



Our bake oven belts will perform reliably
for many years when installed properly.

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BAKE OVEN BELTS SERVICE INSTRUCTIONS FOR INSTALLATION

SERVICE INSTRUCTIONS FOR IPCO STEEL BELTS

A properly installed and maintained IPCO bake oven belt will give many years' reliable service. To achieve satisfactory operation ensure that the guidelines described here are followed carefully. For more information, please contact your nearest IPCO office for recommendations and advice.

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Dismantling the old belt

Fasten a wire or rope to the old belt before pulling it out of the oven. This attachment will then be used when the replacement belt is installed.

When a belt is installed in a new oven, the pulling attachment is inserted through the inspection openings. Please pay special attention to drum surface and belt support.

Before pulling on the new belt

A conveyor and belt typically adjust to each other after long operation why it is important to correctly readjust the conveyor to get the expected belt life.

- Clean conveyor accessories and oven sections.
- Replace defective and worn out rollers and skid bars. Recommendations and advice on design, manufacture and installation of rollers and skid bars are given in a separate leaflet.
- Align the terminal drums, rollers and skid bars horizontally and at right angles to the center line of the longitudinal axis of the oven line.
- Ensure that the terminal drums and all rollers can rotate freely.
- Check that the tension device is functioning properly.
- Check that safety devices, such as limit switches and drum scrapers, are operating correctly.
- Ensure correct center to center distance of pulleys to ensure correct belt tensioning possibilities.

Pulling on the new belt

- The belt coil should be placed preferably on a roller type support as shown in figure 1.
- The belt is normally delivered with the baking side on the inside of the coil. The outside of the coil is marked with a label "This side bottom side". Make sure that you pull the belt on correctly. See figure 2.
- The belt surfaces are greased for protection against rust during transit and storage on site. This protective oil must be removed before the belt is pulled into the oven in order to prevent contamination of the oven conveyor and other oven parts. The rust protection oil is not of food quality.

A simple method for cleaning the belt is a pair of cloth covered wooden bars or square tubes pressed against each side of the belt as it is uncoiled. The cloth can be cotton or a similar material, which will not leave fibres on the belt.

The cleaning bars are fastened to the terminal end by screw clamps in the position shown in figure 2. Before pulling on the belt, the cloth should be soaked in an appropriate solvent. When the cloth facing the belt is saturated with oil, the bars or square tubes should be turned ¼ revolution.

This same cleaning method can also be used when running in the belt.

The belt should be at room temperature during the cleaning process:

- Make sure that the belt ends are positioned at a suitable place for welding the belt together.
- Ensure that the belt is positioned symmetrically in the oven.

Figure 1

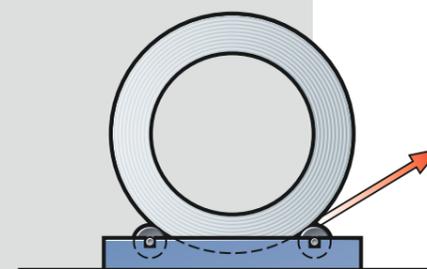
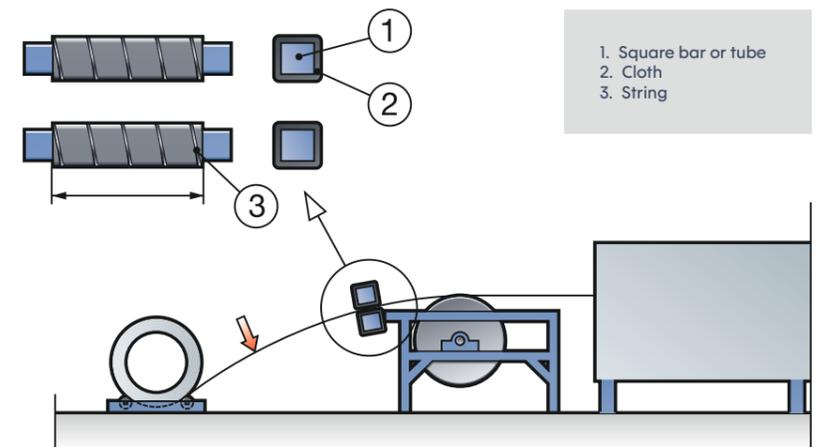


Figure 2



Joining the belt

Belts in bake oven lines are normally joined by welding. Special tools, such as belt welding fixtures, tig-torch carriages and annealing tools, are required. For best results, welding should be carried out to IPCO recommendations, preferably by a IPCO steel belt welding specialist.

Sometimes riveting, using a special riveting tool, can be an alternative method.

The overlapped riveted joint is the easiest to make and can be performed by factory trained maintenance personnel. If a smooth working surface is required, the butt strap joint with flush rivet heads should be used. A butt strap joint is also used on reversible conveyors.

More information, regarding what method to choose and equipment to use, can be accessed easily from the IPCO Process Systems website or, alternatively, contact your local IPCO office for professional guidance.

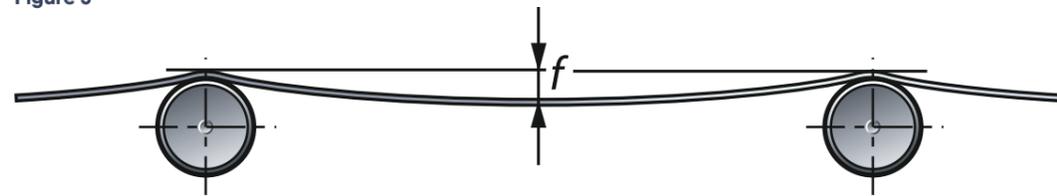
Tensioning the belt

- Centralize the belt on drums, skid bars and rollers.
- Check the sideways clearance between the edge of the belt and the structure.
- Check that all safety devices, such as safety plough, drum scrapers, limit switches etc., have been fitted.
- Apply tension to the belt. The specific tension stress should be a minimum of 10 MPa (1 450 psi) over the belt crosssectional area. A maximum of 20 N/mm² (2 900 psi) is acceptable.
- Check whether the tension is correct by measuring the sag of the belt between two idlers in the bottom strand. The values in figure 3 are valid for a pretension of 10 MPa (1 450 psi).

| Distance between supporting idlers of bottom strand | | | | | |
|---|-------|-------|-------|-------|-------|
| m | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 |
| feet | 10-13 | 13-16 | 16-20 | 20-23 | 23-25 |

| Sag of belt <i>f</i> | | | | | |
|----------------------|------|------|------|------|------|
| mm | 10.0 | 20.0 | 30.0 | 45.0 | 60.0 |
| inch | 0.4 | 0.8 | 1.2 | 1.8 | 2.4 |

Figure 3



Starting up and running in the belt with a cold oven

When a bake oven conveyor is first put into operation, every precaution should be taken to protect the belt against any possible damage likely to arise if it is not correct. Operators should be placed at all strategic points along the oven, especially near the motor starting switch, so that the power can be shut off immediately if anything is wrong. Additional cleaning is recommended in the beginning of the running in procedure you have achieved straight running when a specific point of the belt returns to the exact same position each lap.

When running in the belt, proceed as follows:

- Mark the edge of the belt at several points, number the points and record them in a table.
- Choose an easily accessible part of the structure as a reference point.
- Let the belt run and measure the distance between the edge of the belt and the structure when the marked points pass the reference point, see figure 4.
- Enter the measurements into the table as a guide for adjusting the terminal drums. See table below.
- Start the belt and let it run for a few meters. Stop it and check the position of the belt.
- Start the belt again and let it run for a few meters. Stop it and check the position of the belt again.
- Start again, increasing the distance each time until continuous operation over several revolutions.

If more than one reference point is being used, make a table for each one. Make adjustments only if the belt shows a tendency to wander in one direction.

Adjusting the guide rollers

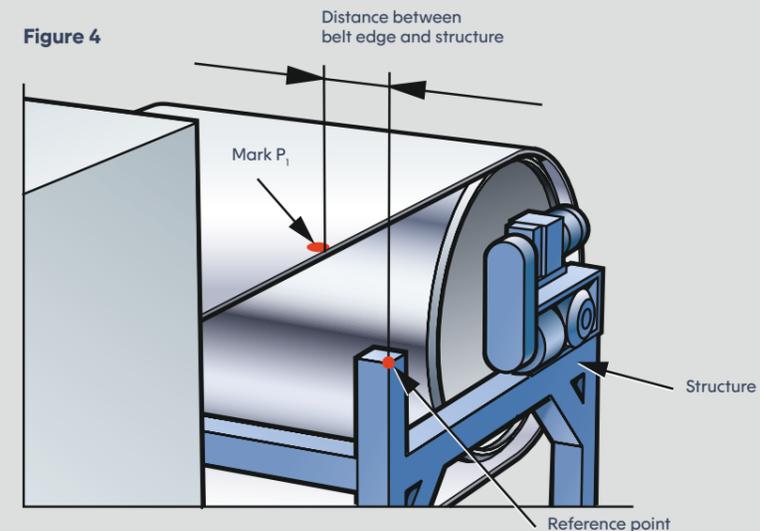
Having satisfactorily completed the cold tracking operation, stop the belt when it is absolutely central. Set the vertical guide rollers on each side so that there is a clearance of 10 to 15 mm (1/2") on each edge of the belt.

Under no circumstances should the guide rollers touch both sides of the belt at the same time.

Running in the belt with a hot oven

- A procedure similar to that described for cold running in is now carried out. Note the guidelines for starting and stopping the belt on page 7.
- Ensure that all access and inspection openings of the oven are closed, since any draughts may cause localized cooling effects with consequent belt distortion and erratic running.
- The exhaust system of the oven must be working at full capacity to get rid of vapourized oil fumes or other inflammable gases. With an oven heated by a direct gas fired system or with a turboradiant oven incorporating a radiant heat section, the burner flames must be as small as possible to prevent any possibility of ignition.
- When the oven is heated up for the first time after the installation of a replacement belt, the temperature must be gradually increased – about 70 °C (160 °F) per hour until the baking temperature is reached.
- When the oven is heated you should expect some changes to the belt tracking.
- The belt must be allowed to run for several revolutions before any adjustment is made, so that conditions can stabilize.
- The belt must run centrally in the oven. If there is pressure on any of the vertical guide rollers, a careful investigation should be made to establish and rectify the cause.
- In the early stages, the belt should be run continuously for long periods under close supervision. When the belt starts running, constant attention is needed over at least three days under production conditions.

Figure 4



Conditioning the baking side of the belt

Make sure that the belt is clean. If necessary, clean finally with hot water and detergent.

Rub the clean, warm belt surface using a swab soaked in an edible oil to produce a fine smooth skin or patina to which goods cannot stick during the baking process.

Use the minimum amount of oil to reduce fumes.

Instead of edible oil, beeswax, liquid paraffin or some other food quality release agent can also be applied.

If wax is used, the oven temperature should be kept at about 65 °C (150 °F) and the wax rubbed onto the belt for about two revolutions. Then, the belt should be polished, using plenty of clean dry rags, until it is completely dry and has a high lustre.

Lubrication of the underside of the belt

In ovens where the belt is supported by cast iron skid bars, the underside of the belt should be lubricated. Lubricants used are graphite or specially selected oils.

A new belt, when installed, should be lubricated before starting up.

Using graphite

There are two types of graphites that can be used:

Powdered graphite mixed with water

This is the best type to use as the operation can be carried out at the initial stage and also when the plant is in production. This requires careful application and not too much graphite being used to avoid it spreading to the baking side of the belt. The baking-on temperature is in excess of 150 °C (300 °F).

Colloidal graphite (Foliac L621, Rocol Ltd.)

This is a graphite in oil and should not be applied while production is taking place. Foliac is baked-on in excess of 200 °C (390 °F) up to baking temperature. All exhaust vents must be open to get rid of any smoke and fumes given off when baking-on.

As an alternative to occasional applications of graphite to the underside of the belt, skid bars made from graphite can be used. They give continuous "self-lubrication" of the belt.

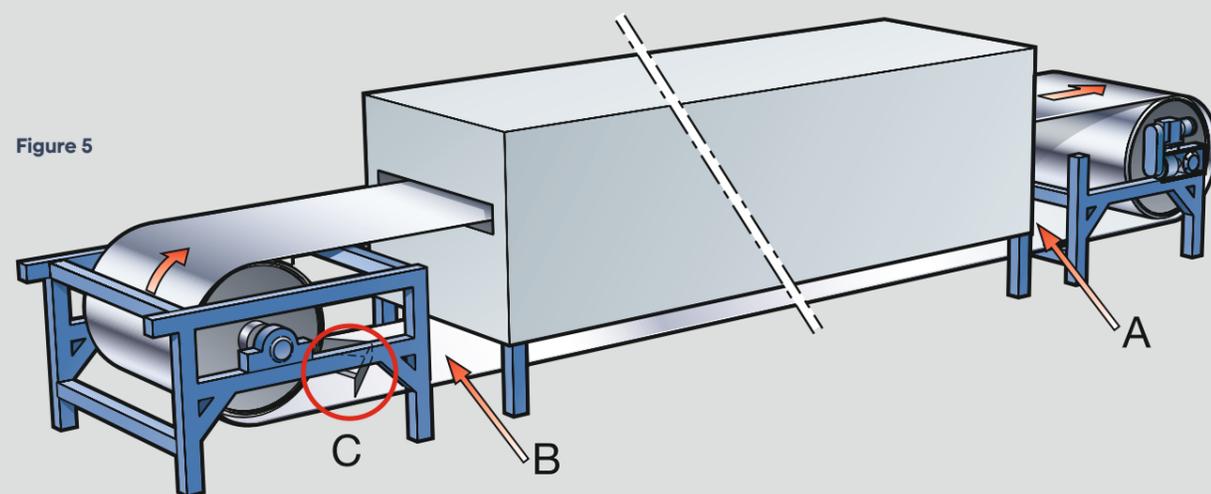


Figure 5

Graphite application procedure

- Safety scraper C should be removed to prevent the spread of graphite over the edges of the belt onto the baking side of the belt.
- Any back-up rollers to cleaning brushes on the top side of the bottom strand should be removed. Set the oven at the correct temperature and open the vents if required.
- If the cooling section of the oven is short, apply graphite at point A while the belt is still warm.
- If the cooling section is long, graphite can be applied at point A or B, whichever is most convenient.
- Application: Graphite is best applied by using a paint roller and a tray. Shake the graphite mixture to give even dispersion and pour a little into the tray. Dip the roller and roll it on the raised section of the tray to give an even spread. Apply in even strokes across the belt. Repeat as required.

Graphite should not be applied to the last 100 mm (4") of each edge of the belt. This is to prevent graphite from spreading to the baking side of the belt.

- Whilst applying graphite, it is essential to keep both terminal drums free from too much graphite by wiping with clean rags. Afterwards, both drums should be cleaned with rags and solvent. Too much graphite deposited on terminal drums will lead to bad tracking and will eventually damage the belt if allowed to remain.
- Graphite should not be applied too heavily. If the procedure is carried out correctly, a clean hand wiped over the surface should pick up a dry grey/black residue.
- Replace safety devices, back-up rollers etc. before proceeding with production.

The frequency of applying graphite depends on the type of oven and the products baked. When products with a high fat content are baked, the periods between applications can be relatively long, since fat will spread to the underside of the belt. When dry products are baked graphite should be applied more frequently.

Indications of an urgent need for lubrication are when the belt shows a tendency to vibrate or slight wear of the belt is observed.

It should be possible for maintenance staff to establish and control the optimum periods between graphite applications.

A general rule is as follows: Graphite the inside of the belt once a month during the first three months of running. Then, graphite the belt once every three to six months.

Applying graphite has the following effects:

Radiant and convection ovens

- Cuts down friction.
- Gives longer life to the belt.
- Less wear on skid bars.
- Helps to keep an even colour on the belt, otherwise the dark area will absorb heat and the light area reflect heat. If it is not carried out there is a risk of uneven bake and colour of the products.
- Helps prevent belt distortion.

Long ovens with high speed

- Rolling ovens of the radiant type may need graphite applications periodically to maintain an even colour.
- Sliding ovens with speeds in excess of 15 m/min (50 fpm) need graphite applied in the commissioning stage. If the oven is run for long periods at this stage, graphite should be applied again before production starts.

Using edible oil

If graphite is not permitted for any reason, specially selected oils can be used instead.

Be aware of the risk of rust on belts, which can occur e.g. at weekends when the oven is not working, especially when dry biscuits are baked in convection ovens.

When bread is baked and proving takes place on the same belt, as it is passing through the oven, it is difficult to avoid rust on the underside of the belt due to the high humidity in the proving section. To prevent rust from developing, the underside of such belts should always be given a thin coat of an appropriate quality oil.

Running the belt with a product

When production has started, products must be loaded symmetrically onto the belt to ensure straight running. The free area of the belt should be of equal width on both edges, and preferably as narrow as possible.

Starting and stopping the belt

Starting

First start the belt. Then heat up the oven.

Stopping

First switch off the heating. Do not stop the belt unless the oven temperature is lower than 80 °C (180 °F).

Periodic maintenance

Cleaning solid belts

Cleaning of most solid belts is carried out by rotating brushes, assisted by scrapers, to suit the various products baked. The brushes should be gently adjusted to the belt surface. This cleaning is undertaken when the empty belt is running through the oven. At the same time, the belt should be rubbed manually with clean cloths to ensure overall cleanliness.

However, belts can be wet washed if required to suit particularly sticky products.

Failure to maintain regularly and to clean the baking side of the belt results in the deposition of carbon. The removal of these deposits can be difficult and time-consuming.

There are many ways to remove carbon deposits, but it depends on the main product in the layer i.e. sugar, flour, fats or a combination of these.

For best result, clean the belt with IPCO Quickcleaner service using salt as a cleaning agent. Please contact IPCO for more information.

The following are the most commonly used methods for removing carbon build-up:

Mixture of corn starch and caustic soda

For this procedure the following cleaning solution is recommended: Mix water and corn starch 50:1, boil to obtain a gel and then cool to 65 °C (150 °F). Mix water and caustic soda 3:1, in same volume as above, at a temperature of 65 °C (150 °F).

Mix the two solutions and allow to stand for 10 to 12 hours. Safety precautions must be taken when handling this mixture.

Run the belt at its lowest speed.

Heat the oven to about 65 °C (150 °F). Apply the mixture by means of mops or brushes before the belt enters the oven.

When the belt comes out of the oven many of the carbon deposits will have loosened and can be scraped off reasonably easily with a hand scraper. This procedure should be carried out until the entire belt is clean.

The belt must then be washed with warm water and a household soap powder or detergent until all traces of caustic soda have been removed. After rinsing, the belt must be dried.

Condition the belt as described in the procedure "Conditioning the baking side of the belt", page 6.

Dry ice

Shot blasting of the slightly warm belt with dry ice will remove carbon deposits.

Condition the belt after cleaning as described in the procedure "Conditioning the baking side of the belt", page 6.

Washing with hot water and detergent

This procedure is mainly suitable for sugar based carbon deposits.

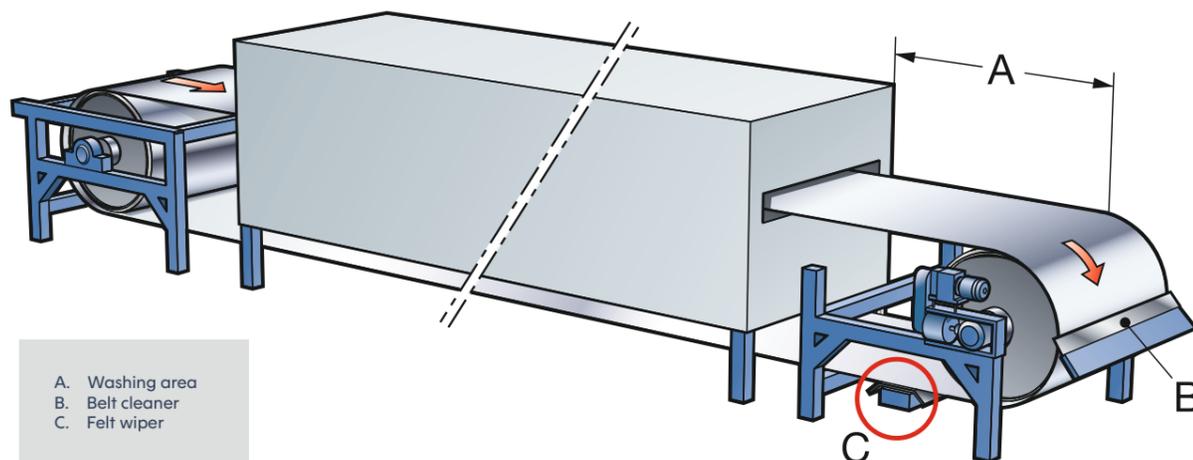
The belt should be washed with detergent mixed in hot water and cleaned using nylon scourers at the exit of the oven, until the deposits have been removed. The oven should be pre-heated to approx. 65 °C (150 °F).

The belt should be conditioned after cleaning as in the procedure "Conditioning the baking side of the belt", page 6.

Baking release agent

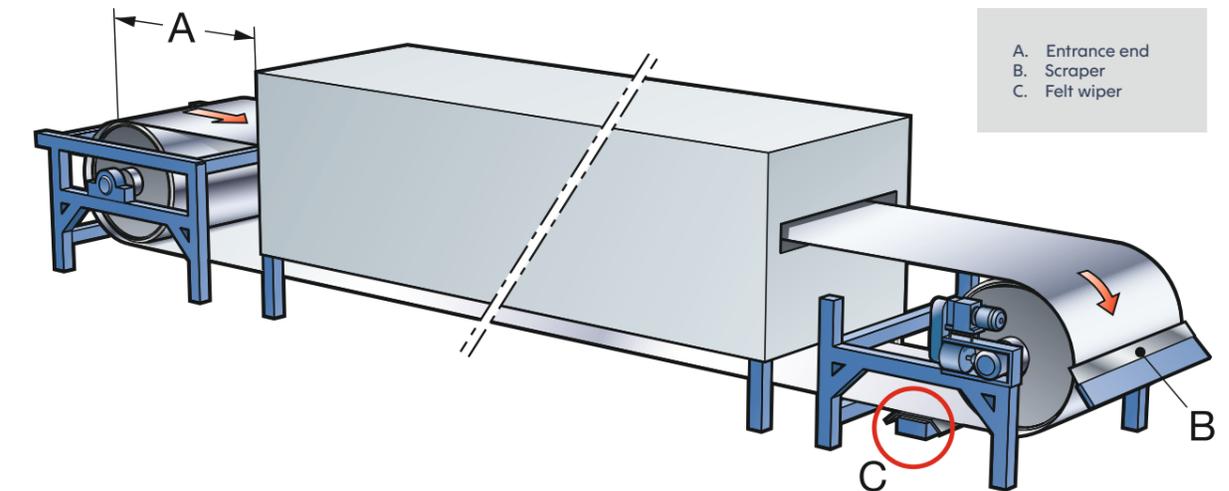
The release agent is spread in a thin and even layer on the belt at the entrance to the oven. The release agent softens the carbon layer when it enters the hot oven (approx. 120 °C (250 °F)). The layer on the belt is then removed by scrapers and finally cleaned with felt wipers on the bottom strand.

Figure 6



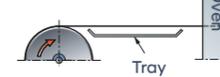
A. Washing area
B. Belt cleaner
C. Felt wiper

Figure 7



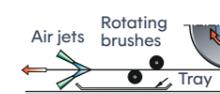
A. Entrance end
B. Scraper
C. Felt wiper

Figure 8



It is not necessary to condition the belt after cleaning, provided that the baking release agent is used correctly.

Figure 9

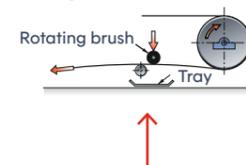


Cleaning perforated belts

The system selected for cleaning depends on the type of product being baked and its ingredients i.e. fats, oils, free flour, sugar, syrups, fruit etc.

The cleaning equipment may need to be run continually, intermittently, or at the end of each shift, depending on the product.

Figure 10



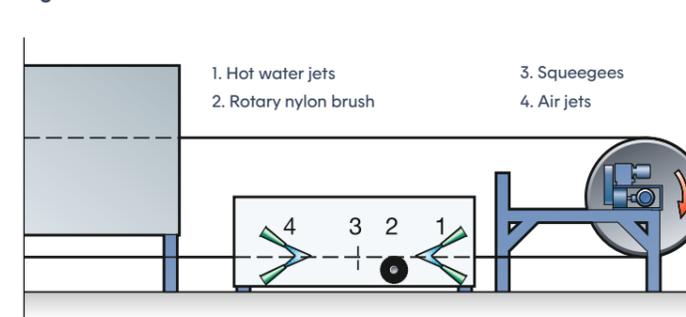
Most perforated belts need a tray beneath the top strand in the feed area to prevent product from falling onto the reverse strand. See figure 8. There are basically two different types of cleaning method; dry and wet.

For best result, please consider to install the IPCO Perforated belt cleaning device. Please contact IPCO for more information.

Dry cleaning with rotating brushes

- Rotating brushes (driven) clean both sides of the belt on the bottom strand. Residue from the cleaning is removed by compressed air. See figure 9.

Figure 11



1. Hot water jets
2. Rotary nylon brush
3. Squeegees
4. Air jets

- A rotating brush on the inside of the belt driven by friction cleans the perforated holes continuously. To obtain sufficient pressure on the brush, the belt is supported by an idler roller on the opposite side. See figure 10.

The cleaning residue is collected on a tray placed on the floor. The belt surface should be cleaned periodically with cloths.

Wet cleaning with hot water using a washing unit

To get rid of waste, the washing unit can be either open to drain or equipped with a sludge pump.

The unit is placed as close to the discharge end of the oven as possible, where the belt is warm. It can be used continuously or when required.

When using the wet cleaning process, the belt should be oiled or conditioned when left standing for any length of time, or shut down to prevent the development of rust. See figure 11.

Periodic checking

We recommend periodic checking of the following items:

- Overall condition
- Belt
- Riveted or welded joint
- Terminal drums
- Belt support
- Guide rollers
- Safety scrapers
- Rotary brushes and back-up rollers
- Break points
- Tension device

Overall condition

- Keep the area around the installation clean.
- Make sure that terminal drums and rollers can rotate freely.
- Repair or replace worn parts. Remove encrusted baking residue.

Trouble shooting

The belt is an essential part of the bake oven. Here are some tips on what can happen and what to do about it.

Belt wandering

Causes:

- Drums, idlers, skid bars, break points not correctly adjusted, contaminated or worn.
- Unequal temperature over the belt width.

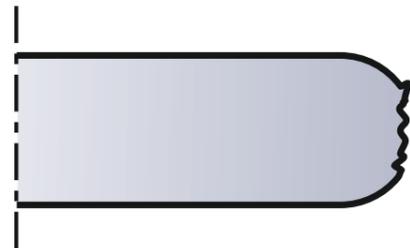
Actions:

- Clean the items, make sure that they are rotating freely, replace worn parts, adjust drums and idlers.
- Ensure that a uniform temperature is achieved over the whole belt width.

Burrs at the edges

Cause:

Due to side belt wandering, the belt has touched the structure or another rigid object.



Action:

File the belt edges so that they are round. Examine the belt tracking.

Scratches on the bottom side

Cause:

Belt support, safety scraper or other parts in contact with the belt are damaged.

Action:

Worn or damaged parts need replacing. The belt may need to be lubricated.

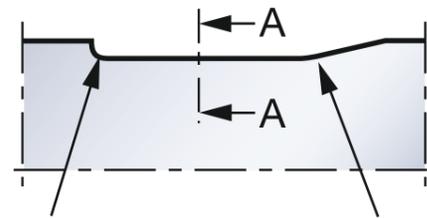
Wavy edges

Causes:

- Due to side belt wandering the belt has touched the structure of another rigid part. Pressure of the belt cleaner or scraper is higher at the belt edges than at the middle of the belt.
- Belt scraper is too wide. (Should be of the same width as the belt.)

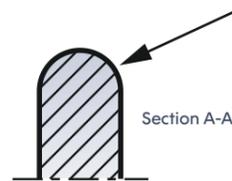
Actions:

- The conditions causing the damage must be corrected.
- If the edge is damaged, it must be cut off and the new edge carefully filed so that it is round.



Wrong

Correct



Wavy edges and/or small blisters in the belt

Cause:

Uneven temperature.

Action:

Usually these deformations disappear when the belt temperature is uniform.

Note: In cases where the deformations remain in the belt, belts with concave or convex deformations can be levelled by special levelling devices. Please contact our IPCO Service.

Deformations

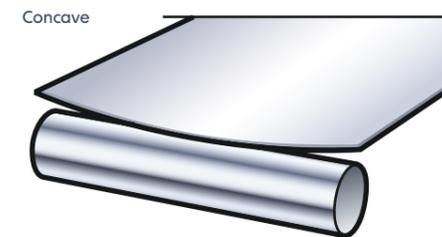
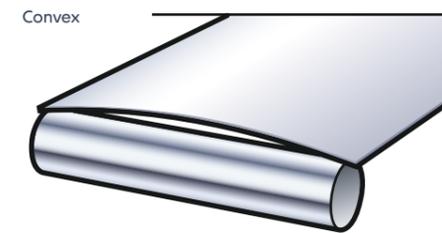
Causes:

- Drums contaminated.
- Belt support contaminated and /or damaged.
- Scratches and abrasions.

Actions:

- Clean drums.
- Clean or replace belt support.
- Check scrapers, rollers or other objects in contact with the belt and also belt tensioning.

Note: Belts with concave or convex deformations can be levelled by special levelling devices. Please contact IPCO Service.



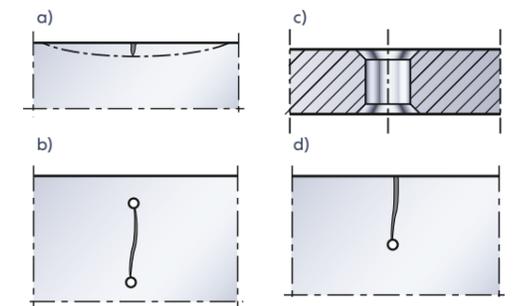
Hairline cracks in belt

Cause:

Fatigue cracks.

Actions:

- If the crack is at the belt edge, a crescent-shaped piece may be cut out and the edges filed so that they are round.
- If the crack is not at the edge of the belt, small holes may be drilled at each end of the crack to prevent it from spreading.
- Thoroughly remove burrs at the drill holes.
- If the crack develops from the edge of the belt, and is so long that the belt edge cannot be cut, a small hole should be drilled at the end of the crack. Fatigue cracks can also be welded. For further information, contact IPCO Service. When a belt shows signs of fatigue, the purchase of a spare belt should be considered.



Accidental damage

Action:

It may be necessary to cut out the damaged section and to splice in a new piece.

Note: The length of the new section must not be less than 2/3 of the circumference of the drum.

Incorrect belt tension

Cause:

Temperature variations. Tension device does not operate properly.

Action:

The specific tension stress should be a minimum of 10 MPa (1 450 psi) over the belt cross-sectional area. Check whether the tension is correct by measuring the sag of the belt between two idlers in the bottom strand. Check tension device, counterweight or tension springs.

For more information on installing or maintaining IPCO bake oven belts, contact our Service Center.

Loose rivets in the joint

Cause:

Normal wear or belt cleaner incorrect.

Action:

Loose rivets must be drilled out and replaced. If necessary, the whole joint must be cut out and a new joint made.

Note: Use IPCO rivets and riveting tools. It facilitates the work and enables accurate joining.

Hairline cracks in welded joint

Cause:

Normal wear.

Action:

Contact our IPCO Service regarding repair welding.



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