TECHNICAL BULLETIN

BAKING BAND TRACKING & MAINTENANCE

TRACKING THE BAND

Band Start-Up

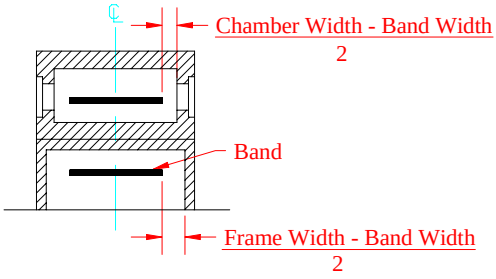
Start the band at a low speed. The band path will stabilize after three or four cycles. Position observers at essential locations to insure the band is not damaged during these first cycles.

Adjusting the Band Path

To adjust the band path, use only the support rolls by skewing them in the horizontal plane. Alignment of the terminal drums and other major rolls insures equal tension across the bandwidth, and moving the supports does not affect this balance. ***Do not*** skew or cock the terminals or other major rolls to track the band.

Ideally, the band centerline will also be the oven centerline.

- Measure the oven chamber width, subtract the bandwidth, and divide by two. This value is the distance desired between the band edge and the oven wall through the load path.
- Similarly, for the belt return measure the oven frame width and subtract the bandwidth. Half of this value is the distance desired between the band edge and the oven wall through the return path.
- Measure band position every 10 to 15 feet [3 to 4 m].

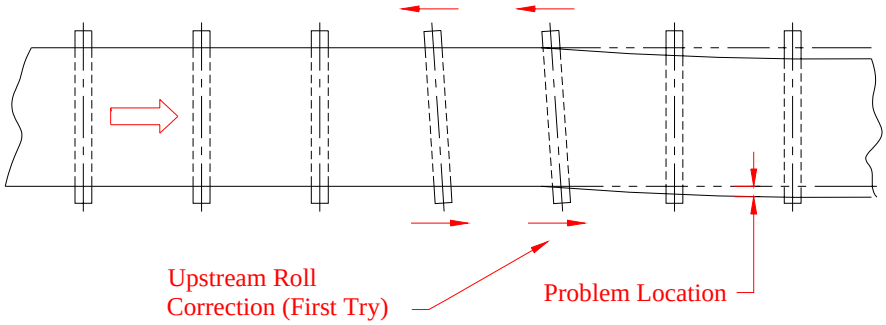


Band tracking will change as the oven is brought to temperature. Start tracking with the band cold. When the path is close to being straight, heat the band. Make final adjustments when the band is at baking temperature. Additional tracking adjustments may be needed when product is introduced.

Free Turning Roller Supports

A band approaching a free turning roll will attempt to leave that roll at 90 degrees to its axis. A roll perpendicular to the band path exerts no lateral influence. To move the band face in the direction of band travel (loaded and return paths go in different directions) move the roll as if steering a bicycle. After each adjustment, the band will take about three cycles to re-stabilize. Make tracking corrections several bandwidths before the trouble spot.

Moving several rollers a small amount is recommended over moving one roller a greater amount.



Rollers with frozen bearings have the opposite effect as the free turning roll. Consider the direction of oven expansion when setting roller positions. Expansion of the oven frame may bind a roller at baking temperature.

Lateral Skid Bars

Skid bars have the opposite effect of the free turning roll. Since lateral skid bars have no adjustment, the controls are all that is available to keep the band in position.
Refer to: Ashworth's Technical Bulletins "Control Systems".

MAINTENANCE OF BAKING BANDS

Inspection

General inspection should include, but not limited to:

Band

- no product debris
- equal tension across full width
- equal edge sag, both sides
- no broken welds
- no curl along belt edges
- no broken wires
- out of crimp
- discolored
- evenly distributed load

Band Path

- no obstructions
- not contacting framework
- not overhanging any rollers
- not passing under any rollers
- waver through oven
- waver at terminal drums
- light contact with the controls
- limit switches properly located
- cleaning brush not binding

Oven

- Equal heat distribution across the full belt width.
- Vents are operating properly to prevent "zonal" heat build-up
- All doors are shut. If doors must be opened, open an equal number of doors on both sides of oven.

Terminals and Major Rolls

- flat faced
- parallel to each other and perpendicular to the belt
- no build-up of product debris
- shafts not broken
- no objects between belt and drum

Controls
- free turning
- bearings
- lubrication
- condition of roll faces
- free pivoting
- proper clearance
- proper location

Take-Up
- Verify air pressure setting
- equal air pressure in both cylinders
- free travel
- equal travel on both sides
- tracks are clean

Roller Supports
- free turning
- concentric rotation
- no flat spots
- shaft not broken
- no flanges
- no deflection
- level

Slider Supports
- level
- secure to framework
- smooth transition between joints
- not warped/damaged
- no product debris

Conditioning

During Manufacture

Nearly all mesh bands are manufactured from a medium grade carbon steel wire. The wire is received from the manufacturer with a protective coating of oil.

An OSHA approved water-soluble lubricant is used during the forming of the spirals.

While welding the band edges the lubricant is naturally burned off in this area. An "oven band oil" of hydrogenated soybean oil and coconut oil is applied by spray gun prior to shipping and/or storage.

After Installation, Proper Alignment and Initial Tracking

The band oil burns off when the oven temperature reaches several hundred degrees Fahrenheit. “Burn Off” may last up to an hour depending on the amount of oil on the band and the oven temperature.

Insure all exhaust fans are on and notify all employees of the "burn off" -- there will be smoke.

A heavy board wrapped in multiple layers of clean cloth and laid across the band can be used at the discharge end to wipe off the band surface. Rotate the board periodically to expose a clean surface. This board can be applied anytime during "burn off" depending on if customer prefers to burn or wipe off the majority of the oil. When the cloth remains clean during continued running, the band is sufficiently clean.

It is not necessary to oil the band before baking.

CAUTION: If the oven is equipped with a band brush, it is suggested that it not be used during "burn off" to avoid gumming the bristles with oil.

TROUBLESHOOTING BAND PROBLEMS

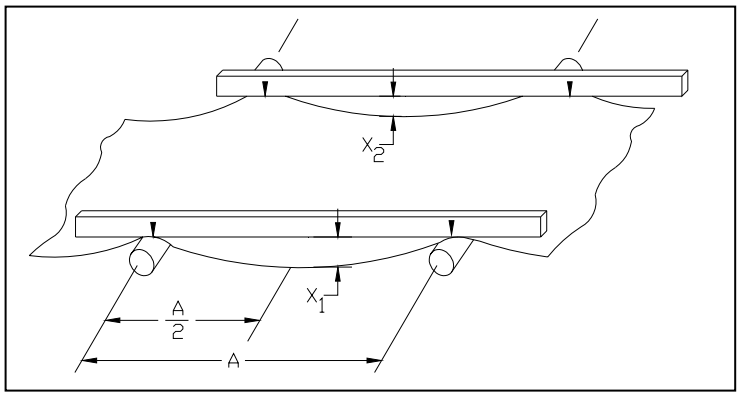
Unequal Edge Sag

Recommend keeping the difference in belt sag between the two band edges no greater than 1/32 inch [1 mm].

Causes of Unequal Edge Sag
- unequal tension across the band width
- conveyor misalignment
- temperature variation across the band width

Correcting a Stretched Edge

Once a band becomes elongated on one edge, little can be done unless caught early. A quick fix, while awaiting a new band, is to flip alternating sections of the belt in an attempt to equalize the elongation. If successful, it is only temporary as it results in loose edges with a tight middle. Finding and correcting the cause of the problem then replacing the band is the most economical long-term solution.



Excessive Side Pressure

During normal operation, controls should exert zero or minimal force to maintain a straight belt path. If the belt tends to run against one set of controls, grip the top of the rotating vertical roll with your thumb and forefinger and try to stop it. If you cannot stop the roll rotation, inspect for causes of change in the band tracking.

Possible causes include, but are not limited to:

- stopped roller supports
- broken shaft on roller support, snub roll, or bend roll
- damaged slider rails
- cocked terminal roll, snub roll, or bend roll

Band Vibration

Excessive vibration of oven bands is fortunately a rare problem, but when it occurs the cause and cure are seldom obvious. The most frequent complaint is the disorientation of product to the point of spillage off the band edge, creating the opportunity for oven fires.

Band Related Factors

- **Band Weight** — Greater band weight generally means a lower fundamental frequency.
- **Spiral Pitch and Shape** — Spiral pitch affects the frequency. Smooth surfaces of the compound balanced weave meshes are very favorable. For even smoother surface, operate a PGLW belt with smooth side down. Balanced Weave mesh with an ordinary oval spiral could be a vibration producer.
- **Non-Uniform Band Tension and Wear** — When one band edge is loose in comparison to the other, there is usually one zone across the bandwidth that will result in a fundamental frequency that will respond with some disturbing source. Coupled with the fact that the product has the opportunity to slide downhill this will result in both disorientation and spillage.

Oven Related Factors

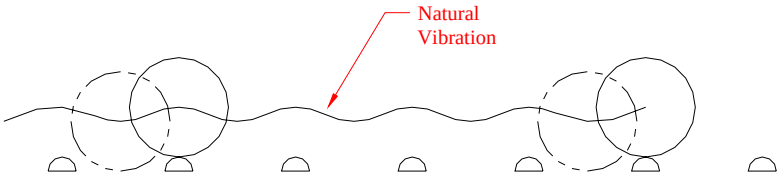
- **Friction Drag** — Support bars, non-rotating rails, or badly tracking bands contacting framework can produce vibration. A significant difference between static and dynamic coefficient of friction can produce "stick/slip" resulting in surging.
- **Eccentric Rolls** — Through imprecise manufacture, long term wear, or build up of product, eccentric rolls are recognized as a primary source of band vibration.
- **Small Support Roll Diameters** — Small support roll diameters coupled with the pitch and shape of the spiral can be another major source of vibrations.

- **Vibrating Framework & Unbalanced Equipment** — These vibrations are readily apparent by their low frequency. Only in severe cases would they effect the band itself.

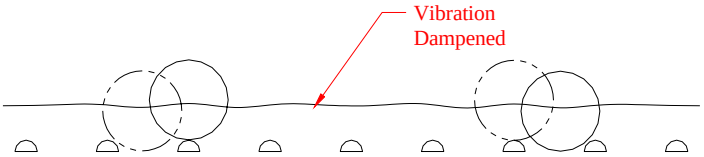
- **Belt Drive** — Avoid long pitch chains on small diameter sprockets. Speed change from the chain chordal action would produce a band surging motion.

- **Support Roll Spacing** — Evenly spaced support rolls where the center-to-center distance between rolls and the spiral pitch are multiples of each other will produce vibrations.

  This phenomenon can best be described by analogy. Assume a car with a wheelbase of four (4) feet is traveling a section of road, which has speed bumps on one-(1) foot centers.



  As the car travels the wheels will always be either on top of the speed bumps or between them, therefore the driver will experience a rise and fall relative to the ground (or achieve a natural vibration). If the driver is not wearing a seat belt and the forward speed is great enough he may be thrown from the vehicle. The same is true of conveyor belts. To prevent product from being thrown from a belt (dampen vibration), the support rolls (speed bumps if you may) need to spread out to dampen the natural frequency of the belt.



  As with the car the distance between the support rolls should not be divisible by the belt pitch. This prevents the spirals from being either up or down at the same relative time thus dampening the vibration.

Operating Factors

The opportunity to vary these items is severely constrained by the oven settings determined by product.

- **Band Speed** — Speed determines the frequency of both the band and roll induced disturbing forces. Sometimes a change in speed will sufficiently reduce vibration to acceptable levels. There is the possibility the vibration may only move to another location.

- **Take-Up Tension** — Take-up tension will affect the vibration frequency. Varying the tension may help, but as with speed can move vibration elsewhere in the band.

- **Oven Temperature** — Temperature should not affect the band other than by altering band tension or friction characteristics.

- **Band Tracking** — Band tracking is a reflection of the condition and alignment of the terminal drums, all major and minor rolls, belt supports, and the take-up.

"Hot Spots" on the Band

CAUTION: *Do not* apply water to a band at high temperature as irreparable distortion can occur.

Efforts to cool the edges of a baking band with water have resulted in irreparable band damage. Ashworth does not recommend this practice. Effectively, this is quenching a heated metal surface with water. The normal procedure for quenching is to use oil to have some control over the cooling rate. Quenching with water is the most severe method and will produce stress fractures within the grain boundaries of the material. Once these fractures are created any side pressure on the band may cause the band to fracture (crack) along the quenched zone. Buildup of the product on any support roll that causes the band to flex may also lead to broken wires in the area of the quench. Instead of quenching the band, determine the cause of the hot spots. Possible causes include:

- burners not supplying even heat across the band width
- burners are closer to the band in the return path pre-heat zone
- air circulation within the oven is not adequate
- product configuration
- Burners under the band (example: pre-heat burners in the return path) may cause heat to build up under the band. This heat can only escape where product is not onto the band, which is often only the band's edges. This will heat the band's edges more because the product is effectively insulating the rest of the band.

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