AGENDA OF THE CEMA ENGINEERING CONFERENCE

BULK CONVEYOR ACCESSORIES COMMITTEE MEETING

Tuesday, June 27, 2017 – 1:00 PM

1. Call to order
2. Update status of Committee Chair & Vice Chair
3. Attendance and introductions – recognize new attendees
4. Review and Approval of Previous Minutes (attached)
5. Old Business
    a. Review Best Practices Document from Skirtboard Sealing Sub-Committee (Attached)
        i. Have we incorporated information brought to EC 2016?
        ii. Are there sufficient graphics?
        iii. Metric units included where applicable?
    b. Belt Tracking & Training best practices discussion
        i. Belt Book has placement guidelines and type descriptions
        ii. Ideas for best practices document
            1. Define performance & measurement technique
            2. Create load or capacity categories
            3. Other?
    c. CEMA Standard 575-2013 update for high speed, high tonnage belts? (Attached)
6. New Business – any new topics for Accessories Committee?
7. Nomination and Election of Vice Chair
8. Next Meeting – June 26, 2018 – La Playa Hotel, Naples, FL
9. Adjourn

MIINUTES OF THE CEMA ENGINEERING CONFERENCE

BULK HANDLING CONVEYOR ACCESSORIES MEETING

Tuesday, June 21, 2016 – 1:00 PM

1. Call to order – The meeting was called to order by Chair John Barickman at 1:00 P.M.

2. The Agenda was Approved

3. The minutes from 2015 Engineering Conference (attached) were approved

4. Old Business

   i) Discussed Skirtboard Sealing Best Practices. Reviewed work and data gathered to date.

      (1) Discussed 2/3 belt width. Most folks used this criteria however, sometimes 2/3 isn't enough for belts <36" and too much for belts > 72". Double check book for 5% criteria.

      (2) Discuss 2 ft for every 100 ft/min. Suggested to make sure you start after load zone.

   ii) Suggest survey minimum skirt board height. Need to canvas OEMS

   iii) Other considerations. Would like to understand better how the following applications are handled: multiple load points, moving hoppers, trippers, sealing pressure, tolerance installation, sealing catenary idlers.

   iv) Important to consider both hardness and tensile strength when selecting an elastomer for sealing.

   v) Additional content: Best practices in sealing catenary Idlers

   vi) Reviewed illustrations

   vii) Subcommittee expanded to include OEM's new members include
      (1) Todd Hollingsworth
      (2) Matt Koca

   viii) Plan teleconference prior fall meeting

5. New Business

a. Brainstormed new topics for Accessories Committee

    i. Belt tracking and training best practices
        1. How many trackers require?
        2. How far apart?
        3. Where do you place them?

    ii. Need guidance on dealing with impact in load zone on high speed high tonnage belts. Not a lot of guidance on impact energy.

    iii. Chord. Belt wear, rip monitoring. Possibly more discussion on this in emerging technologies committee.

b. Discussed whether a best practices document is required or should we compile information for next belt book. Decision was to create usable documents that could be incorporated into next belt book as applicable.

c. It's ok to start working on improving existing chapters to 7th edition.

    i. Judd Rosebury volunteered to start work on accessories chapter.

    ii. Todd Swinderman volunteered to provide some guidance on pulley diameter requirements when fitting multiple cleaners

6. Next Accessories meeting June 27th, 2017

7. Meeting adjourned

Greg Westphall, Vice Chair

MINUTES OF THE CEMA ENGINEERING CONFERENCE

BULK BELT CONVEYOR ACCESSORIES COMMITTEE MEETING

Tuesday, June 23, 2015 – 1:00 PM

1. The meeting was called to order at 1:00 PM by Judd Roseberry. Roll call and contact info is at the end of these minutes.
2. Reviewed and approved minutes from June 24, 2014. The 2015 agenda was presented and approved.
3. Old Business

   Skirtboard sealing- Compile a list of suggested items from skirtboard manufacturing companies for proposed best practices document.

4. New Business- None to report
5. Committee Elections: Chair- John Barickman (Martin Engineering)

   Vice Chair- Greg Westphall (Flexco)

6. Next Meeting – June 21, 2016 – LaPlaya Hotel, Naples, FL
7. Meeting adjourned at 1:24 PM

Skirtboard Sealing

Best Practices Approach

Draft 1

The primary purpose of a skirtboard is to keep the load on the conveyor, preventing material spillage over the belt edge, while the load is settling onto the belt and material has reached belt speed. Best practices in chute and skirtboard design now provide the opportunity for much cleaner and more efficient material handling system.

The skirtboard and the wear liner placed inside the skirtboard combine with an elastomer sealing system to form a multiple-layer seal. The elastomer seal should not be expected to withstand material side pressures or pieces of material larger than small fines. The skirtboard and wearliner form the first line of defense intended to contain fugitive material and prevent material head pressure from contacting the sealing system. To avoid entrapment of material between skirtboards, wear liner, and belt, skirtboards should be installed so they taper upwards providing increased clearance from the belt (vertical).

Inadequately sized skirtboard always leads to poor conveyor performance in form of material spillage, excessive dust, and higher operating cost by the end user.

Proper Skirtboard Size:

Length- Refers to additional length of steel beyond the impact zone. Skirtboard should extend past point where material fully settles onto the profile. The length needed for the bulk material to reach receiving belt speed and settle into the surcharge profile is calculated in the equation below (Eq. 12.45 p.513 Belt Book).

$$L_a = \frac{V_b^2 - V_{ey}^2}{2g\ (\mu_b - \tan(\Theta))}$$

$L_{a=}$ distance to accelerate bulk material to receiving belt speed

V_b =velocity of receiving belt

V_{ey}=vertical velocity of bulk material as it leaves discharge chute

g=gravitational constant

μ_b=effective coefficient of friction between bulk solids, skirtboards and belt

Θ=inclination angle of receiving belt

If difference between V_b and V_{ey} is small and receiving belt flat, La= 2 ft. per 100 ft./min belt speed, with minimum 3 feet past loading chute

It is good practice to terminate skirtboards above an idler rather than between idlers to prevent spillage or belt damage.

Width- CEMA recommends distance between skirtboards is 2/3 width of troughed belt. May be more effective to recommend amount of free belt edge distance **minimum** required for belt edge seal and belt wander; acceptable amount of belt wander is 1.00" (25mm).

Height- Contributing factors effecting height of skirtboard include belt width and speed, material lumps and air speed at discharge. Skirtboard should be tall enough to contain the material load when belt is operating at normal capacity and to pass two of largest lumps stacked on top of each other without jamming. CEMA has published a table specifying minimum height for uncovered skirtboards (Table 12.47 p.515 Belt Book). For dusty materials, it is a good practice to increase height of skirted area to create an added space to reduce positive air pressure. This area serves to "still" dust laden air so particles can fall back onto the cargo of the conveyor. To control dust, the cross sectional area of the chute should be sized to keep the exit air velocity below 200-250 feet/minute. If this maximum exit velocity cannot be achieved, then mechanical dust suppression or collection is necessary.

Purpose of Wear Liner

A. Provides sacrificial, easily replaceable wear surface protecting wall of the chute and skirtboard
B. Helps center the material load
C. Prevents material load from applying high side forces to sealing strips
D. Can reduce friction, impact, noise, and degradation of bulk material

Wear Liners-4 styles: straight, spaced, deflector, tapered

Straight Wear Liner- Real benefit is it provides improved life and improved sealing effectiveness without closing down the effective load area. Best for belts with multiple load points.

Spaced Wear Liner- Variation of straight where a space is created between the skirtboard and liner used as a negative pressure area. Fines and dust can be pulled from this space by a dust collection system.

Defector Wear Liner- Bend inward at bottom half of liner- provides free area between elastomer seal and liner for collecting fines for the outer seal to handle without the outward forces of material load. Reduces effective cross-sectional area of the skirtboard area.

Tapered Wear Liner- Cast from Molybdenum steel for use in heavy duty applications. The cross section is trapezoidal to reduce the gap where the bottom edge meets the belt, skirtboard, and

skirting seal. They are heavy and supplied in short lengths, therefore difficult to keep bottom edges in a smooth straight line.

Edge Sealing Systems

Effective sealing at the edge of a belt requires a properly supported belt, wear liners, skirtboards, and an edge seal. A number of engineered sealing systems are now commercially available. These systems consist of a strip of elastomer attached to the lower portion of the skirtboard by an arrangement of clamps. Effective sealing requires an adequate amount of free belt distance. Free belt distance, amount of belt outside the skirtboard on both sides of the conveyor, provides space for the sealing system and belt wander. A good practice is to use a minimum of 3.50" (90mm) for the sealing system and 1.00" (25mm) for belt wander. The seal should start in the loading area and continue to the end of the settling zone.

There are a number of different approaches to skirtboard sealing. The best way to define these systems is to describe where each contacts the belt.

Vertical Sealing- This type of sealing arrangement uses a single rubber or elastomer sealing strip attached to the skirtboard with some type of clamp.

Advantages:

1. Low in cost
2. Minimal free belt edge required
3. Can be self-adjusting

Disadvantages:

1. Difficult to adjust accurately
2. Easily over adjusted causing premature wear
3. Prone to material entrapment
4. Susceptible to leakage of dust and fines

Inward Sealing- This type of seal contains an elastomer seal clamped to the outside of the skirtboard with the lower portion curled back under the steel.

Advantages:

1. Self-adjusting
2. Require limited free belt edge distance
3. Handle light fluffy and fine non-abrasive materials
4. Handle high internal chute pressure
5. Handle severely mistracking belts

Disadvantages:

1. Shorter seal life due to being in material flow

2. Prone to material entrapment under sealing strip-leads to premature belt wear
3. Reduced carrying capacity due to space taken up by the seal where the load could be carried

Outward Sealing- Type of system that seals on the outside of skirtboard. The most effective is a multi-layered seal containing a primary strip which contains most of the material escaping past wear liner and secondary seal containing fines and dust.

Advantages:

1. Long lasting- positioned away from material flow and protected by skirtboard and wear liner
2. Can be self-adjusting
3. Low required sealing pressure due to multiple layered sealing design
4. Adapt to existing clamp system

Disadvantages:

1. Require greater free belt edge distance
2. Susceptible to damage if belt mistracks underneath seal

The skirtboard seal should not be the first line of defense in preventing material spillage, but rather a last chance to contain fugitive material and prevent its release. The better job done by the belt support and wear liner systems to contain material and keep it away from the belt edge, the better the performance will be of the belt's edge sealing system. A multi-layer flexible seal incorporating some self- adjustment will provide effective material containment for a transfer point. Maintenance and periodic inspection are also important to extend the life of the conveyor's sealing system.

CEMA Skirtboard Sealing
FLEXCO Commentary

June 10, 2016

WIDTH

- In favor of maintaining the 2/3rd belt width specification. Concern was that changing standard to reference an offset from the edge of the belt would restrict the throat of the chute too severely for material flow on the narrower belt sizes (≤36").
- Would consider a rule stating skirt width is 2/3rd belt width or 12" of freeboard from edge of belt, whichever results in a larger chute opening.

BELT WANDER

- While 1" maximum of belt wander is a laudable goal, we feel that it does not represent general practice. Standard return idler widths assume approximately 1-1/2" of belt wander before the belt runs off the end of the idler, and frequently belts are even beyond this point.
- Transfer points should be designed conservatively so that spillage is not occurring under typically conditions. To that end, we suggest that skirting be designed to accommodate belt mistracking of 2" or 5% of belt width, whichever is greater, without spillage.

SKIRTING TYPES

- Inward – We refer to this as tangential skirt. Are there are names/descriptions for this design?
    - Excellent seal against dust
    - Dips and moves as the belt traverses idlers (Slider beds not needed)
    - Slow wearing
    - Choose durometer to be softer than belt (60A typically)
    - Excessive belt wander will disengage this skirting rendering it inoperable.
    - Lack of freeboard prevents use on belts ≤36"
- Vertical
    - "Standard" skirting predominate in the industry
    - Requires least amount of freeboard
    - Can be fixed position or self-adjusting
    - Usually suffers from uneven wear against belt rendering it less effective at containing dust and material
    - Frequently wears a shallow groove in the top cover of belt

- Outward
    - Include multiple seal skirting designs in the category?
    - Requires more freeboard than vertical skirting

WEAR LINER

- Clearly define and distinguish “skirt wall”, “skirt board”, “wear liner”, “canoe liner”, etc.
- Types & materials
- Intended to contain material (lumps), not dust?
- Application guidelines

BELT TRANSITION

- Do not load belts in the transition zone
- Effective skirting systems are very difficult to design in this zone. Subpar material containment is likely

MINIMUM HEIGHT

- If a minimum chute opening of 2/3rd belt width is maintained, we favor a minimum 8” tall wear liner and a minimum 15” skirt wall for covered skirting systems.

PERPENDICULAR SKIRTING

- The chute wall is bent outward to make 90° intersection with the troughed belt surface.
- Flat skirt rubber is used. (Not tangential or outboard)
- When multiple chutes load onto the same belt, the downstream chutes need perpendicular skirting
- The inlet is usually AR steel and flared
- This skirting is less likely to disturb already loaded material

SKIRT MATERIAL DUROMETER & ABRASION INDEX

- Conventional wisdom says the skirt material should be of a softer durometer than the belt
- We typically use 60A rubber
- Do not know what the abrasion index is or have experience with higher durometer skirt materials

SKIRT PRESSURE

- We do not have a specification or target value for skirt pressure

DIN & ISO

- I was unable to locate any DIN or ISO standards regarding conveyor skirting.

SIX STEP METHODOLOGY FOR MATERIAL CONTAINMENT ON A CONVEYOR BELT

I. Achieve constant and consistent belt elevation
   A. Full idler / belt contact both empty and full loading conditions
   B. Full trough transition
   C. Belt fully troughed to final conveyor trough angle
   D. Avoid catenary curves near the load zone

II. Provide impact protection
   A. Absorb impact
   B. Protect belt
   C. Reduce material bounce

III. Provide proper belt support
   A. Continuous bed under seal area
   B. Belt support stands between idlers at seal location prevent belt sag between components which allow gaps

IV. Containment of bulk material
   A. Proper size skirt board
      1. Length (0.02 X Belt speed or equation?)
      2. Width : Free edge distance may be problematic for walking conveyors, narrow conveyors (outward seal design may limit loading width), or different types of skirt manufacturers while 2/3 BW may be problematic for narrow conveyors (may not have enough room for sealing components)
      3. Height

V. Wear liners
   A. Straight
   B. Spaced
   C. Deflector
   D. Tapered

VI. Sealing of dust and fines
   A. Edge sealing (I believe we should remove the advantages/disadvantages portion as different manufacturers may develop components to mitigate disadvantages)
      1. Vertical
      2. Inward
      3. Outward
      4. Skirt liners (similar to wear liners but on outside of skirt boards)
   B. Covered conveyor sections
   C. Stilling chambers
   D. Dust curtains
   E. Vacuum systems