



Creating **VALUE** in a cyclical environment

2017 SME ANNUAL CONFERENCE & EXPO
CMA 119th NATIONAL WESTERN MINING CONFERENCE



DENVER, COLORADO | FEBRUARY 19-22, 2017

Improving Transfer Point Performance in Hard Rock Mines



Richard Shields
Martin Engineering



2017 SME ANNUAL CONFERENCE & EXPO
CMA 119th NATIONAL WESTERN MINING CONFERENCE



DENVER, COLORADO | FEBRUARY 19-22, 2017

The Needs of Hard Rock Mines

Challenges of Hard Rock Mines

- High Tonnages
- Large Lumps
- High Impact Levels
- Round The Clock Operations

**Equipment Must
Stand Up To Conditions:
*Bigger/Stronger/Faster***



Problems at Transfer Points

- 85 % of Conveyor Maintenance Requirements arise at Transfer Points, due to Escape of Fugitive Material (*Dust, Spillage, Carryback*)
- Leads to Equipment Failures and Maintenance Headaches
- Leads to Missed Opportunities (for Productivity and Profit)
- Creates Safety Hazards for Workers Who Must Work (Maintain and Clean) Around Operating Conveyors



Controlling Dust & Spillage

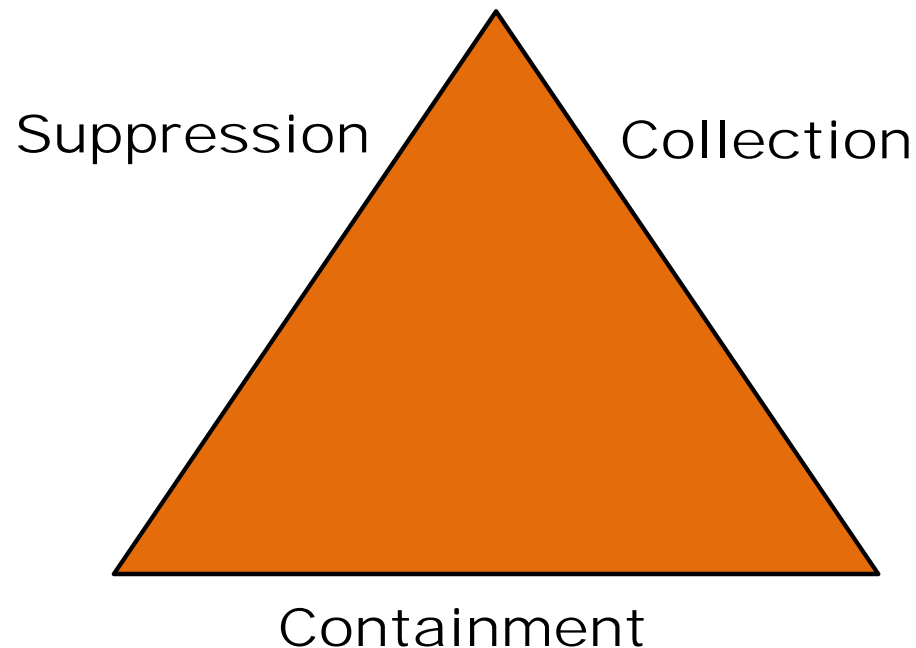


**Pyramid Approach
for control for
fugitive material:**

- ***Containment***
- ***Suppression***
- ***Collection***

**Containment for
Improved Transfers:**

- ***Belt Support***
- ***Wear Liner***
- ***Edge Seal***
- ***Expanded Stilling Zone***



Maximum Belt Support

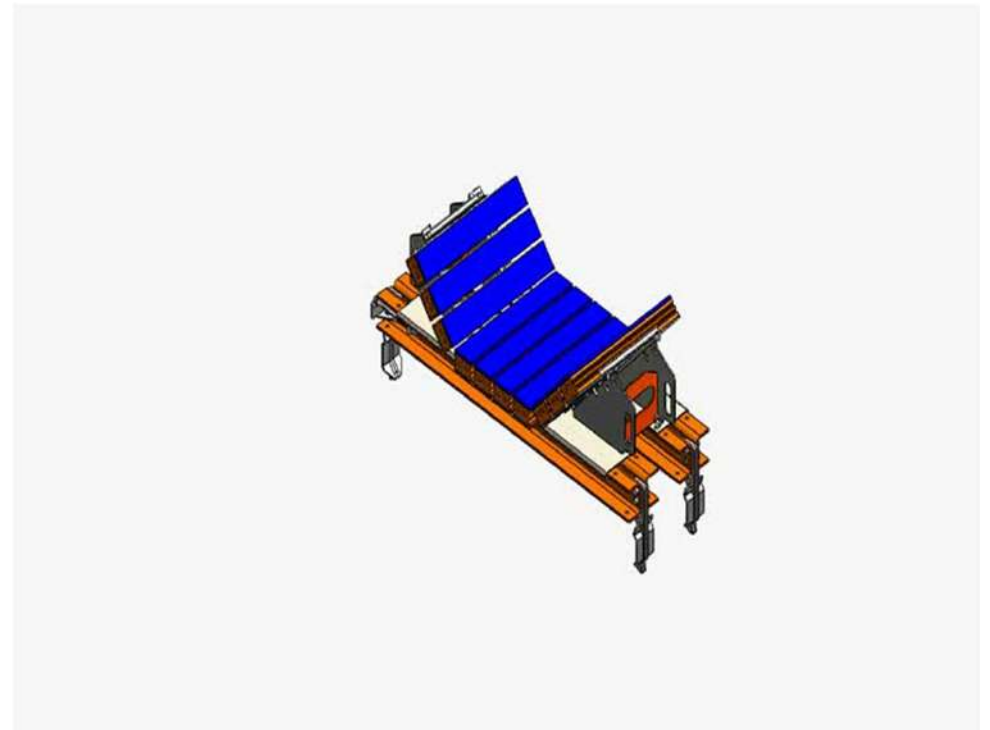
Belt support cradles absorb impact, eliminate belt sag, and stabilize belt path.



Impact
Cradle



Support
Cradle



*Cradles designed for slide-in/slide-out
installation and maintenance*

High Speed Impact Roller Cradle



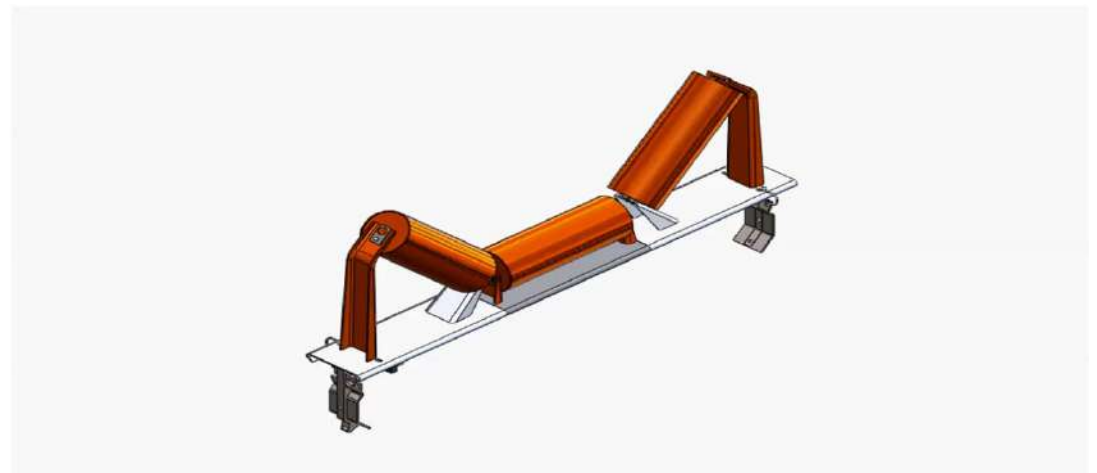
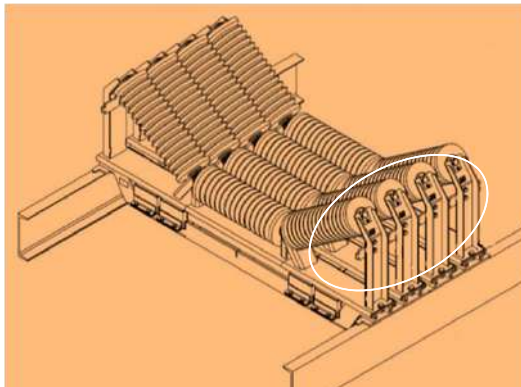
Allows Belt Speeds
Up to 5 M/Sec (985 FPM),
Depending on Roll Diameter.

Slide-in/-out Frames
Improve Installation
and Maintenance.



Elastomer Bar
Suspension
Absorbs Impact
to Maximize Life
of Structure and Rolls.

Connector
Brackets
Link
Frames,
to Work as
a Unified
Structure.



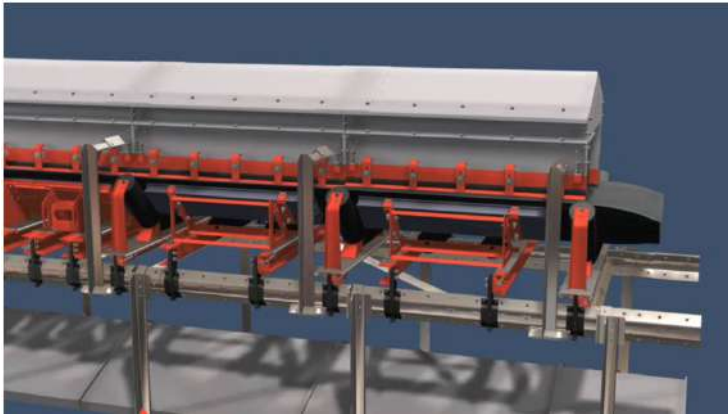
Wear Liner to Preserve Seal



Wear liner prevents cargo side pressure against the sealing strips

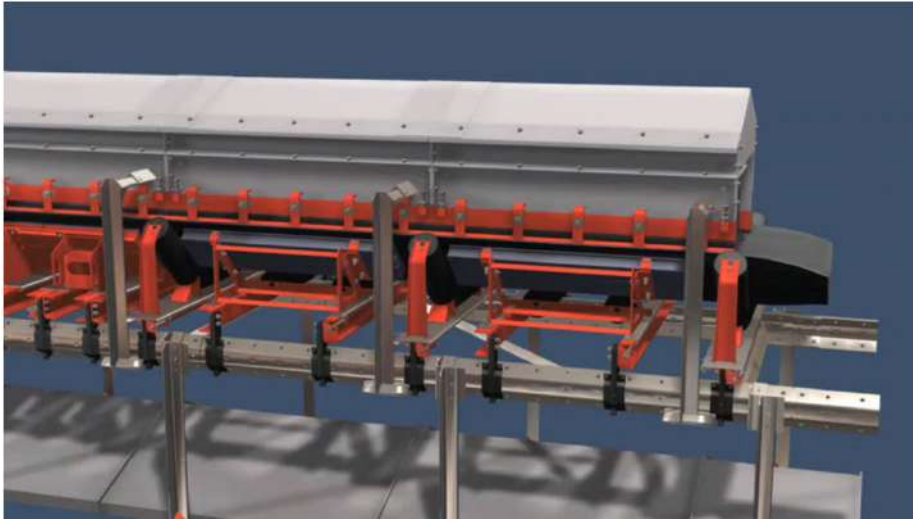
External Wear Liner

- Preserves sealing strip from cargo pressure.
- Mounts on outside of skirtboard for ease of installation.
- Allows adjustment toward belt.



Multiple-Layer Edge Sealing

Multiple barrier seal at belt edge in skirted area that conforms to belt and can be adjusted for wear.



Dual sealing system

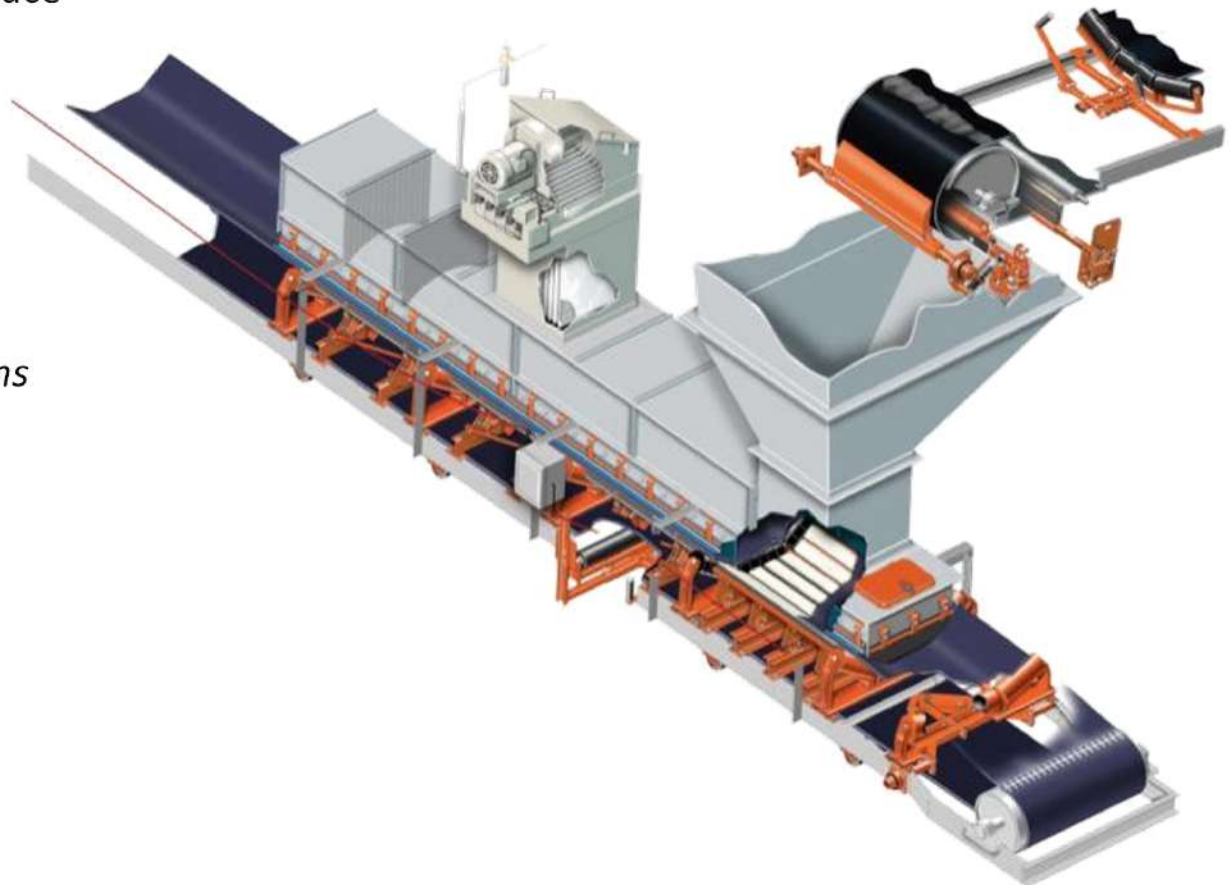
- Primary strip against skirtboard
- Outrigger strip lays on belt to captures any fines that push underneath the primary seal.



More Mine-Grade Components



- To Slow Air Currents and Reduce the Escape of Airborne Dust
Expanded Skirtboard with Stilling Zone and Cover
- To Reduce Escape of Dust
Dust Suppression or Dust Collection Systems
- To Keep Belt in the Center
Belt Tracking Devices
- To Reduce Carryback
Belt Cleaning Systems
- To Keep Personnel Safe Around Moving Conveyors
Guard Panels



A Case History: Coeur Rochester



Coeur Rochester Mine



2nd Largest Primary Silver Mine in the U.S.

- Open Pit, Heap Leach Operation in Production since 1986.
- 10,800 acres (43.7km²) Site.
- 67% Production Growth; 40% reduction in Unit Costs Between 2013 and 2015.
- ≈300 employees.

2015 Production

4.6M silver oz; 52,588 gold oz

2016 Production Guidance:

4.8 - 5.3M silver oz;

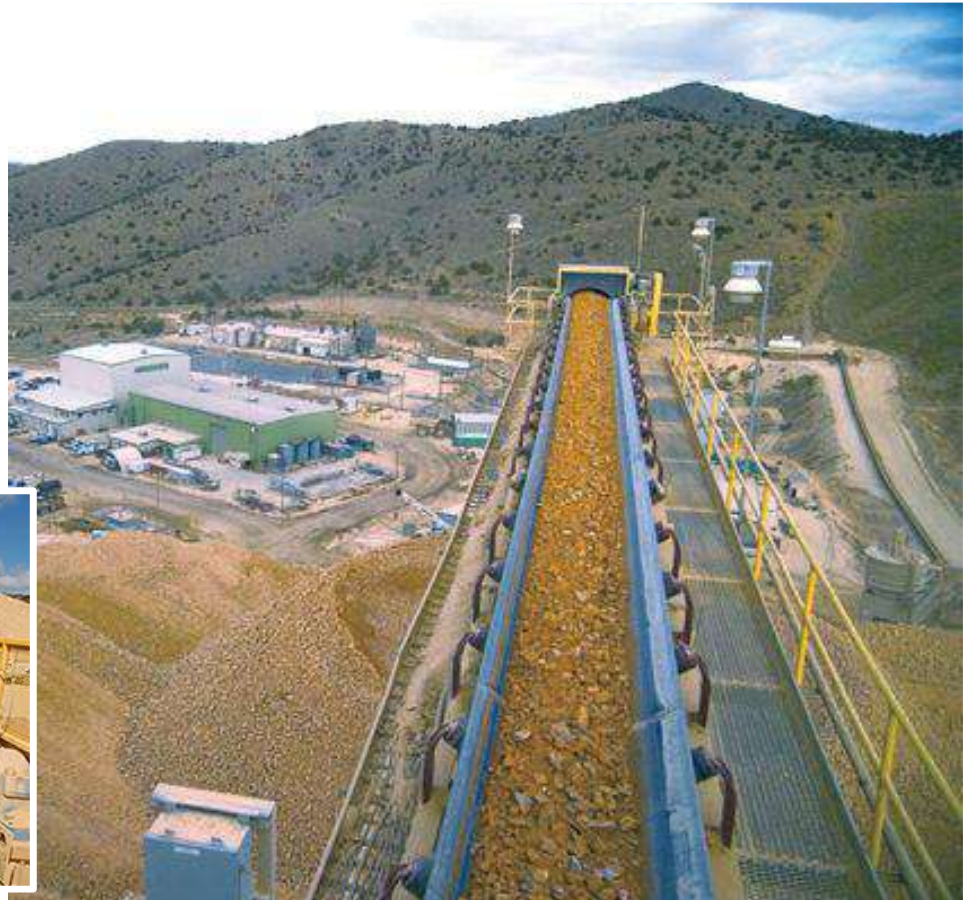
48,000 - 55,000 gold oz



Conveyors at Coeur Rochester



- Network of 20 Conveyors Designed and Installed in 1986.
- After Nearly 30 Years of High-Volume Use, Mine Ready to Upgrade the System
- Goals for Conveyor Project
 - *Raise Efficiency*
 - *Reduce Dust and Spillage*
 - *Improve Safety*



Conveyor B



- Carries Ore from the Secondary Crusher (Cone or Grizzly) to the Surge Pile Stack.
- 1500 TPH of 4 inch (100 mm)-Minus Ore.
- “Most Improvement Potential”
(= ‘*Had the Most Problems*’)

Conveyor	
Belt width	48 inches
Belt speed	386 fpm
Troughing angle	35 degrees
CEMA class/roll diameter	D / 6 inches
Length of chute wall	40 feet
Material	
Material type	Silver ore
Material size	4-inch minus

Conveyor B Specifications

The Problems of Conveyor B



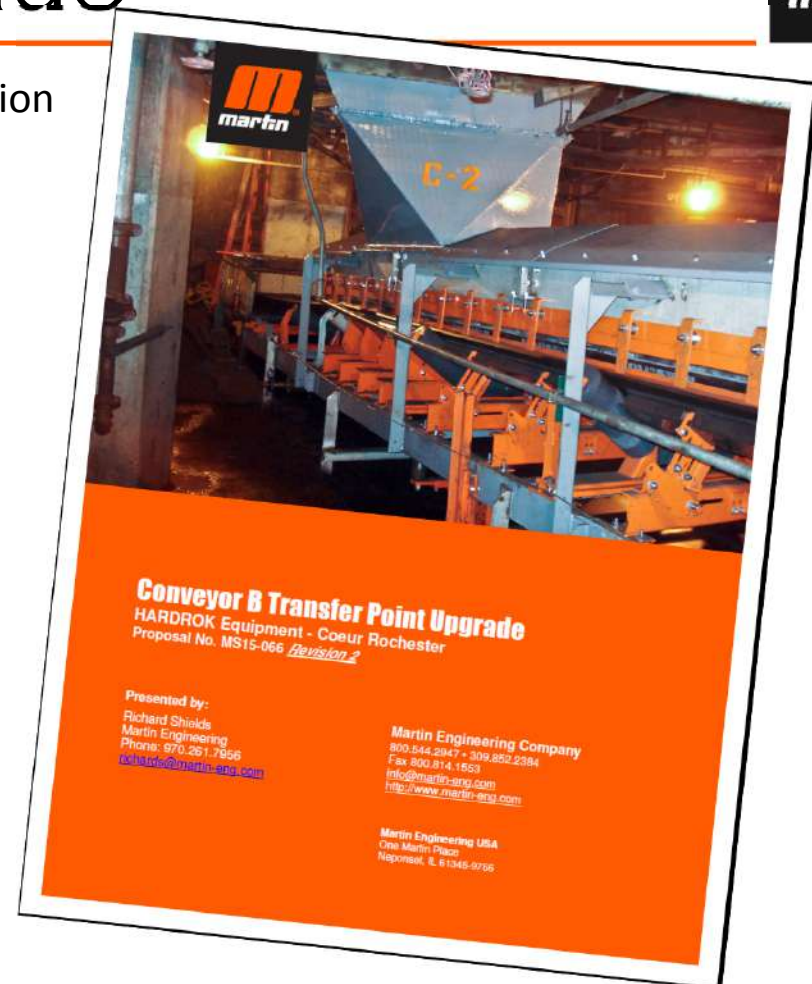
- Severe Dust and Spillage
- Buried Idlers = *Shorter Life for 'Cans' and Bearings*
- Excessive Cleanup Costs: *5-10 man-hours a day, 7 days a week.*
- Safety Risks *Cleanup Workers Close to Operating Conveyors.*
- Air Quality Concerns

Transfer Point Upgrade



Includes Contractor Installation with Factory Supervision

- Chutewall System with Tail Sealing Box and Skirtboard Covers
- 5 Impact Cradles (@ 4 feet long)
- 5 Support Cradles (@ 4 feet long)
- 11 Track-Mounted Idlers
- 1 Track-Mounted Transition Idler
- Chromium Carbide Chute Liners (4)
- External Wear Liner (48 feet x 2 sides)
- Skirt Seal with Clamps (42 feet x 2 sides)
- 1 V-Plow Tail Pulley Plow
- 1 Air Cleaner Dust Collector with Stand
- 2 Belt Trackers (1 Upper, 1 Lower)
- 1 Primary Belt Cleaner
- 1 Secondary Belt Cleaner
- 2 Inspection Doors



The Completed Project



New

- External Wear Liner
- Belt Support Cradles
- Multiple-Layer Sealing Strip
- Tail Sealing Box



Load Zone Extension



New

- Skirtboard Cover Over Modular Chute Wall
- Dust Curtain at Stilling Zone Exit
- Air Cleaner Integral Dust Collector

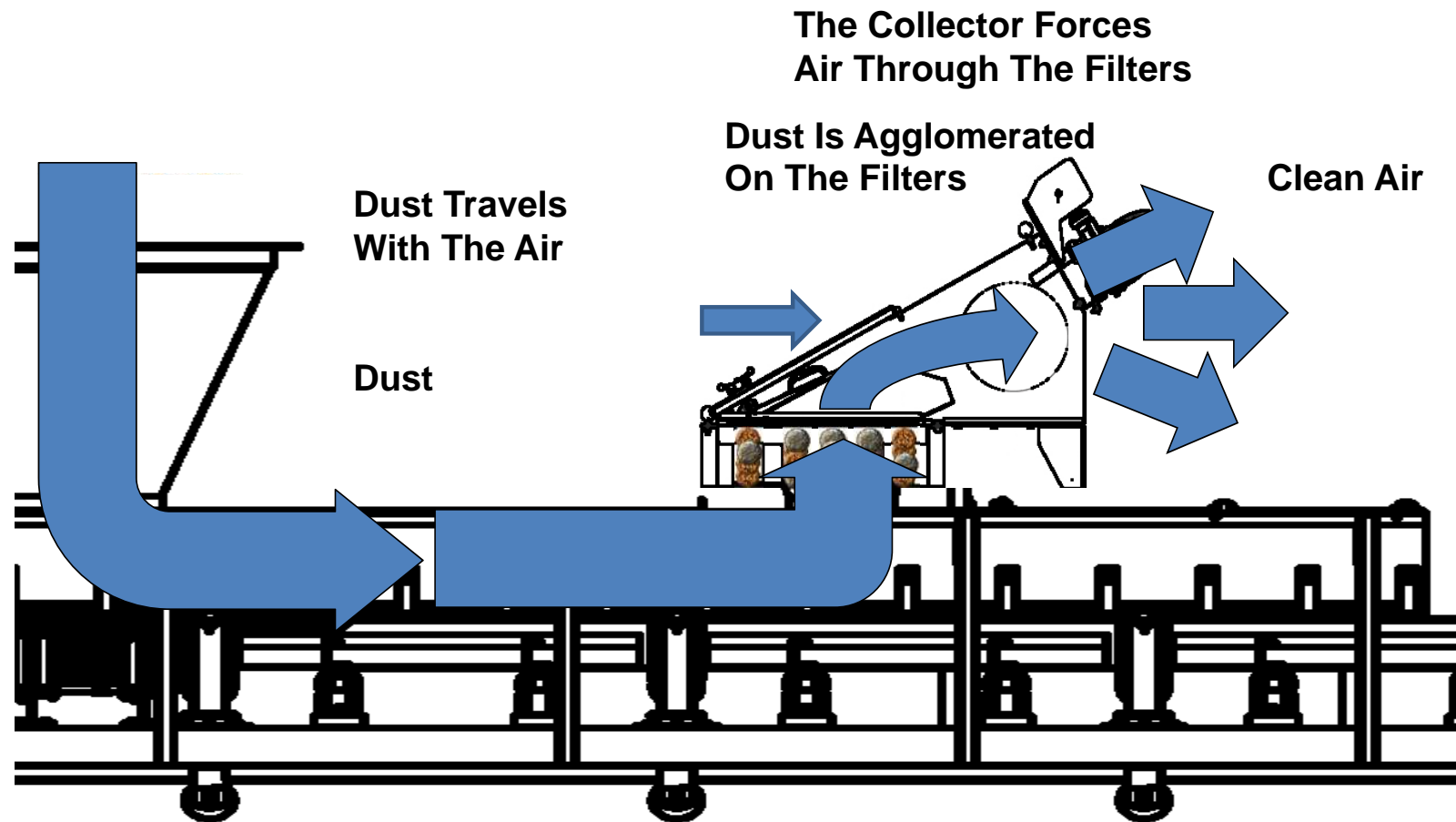
Dedicated Air Cleaner



- Self-contained Dust Collector for Loading Zone.
- Returns Captured Dust to Belt Cargo with Reverse Air Pulse.



How it works

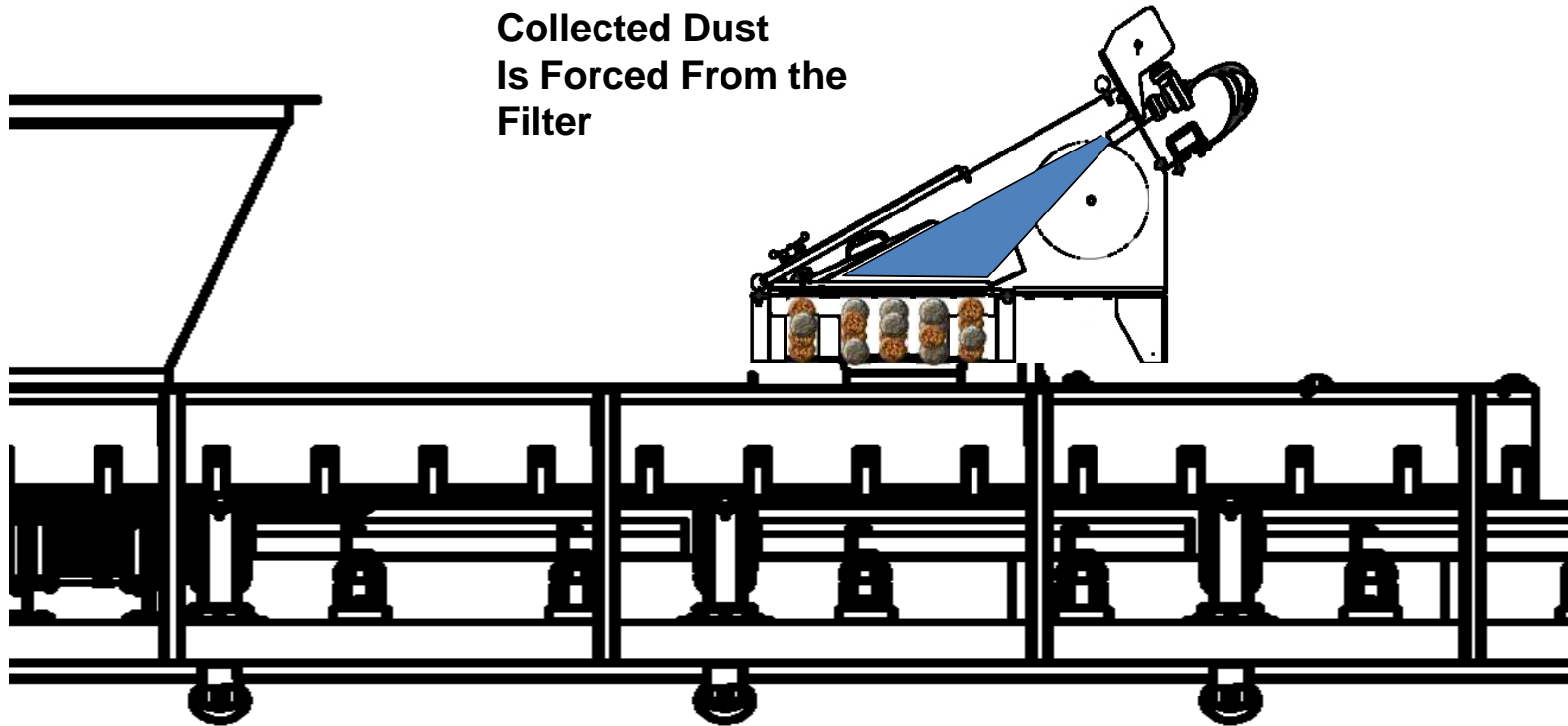


Self-Cleaning Cycle



Collector Reverse
Pulses

Collected Dust
Is Forced From the
Filter



Improved Transfer Point Performance



- Upgrade completed during 7-day outage.
- Cleanup was 70 man-hours/week; now “reduced to one guy with a broom every couple days.”
- “...from a nightmare to a system operating at a high level...”
- Coeur Rochester considering upgrades for additional transfer points



Return on Investment (ROI)



- $\text{ROI} = \frac{\text{Total Savings}}{\text{Total Costs}}$
- Savings- 60 man hours a week x 40 weeks x \$50.00 fully loaded = \$120,000.00 Year 1
- Cost- \$120,000.00
- $\text{ROI}\% = 1.0 \times 100 = 100\%$
- Years to Payback 1

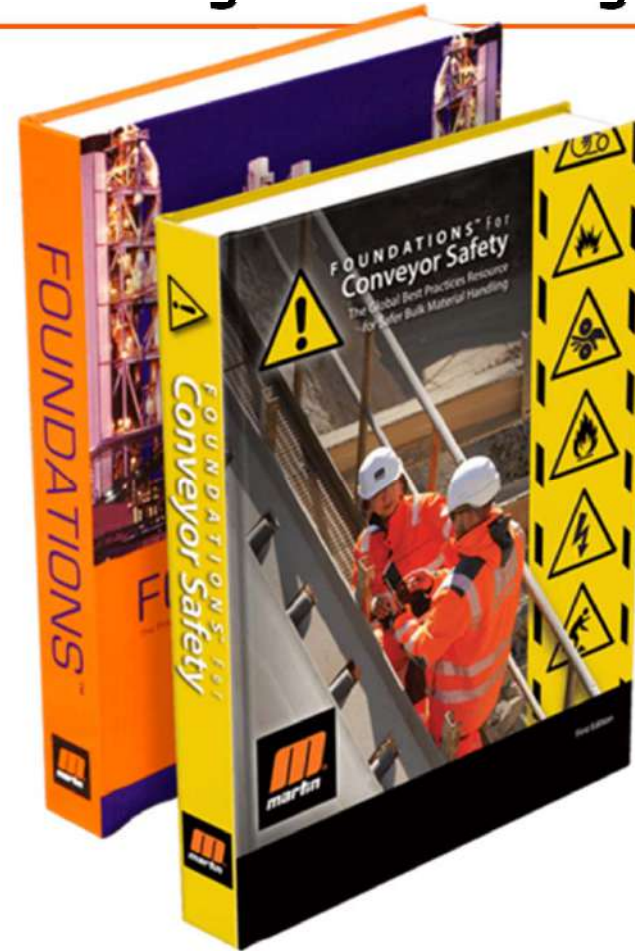
FOUNDATIONS™ for Conveyor Safety



Following on the path blazed by its *FOUNDATIONS™ Books* on controlling fugitive material, Martin Engineering's new book discusses:

- Global standards and practices for conveyor safety.
- Ways to improve conveyor safety.
- How to justify expenditures to improve conveyor safety through increased productivity.

Copyright 2016
Martin Engineering





Costs

Tangible vs. Less Tangible

More Tangible Costs (easier to measure)	Less Tangible Costs (harder to measure)
Initial Capital Expenditure	Any Lost Production as a Result of Unplanned Downtime
Transportation Costs	Safety Compliance Costs
Assembly and Installation	Functionality of the System
Maintenance	Expected Component Life
Spare Parts Cost	Warranty Costs
Operating Costs	Replacement Cost
Initial Component Cost	Repair Time Prediction
Maintenance Labor Cost	Injury Case Management
Electricity Cost per Kilowatt-Hour	Medical Costs for Surgery, Medicine, and Rehabilitation
Worker's Compensation Premiums	Lost/Decreased Productivity
Loss of Products or Services	Time to Go to Medical Appointments
Government Inspections and Reports	Production Downtime
Run-In Time	Administrative Costs
Waiting on Tools or Parts	Additional Overtime Pay Required
Waiting on Operations to Clean or Shut Down the System	Time to Hire Replacement
Health Insurance Costs	Interviewing and Training New Employee
	Delays in Shipments and Filling Orders
	Negative Media Attention
	Penalties and Fines
	Attorney Fees
	Damages to Equipment, Machinery, Materials, and Facility
	Reputation Loss
	Degraded Client Loyalty and Support
	Managerial Costs Due to the Accident Including Inspections, Investigations
	Loss of Employee Time Associated with Assisting With the Accident, Administering First Aid and Witness Interviews
	Loss of Employee Morale
	Slowed Work Pace Due to Other Employees' Fear of Injury

Return on Conveyor Safety (ROCS)



- Todd Swinderman
 - Room 107
 - 9:00 am
-
- Foundations for Conveyor Safety
 - Booth 2104

Q & A



Improving Transfer Point Performance in Hard Rock Mines



Richard Shields
Martin Engineering
richards@martin-eng.com

**THANK
YOU!**

COLORADO | FEBRUARY 19-22, 2017



Creating **VALUE** in a cyclical environment

2017 SME ANNUAL CONFERENCE & EXPO
CMA 119th NATIONAL WESTERN MINING CONFERENCE



DENVER, COLORADO | FEBRUARY 19-22, 2017