around conveyors includes open walkways clear of debris, dust-free air, guarded belts with safe access points, signage and sufficient lighting.[1] Violations can result in fines and downtime, but a workplace injury can carry substantial penalties affecting operations and insurance. Hazardous conditions can easily be missed by employees who work in the environment on a daily basis, but as an independent outside party, service contractors are trained specifically to recognize potential violations and offer practical solutions.

The time and resources required to train an employee on equipment and certify them to conduct certain procedures such as confined space entry, electrical work, etc. can be a significant ongoing expense. As workers become more experienced and gain certifications to properly maintain efficient systems, their value in the marketplace rises, and retention can become an issue. In contrast, contractors must be experienced, knowledgeable and certified to conduct the appointed maintenance, and it's up to the contracted company to retain and train that staff.



Fugitive material is an expense and potential hazard that can be prevented.

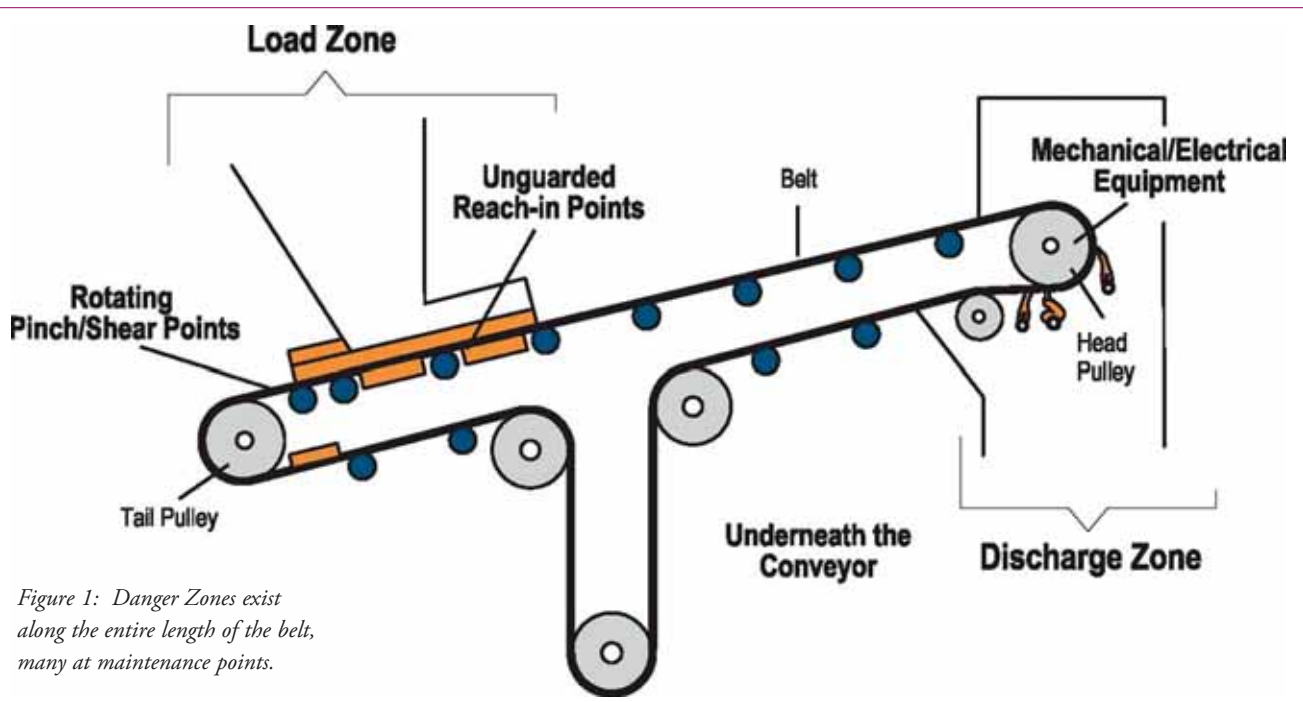


Figure 1: Danger Zones exist along the entire length of the belt, many at maintenance points.

MAINTENANCE DANGER ZONES

Exposed to punishing industrial environments and harsh weather conditions, in the past conveyors generally were left to run until they stopped working. But, due to a greater emphasis on safety and the expensive consequences of unscheduled downtime, bulk handlers are being more meticulous about conveyor operation and maintenance. This increased scrutiny includes regular cleaning of spillage, improved dust control, and additional monitoring and maintenance, exposing employees to a moving system more often. These changes introduce a variety of hazards.

Conveyor danger zones where work injuries are likely to occur (see Fig. 1, above):

- ❖ loading zone;
- ❖ discharge zone;
- ❖ mechanical/electrical equipment;
- ❖ rotating pinch/shear points;
- ❖ underneath the conveyor; and
- ❖ unguarded reach-in points.

Some hazards are industry- and application-specific. A mine may be concerned primarily with dust, while other industries might have serious issues with tacky carryback, for example. However, most common conveyor-related issues are

found across bulk handling operations. Personnel who work around the equipment on a daily basis often become comfortable with conditions, viewing these issues as an unavoidable outcome of production rather than abnormalities in need of resolution.

A component manufacturer or experienced maintenance contractor views these issues with a different eye and — having serviced many other sites — may present solutions that internal resources have overlooked. These improvements are designed to reduce employee exposure, improve workplace safety and maximize productivity.

Figure 2: The list of potential sources of hazards is long and varied.



THE INJURY BLAME GAME

Why are service contracts safer? Because service and maintenance around a moving conveyor is one of the main causes of injury and fatality in all of bulk handling, as well as presenting tremendous liability to operators, poor work practices around danger zones can lead to catastrophic results. A 1999 US Mining Safety and Health Administration (MSHA) "Fatalgram" provides an excellent example. A worker went into an unguarded area and entered a confined space alone near an operating conveyor that was not locked out. There, the individual's clothing became trapped in the conveyor's moving tail pulley, drawing the person in and killing him. Any of these poor work practices could have resulted in a fatality, but combined with lack of safeguards, they may be an indicator of a larger safety issue within the company.

Following an injury, company officials and workers can play the blame game, which deteriorates morale. Herbert W. Heinrich's 1931 book, *Industrial Accident Prevention, A Scientific Approach*, was based on summarizing thousands of accident reports. Heinrich concluded it was the workers' unsafe acts that were the primary cause of accidents, a mode of thought that continues to dominate the opinion of managers and supervisors. Yet many safety professionals have realized for some time that the root causes of accidents are not that straightforward.

In many cases, concluding that the incident's root cause was an unsafe act is a simplistic excuse for a less-than-thorough investigation. Often, the employee's action is not the only — or even the most significant — root cause. The real root



Experienced inspectors provide an outside perspective on conditions and operations.

causes are usually more involved and require a more complete accident analysis, followed by thoughtful corrective action. It's been observed that there are five root causes which lead directly to an increased release of fugitive materials. This release results in scenarios that encourage workers to react the way they do. These five root causes are:

- ❖ a 'production first' culture;
- ❖ 'low bid' purchasing;
- ❖ needlessly complex designs;
- ❖ over-regulation; and
- ❖ understaffed or undertrained personnel.

The written company policy is (of course) one of 'safety', but the company culture can dictate the unwritten rule of using the lowest bid on any conveyor improvement project. This inevitably comes at the detriment of workplace safety due to inferior design, low quality materials and/or inadequate training.

Lowest-bid policies are an industry-wide epidemic, since most engineering and construction project contracts are awarded primarily on that requirement. A common supplier practice is to base a bid on the price per kilogram (or per pound) of fabrication in order to be competitive in the low-bid system. To minimize expensive design time, it's not unusual for suppliers to recycle specifications, drawings and designs, producing what is essentially a 50-year-old design at state-of-the-art prices.

Since the system was designed with old thinking, it will likely fail to meet today's expectations. Maintenance on a low-bid design can cost more in labour and materials in the long run and compliance issues may become more common as the equipment succumbs to wear and tear. Leading engineering firms recommend companies make a higher capital expenditure for a customized holistic, longer-lasting and safer solution, then contract experienced, trained technicians to maintain it.

In industrial settings, many managers and shift supervisors use a 'management by edict' style, which may be effective in a military environment, but has proven unproductive in other settings. Resisting authority is human nature, so written policy and rigid directives can quickly become "stupid rules" that are easily ignored by employees. In contrast, service contracts are typically explicit about the scope of work and procedures required for technicians to conduct the maintenance safely, often exceeding the standards set forth for employees by the corporation or in applicable regulations.

As seen in the MSHA example, individuals are certainly not beyond culpability for injuries. Belt conveyors are powerful and fast, with many potential



Strict operational protocols focused on safety ensure that procedures are executed properly.

hazards, and should never be worked on or around without the proper safety procedures. When a worker loses respect for the power and constant changeability of a conveyor — either through overconfidence or cutting corners — accidents and death can result. Maintenance staff should have the training and foundational knowledge about the specific equipment to properly perform service on the system. This is another benefit provided by a service contract.

PM, PdM AND SERVICE CONTRACTS

Modern equipment designed with a Production Done Safely™ approach often integrates best practices (guards, training, etc.) with innovative autonomous technology to reduce worker interaction with equipment by predicting and even preventing issues before they reach crisis status.

Preventive Maintenance (PM) uses historical data from similar applications and environments to determine a component's general equipment life and when it should be retired, replaced or restored. Often equipment is replaced on a schedule whether it needs to be replaced or not in the PM model, increasing exposure to risks.

Predictive Maintenance (PdM) uses sensors to monitor equipment performance to anticipate failure. Cloud-based software collects and aggregates data and relays the result to technicians in the field via mobile app. A pre-set range of factors creates alerts that are sent to technicians and operators who are able to assess causes and recommend proactive solutions, rather than reacting to the outcome.

Some service contractors maintain data bases on customers' conveyors, recording system specifications, status details and service procedures performed. The collected information is helpful in scheduling maintenance activities and in determining when outside resources should be utilized. This data can be used to better manage an operation's equipment and budget.

TYPES OF SERVICE CONTRACTS

Performance analysis and maintenance programmes, implemented by in-house departments, are seldom seen as a priority, due to the overwhelming daily challenges presented to the facility. The easiest way to get results from an investment in conveyor equipment is by awarding a service contract to a specialist in the supply, installation, maintenance and analysis of bulk handling systems. Maintenance

Contracted services, such as mobile belt cleaner maintenance, help reduce component failures.



programs differ by provider and may be customizable, but they generally fall into three categories: inspection/report, cleaning/servicing and full service.

A scheduled inspection and report contract sends a specialty contractor to thoroughly examine a system — from belt health to equipment function to surrounding environment — and identify potential issues. A report is produced that presents findings and offers solutions. This can remedy the issue of in-house personnel deprioritizing inspections and routine adjustments in the face of an ever-mounting workload, labour shortages and/or time limitations. Through daily exposure, in-house inspectors may see conditions such as dust, spillage and carryback as “normal,” rather than operational issues in need of resolution. There is also the danger that what is perceived as a minor problem may be intentionally ignored in the “walk the belt” survey, because the employee conducting the survey knows that he or she will be called on to fix the problem, adding to a seemingly insurmountable list of tasks.

The cleaning and servicing contracts are perhaps the most common. From spillage and silo cleaning to monitoring and changing belt cleaner blades, services can be very specific and fill gaps where maintenance crews might be overstretched. Using contract personnel for data census, site survey and routine maintenance activities offers several advantages. The first is that a conveyor can be surveyed without requiring the attention of plant personnel, freeing them to go about their usual tasks. A second advantage is that the outside surveyor is an expert in proper conveyor practices and current governmental regulations. This

objective resource will be able to tell plant personnel when the “standard” plant practices are not the best way to do things.

At the highest level, a full service and maintenance contract sends trained technicians who take accountability for monitoring, maintaining and reporting on every level of system function. They replace wear components when needed and propose required upgrades in order to maximize efficiency, safety and uptime. This provides operators with cost certainty, making it easier to project and manage the cost of operation.

RETURN ON INVESTMENT (ROI)

Maintenance service contracts are an answer to increasing market pressure in several bulk handling sectors. Demands for more output result in faster belt speeds, higher cargo volumes and longer uptime, but may require operators to improve or replace current conveyor technology. Increasing speeds and volumes on older conveyor systems designed for lower production levels contribute to workplace injuries and increased downtime.[2] Capital investments in newer semi- or fully-automated systems designed for higher throughput require less labor, but maintenance staff need to be highly trained and specialized technicians. This is where maintenance service contracts deliver the best ROI through a series of factors:

- ❖ **compliance:** prior to performing regular scheduled maintenance, the contractor may point out compliance issues and offer solutions. This avoids expensive fines and violations that could result in excessive downtime.
- ❖ **injuries/liability:** working in several locations, contractors avoid the ‘comfort factor’ and rely on a strict set

Cleanup under a conveyor can divert essential staff from more productive tasks.



Occupational Safety and Health Administration (OSHA), Department of Labor, Washington, D.C.

[2] Swinderman, Todd; Marti, Andrew D.; Marshall, Daniel: Foundations for Conveyor Safety, Sec. 5, pg 426 (2.7), by Martin Engineering, Worzalla Publishing Company, Stevens Point, Wisconsin, 2016.

[3] Swinderman, Todd; Marti, Andrew D.; Marshall, Daniel: Foundations for Conveyor Safety, Sec. 6, pg 472-476, "Case Study Return on Safety at a Coal Mine" by Martin Engineering, Worzalla Publishing Company, Stevens Point, Wisconsin, 2016.

ABOUT MARTIN ENGINEERING

Martin Engineering is a global innovator in the bulk material

of safety procedures to conduct maintenance. This minimizes injuries and their effect on insurance premiums, while reducing liability.

- ❖ **efficiency:** maintenance service contracts focus on improving and sustaining uptime with the least capital investment possible.
- ❖ **consistency:** contractors have a clear directive and are not affected by internal factors (labour disputes, morale, etc.). The priority is maintaining safety, production levels and preserving the customer relationship.
- ❖ **cost of operation:** with a defined scope of work on a set budget, along with clear reporting and recommendations on pending needs, operators can better forecast improvements and control labour costs, further improving ROI as time passes.

CONCLUSION

Maintenance service contracts are not just a way of controlling and potentially reducing the cost of operation; they are also a safety mechanism. For example, one case study showed a 79% reduction in lost time incidents and a 40% improvement in production using specialty services, which demonstrated paybacks in days from an annual specialty maintenance contract.[3]

Regulators do not differentiate between employees and contractors when inspecting equipment and workplace compliance. Workloads may preclude staff from maintaining proper compliance or they just might not notice some violations. Conveyor equipment manufacturers and certified contractors are highly-trained

independent third parties who can assess and offer practical solutions on a regular schedule.

Outside resources take ownership of the plant's efficient and productive use of the conveyor system. They must demonstrate a dedication to the operation and to their responsibilities and duties. Wisely chosen and effectively used, these outside personnel will improve conveyor efficiency, maximize equipment life and add value to the operation.

At the core of the issue is lower operating costs and improved production. The work should match or improve efficiency regarding downtime and throughput. If the criteria of compliance, cost savings and efficiency are met, then the maintenance service contract has provided a tenable ongoing solution.

REFERENCES

[1] "Standards: 1926.555 - Conveyors" U.S.

handling industry, developing new solutions to common problems and participating in industry organizations to improve safety and productivity. The company's series of *Foundations* books is an internationally-recognized resource for safety, maintenance and operations training—with more than 20,000 print copies in circulation around the world. The entire 500+ page volumes can also be downloaded as free PDFs from the Martin web site. Martin employees take an active part in ASME, SME, VDI, CMA and CEMA, and the firm played a pivotal role in writing and producing the 7th edition of the CEMA reference book, *Belt Conveyors for Bulk Materials*. Martin Engineering products, sales, service and training are available from 18 Martin facilities, including factory-owned business units in Australia, Brazil, China, Colombia, France, Germany, India, Indonesia, Italy, Mexico, Peru, Russia, Spain, South Africa, Turkey, the USA and UK.



Scheduled maintenance from outside experts helps maximize equipment life and reduce downtime.