ASHWORTH ENGINEERING

Committed to on-time delivery of defect-free products and services, fit for use, exactly as promised, every time.

PRODUCT TECHNICAL BULLETIN

Small Radius PosiDrive Grid 100 (SRPDG100)

Patented: US 9,884,723, US 10,364,101, and other US and International patents pending

PosiDrive Spiral™ is an alternative to Lotension drive systems. PosiDrive Spiral™ features a stainless steel grid belt with driving tabs on the inside edge. The tabs engage and are driven by vertical ribs on the spiral center drum. PosiDrive Spiral™ is recommended particularly for applications where product movement is a problem, or where oils or other product characteristics cause operational issues with Lotension drive systems. The PosiDrive Spiral™ system is suitable for new or existing spiral conveyors.

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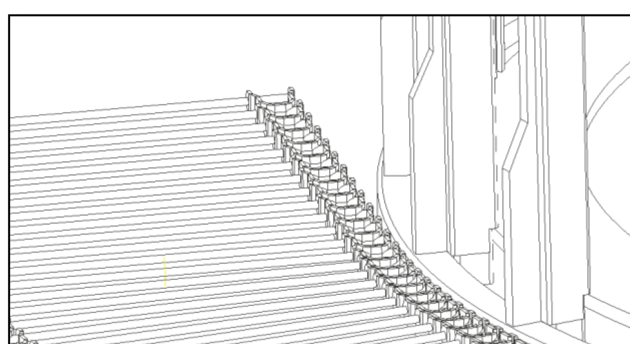
POSIDRIVE SPIRAL™ OPERATION

PosiDrive Spiral™ differs from Lotension drive systems in several important ways:

LINKS WITH DRIVING TABS
PosiDrive Spiral™ belt links feature a driving tab on the inside edge of the belt. The tab provides a driving surface to positively engage the drum (see image at right).

DRIVING RIBS ON THE CAGE
The PosiDrive Spiral™ system features drive ribs on the drum, typically as part of the cage bar cap. The driving rib engages the driving tab of the link to drive the belt in the same way that a sprocket drives a chain. The driving rib projects outward to create a larger drum diameter in the first tier of the spiral and tapers to create a smaller drum diameter above the first tier. The decreasing diameter serves to relieve tension in the belt.

GUIDE RINGS
Guide rings will be placed on the drum where the belt enters and exits. The guide rings allow the links to collapse smoothly before engaging the ribs, then expand smoothly after disengaging from the ribs. Systems that have a belt return on the cage **MUST** also have a return guide ring. Mounting locations for the rings will be provided on the cage bar caps (see image at right).



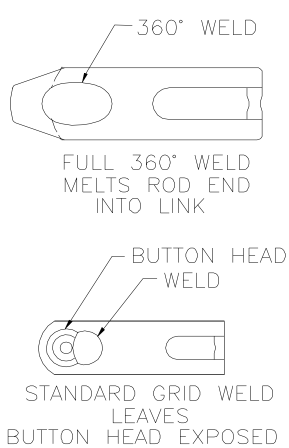
POSITIVE DRIVE (NO OVERDRIVE)
PosiDrive Spiral™ does not rely on friction to drive the belt, as in Lotension drive spirals. Because of the positive engagement between the belt and the drum, overdrive (faster movement of the drum relative to the belt) is eliminated. Belt speed will always match the drum speed precisely. This ensures smooth, constant belt speed without surging, which minimizes movement and damage of delicate products.

LUBRICATION
Since the PosiDrive Spiral™ system does not rely on friction to drive the belt, it is unaffected by product oils and other lubricants on the drum. The system can be freely lubricated with any suitable lubricant.

CONSTANT TENSION OUTFEED
Lotension spirals can experience high tensions and even belt flip-ups in the last tier. This occurs whenever oils, frost, or other issues prevent the drum from adequately driving the belt. The outfeed motor is forced to pull with increasing tension in order to maintain the pre-set speed. However, the PosiDrive Spiral™ system eliminates this problem. It uses a special outfeed motor programmed to pull the belt at a low, pre-set tension. Belt speed is determined by setting the drum speed. The outfeed motor will automatically match the belt speed without increasing the belt tension.

DEFINING CHARACTERISTICS

Minimum Turn Ratio:	As low as 1.0:1 inside turn ratio. *Turn ratios and configurations must be evaluated by Ashworth Engineering.*
Turn Capability:	Turns either clockwise or counterclockwise per system. Turn direction must be specified at time of order.
Mode of Turning:	Inside edge collapses in turn.
Width Limits:	14 inch [*356 mm*] through 48 in. [*1219 mm*].
Max Allowable Tension:	150 lbs. *[68 kg]* through a turn and 300 lbs. [*136.1 kg*] in straight runs.
Longitudinal Pitch:	1.08 inch [2*7.4 mm*].
Link Strip Size:	Inside: .50 inch x .090 inch [*12.7 mm x 2.3 mm*], Middle: .50 inch x .105 inch [*12.7 mm x 2.7 mm*], Outside: .50 inch x .090 inch [*12.7 mm x 2.3 mm*]
Rod Diameter:	.192 inch [*4.88 mm*].
Material:	Stainless steel.
Method of Drive:	Sprocket driven on inside and center links only at conveyor outfeed, cage driven at belt edge throughout spiral, and optionally sprocket driven at conveyor infeed.
Conveying Surface:	Inside conveying surface = center link location – 2-1/64 inch [*51 mm*], Outside conveying surface = overall belt width – center link location – 1-13/16 inch [*46 mm*]
Mesh Overlay:	Standard mesh configurations available (see page 4)



Improved Weld
The traditional welded construction of Grid belts fails when the weld breaks. Failure of either the inner or the outer weld allows the link to flex inward when subjected to cyclic loading. The flexing of the link causes fatigue failure at the corners of the link.

Some manufacturers have attempted to slow this process down by including additional welds. However, the weakest weld remains on the inside, the size of which is limited due to the rod size. Too large a weld on the inside will cause the rod to bend when the weld cools, which leads to collapse, tracking, and tenting problems.

The Ashworth solution is to create a full 360º weld on the outside edge of the link. This prevents stress on the weld during operation, even with heavier loads. The design and heavier gage of material used for the PosiDrive Spiral™ Omni-Grid 360 Weld links eliminate the need for a weld on the inside of the link. By forming the 360° weld, only on the outside of the link, the inside weld is not necessary, so the belt will not experience the problem of rod bending caused by excessive inside welds.

Wear Resistant Feature

The next mode of failure, once weld and fatigue have been eliminated is belt elongation due to link face wear. The patented wear resistant feature in the link face, included in the PosiDrive Spiral™ Omni-Grid 360 Weld belt, now becomes more important than ever. It provides increased bearing surface to reduce belt elongation.

Patented 360° Weld

Patented Wear Resistant Feature

BELT SPECIFICATIONS

MESH OVERLAY:

Designation:

B X-Y-Z and U X-Y-Z

First Digit: B = Balanced Weave; U = Unilateral Weave

X: First Number: No. of Loops per Foot of Width

Y: Second Number(s): No. of Spirals per Foot of Length (12 for 1.08 in. pitch)

Z: Third Number: Wire gauge of overlay

Examples:

B30-12/12-17

U42-12/12-16

OMNI-TOUGH®:

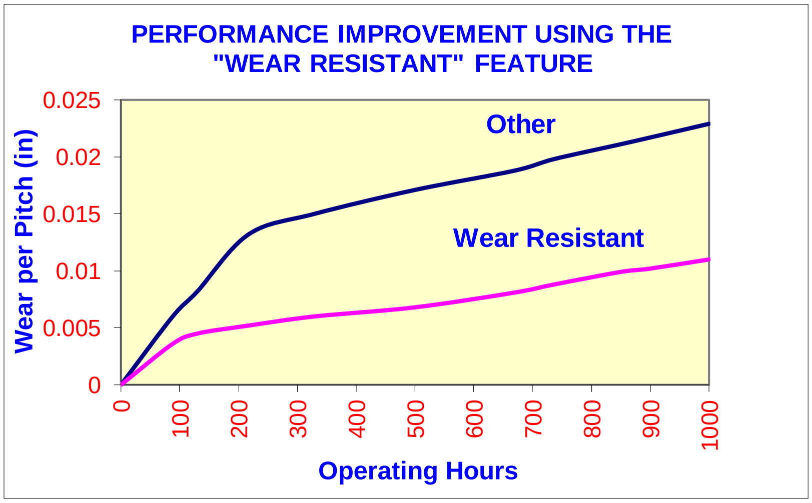
- Provides a flatter mesh surface with a high resilience to impact.
- Not available in all mesh configurations or for all belt widths.
- Available in 16 ga. (.062 inch [*1.6 mm*]) and 17 ga. (.054 inch [*1.4 mm*]).

Wire Sizes: 16 ga. [1.6 mm] and 17 ga [1.4 mm].

Material: Stainless Steel high tensile spring wire (Omni-Tough®)

PATENTED "WEAR RESISTANT" FEATURE

- Standard on all tension bearing links.
- Increases belt life by reducing belt elongation.

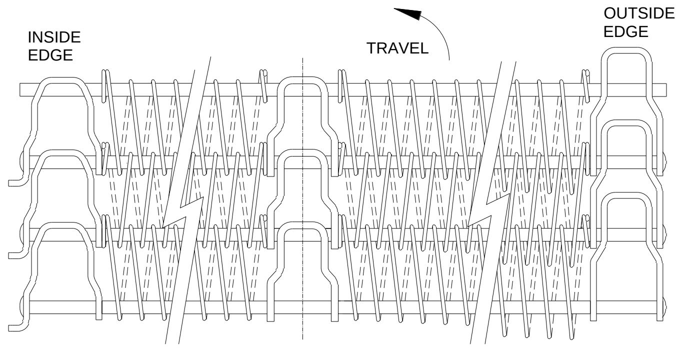


BELT WEIGHT

BELT WEIGHT TABLE (WITHOUT MESH)

PosiDrive Small RadiusOmni-Grid 360 Weld 100 Belts (1" nominal Pitch)			
OA Belt Width		Base Belt Weight	
inch	mm	lb/ft	kg/m
14	356	2.42	3.61
16	406	2.61	3.89
18	457	2.79	4.16
20	508	2.98	4.44
22	559	3.16	4.71
24	610	3.35	5.0
26	660	3.53	5.26
28	711	3.72	5.55
30	762	3.9	5.82
32	813	4.09	6.1
34	864	4.27	6.37
36	914	4.46	6.65
38	965	4.64	6.92
40	1016	4.82	7.19
42**	1067	5.01	7.47
44**	1118	5.19	7.74
46**	1168	5.38	8.02
48**	1219	5.56	8.29

***Engineering review recommended*



MESH WEIGHT TABLE:

INSIDE MESH

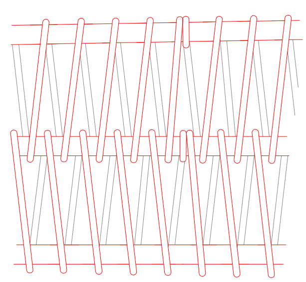
Mesh Lateral Count	16 ga.		17 ga.	
	lb/ft^2	kg/m^2	lb/ft^2	kg/m^2
18				
24	0.74	3.61	0.56	2.73
30	0.92	4.49	0.69	3.37
36	1.10	5.37	0.82	4.00
42	1.28	6.25	0.96	4.69
48	1.45	7.08	1.09	5.32
54				

OUTSIDE MESH

Mesh Lateral Count	16 ga.		17 ga.	
	lb/ft^2	kg/m^2	lb/ft^2	kg/m^2
18				
24	0.99	4.83	0.79	3.86
30	1.24	6.05	0.99	4.83
36	1.49	7.27	1.19	5.81
42	1.74	8.50	1.39	6.79
48	1.99	9.72	1.59	7.76
54				

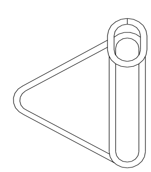
BELT OPTIONS

INTERNAL PIGTAILS (standard feature for 1" SRPDG) secure the rod position within the overlay spirals, which is particularly helpful for applications with a soft or wet product. Internal pigtails may be manufactured into any Omni-Tough tapered spiral overlay.



SPECIAL SPIRALS (PATENTED)

- Available in Omni-Tough® only.
- Available in 16 ga. and 17 ga. only.
- One or more spirals on conveying surface are raised.
- Used as guard edges, lane dividers and flights.
- Maximum height 1 inch [25.4 mm].
- Available Options: height, spacing, location, shape, and number of lanes in belt.



Isosceles Triangle

SPROCKETS

UHMW-PE SPROCKETS

No. of Teeth	Overall Diameter		Pitch Diameter		Hub Width		Hub Diameter		Bore Minimum		Bore Maximum*	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
13	4.90	124.5	4.53	115.1	2.00	51.0	3.90	99.1	1.00	25.4	2.19	55.6
18	6.65	168.9	6.24	158.5	2.00	50.8	5.65	143.5	1.00	25.4	3.75	95.3
23	8.39	213.0	7.96	202.2	2.00	50.8	7.39	187.6	1.00	25.4	4.00	101.6

NOTES:

- UHMWPE material type components have a 150°F [*66°C*] maximum operating temperature.
- Maximum bore sizes listed for UHMWPE material is based on 1/2 inch [*12.7 mm*] of material above keyway.
- One sprocket will engage the inside row of links and one sprocket will engage the middle row of links.
- One toothless flanged idler support roll supports the outside row of links

FILLER ROLLS

- 4-3/16 inch [106 mm] diameter filler rolls recommended with #4-13 tooth sprockets
- 5-7/8 inch [149mm] diameter filler rolls recommended with #6-18 tooth sprockets
- 7-5/8 inch [193 mm] diameter filler rolls recommended with #8-23 tooth sprockets

SYSTEM REQUIREMENTS

CAGE BAR SPACING:
Number and spacing of cage bars is dependent on cage diameter vs. belt width (turn ratio).

CAGE BAR CAPS:
PosiDrive Spiral™ cage bar caps must be installed on every cage bar. Only PosiDrive Spiral™ cage bar caps are designed specifically to work with PosiDrive Spiral™ belt and are custom engineered for each spiral system's requirements. PosiDrive Spiral™ belt will not work with standard Lotension cage bar caps.

OUTFEED DRIVE:
PosiDrive Spiral™ systems must be equipped with a special outfeed drive motor that is programmed to operate at a constant torque. Since PosiDrive Spiral™ systems operate without overdrive, belt speed will be set by the drum speed. Therefore, the outfeed motor must have the ability to operate at variable speeds to conform to the drum speed. Standard outfeed motors, which operate at one constant speed, will cause operational issues.

INFEED DRIVE:
In systems with extremely high tensions, an additional motor may be required at the infeed to reduce belt tension entering the spiral. Contact Ashworth Engineering to receive a recommendation.

TERMINALS:
At all terminals with a wrap of 120° or more, the belt should be supported by 4 inch [100 mm] minimum diameter rollers or flanged idlers.

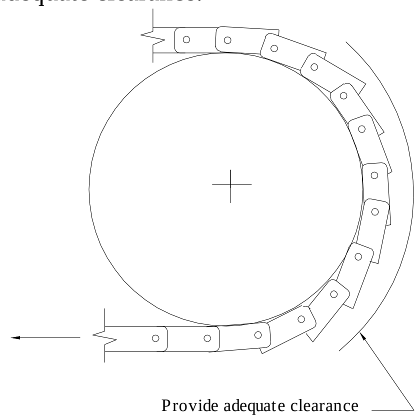
CENTER LINK POSITIONING:
Center link location is based on turn radius and determined by the formula on page 8 (see Center link Position). Failure to properly position the center row of links will result in an unfavorable operating condition.

- If the center row of links is positioned too close to the inside edge of the belt, the links along the inside edge will tent (/\). The center link position will be too short to collapse to the inside turn radius.
- If the center link is positioned too far from the inside edge, there is incomplete collapse of the inside edge. This condition allows excessive movement of the connector rod in the link slot, which may disturb product orientation.

SPROCKET DRIVE:
Locate sprockets only in the inside and center link rows. Do not set the sprockets in the outside row of links. Use a simple idler roll of a matching flange diameter under the outside row of links.

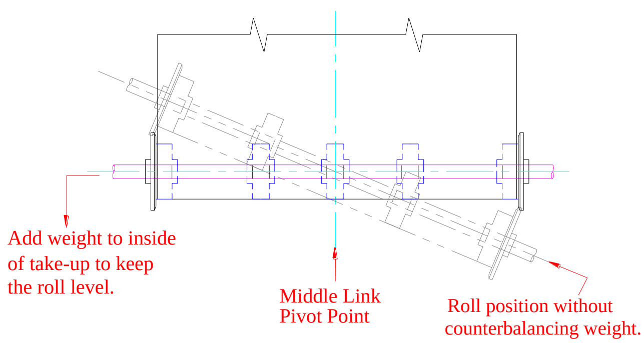
TRANSFERS:
Because the outside section has a longer pitch than the inside section, and the links in the outside row are in a collapsed position in straight runs, the forward corners of the links protrude above the belt surface at the terminals.

- **To provide a close transfer for the product to the adjacent equipment**, modify the transfer plate or blade in the area of the outside links to provide adequate clearance.

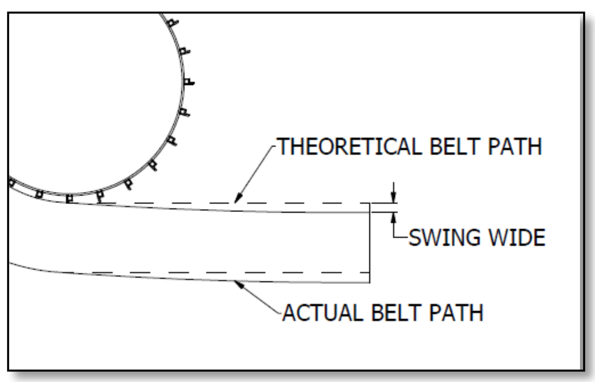


TAKE-UP:
Small Radius belts usually will not hang squarely in a take-up loop, because the collapsed outside edge extends due to gravity. The belt will pivot about the center link, causing the inside edge to collapse. This causes the take-up roll to hang at an angle and bind in the take-up frame.

Solution:
To keep the take-up level, add weight to the inside end to counterbalance the weight of the belt's outside section. Use a take-up that exerts minimum force on the belt. For spiral systems, a free-floating take-up system as shown is typical.



SWING WIDE:
Any belt tends to "swing wide" as it enters or exits the spiral cage, following a path that is offset but parallel to the normal tangent line to the cage. This phenomenon itself does no damage, but often the belt edge contacts framework that does not leave sufficient clearance for this to occur. The usual reaction of builders or users is to restrict the path of the belt from swinging wide, typically by use of rollers or shoe guides.



However, restraining the belt path can have several adverse effects on belt life:

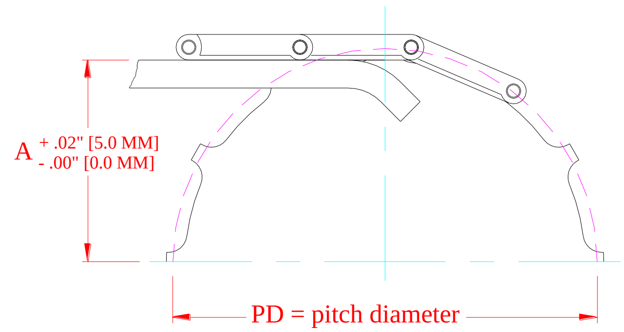
- The belt can wear through a shoe guide, allowing the edge to snag. This will eventually cause an increase in belt tension and damage the belt edge.
- If the belt is pushed into a straight tangent path, the tension carried in the outside edge of the belt is shifted to the inside edge of the belt, resulting in a pronounced tendency for one edge of the belt to lead the other.
- Ashworth recommends that a minimum swing wide clearance of 1 inch per foot [75mm per meter] of width be built into all conveyors where the belt enters or exits a turn.

SUPPORT RAILS
As a rule, support rails are required, with maximum spacings of 18 inches [*457.2 mm*] on the load side and 24 inches [*609.6 mm*] on the return side. Rollers may also be used. For light loads, support rails may be placed farther apart – consult Ashworth Engineering for your particular application.

Rail Height (with wear strip):

A = ½ X PD – 0.25 inch [*6.4 mm*]

This is only a guideline; it does not take into account the influence of speed. At speeds above 75 ft/min [*23 m/min*], Ashworth recommends increasing the distance A and shortening the wear strips as much as one belt pitch in length. (Nominal Belt Pitch = 1.08 inches [*27.4 mm*])



Inner Rail Spacing (with wear strip):
In the first tier, a minimum of 2 ½ inches [*63.5 mm*] clearance is required between the cage bars (without caps) and the inner support rail, with wear strip installed. The remaining tiers should have a minimum of 1 ¾ inches [*44.5 mm*] clearance. In existing systems, the inner rail on the first tier may need to be moved.

ENGINEERING CALCULATIONS

Turn Ratio: (for calculating maximum acceptable belt turn ratio for existing systems)

TR = ITR ÷ BW where ITR = Inside Turn Radius
BW = Belt Width

Turn Ratio is dimensionless. Inside Turn Radius and Belt Width must both be in same unit of measurement, either both in units of inches or both in units of millimeters.

Inside Turn Radius: (for calculating radius dimensions for new system design)

ITR = TR x BW where TR = Turn Ratio
BW = Belt Width

Belt Weight:

(Weight of Base Belt) + (Weight of Mesh Overlay)

Steps of Calculation:

- Calculate Inside Conveying Surface area in square inches per foot [*square mm per meter*] of belt length. Convert to units of square feet per foot of length [*square meters per meter of length*]. See page 2 for conveying surface widths. Keep units consistent to Imperial or Metric throughout calculations.
- Calculate Outside Conveying Surface per foot [*meter*] of length using the same procedure.
- Use the mesh type to determine weight of mesh in lb/square foot or kg/square meter (see Mesh Weight tables on page 4). Calculate the inside and outside mesh weights per foot [*meter*] of belt length.
- Add the weights of the inside and outside meshes per foot [*meter*] of length to the weight of the Base Belt per foot [*meter*] of length.
- Multiply calculated value by belt length in units of feet or meters for the total belt weight in units of lb or kg.

Center Link Position: (calculate center link position in units of inches; convert to millimeters if necessary)

Inside Turn Radius ÷ 2.2.

Sample calculation:

For Inside Turn Radius = 39.6 inch, Belt Width = 36 inch
Center Link Position = 39.6 inch ÷ 2.2= 18

Belt Length: Calculation will depend on system layout. In calculating belt length for Small Radius Omni-Grid, use the radius to the middle of the center row of links.

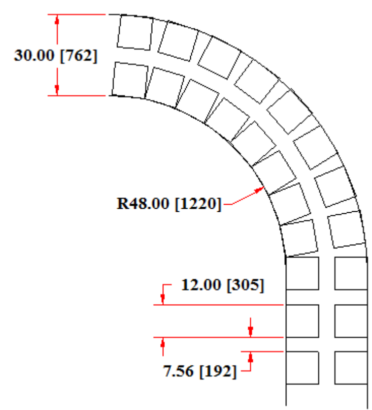
Conveying Surface Width: See page 2
Sample calculation:

For a 36 inch [*914 mm*] wide, Center Link Position = 18 inch [*457 mm*],
Inside Section = (18 inch – 2.01 inch) = 15.99 inch Metric: [*457.2 – 51.1 = 406.1 mm*]
Outside Section = (36 inch – 18 inch) – 1.80 inch = 16.20 inch Metric: [*(914.4 – 457.2) – 45.7 = 411.5 mm*]

Belt Tension: Needs to be calculated/reviewed by Ashworth Engineering for each application.

PRODUCT LOADING REQUIREMENTS

All PosiDrive Spiral™ belts accommodate a turn by collapsing along the inside edge. Product loading must be adjusted accordingly. The allowable loading per length of belt is determined by the ratio of the inside turn radius and the radius to the tension link. The tension link is the center link for this belt.



Product along inside edge moves closer together; no effect is observed on the product along outside edge. Loading: 1 in 1.63 product lengths.

STANDARD LOADING RECOMMENDATIONS
Allowable Loading per length of belt = (Radius to Tension Link) ÷ (Inside Turn Radius)

Sample Calculation:
Let BW = Belt Width = 30 inch [762 mm]
Let IR = Inside Turn Radius = 48 inch [1219 mm]

Radius to Tension Link = BW + IR
= 30 inch [762 mm] + 48 inch [1219 mm]
= 78 inch [1981 mm]

Allowable Loading = 78/48 = 1.63

Which means a minimum space of 63% of the product length is required between products.

MAINTENANCE

Lower belt tension will improve belt life and reliability. Therefore, proper operation and regular cleaning, lubrication, and maintenance are encouraged. Generally, belt tension increases when product debris (flour, glazing, marinade, etc.) increases the friction between the belt and the support rails. Other factors, such as worn or misaligned components and increased product loading will also increase belt tension. The following guidelines will help lower belt tension and reduce wear.

CLEANING

- Clean product debris from support rails.
- Clean ice and product debris from belt, sprockets, and filler rolls to prevent belt damage.
- Observe the effect of temperature on the coefficient of friction between the supports and the belt. Products may leave a slick residue at room temperature that turns into a tar-like substance as temperature decreases. At freezing temperatures, the debris may become slick again or leave a rough surface, depending upon its consistency.

LUBRICATION

- Lubricate support rails to reduce friction between rails and belt.
- Lubricate inside edge of the belt (note that this is opposite from general practice with Lotension spirals).
- Lubricate links.

OPERATION

- Replace worn wear strips on support rails.
- Remove weight from take-up. Use minimum weight necessary to maintain take-up loop.
- Align sprockets properly and ensure that they do not walk on the shaft.
- Load belt so that belt weight, product loading, friction factors, and belt path do not cause belt tension to exceed maximum allowable limit.
- Decrease belt speed.
- Properly adjust discharge helper drive to maintain lowest possible “take-away” tension.

Reference: Product Technical Bulletin “Conveyor Design Guidelines.”

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