CAB SYSTEMS FOR HVAC

1st International Congress
“Aluminium Brazing Technologies for HVAC&R”
June 16th and 17th 2009 in Düsseldorf

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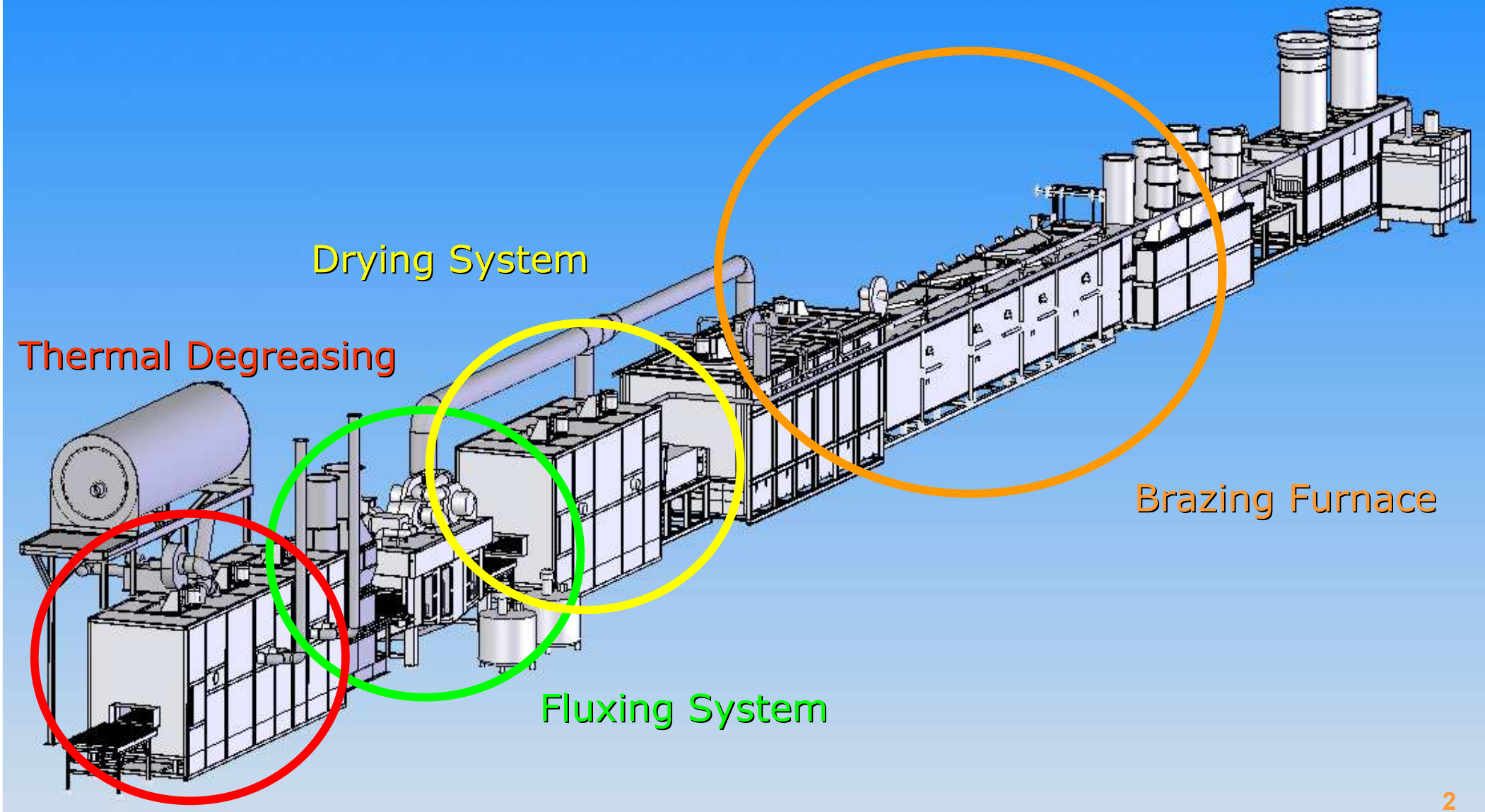
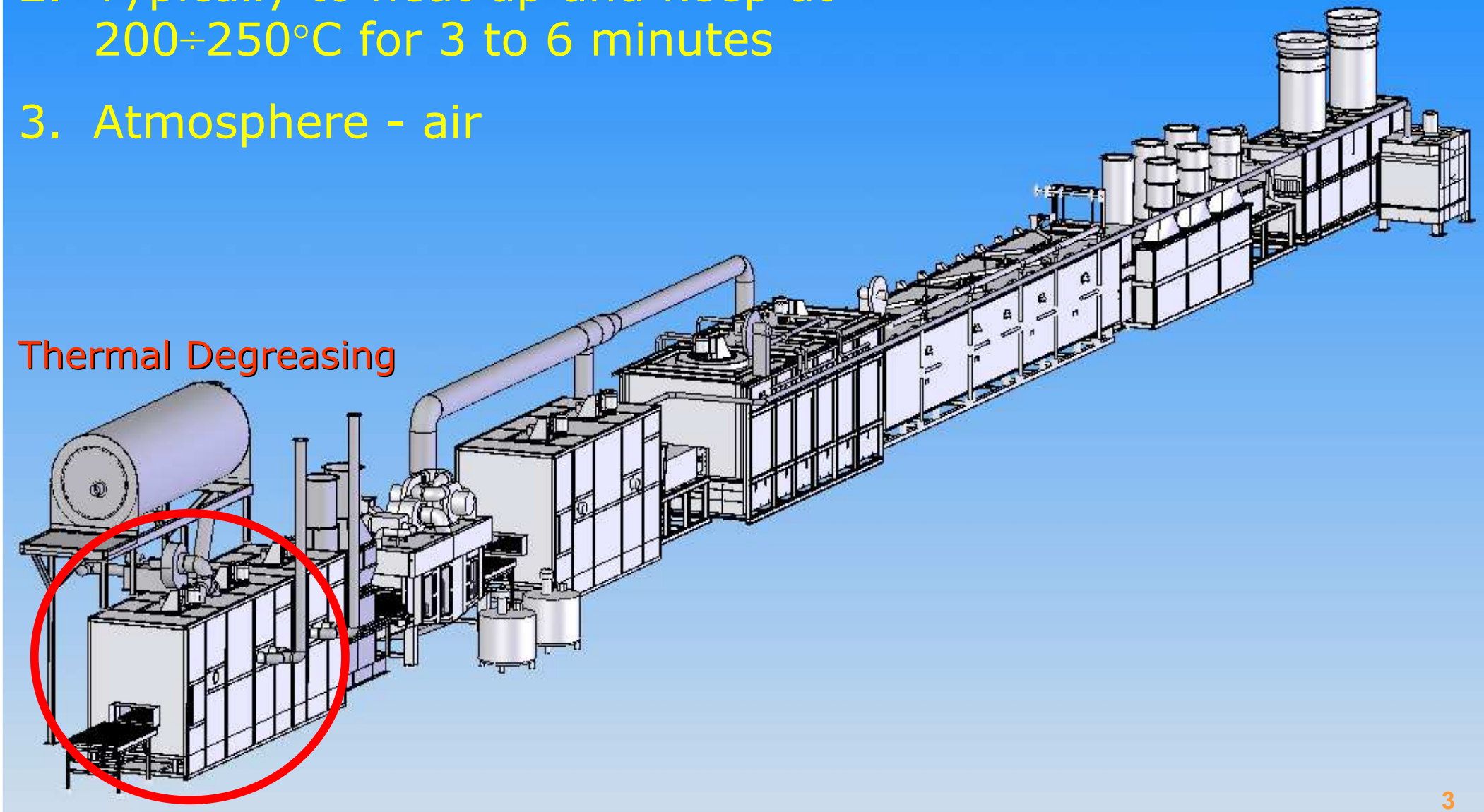
Piotr Skarbiński
Global Product Director
CAB Furnaces

Standard CAB Line



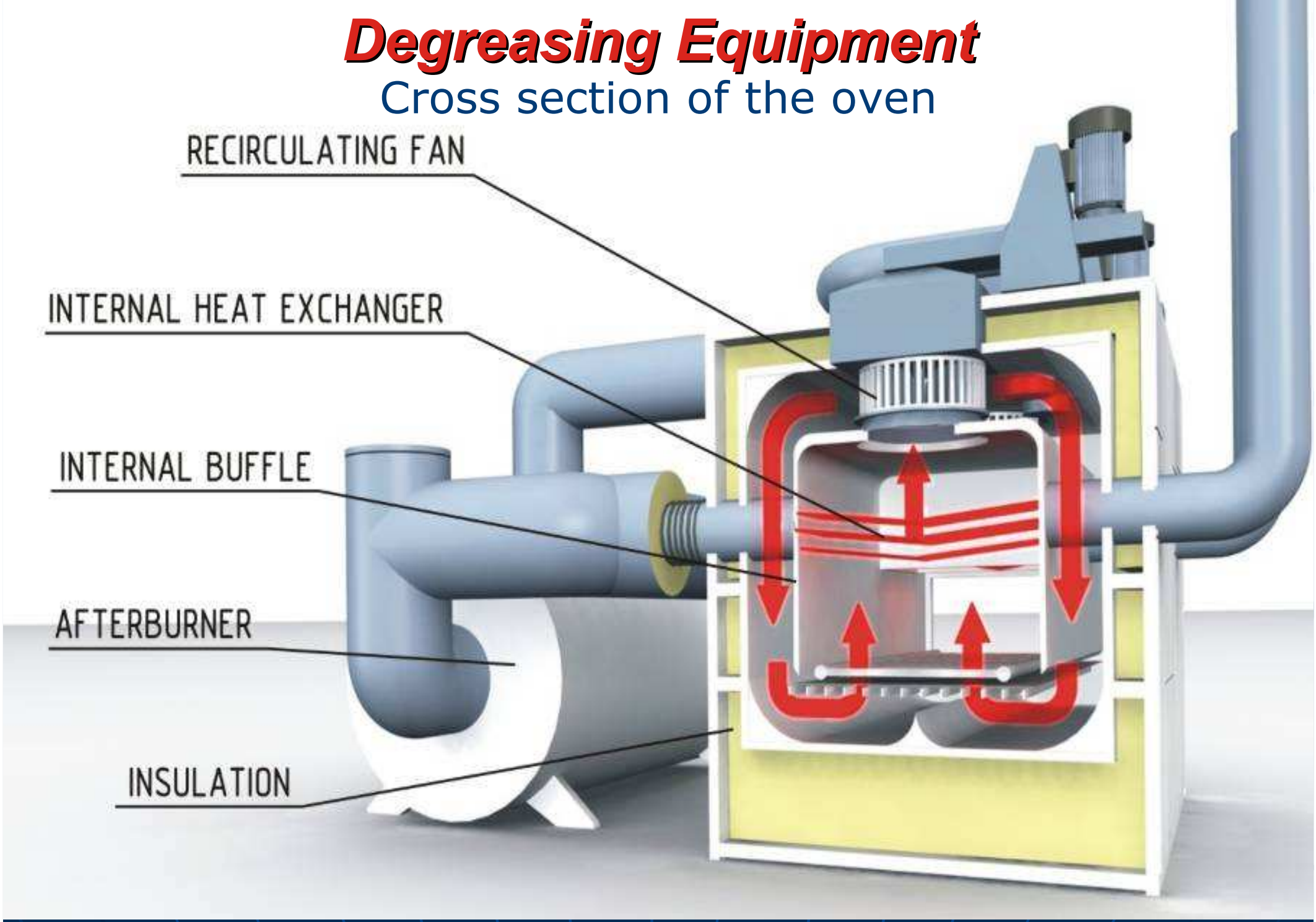
Standard CAB Line

1. To remove oil from previous operations
2. Typically to heat up and keep at 200÷250°C for 3 to 6 minutes
3. Atmosphere - air



Degreasing Equipment

Cross section of the oven



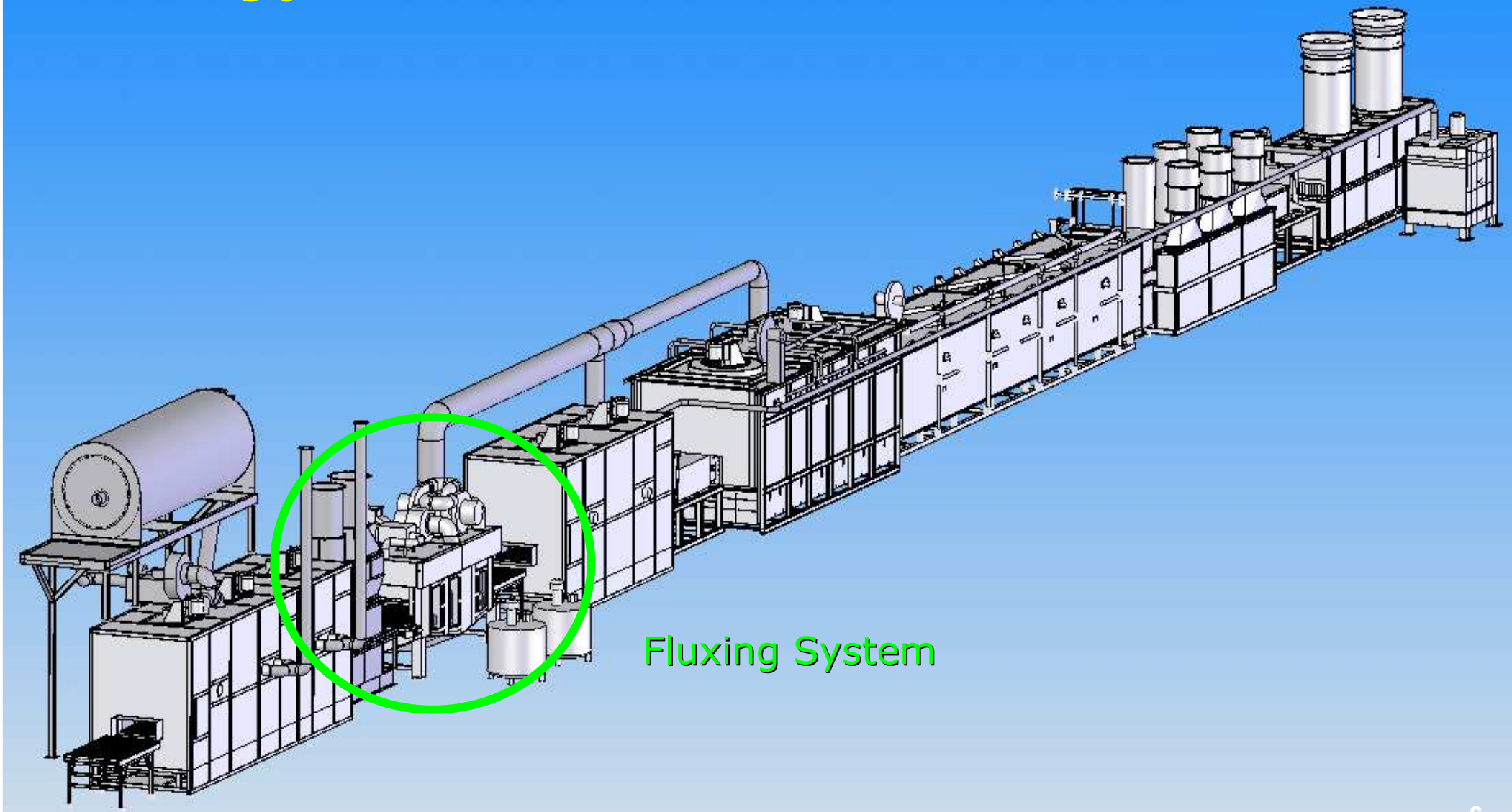
High volume, uniform air flow in the Degreaser

Degreasing Equipment

High volume, uniform air flow in the Degreaser

Standard CAB line

1. To deliver proper amount of flux into brazing joints

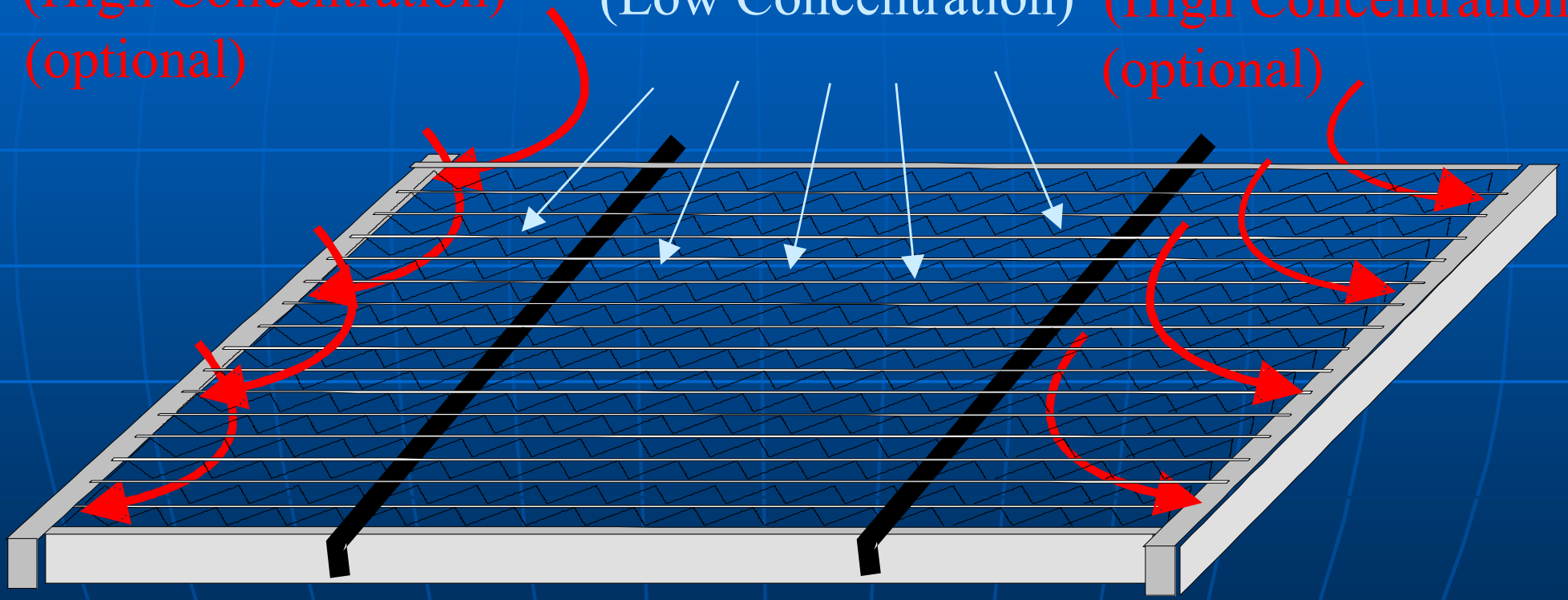


FLUX APPLICATION AREAS

Tube/Header Flux
(High Concentration)
(optional)

General core flux
(Low Concentration)

Tube/Header Flux
(High Concentration)
(optional)



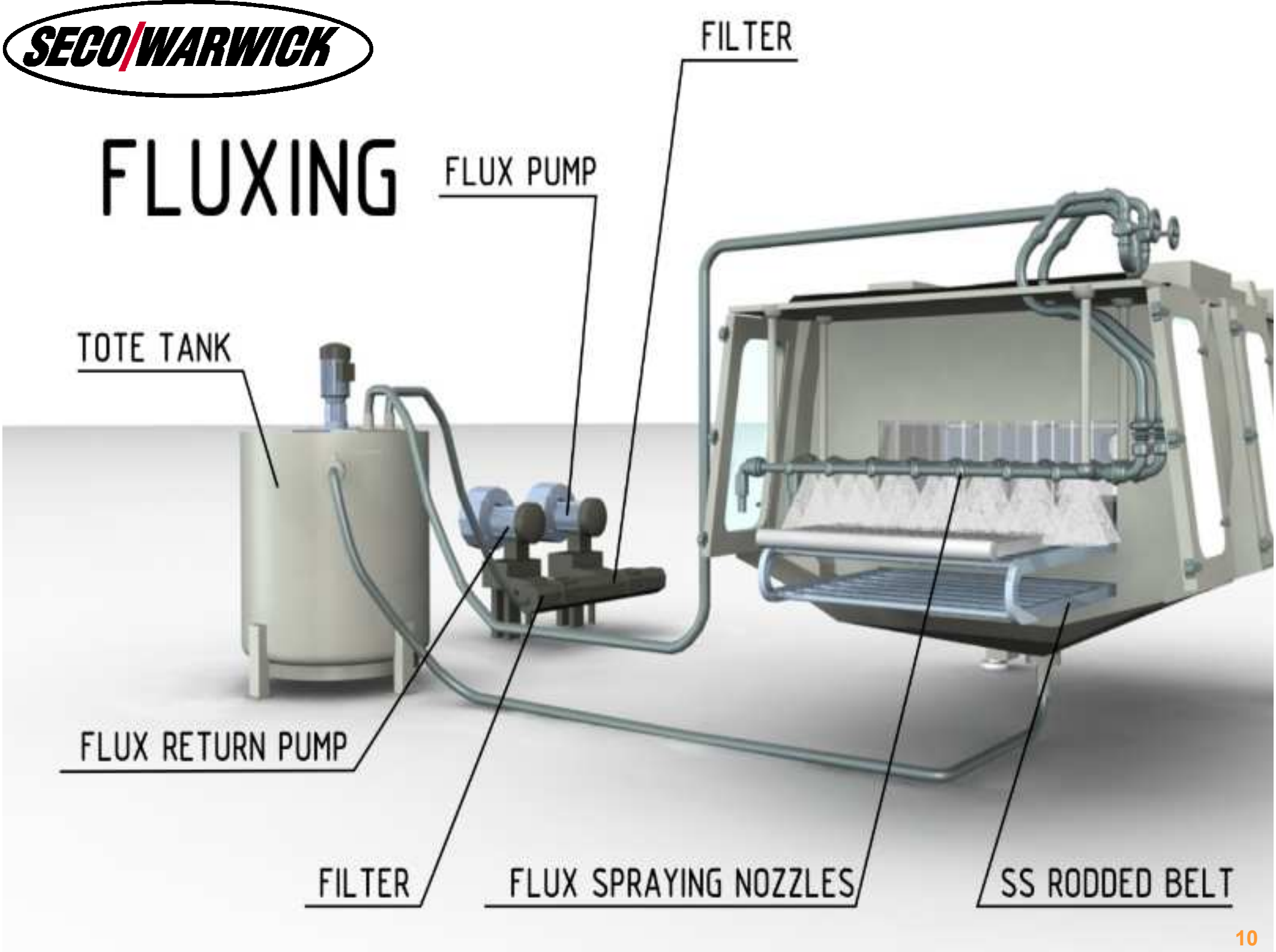
FUNDAMENTAL STEPS OF WET FLUXING:

- Flux slurry preparation
- Delivery of the required concentration(s) of flux slurry into the junctions to be brazed by spraying or dipping
- Air is used to spread the flux into all brazing areas and remove the excess flux

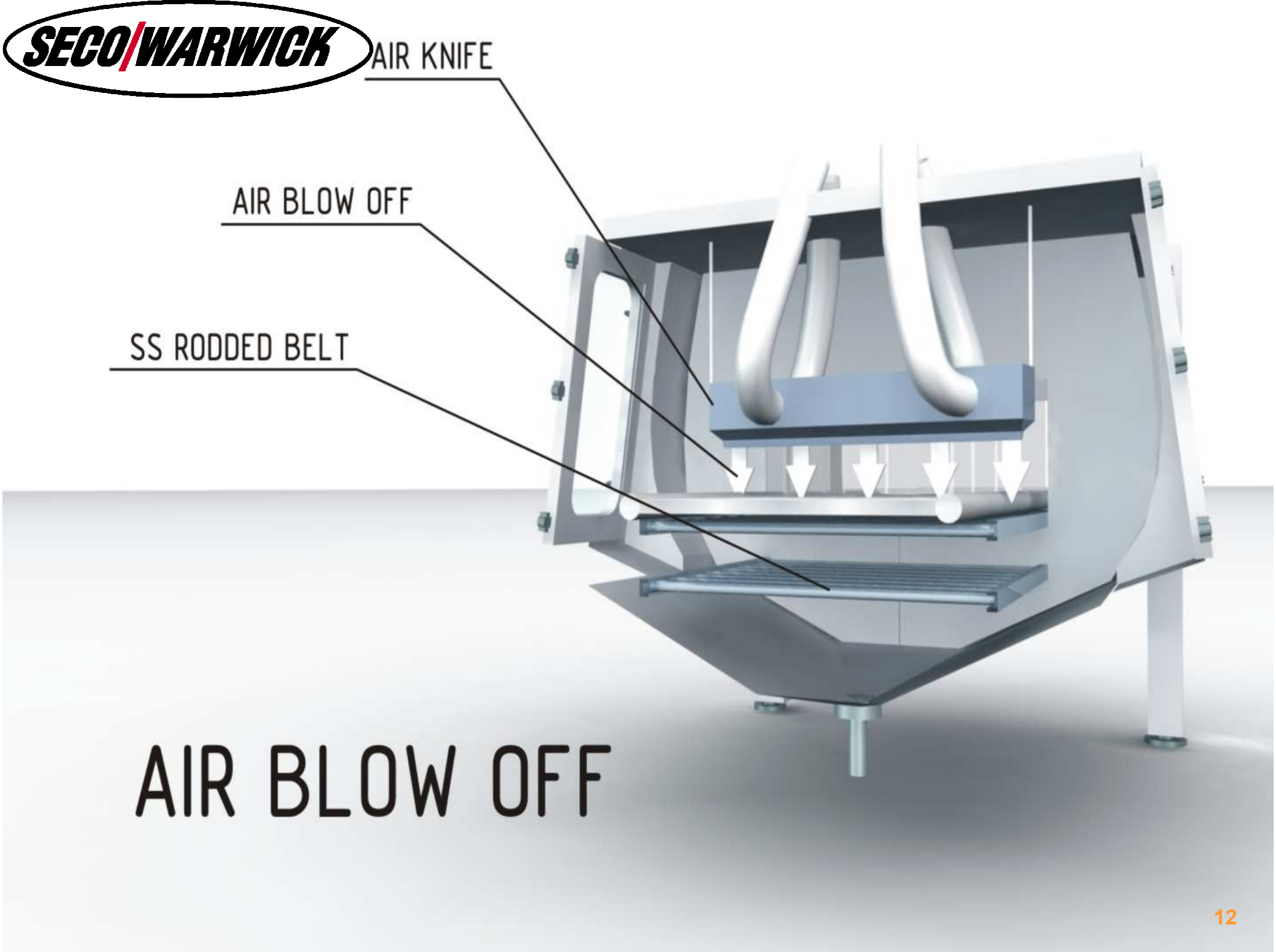
FLUX PREPARATION

SECO/WARWICK

FLUXING

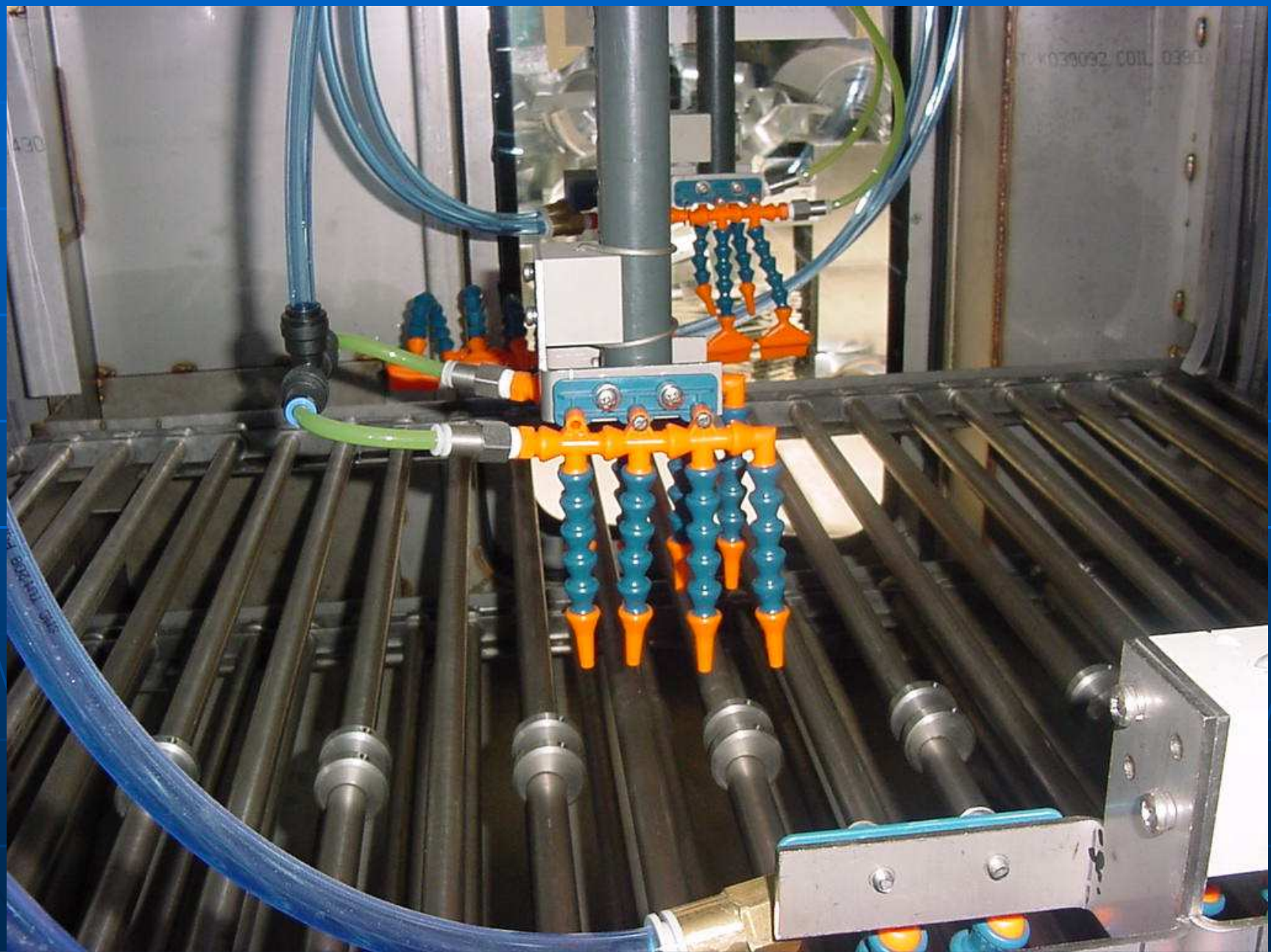


SPRAY NOZZLES


AIR KNIFE
AIR BLOW OFF
SS RODDED BELT
AIR BLOW OFF

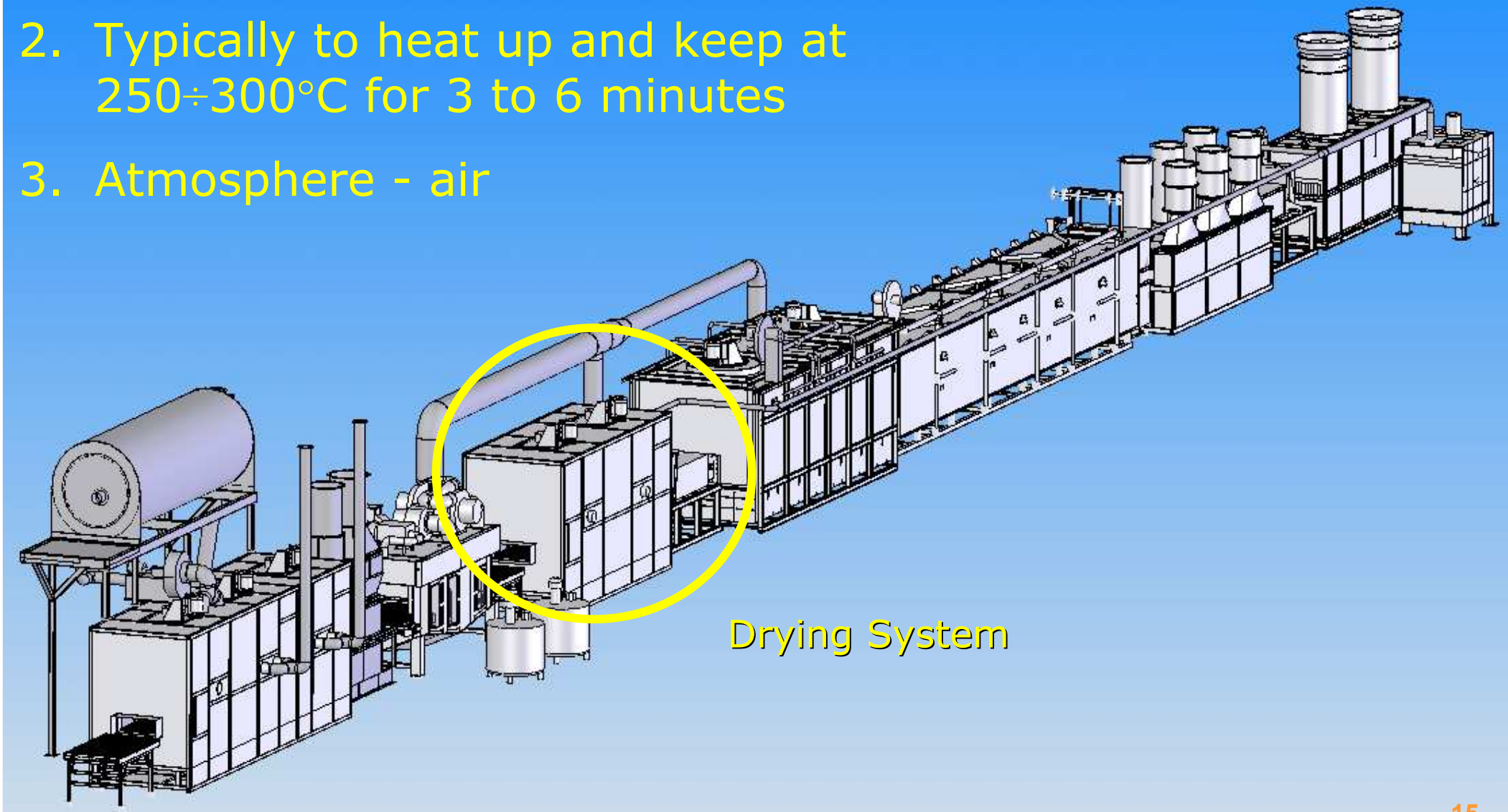

SECO/WARWICK
SECO/WARWICK CAB
Fluxing Equipment Air knife

OPTIONAL SECOND HIGH CONCENTRATION NOZZLES



Standard CAB Line

1. To remove water from the parts before entering the brazing furnace
2. Typically to heat up and keep at 250÷300°C for 3 to 6 minutes
3. Atmosphere - air



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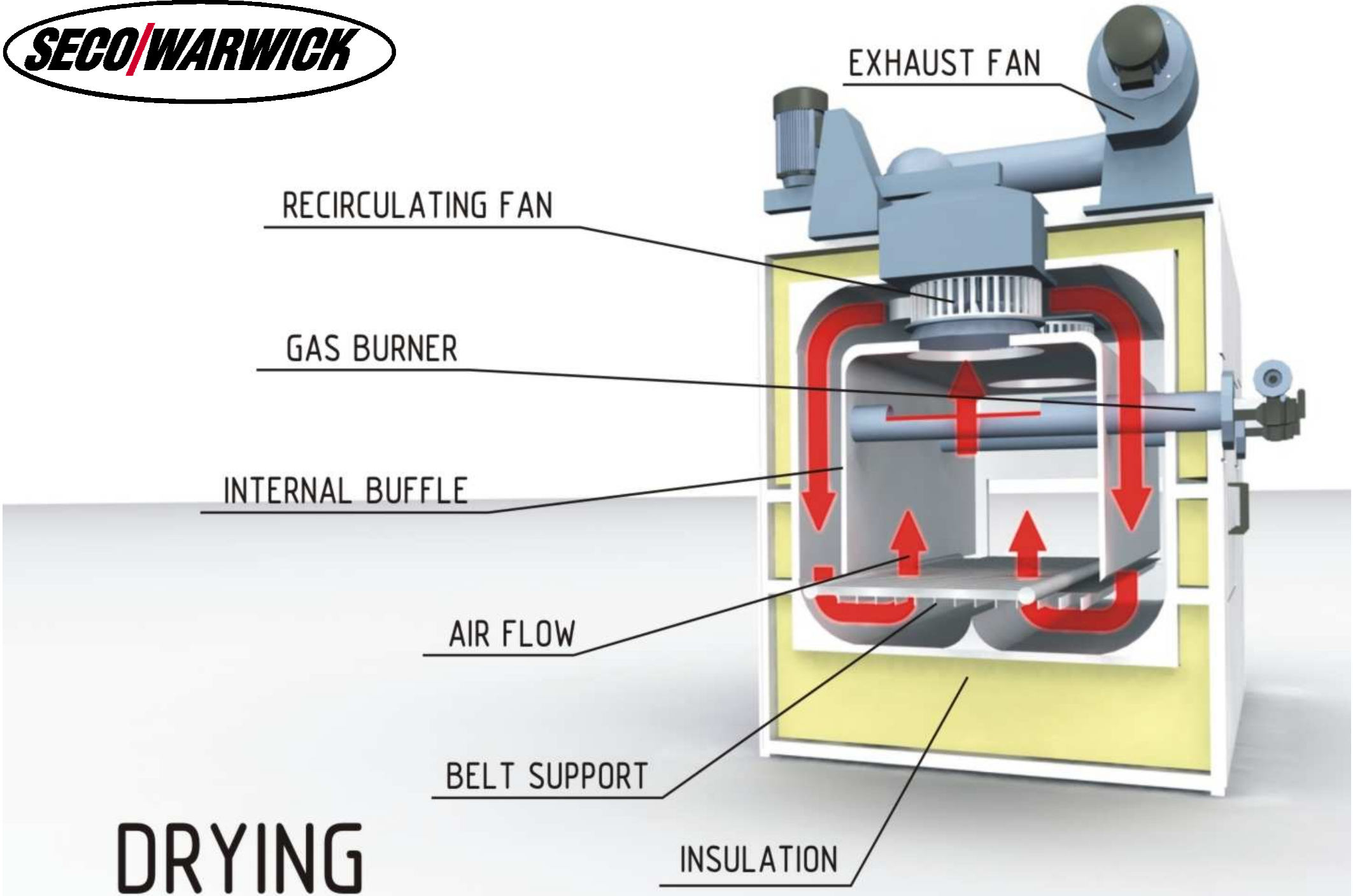
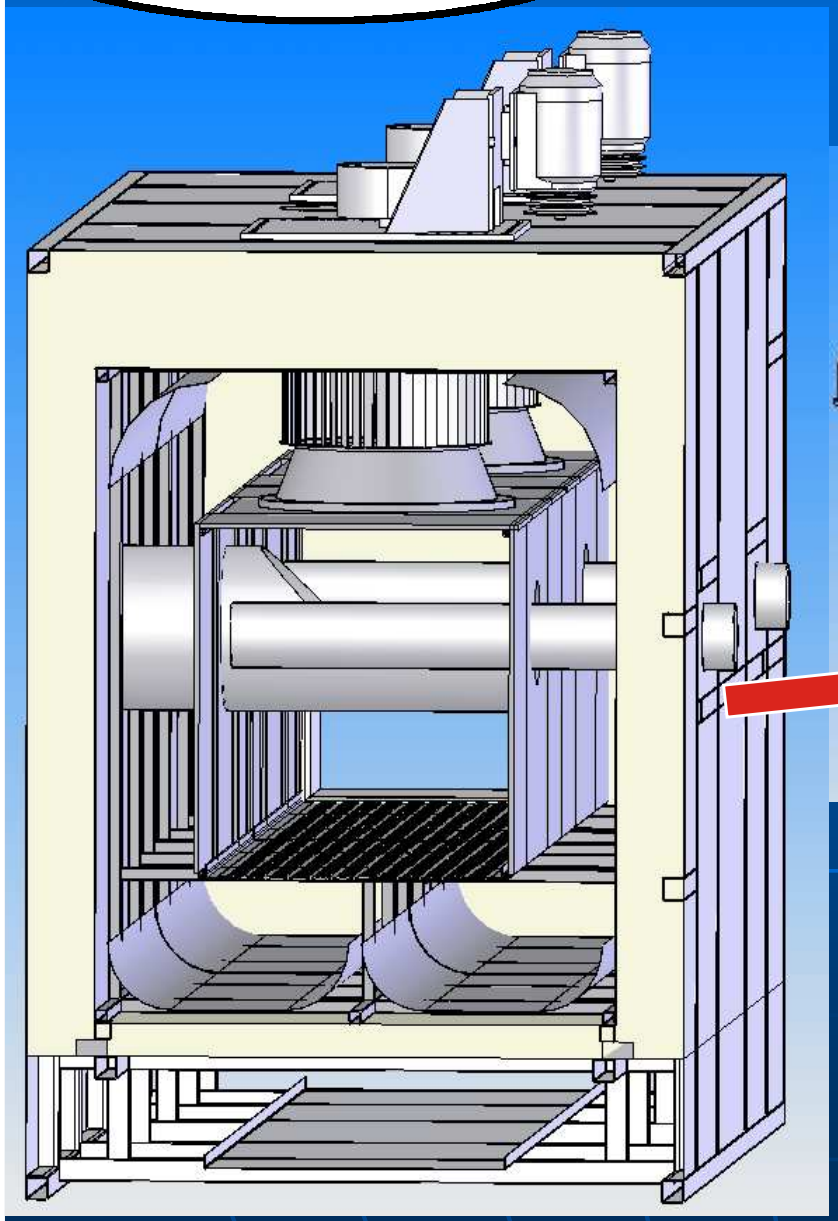
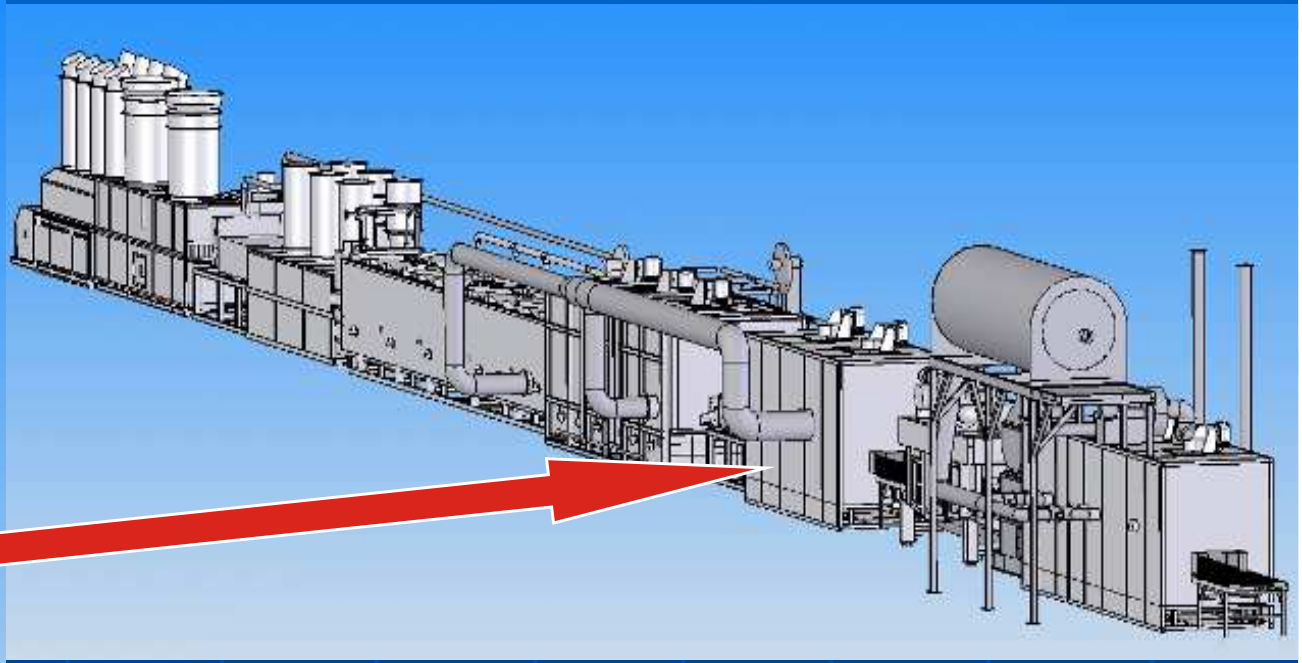


CROSS SECTION OF DRY OFF OVEN WITH DIRECT HEATING SYSTEM – GAS BURNERS

2 zone - Dry Off Oven

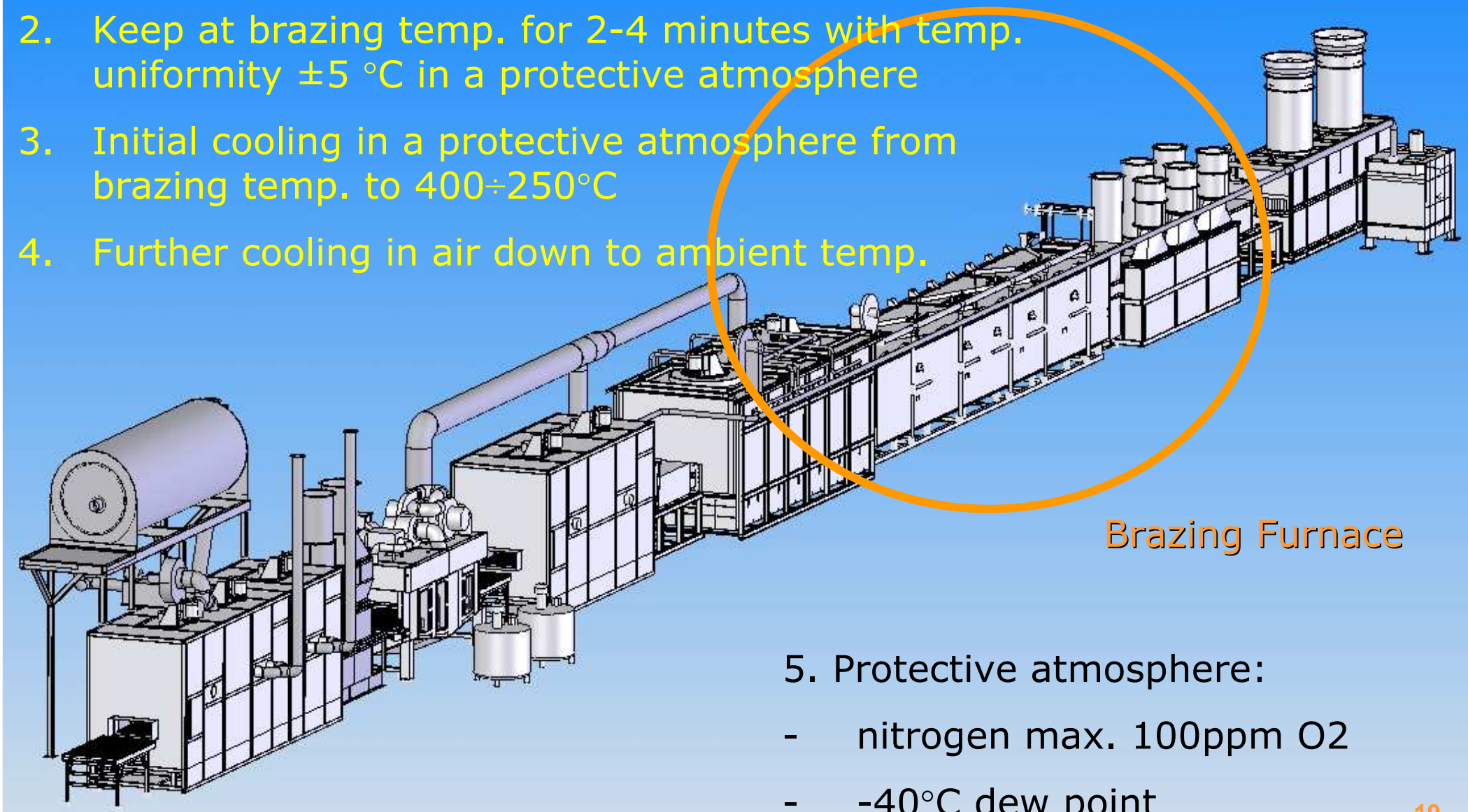




CROSS SECTION OF DRY OFF OVEN WITH RECUPERATION SYSTEM (HEAT TAKEN FROM THE BRAZE FURNACE)

Standard CAB Line

1. Heat up to brazing temp. (typically 595÷605°C in a protective atmosphere
2. Keep at brazing temp. for 2-4 minutes with temp. uniformity ±5 °C in a protective atmosphere
3. Initial cooling in a protective atmosphere from brazing temp. to 400÷250°C
4. Further cooling in air down to ambient temp.



Brazing Furnace

5. Protective atmosphere:
   - nitrogen max. 100ppm O2
   - -40°C dew point

SECO/WARWICK

The main difference is the size of the condenser because this influences the size of the equipment

However, the process parameters are basically the same

	Automotive condenser	*Stationary HVAC condenser*
Typical size	~500mm x~700mm	1100mm x 2000mm÷4000mm
Core weight	3÷5 kg	15÷150 kg
Microchannel tube width	10÷16mm	16÷25mm (40…100mm)
Typical brazing time in a radiation furnace	10÷12 minutes	12÷15 (and more) minutes

CAB Brazing Technology has been in popular use in the automotive industry for brazing condensers since the early 1980's

CAB System brazing 2 layers of automotive condensers in a semi-continuous furnace

CAB Technology is becoming increasingly more popular in the stationary HVAC&R Industry for manufacturing condensers

High performance condenser
for stationary HVAC unit
brazed in CAB furnace

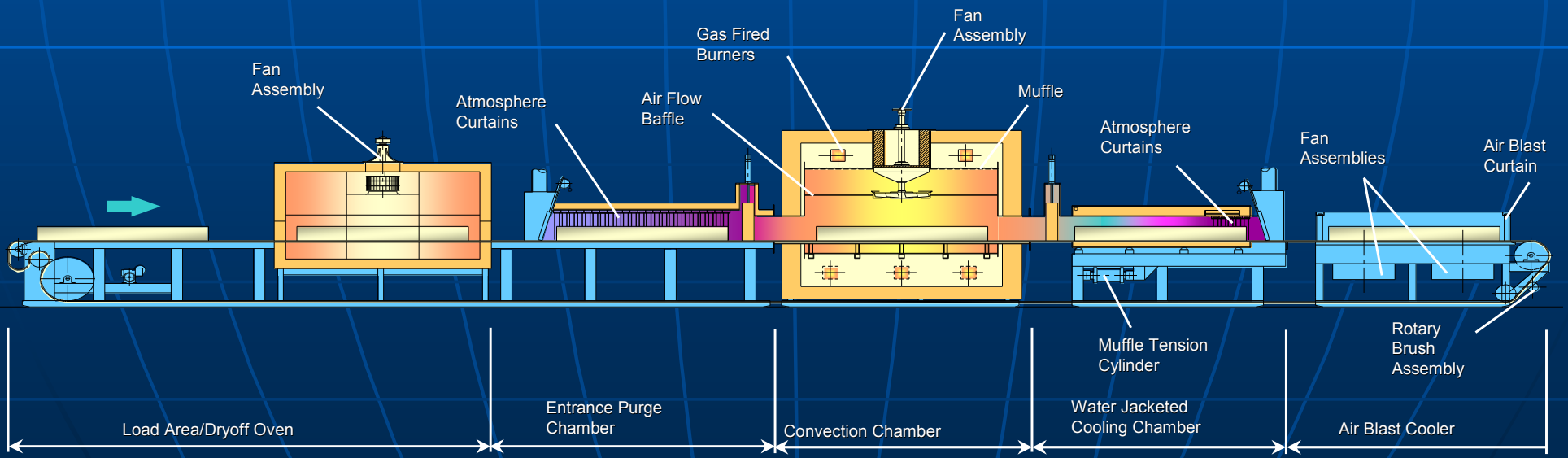
CAB equipment recommendations for HVAC condensers

- BATCH OR SEMI-CONTINUOUS SYSTEM:
  * low and medium volume production (1 to 20 pcs/hour)
  * wide range of condenser sizes

- CONTINUOUS SYSTEM:
  * high volume production (more than 20 pcs/hour)
  * a reasonable size is up to 2500mm from manifold to manifold

ACTIVE Only® CAB Furnace

- Semi-Continuous
- Lower production rates
- Very high product mix
- Ideal for large products



ACTIVE Only® CAB Furnace

Flexibility

Active Only® CAB Furnace

Main Design features

- low thermal mass ceramic fiber insulation

- patented convection muffle design

- combustion system utilizes high velocity burners

- advanced convection fan design

These features provide fast and uniform heat transfer to the load to obtain the desired brazing profile

ACTIVE Only® CAB Furnace

Typical furnace size and output

Working area:

-1300 mm wide x 4000 mm long x 400 mm high

-maximum total weight of the product including fixtures – 300kg

Output of the furnace – depends on the condenser size:

- for large 4 meter long cores based on 80 mm tube 3 pcs/h

- for 2 meter long units utilizing 25 mm tube 16 pcs/h

ANIMATION

ACTIVE Only® CAB Furnaces in operation

915 x 1830 x 203 mm

1400 x 2300 x 330 mm

1200 x 4000 x 300 mm

Some popular sizes

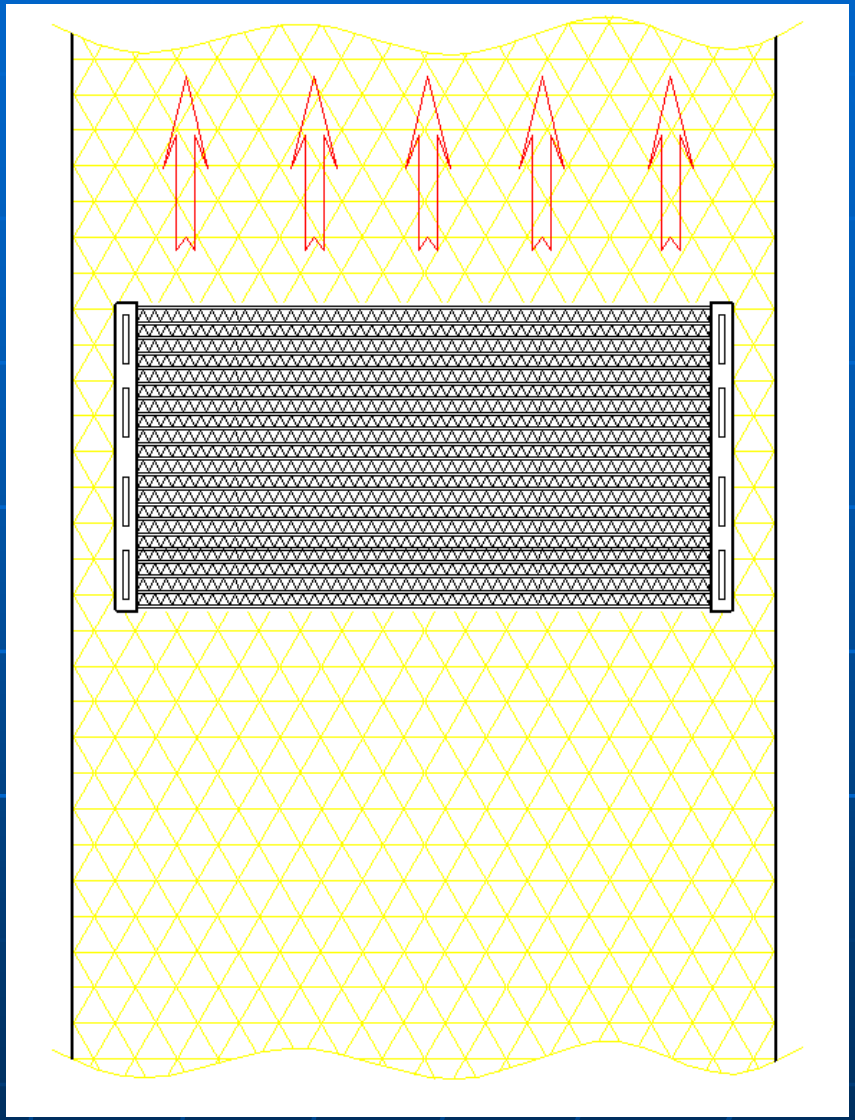
ACTIVE Only® CAB Furnace Advantages

- Proven design
- The system is flexible and guarantees very good repeatability of the brazing process
  - The heating time always is the shortest one - Sharp profile of temperature
  - High uniformity of temperature on the load +/- 3ºC
  - Due to Additional Process thermocouples we guarantee high accuracy of the brazing process and the number of the recipes has been minimized – you use only one recipe!
- The system is designed for the HVAC market – the semi-continuous mode of work guarantee uniform heating up of the large products and avoids deformation of the long parts

Continuous Systems

Preferred load configuration

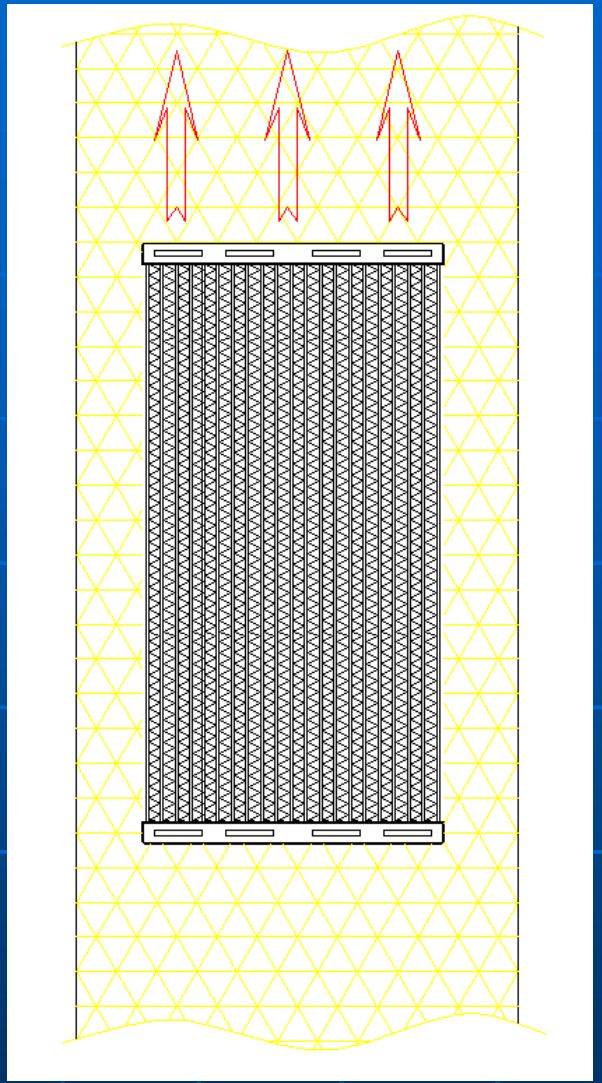
-Wide belt system (more than 2 meters)
-Manifolds on the sides of the belt



Continuous Systems

Possible load configuration

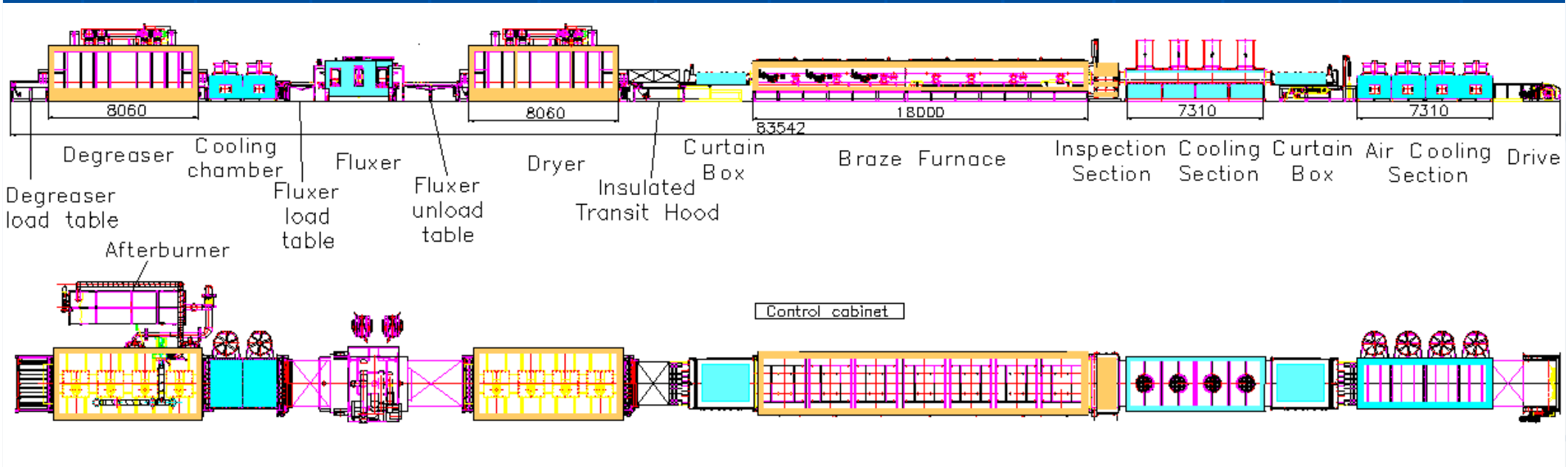
-Standard (existing) CAB systems could be used



Consideration – non-uniform heating and heat transfer down the tubes resulting in:
- thermal distortions
- much more difficult to fit into brazing window

Continuous CAB Furnace System with 2,5 meter wide belt

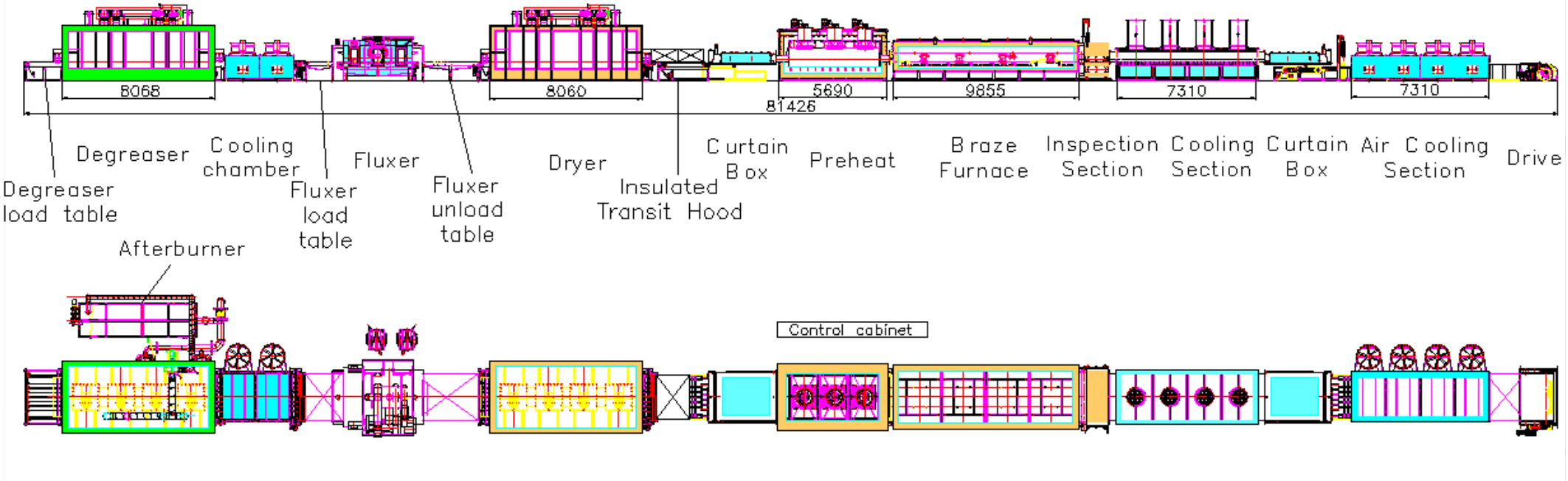
CAB Line option using a radiation furnace



Continuous CAB Furnace System with 2,5 meter wide belt

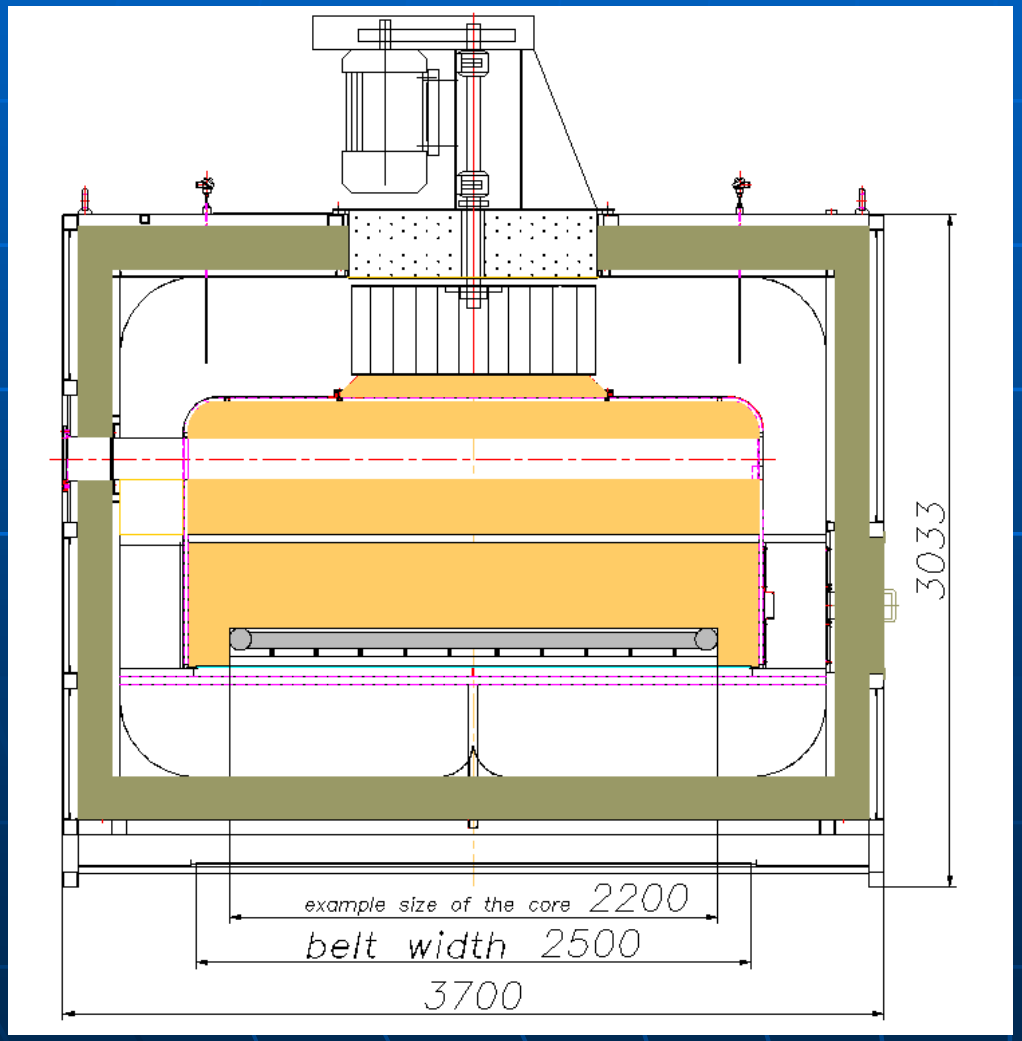
CAB Line option using

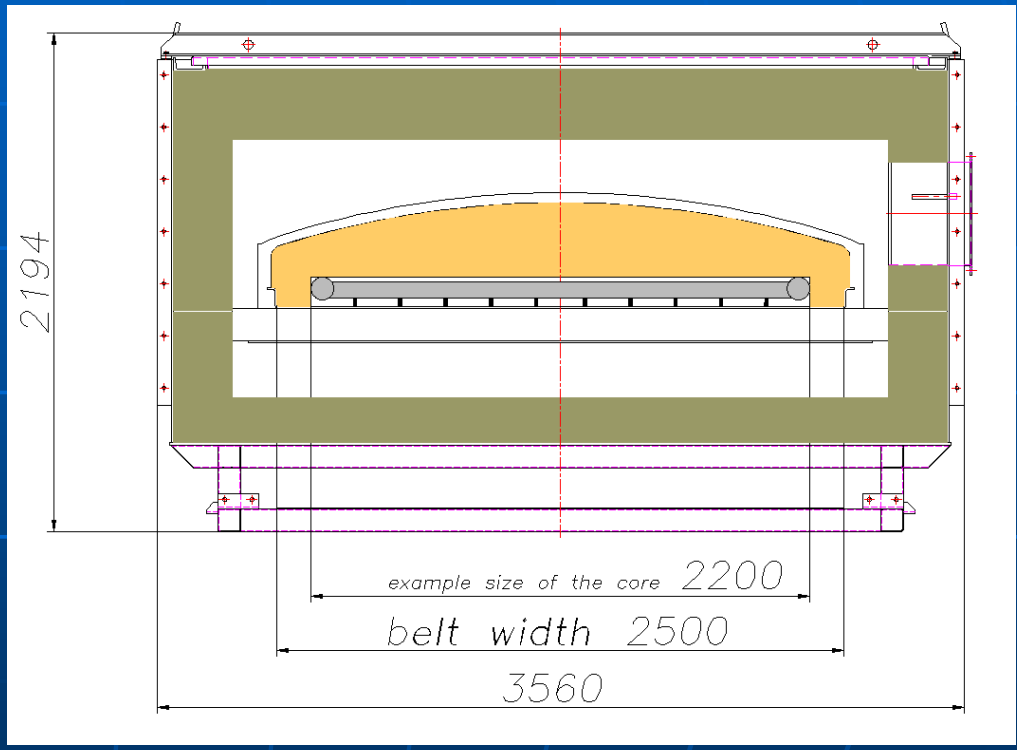
convection preheat and radiation furnace



Continuous CAB Furnace System with 2,5m wide belt

Degreaser and Drying oven cross sections





Brazing Furnace cross section

Continuous CAB Furnace with 2,5m wide muffle Typical Parameters

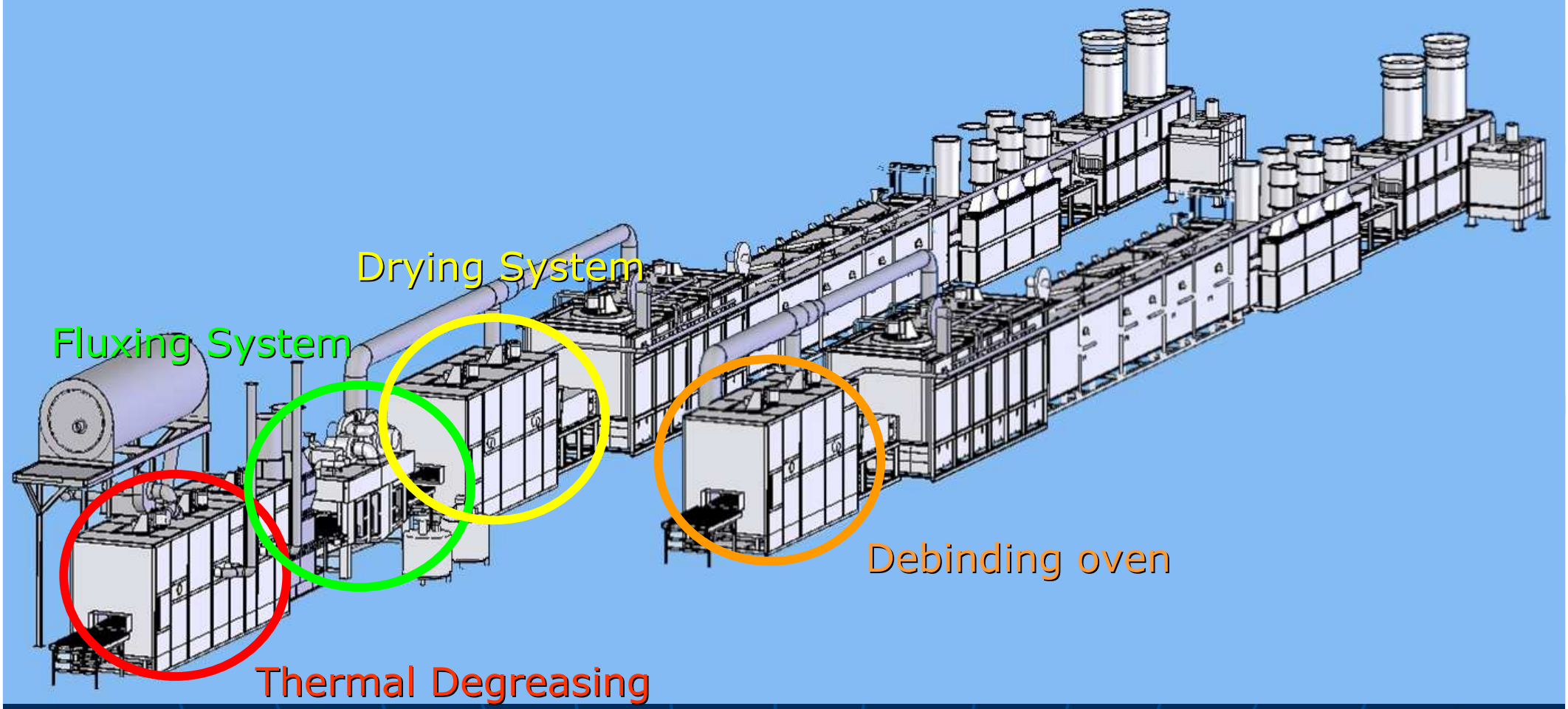
Reference load:
load type – condenser with manifolds, without tanks, microchannel dia. 25mm
-load dimensions L 1100mm x W 2200mm x 25mm
-load weight 25kg Al, 8kg SS fixtures
-Usable belt width – 2400mm
-Maximum usable height above belt – 250mm

Output of the furnace:

60 condensers per hour - the final output of the furnace depends on the design and size of the condenser and it is determinated after receiving the drawing by SECO/WARWICK

Continuous CAB Brazing system with wide muffle

Optional CAB Line when precoated materials are used



CONCLUSIONS

•CAB process and equipment has been in popular use for brazing automotive condensers for more than 20 years.

• SECO/WARWICK can provide brazing lines with proven designs for large HVAC&R stationary units.

• The first installations are already under operation.

ANNOUNCEMENT

In September, 2009, SECO/WARWICK S.A. will have a semi-continuous Active Only® complete brazing system in the Świebodzin, Poland plant available for brazing aluminium heat exchangers.

Max. Size of the core 2500 x 1500 mm

We invite every our potential customer for:

- *presentation of the equipment and brazing process*
- *brazing of customer's samples and prototype cores*

✓ Confidentiality guaranteed

✓ First day of brazing trials for each customer for free

Thank You