

# WORLD CEMENT<sup>®</sup>

December 2019



**MOLE-MASTER**<sup>™</sup>  
SERVICES CORPORATION



# CONTENTS

03 Comment

05 News

80 Five Minutes with Edelio Bermejo

## REGIONAL REPORT: INDIA

10 A Passage To India

Yogender Malik shows how steady growth is on the cards for the Indian cement industry.

18 India Cements Its Future

The GCCA considers the possibility of a sustainable and efficient future in India's cement industry.

24 Seeking Sustainability

Hari T. R., FLSmidth, shows how a progressive business mindset has motivated one of India's top-performing cement manufacturers to set an ambitious, sustainability goal.

## MATERIALS HANDLING

27 *World Cement* Interview: Shaping The Future

*World Cement* speaks to Franz-W. Aumund, Owner and President of the AUMUND Group of companies, about the group's place in the industry and what the future holds.

33 Top Of The Chain

Toby Imgrund, Renold, discusses common engineered chain assembly pitfalls.

37 The Contractor Factor

Daniel Marshall, Martin Engineering, discusses the benefits of maintenance service contracts.

45 The Benefits Of Belt Maintenance

Franklin Moore, Flexco, explains best practices for safe belt maintenance.

## EXPLOSION PREVENTION

49 Keeping Coal Under Control

Marius Bloching, Rembe, Germany, discusses safety concepts and explosion protection measures for the cement industry.

## ON THE COVER

Mole-Master Services Corporation has been setting the standard in silo and bin cleanout safety and efficiency in more than 35 countries for more than three decades. Innovative equipment in the hands of certified technicians along with an efficient mobilisation process means Mole-Master is ready for any silo clean-out project, anywhere in the world.

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## REFRACTORIES

53 Refractory Review

*World Cement* spoke to Stefan Rathausky of RHI Magnesita about sustainability, R&D, and the state of the refractory sector.

## SILO CLEAN-OUT

57 Taking Silo Cleaning Halfway Around The World

Michael Bailey and Nat Miller, Mole-Master Services Corp., discuss the challenges involved in cleaning out cement silos.

## LIME PLANT ENGINEERING

60 Flying Into Orbit

Luca Sarandrea, Valerio Colombari, and Pierangelo Bresciani, Cimprogetti, explore the utilisation of data in industrial processes.

## XRD/XRF

67 Improving Strength And Sustainability

Dr Jesus Rodriguez Sanchez, Lucideon, examines creating mechanical strength in sustainable calcium carbonate cement.

## AIR POLLUTION CONTROL

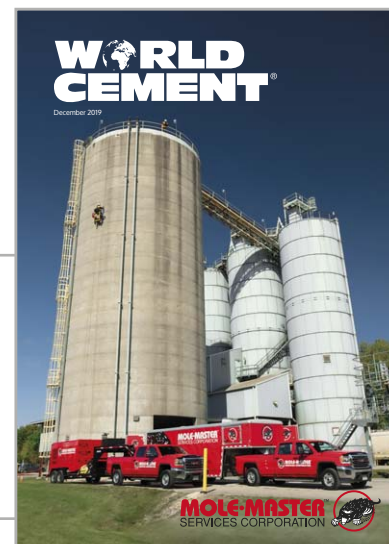
72 The Zero Emissions Mission

*World Cement* sat down with Jan Kjærsgaard, FLSmidth's Cement President, to discuss how the cement industry has evolved since the Paris Agreement and what opportunities represent the most potential impact going forward.

## ADDITIVES

75 Making Concrete Elite

Eduardo Tió, GrapheneCA, outlines the advantages of graphene additives in concrete.





# THE CONTRACTOR FACTOR

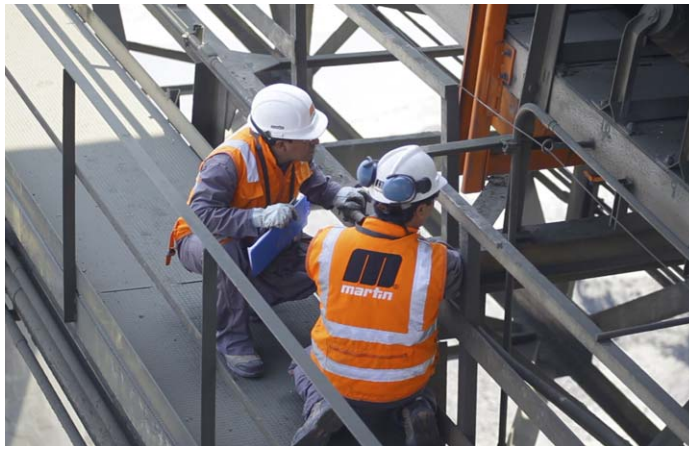


**Daniel Marshall, Martin Engineering, discusses the benefits of maintenance service contracts.**

**T**here is a likely a coffee machine in the break room and no matter how automated it is, at some point someone has to add the beans. 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?

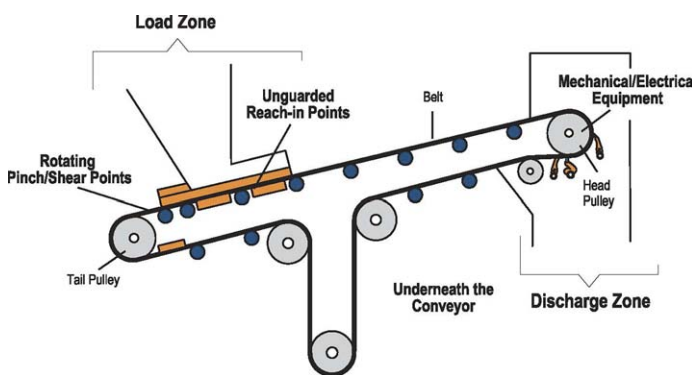




**Figure 1. Expert maintenance teams are trained to recognise possible trouble spots.**



**Figure 2. Fugitive material is an expense and potential hazard that can be prevented.**



**Figure 3. Danger Zones exist along the entire length of the belt, with many located at maintenance points.**

In many industries, operators are increasingly turning to outside contractors to take advantage of consistent maintenance schedules and ongoing service that is conducted safely by an experienced and well-trained technician from a specialty contractor; this is done to better improve safety and control costs. Many of these firms also design and produce bulk handling components that 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, seeing as the technicians are fully trained on the newest equipment designs, are 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 is recommended that the component manufacturer or contractor installs 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.

### Regulations, training and retention

According to the US Occupational Safety and Health Administration (OSHA) and most global government safety organisations, 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.<sup>1</sup> 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 recognise 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 is up to the contracted company to retain and train that staff.

### Maintenance danger zones

In the past, when exposed to punishing industrial environments and harsh weather conditions, conveyors were generally left to run until they stopped working. But, due to a greater emphasis on safety and the expensive consequences of unscheduled downtime,

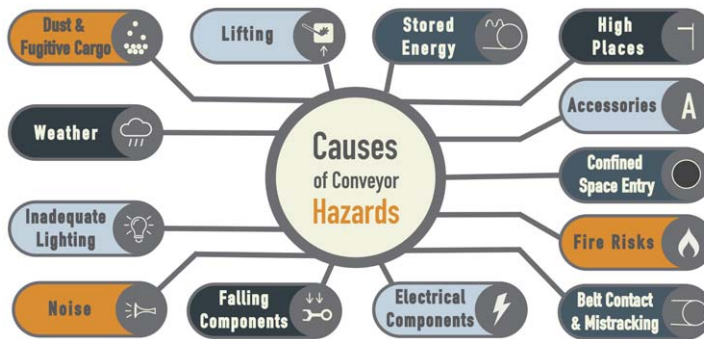


Figure 4: The list of potential sources of hazards is long and varied.

bulk handlers are paying more attention to conveyor operation and maintenance. This increased scrutiny includes regular cleaning of spillage, improved dust control, and additional monitoring and maintenance, which exposes employees to a moving system more often. These changes introduce a variety of hazards.

Conveyor danger zones where work injuries are likely to occur (Figure 3):

- ▶ Loading zone.
- ▶ Discharge zone.
- ▶ Mechanical/electrical equipment.
- ▶ Rotating pinch/shear points.
- ▶ Underneath the conveyor.
- ▶ Unguarded reach-in points.

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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 maximise productivity.

Figure 4 shows the potential sources of hazards.



**Figure 5. Experienced inspectors provide an outside perspective on conditions and operations.**



**Figure 6. Strict operational protocols focused on safety ensure that procedures are executed properly.**

## 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 them. 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 summarising 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 opinions of managers and supervisors. Yet many safety professionals have realised 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 actions are not the only, or even the most significant, root cause. The real root causes are usually more involved and require a more complete accident analysis, followed by thoughtful, corrective action. It has 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.
- ▶ Understaffed or undertrained personnel.

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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, with most engineering and construction project contracts being 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 minimise expensive design time, it is 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 that companies make a higher capital expenditure for a customised, 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 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 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**

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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, thus 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 then able to assess causes and recommend

proactive solutions, rather than reacting to the outcome.

Some service contractors maintain databases on customers' conveyors, recording the system specifications, status details and service procedures performed. The collected information is helpful both in scheduling maintenance activities and in determining when outside resources should be utilised. 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 programmes differ by provider and may be customisable, 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 deprioritising 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.



Figure 7. Contracted services, such as mobile belt cleaner maintenance, help reduce component failures.



Figure 8. Cleanup under a conveyor can divert essential staff from more productive 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 maximise 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.<sup>2</sup> Capital investments in newer semi- or fully-automated systems designed for higher throughput require less labour, but maintenance staff need to be highly trained and specialised 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 of safety procedures to conduct maintenance.



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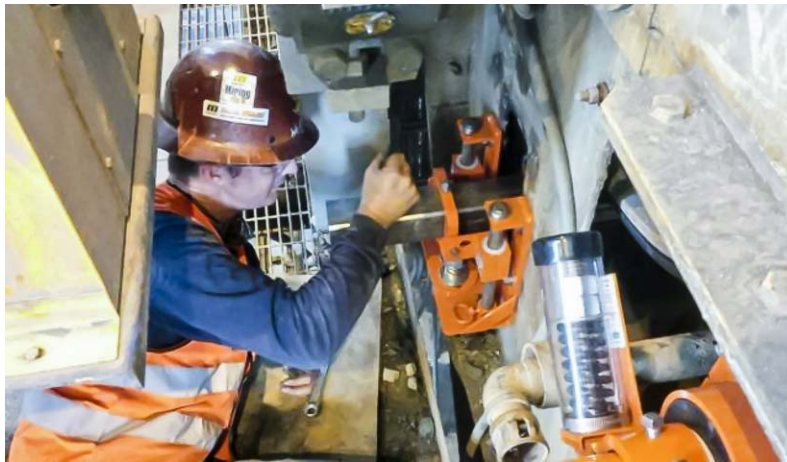


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**Figure 9. Scheduled maintenance from outside experts helps maximise equipment life and reduce downtime.**

- This minimises 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 and production levels as well as 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.<sup>3</sup>

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, maximise 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. ■

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## About the author

Dan Marshall has been working in the bulk solids industry for his entire career. A self-described 'numbers guy,' Dan joined Martin Engineering in 2000 as a Research and Development Engineer, and has since moved into a product engineering role specialising in conveyor components and finally, to a QA position. Marshall has been instrumental in the design and development of transfer point accessories, conveyor components and safety products. He now ensures that Martin products are manufactured to the rigorous standards required by the demanding applications in bulk solids handling. At the time of this printing, Dan has authored 36 published articles, presented at 17 different industry conferences and contributed to more than a hundred press releases. He holds a B.S. in Mechanical Engineering from Northern Arizona University.