

Kelvion



Air Coolers

UNIT COOLER CLEANING RECOMMENDATION



AIRCOOLER CLEANING RECOMMENDATION

CORROSION

According to DIN 50900, corrosion is the reaction of a metallic substance with its environment. This reaction is almost always electromechanically induced. Thus, an electrolyte is the cause for this type of material damage.

HOW AN ELECTROLYTE IS FORMED

If ambient air contains salts, acids or leaches, these materials form an electrolyte in combination with the condensate water, i.e. there is a reaction between two agents, whereby one disintegrates or is at least destroyed.

In order to ensure that the mixing is as even as possible, spice mixes and preservatives, both in the deli department as well as in bakeries are now finely ground as never before. Salts in the processing of brine, cutters, and intestines also enter the ambient air. Deposits of these small particles (pollutants) can also be found on the surfaces of the cooler and result in material damages.

CLEANING AGENTS AND DISINFECTANTS

The stricter hygiene regulations within the EU increasingly require the use of stronger cleaning agents and disinfectants, both in alkaline as well as in acid range. If they are not properly neutralized they can trigger further material damage.

ANTI-CORROSION PROTECTION VARIANTS

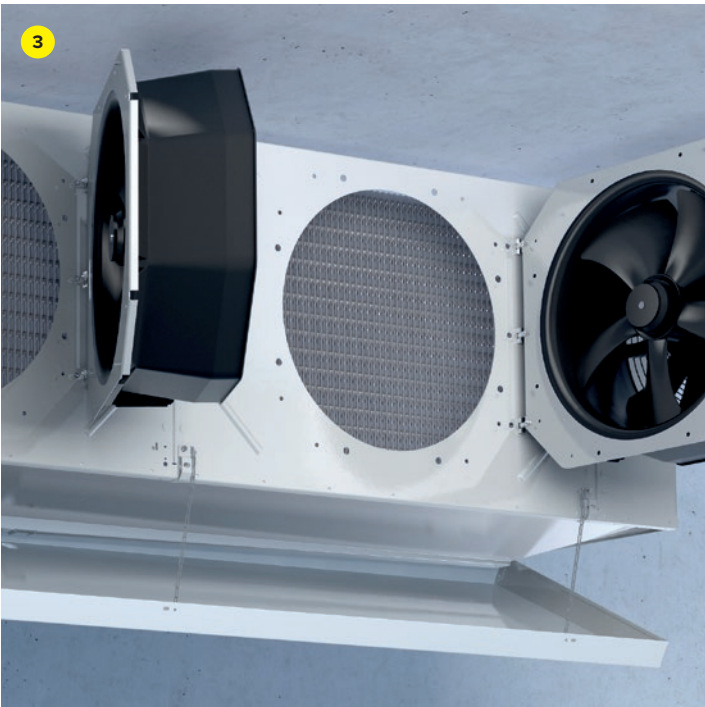
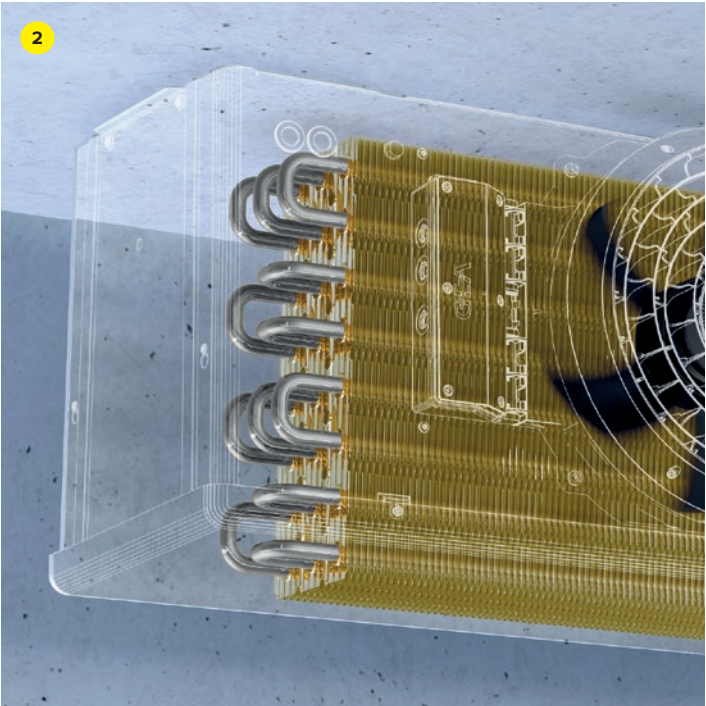
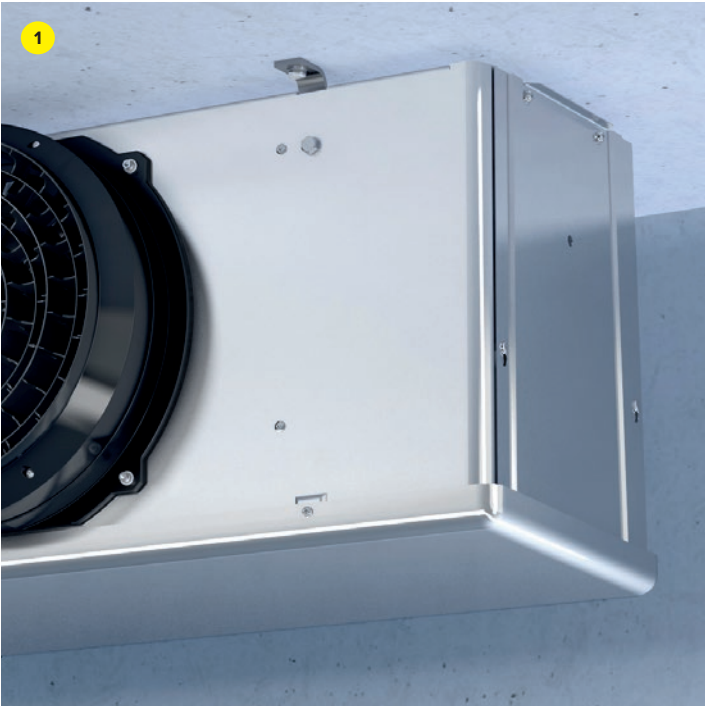
Our range of anti-corrosion protection products protects the material from the aggressive environment. The degree of corrosion depends on the degree of moisture on the heat exchanger surface. All information below shall serve only as recommendations and does not absolve the specifiers and plant manufacturers of their responsibility to take into consideration their own experiences.

When using the cleaning agents and disinfectants, it is important to ensure compatibility with epoxy resin based coatings, aluminium and copper (certain substances are not suitable). The protective coating and the layer epoxy resin coated fins react, for instance, with caustic soda.

MAINTENANCE AND REPAIR

Corresponding to the hygiene regulations relevant for the area of application, the air cooler must be cleaned at regular intervals. The pollution level of the air cooler directly affects its effectiveness. Accordingly, it must be cleaned regularly with chemically compatible cleaning agents.

Only cleaning agents with chemical compatibility may be used to clean the air coolers for which the usage requirements imposed by the manufacturer (e.g. mix ratio, dwell time, after-treatment) must be met. In the event of steam cleaning or high-pressure cleaning (up to a maximum of 3 bar water pressure), the electric connection zones may not be directly sprayed.



- 1 Highest anti-corrosion protection: **Stainless Steel Casing**
- 2 Highest anti-corrosion protection: **Fins epoxy resin coating**
- 3 Easy cleaning: **Fans hinged**
- 4 Easy cleaning: **Hinged Drip Tray**

IMPORTANT

Prior to all repairs and maintenance works, the electric connections of the air cooler must be disconnected and safe-guarded against the possibility of being switched on again.



HEALTH & SAFETY

Kelvion expect that any personnel involved with working on our equipment will be part of a supervised and experienced team. It is expected that all work will be carried out in accordance with the relevant safety directives, the health and safety and any local requirements dictated by the place of installation. It is expected that this document be used as part of the method statement and risk assessment for any work to be carried out.

CLEANING PROCESS

The cleaning can be performed by either wiping or by pressure washing (Between 3-5 bars). When using any type of chemical cleaner it is vital that the cooler is washed down with fresh clean water to reduce the pH levels.

Generally cleaning fluids can have a pH in the order of 12, this must be reduced to as close to pH 7 as is practical after cleaning. This includes removing any over spray from return bends and surfaces that may not have been directly washed (especially fans although avoid direct blasting with high pressure water as this may penetrate the motor drain holes). Any surface left with traces of high pH fluid will start corroding (inc. Stainless Steel!).

As such we cannot recommend a specific cleaning regime or period of cleaning, this is to be decided by the management of the final user and to be appropriate to the type of product in the room. The most important issue apart from the reduction of bacteria within the casing is the corrosion potential and wash down is the only way of keeping corrosion at a minimum.

For extremely corrosive environments a fresh water wash down at the end of every shift on both sides of the coil is recommend. Sometimes fan plates are hinged to provide access to the cooler plenum and fans **MUST BE ISOLATED** before these fan plates are open. There are no interlocks provided on the fan plate but a fan isolator must be provided nearby.

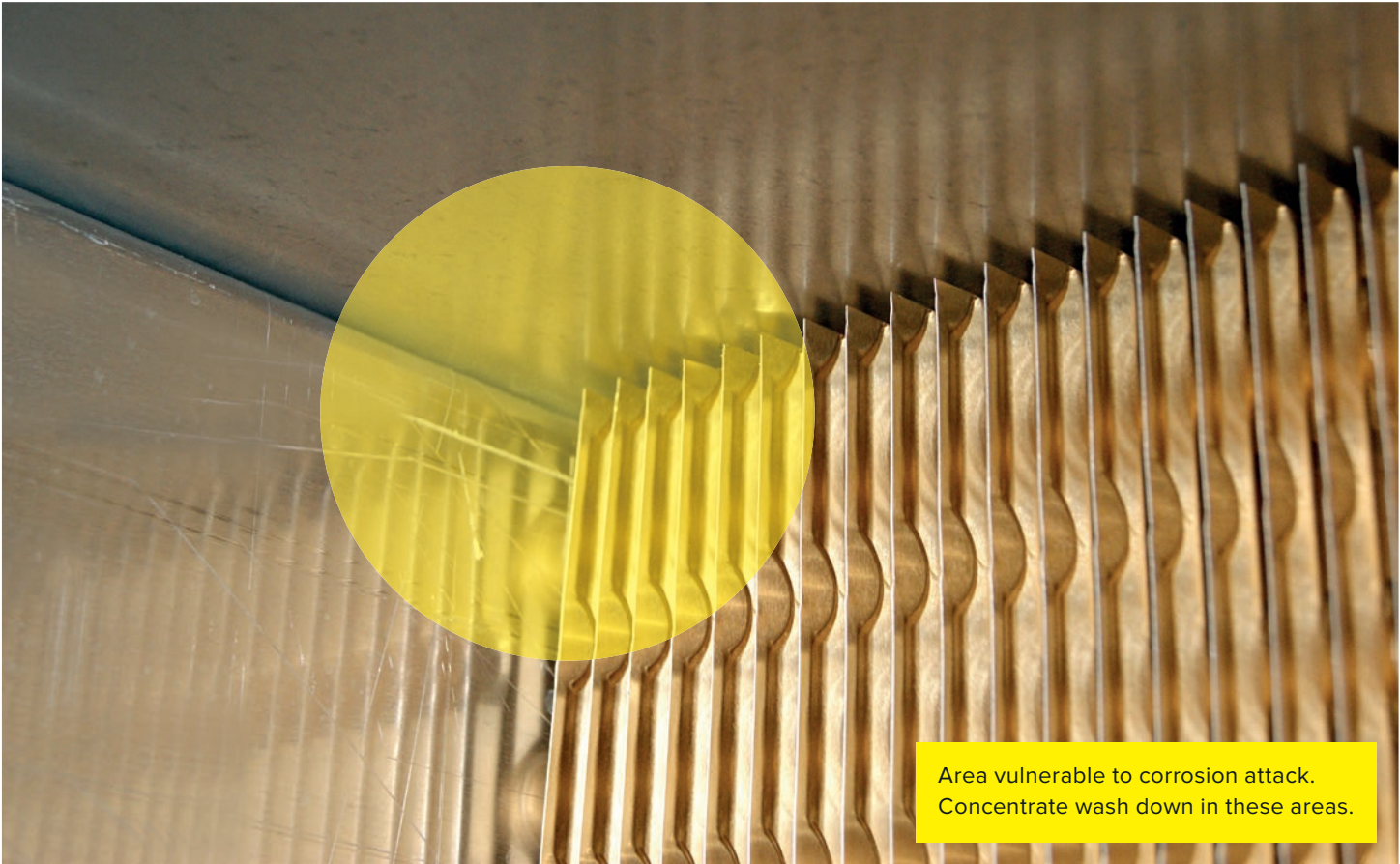
Whilst every effort is made at the factory to ensure all sharp edges are removed, personnel are recommend to wear safety gloves when cleaning under the coil due the number of fins and metal edges in that area.

It has been found on many sites that there may be regular washing of the more easily exposed finned areas, but the less accessible area are neglected. It is these neglected areas that corrode more readily see fig 1.

The washing off of corrosive substances and the resultant fresh water wash down are the only real defence against corrosion. All materials used in evaporators are exposed to a moist air stream containing corrosive chemicals, even stainless steel will be corroded if not cleaned and washed down.

IMPORTANT

Do not power wash electric motors or electrical connections.
Do not use excessive pressure against fins as this shall cause damage and obstruct air supply.



CLEANING RECOMMENDATION

Air Coolers

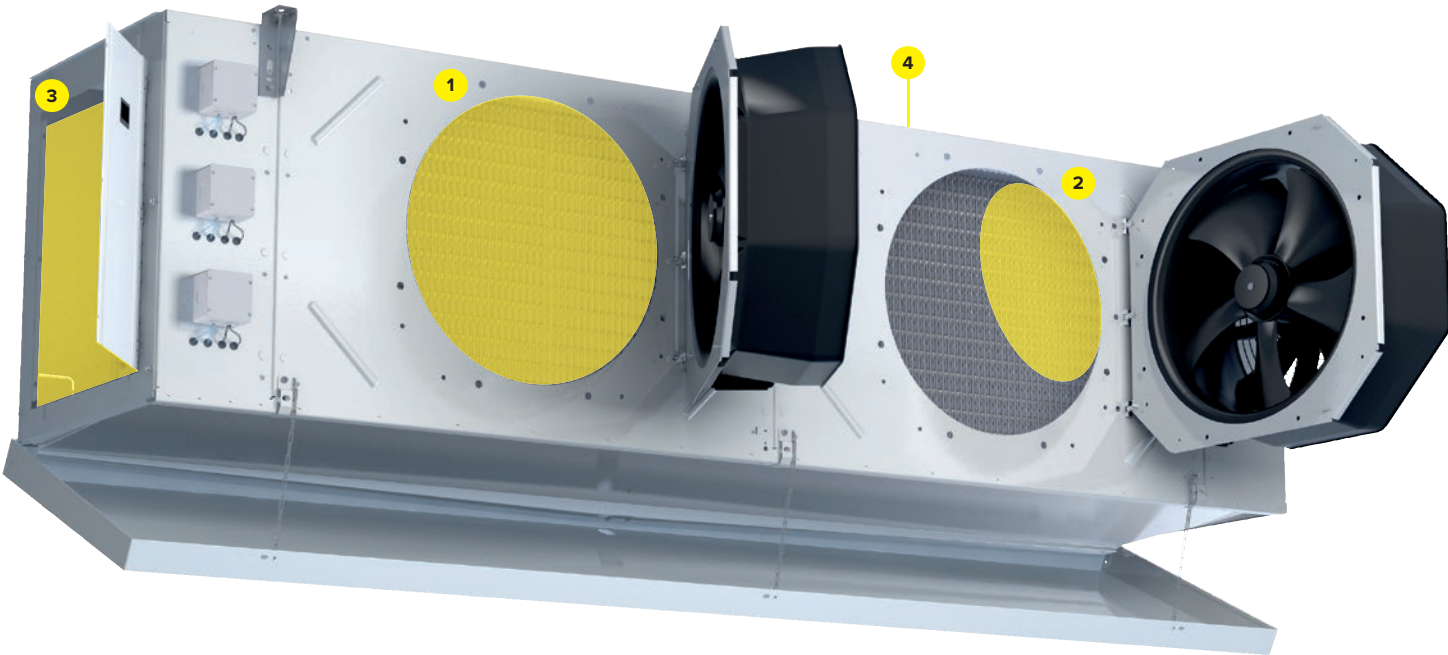
- 1

Ensure inside faces are washed as thoroughly as outside faces use a spray diffuser to help the water penetrate the coil fully.
- 2

Corrosion often happens in these areas, because they are more difficult to wash down
- 3

Removable cover plates to provide access to return bends and headers.
- 4

Coil face to be thoroughly washed both sides. Last operation is to wash with fresh wat so surface PH is back to 7 ph.



IMPORTANT

Do not power wash electric motors or electrical connections. Do not use excessive pressure against fins as this shall cause damage and obstruct air supply



Inside Dual Discharge Cooler: Dark Area shows where wash down is required

CORROSION

If it is felt that the environment that the cooler will work in will have harmful effect upon the materials of the cooler it is vital that the information is given to us at the quote stage so provision in the selection of materials can be made. It has been found over time that evaporators are vulnerable to corrosion attack due to a number offactors:

- ▶ Cleaning of products in the room being cooled
- ▶ Cleaning of equipment in the room being cooled
- ▶ Chemicals given off by the product in the room being cooled
- ▶ Chemicals used as preservatives for the product being cooled
- ▶ Failure to wash coolers off to prevent the build up of harmful compound and chemicals on the heat transfer surface areas and return bends.
- ▶ Unsuitable material and product combination.
- ▶ Potential differences of the material used.

Due to the complex nature of corrosion it is impossible to crea-te one material finish to suit every application. It is important at design stage to foresee any concerns over the material compatibility of the cooler and its working environment.

COOLER CLEANING CHECK LIST:

- ☐ A cleaning procedure has been determined and the compatibility of the materials of the evaporator and the cleaning agents has been verified.
- ☐ The working environment is safe and all personnel are trained in the cleaning procedure and there is safe access to the evaporator.
- ☐ Electrical supply to the cooler is isolated (and locked off if possible).
- ☐ The chemicals are applied in the correct manner and with the required level of dilution.
- ☐ After the cooler surface has been washed with the chemicals then all residual traces should be washed off so there are no traces left, the pH level is back to ph7.
- ☐ Ensure the inner less visible areas of the coil are given as much attention as the more visible areas.
- ☐ Visually check for signs of corrosion inside and outside the cooler casing. Report any signs of corrosion to the engineering manager.

PROTECTION AGAINST CORROSION

Air Coolers



CHEESE

RIPENING ROOMS

Environment: High NH₃ content,
High relative humidity

Note: Little air movement

Protection: **PROTECT. AGAINST CORROSION 2**

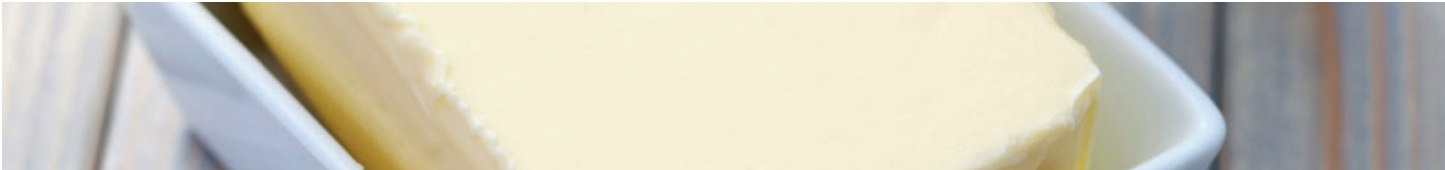
- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

STORAGE

Environment: Low NH₃ content,
High relative humidity

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides



DAIRY FACILITIES

LOW PERCENTAGE

Environment: Vapours from lactic and butyric acids

Protection: **PROTECT. AGAINST CORROSION 1**

- ▶ Tubes: Copper
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Aluminum protective coating
- ▶ Casing: Protective coating on both sides

HIGH PERCENTAGE

Environment: Vapours from lactic and butyric acids

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

PROTECTION AGAINST CORROSION

Air Coolers



MEAT & SAUSAGE

DEEP-FREEZE STORAGE AREA (PACKAGED/UNSEALED GOODS)

Environment: No exposure

Note: Recommendation: Shut-Up® and Defrost hood

Protection: **STANDARD EXECUTION**

COLD STORAGE AREA FOR RAW/FRESH MEATS

Environment: No exposure

Protection: **STANDARD EXECUTION**

RAPID COOLING FOR CARCASSES

Environment: Organic compositions, cleaning agents

Note: High air flow rate required

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

SMOKED MEAT/SAUSAGE

Environment: Organische Säuren, Amine

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

SALT CURING ROOMS

Environment: Salts, organic acids

Protection: **STAINLESS STEEL CASING**
PROTECT. AGAINST CORROSION 2

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

OFFAL

Umgebung: Organic acids, cleaning agents

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides



FISH & SEAFOOD

PREPARATION ROOMS

Environment: Amines, Salts

Note: Observe air speed if people are present

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

STORAGE ROOMS, INCL. DEEP-FREEZE

Environment: Amines, Salts

Note: Recommended: Shut-Up® and defrost hood

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

PROTECTION AGAINST CORROSION

Air Coolers



FRUIT & VEGETABLES

CITRUS FRUIT

Environment: High fruit acid content

Note: Low dehumidification at low DT1
Low airspeed during long-term storage

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

BANANAS

Environment: Corrosive vapours from banana peels

Note: High external pressure

Protection: **PROTECT. AGAINST CORROSION 3**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum
- ▶ End plates: Aluminum
- ▶ Casing: Protective coating on one side

OTHER TROPICAL FRUIT

Environment: No exposure

Protection: **PROTECT. AGAINST CORROSION 1**

- ▶ Tubes: Copper
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Aluminum protective coating
- ▶ Casing: Protective coating on both sides

VEGETABLES

Environment: No exposure

Note: For optimum ventilation note stacking plans

Protection: **STANDARD EXECUTION**



MARINADES & READY-TO-EAT SALADS

OCCASIONAL OPEN STORAGE

Environment: Salts, acids, vinegar, preservatives

Protection: **PROTECT. AGAINST CORROSION 1**

- ▶ Tubes: Copper
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Aluminum protective coating
- ▶ Casing: Protective coating on both sides

FREQUENT OPEN STORAGE

Environment: Salts, acids, vinegar, preservatives

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

PROTECTION AGAINST CORROSION

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BAKED GOODS

DEEP-FREEZE STORAGE AREA

Environment: No exposure

Note: Fin spacing at least 7 mm

Protection: **STANDARD EXECUTION**

BLAST FREEZING ROOMS

Environment: No exposure

Note: Fin spacing at least 7 mm

Protection: **STANDARD EXECUTION**

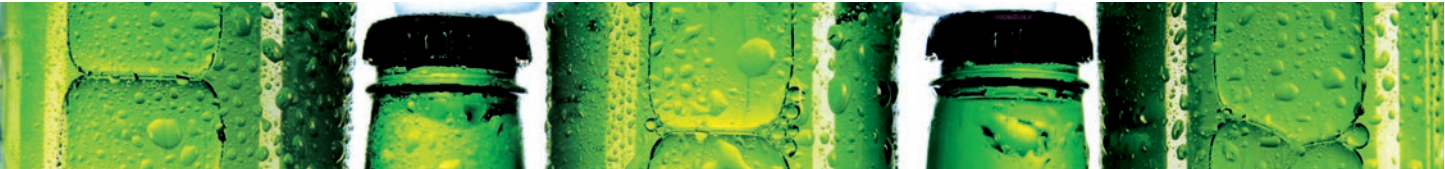
FERMENTATION INTERRUPTER/MACHINES

Environment: Organic compositions dust, vapours including baking ingredients

Note: Fans with speed controllers

Protection: **PROTECT. AGAINST CORROSION 3**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum
- ▶ End plates: Aluminum
- ▶ Casing: Protective coating on one side



BEVERAGES

FERMENTING CELLAR/WINE

Environment: Low CO₂ content

Protection: **PROTECT. AGAINST CORROSION 3**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum
- ▶ End plates: Aluminum
- ▶ Casing: Protective coating on one side

Environment: Higher CO₂ content / sulphur / chlorine

Protection: **PROTECT. AGAINST CORR. 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

MALT HOUSES

Environment: Org. acids, aggr. dusts, high protein levels

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

FRUIT JUICE FILLING SYSTEMS

Environment: Acids, i.e. lemon, wine or sulphuric acids

Note: Observe air speed if people are present

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

MINERAL WATER FILLING SYSTEMS

Environment: Aerosols

Note: Observe air speed if people are present

Protection: **PROTECT. AGAINST CORROSION 1**

- ▶ Tubes: Copper
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Aluminum protective coating
- ▶ Casing: Protective coating on both sides

PROTECTION AGAINST CORROSION

Air Coolers



KILN DRYING

HARDWOODS (E.G. OAK, TROPICAL WOODS)

Environment: Organic acids

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

SOFTWOODS (E.G. SPRUCE, FIR, PINE)

Environment: Low amounts: organic acids; resins

Protection: **PROTECT. AGAINST CORROSION 3**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum
- ▶ End plates: Aluminum
- ▶ Casing: Protective coating on one side



SEA AIR (NO DIRECT SEAWATER)

COLD ROOMS NEAR THE SEA

Environment: Air with slight salt content

Protection: **PROTECT. AGAINST CORROSION 1**

- ▶ Tubes: Copper
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Aluminum protective coating
- ▶ Casing: Protective coating on both sides

COLD ROOMS NEAR THE SEA

Environment: Air with high salt content

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides

PROTECTION AGAINST CORROSION

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CENTRAL STORAGE AREA

PICKING & DISTRIBUTION

Environment: Dust, debris, etc.

Protection: **PROTECT. AGAINST CORROSION 4**

- ▶ Tubes: Copper
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Aluminum
- ▶ Casing: Protective coating on one side

FROZEN STORAGE AREAS

Environment: No exposure

Note: Recommended: Shut-Up® and Defrost hood

Protection: **STANDARD EXECUTION**



PASTRY SHOPS

PREPARATION OF ICING & FROSTING

Environment: –

Protection: **PROTECT. AGAINST CORROSION 1**

- ▶ Tubes: Copper
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Aluminum protective coating
- ▶ Casing: Protective coating on both sides

CANDY MANUFACTURERS

Environment: –

Note: Little air movement

Protection: **PROTECT. AGAINST CORROSION 1**

- ▶ Tubes: Copper
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Aluminum protective coating
- ▶ Casing: Protective coating on both sides



COFFEE

ROASTERS

Environment: Organic acids

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides


PROTECTION AGAINST CORROSION

Air Coolers



CATTLE SHEDS/INTENSIVE ANIMAL HUSBANDRY

HEAT RECOVERY



Environment: NH₃ atmosphere, sulphur compositions, dusts


Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides



GRAINS, ANIMAL FEEDS

STORAGE ROOMS



Environment: Dust, often moist

Protection: **PROTECT. AGAINST CORROSION 3**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum
- ▶ End plates: Aluminum
- ▶ Casing: Protective coating on one side


PROTECTION AGAINST CORROSION

Air Coolers



SWIMMING POOLS

DEHUMIDIFICATION



Environment: Chlorine gas, muriatic acid, (cleaning agents)

Protection: **PROTECT. AGAINST CORROSION 2**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum epoxy-resin-coated
- ▶ End plates: Stainless steel
- ▶ Casing: Protective coating on both sides



INDUSTRIAL FACILITIES

CRANE CABS IN STEEL MILLS/FOUNDRIES



Environment: Aggressive gases (chlorine), sulphur dioxide, metallic dusts

Protection: **PROTECT. AGAINST CORROSION 3**

- ▶ Tubes: Stainless steel
- ▶ Fins: Aluminum
- ▶ End plates: Aluminum
- ▶ Casing: Protective coating on one side

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