CAB SYSTEMS FOR HVAC

1st International Congress
“Aluminium Brazing Technologies for HVAC&R”
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SECO/WARWICK S.A.
ul. Sobieskiego 8
66-200 Świebodzin
POLAND

Piotr Skarbiński
Global Product Director
CAB Furnaces
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
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
FLUXING

- TOTE TANK
- FLUX PUMP
- FLUX RETURN PUMP
- FILTER
- FLUX SPRAYING NOZZLES
- SS RODDED BELT
OPTIONAL SECOND HIGH CONCENTRATION NOZZLES
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

Drying System
CROSS SECTION OF DRY OFF OVEN WITH DIRECT HEATING SYSTEM – GAS BURNERS
CROSS SECTION OF DRY OFF OVEN WITH RECUPERATION SYSTEM (HEAT TAKEN FROM THE BRAZE FURNACE)
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.

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

<table>
<thead>
<tr>
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<th><strong>Automotive condenser</strong></th>
<th><strong>Stationary HVAC condenser</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical size</td>
<td><del>500mm x</del>700mm</td>
<td>1100mm x 2000mm÷4000mm</td>
</tr>
<tr>
<td>Core weight</td>
<td>3÷5 kg</td>
<td>15÷150 kg</td>
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<tr>
<td>Microchannel tube width</td>
<td>10÷16mm</td>
<td>16÷25mm (40…100mm)</td>
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<tr>
<td>Typical brazing time in a radiation furnace</td>
<td>10÷12 minutes</td>
<td>12÷15 (and more) minutes</td>
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CAB Brazing Technology has been in popular use in the automotive industry for brazing condensers since the early 1980’s.
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 +/- 3°C
  - 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
Preferred load configuration

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

- Fluxing System
- Drying System
- Thermal Degreasing
- Debinding oven
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