



# ***Convection Oven Technology***

***Your Process Solution  
For Lead Free Reflow***

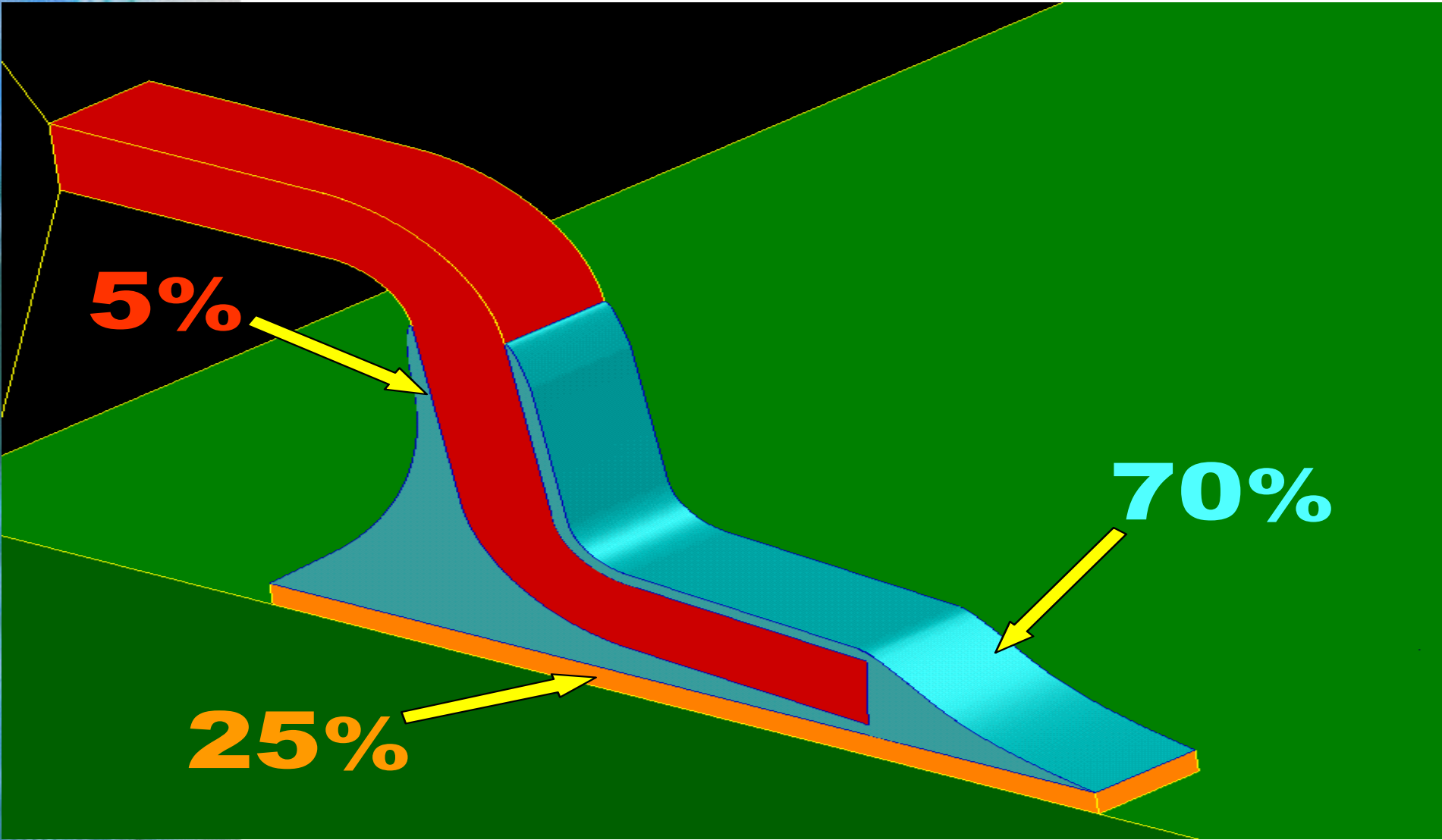


# ***Lead Free Reflow***

## ***The Process***



# Where the Lead comes from in a Typical solder joint





# The Forces Driving Change to Lead Free

## Market Pressure

- **Japanese & other major Multi-National companies driving quick implementation**

## ISO 14000

- **Green environment = lead free / halide-free**
- **Clean Air = Flux Filtration - Air and Nitrogen**

## Directives

- **WEEE – Waste from Electrical and Electronic Equipment (June 1, 2006)**
- **RoHS – Restriction of Hazardous Substances (June 1, 2006)**
- **EEE – Electrical and Electronic Equipment**



# Tin Lead Vs. Lead Free Process window comparison

	Tin Lead	Lead Free
<b>Melting Point</b>	<b>183°C</b>	<b>216°C – 220°C</b>
<b>Full Liquidous Temp</b>	<b>205°C - 215°C</b>	<b>225°C – 235°C</b>
<b>Max PCB Temp</b>	<b>230°C – 240°C</b>	<b>230°C – 240°C</b>
<b>“True” Process Window</b>	<b>15°C – 35°C</b>	<b>5°C - 15°C</b>

## Conclusions

- 1) The true process window for Lead Free Solder is **10 - 20°C** less than standard eutectic tin lead
- 2) Delta T on the PCB becomes critical
- 3) Process repeatability is most critical – Example: If process window is **10 °C** and Delta T is **10 °C**, the process would be running with **0** margin of error

# Tin Lead Profile



KIC File Viewer - [PPBOAT2C.KDF R]

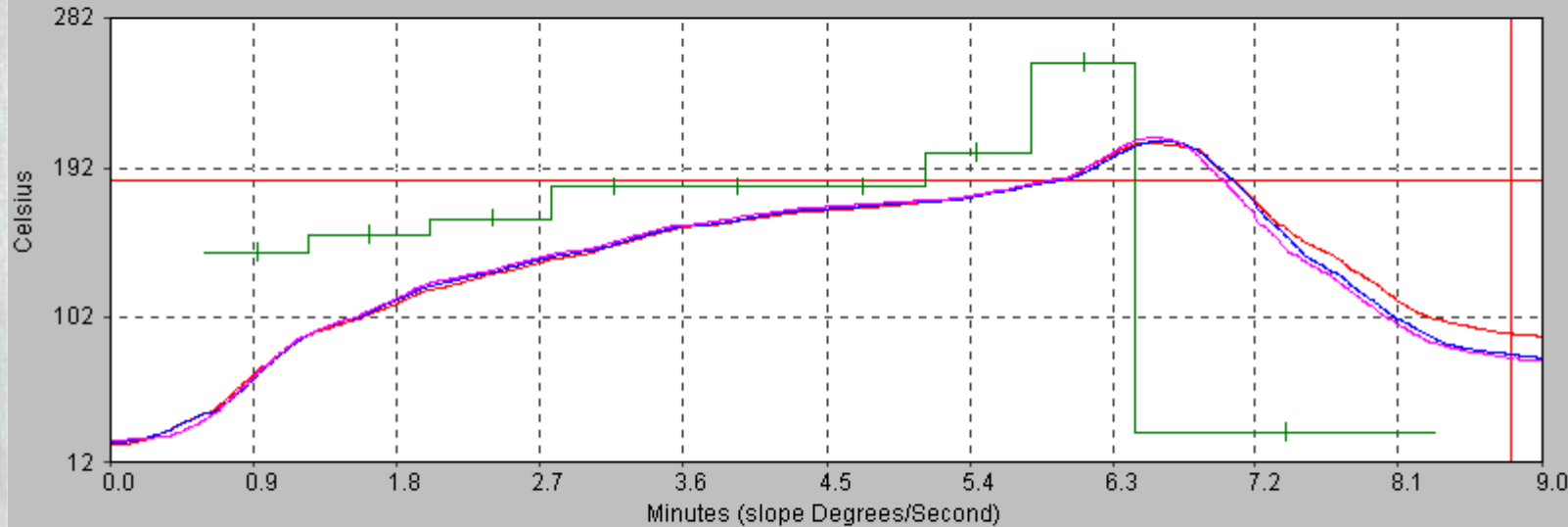
File Edit Setup View Tools Window Help



hist hist hist

none

Data Time Wed 01/27/99 20:09:25



	Peak	Total Time
		183
1	209.0	65.69
2	207.0	65.86
3	206.0	70.51
TC Range	3.0	4.82

63 / 37 tin lead profile. The peak temperature is 205 – 215 °C and time above liquidous is 45-60sec,

Automatic Setup Current Cell

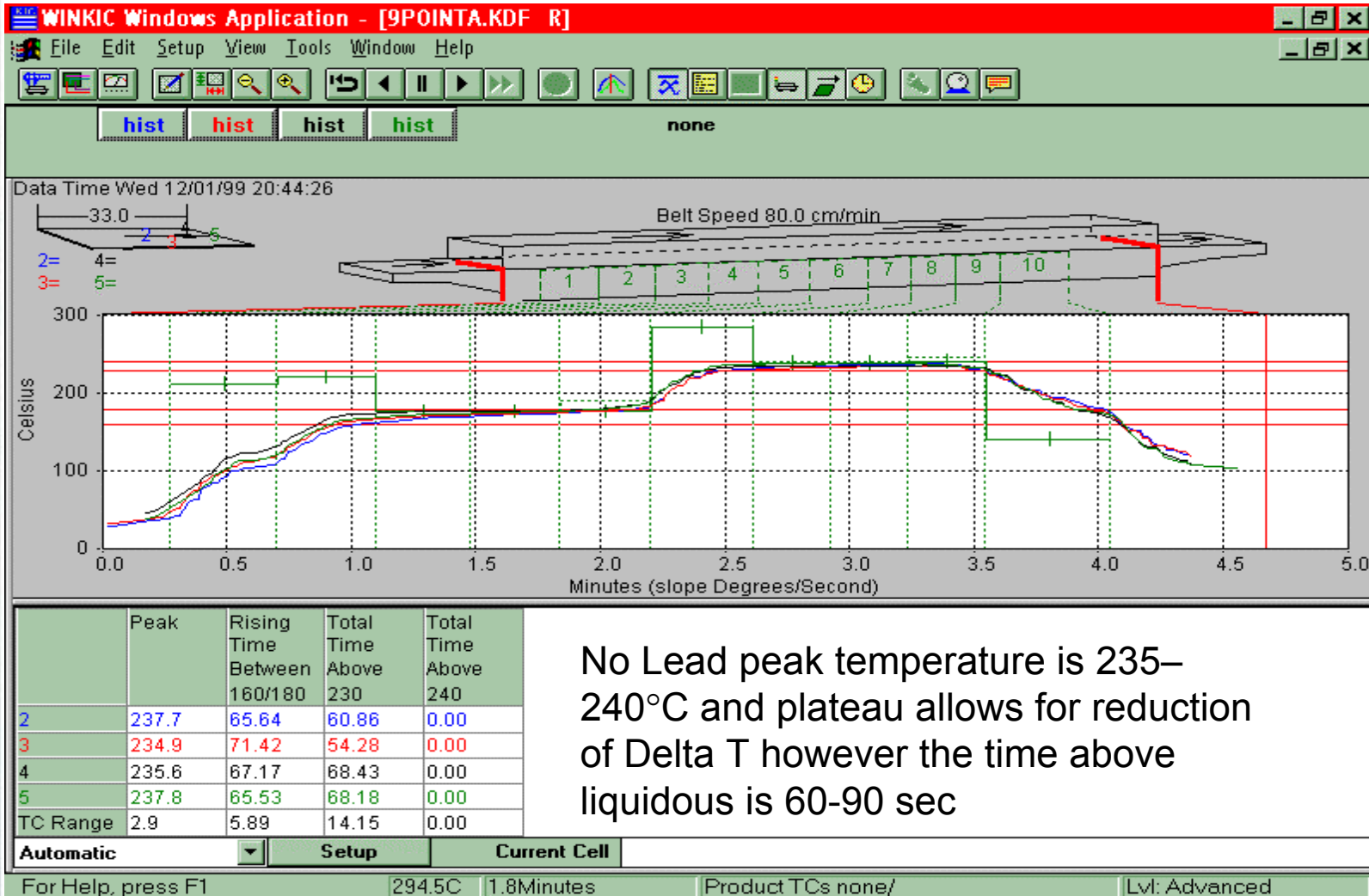
For Help, press F1

Product TCs none/

Lvl: Advanced

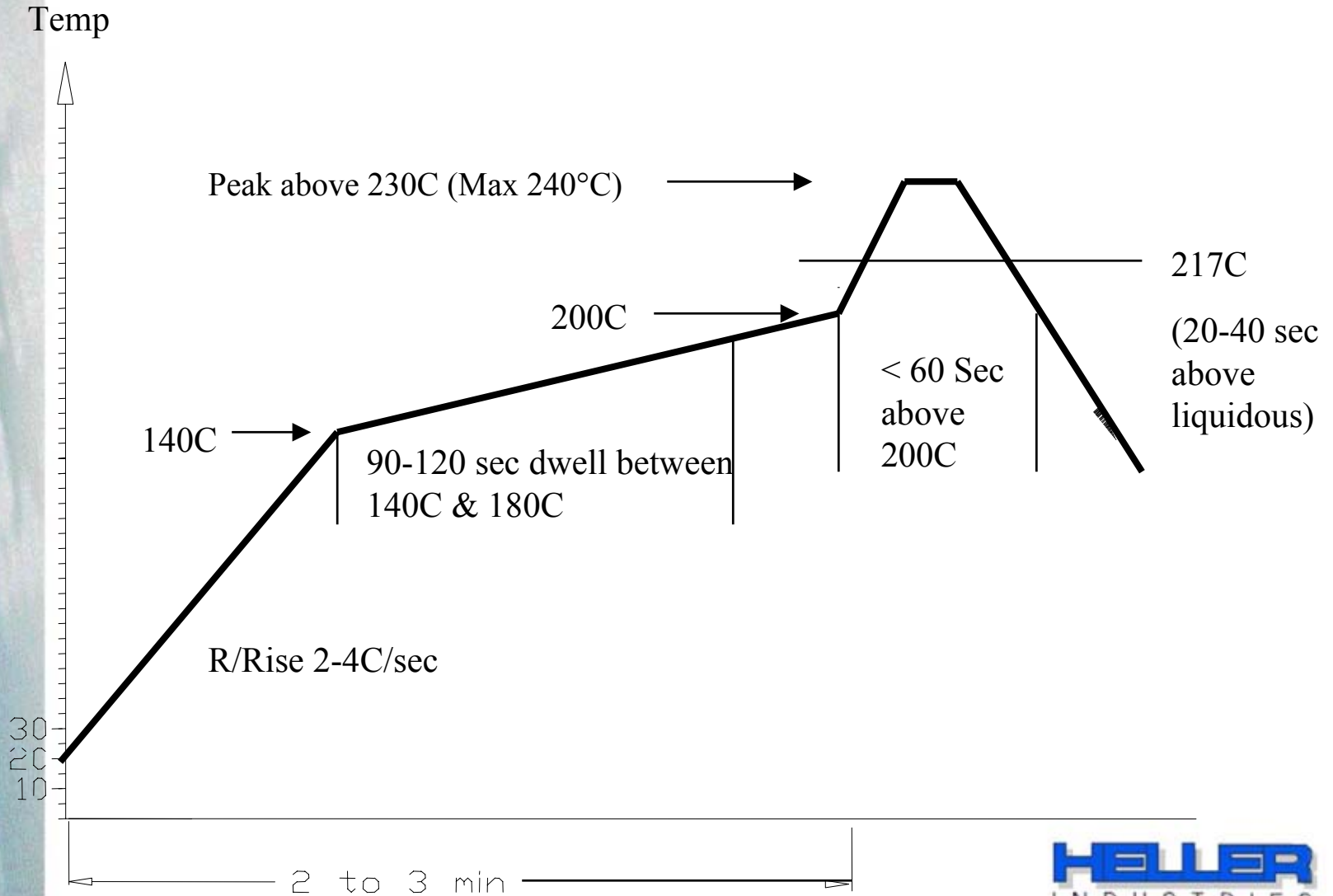


# Evolving Lead Free Profile The Early Days





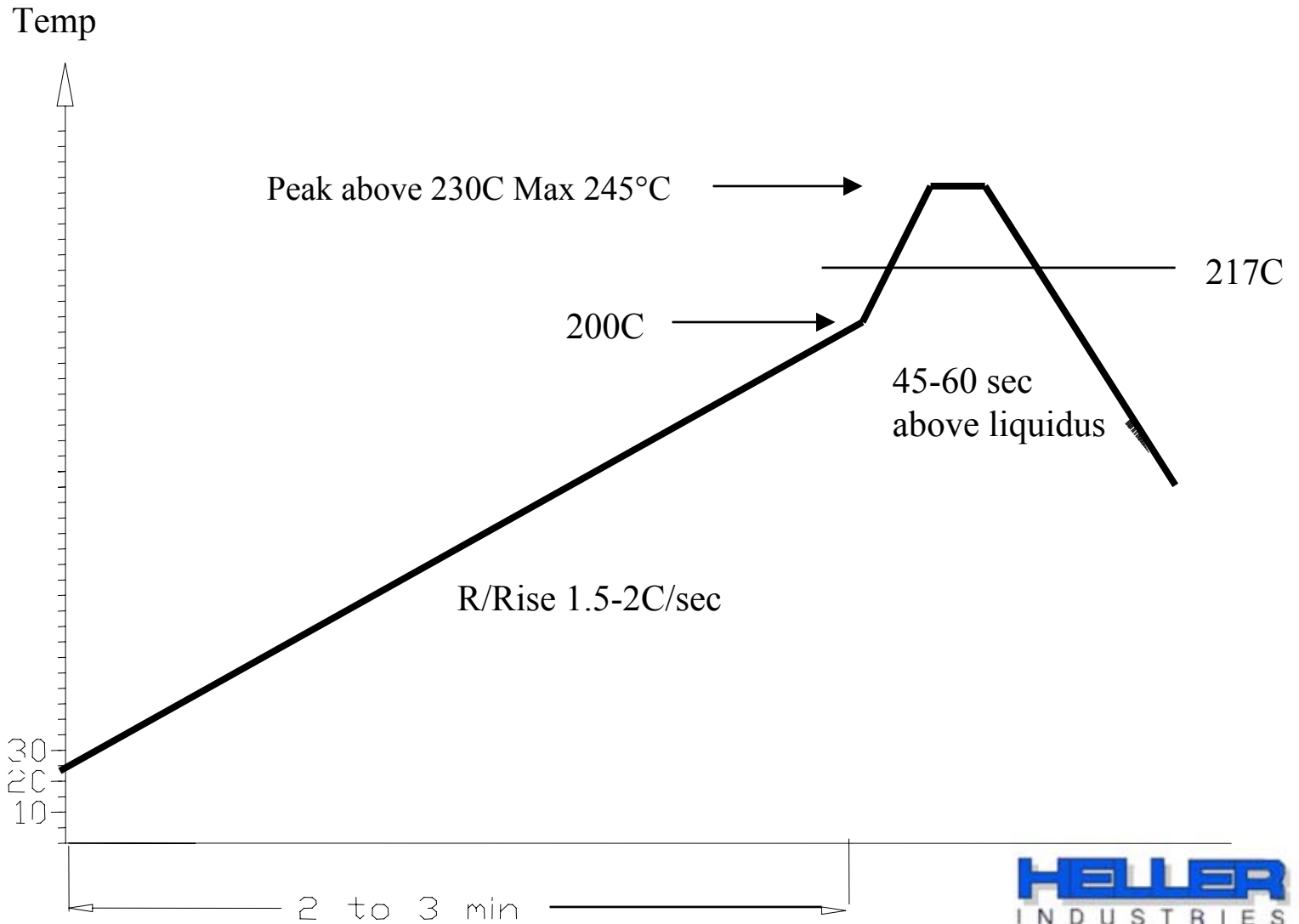
# The Evolving No-Lead Profile







# *The Evolving Profile Tent Shape*





# Is Nitrogen Required for Lead Free Reflow

- Similar to Tin/Lead Pastes
  - Process Dependent
- Advantages
  - Increase process window
  - Improves wetting angles and solder flow
  - Improves aesthetic appearances (no-lead joints tend to be duller)
  - May reduce discoloration due to higher temperatures and durations at temperature



# Other Considerations

- **Components and Boards**
  - Problems with electrolytic caps / connectors / IC's  
Some can't withstand the increased temperatures
  - Component availability is limited in no lead versions
  - No drop-in universal no lead paste – work with suppliers is critical
  - Void formations generally greater in no leads – but joints are still within IPC acceptable limits



# Lead Free Reflow

## The Application



# Changes to Oven Configuration for Lead-free

- Reflow zones may increase to 3- 4 vs. (2) for eutectic pastes
- Exhaust and filtering considerations
- More potential for board warpage – Center Board Support options



# Lead Free Ready Reflow Ovens

# Lead Free Ready EXL Series Reflow Systems



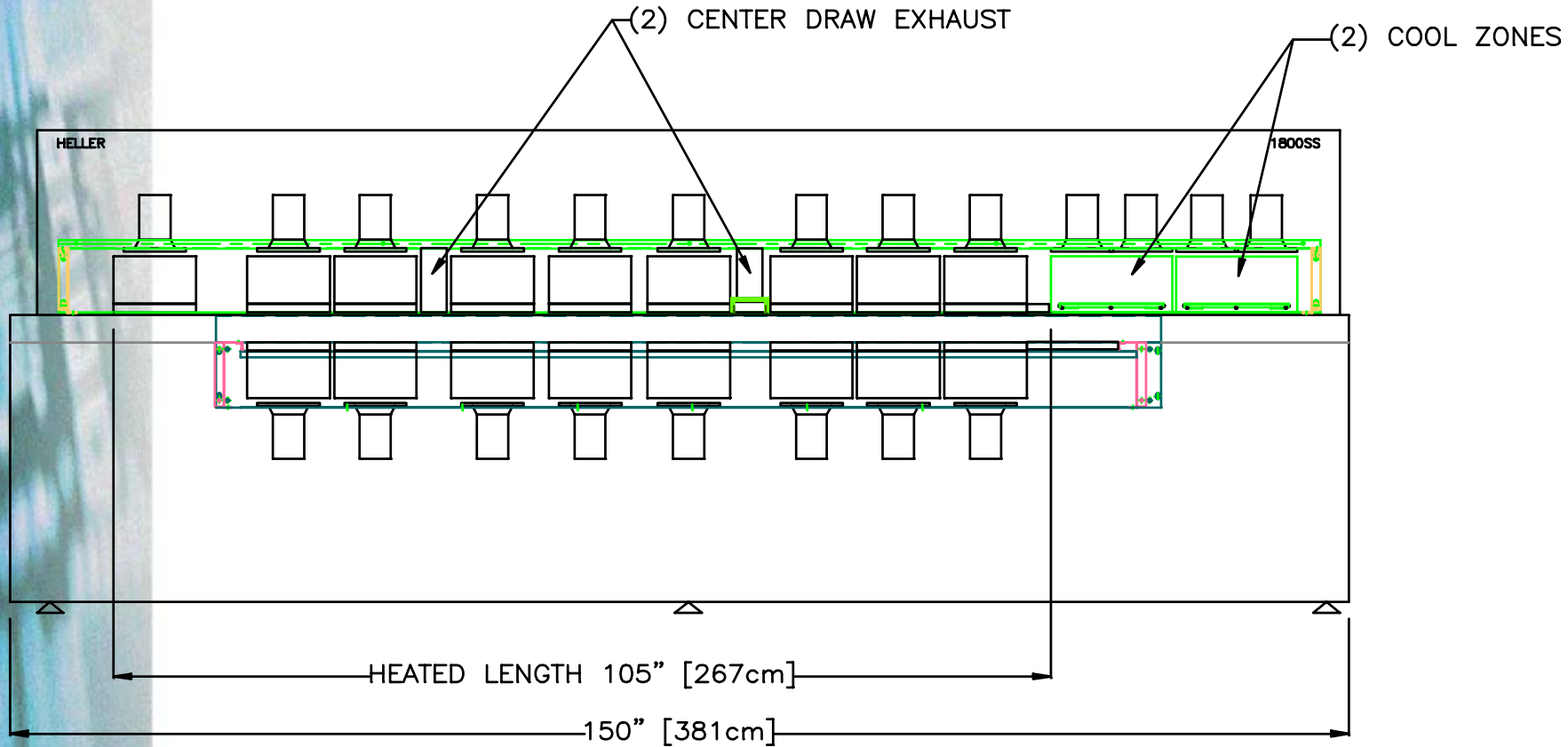
**1700 Series**

**1800 Series**

**1900 Series**



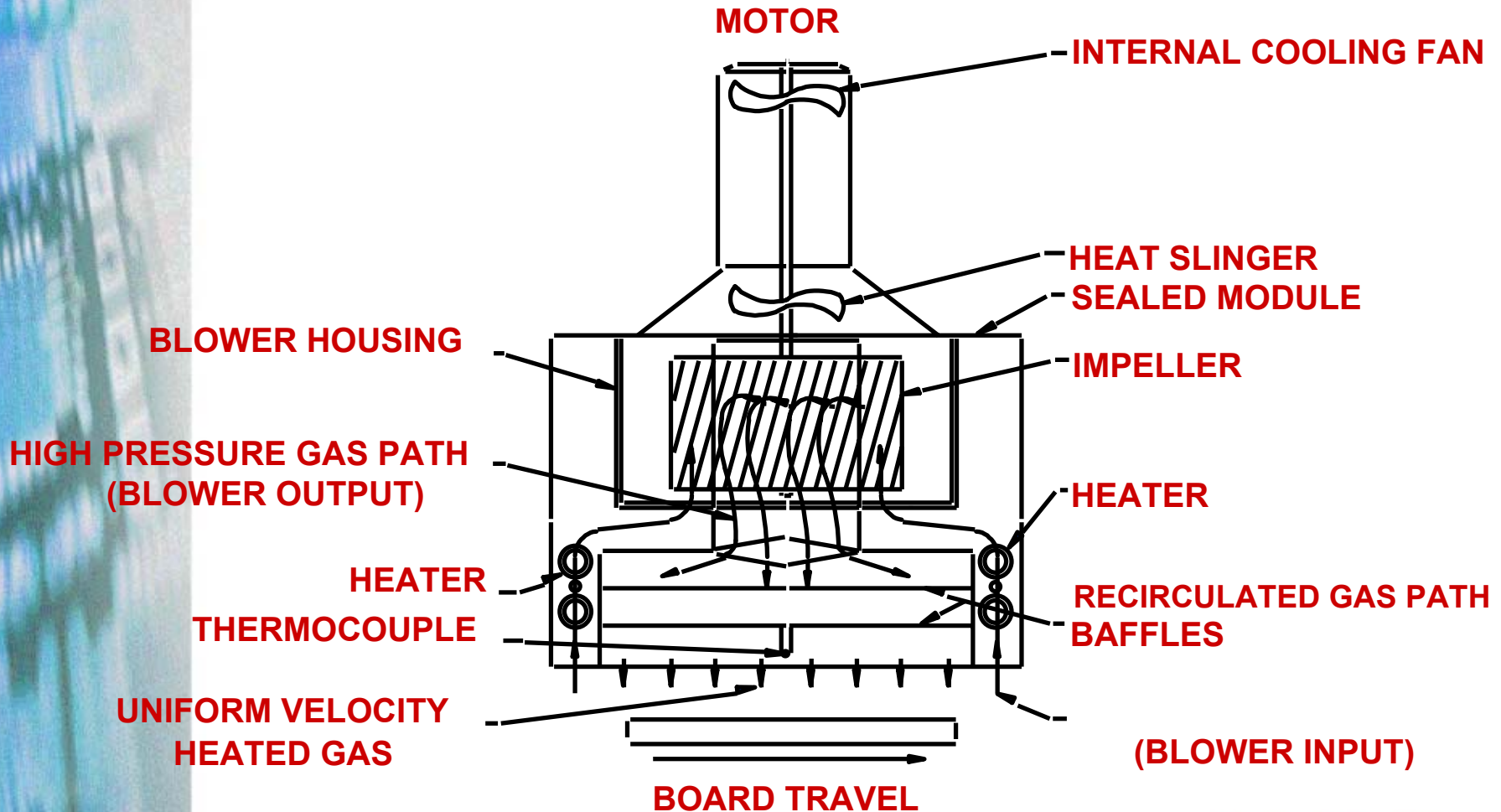
# 1809 EXL-S Configured For Lead Free operation







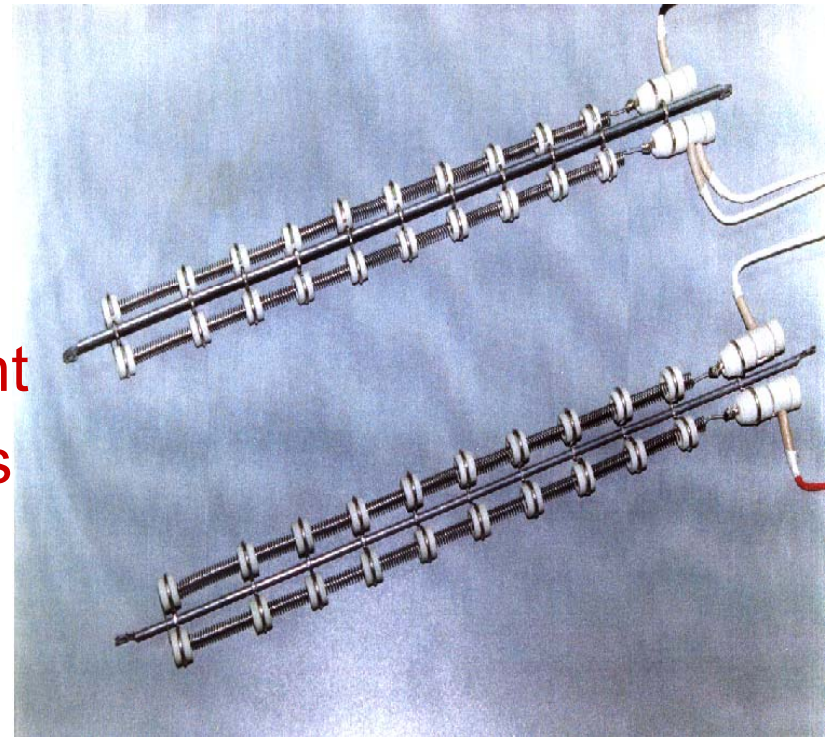
# Lead Free High Performance Convection Module





# Instant Response Low Mass Heaters

- Low mass heater elements provide rapid zone heat-up. Lower power is required to maintain zone temperatures.
- Immediate response to load variation in the zone.
- Rapid change to different heat requirements permits complete flexibility in production planning.
- Highly reliable 6000w per zone and guaranteed for life.





# Blower Motor Assembly

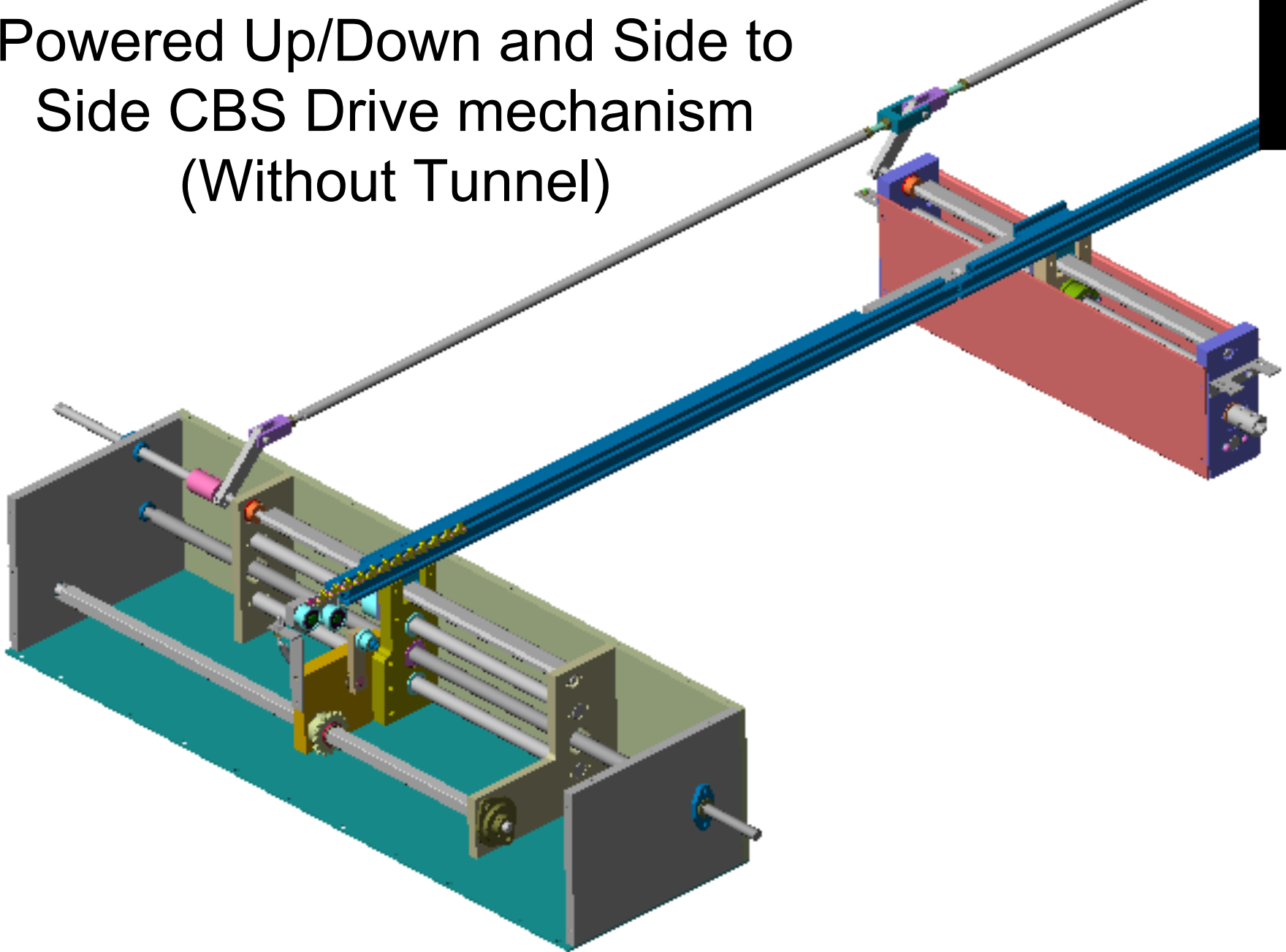
- Mass Flow:  
4.53cu.m/min of Air or Nitrogen
- Board Level Velocity:  
426.7m/min of Air or Nitrogen
- Motor shaft turns  
3700 RPM on 60 Hz
- Motor is rated for over  
70,000 hours
- Blower assembly transmits optimum velocity and volume of gas into the heated oven chamber without changing speeds when switching between Air and Nitrogen processing
- Lifetime Warranty
- Replacement Motors are pre-balanced





# Centre Board Supports

# Powered Up/Down and Side to Side CBS Drive mechanism (Without Tunnel)



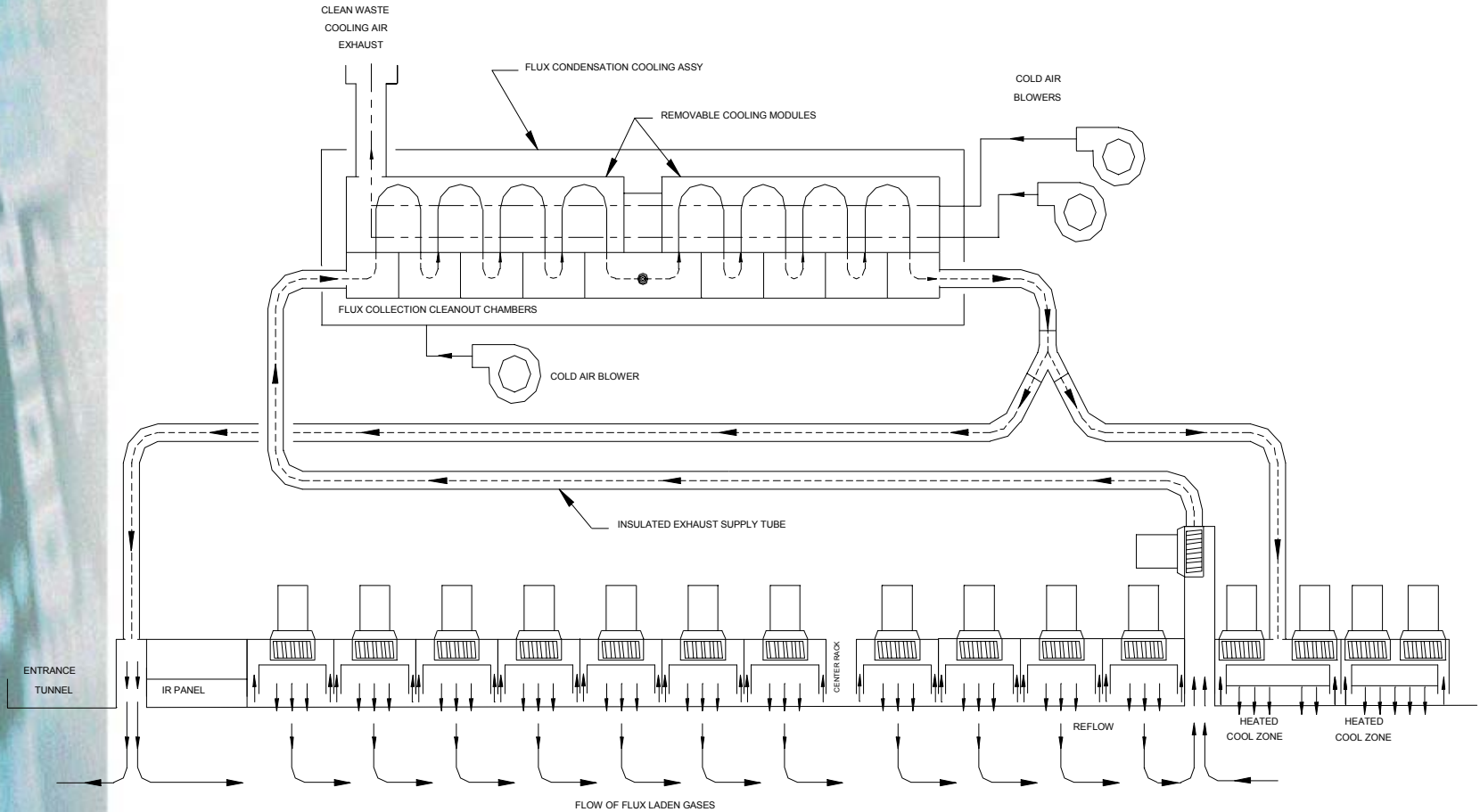


Gen. 5

# Flux Separation & Recovery Systems

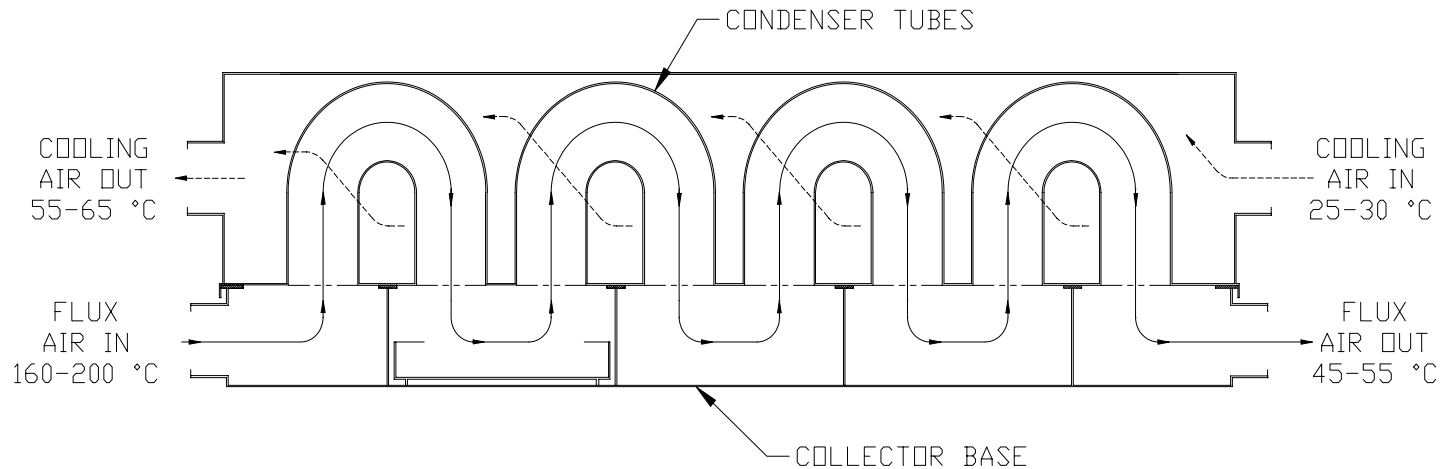


# Gen.5 Nitrogen Flux System





# Condenser Cooling Tube Diagram



- Flux laden gas enters the separation system and is cooled
- Cooled flux condenses on the inner walls of the tubes





## Internal View of Generation 5 Flux Separation Unit

**A series of looping coils reduces the temperature of flux laden gas to its condensation point**



# Flux Collection Before Auto-Clean



**Flux accumulation within the condenser tubes after 30 days and processing of 56.0 kg of solder paste.**



# Flux Re-cycled After Auto-Clean



**The same condenser tube after self-cleaning cycle  
flux is re-liquified and drips into collector trays**

# Conclusion

- Heller has the infrastructure to support sales and service worldwide
  - The Industry Leader
- Technology
  - Driving advanced Reflow Technology
  - Innovative designs
- Products
  - For all reflow and curing applications
- Lead Free Process
  - Lead Free Processing Certified at Sony, NEC, Fujitsu
  - Reduced Emissions Certified at Sony, NEC, Fujitsu and Flextronics
  - ISO 14000 Learning Curve Eliminated





**HELLER**  
**INDUSTRIES**  
*The Intelligent Choice Worldwide*