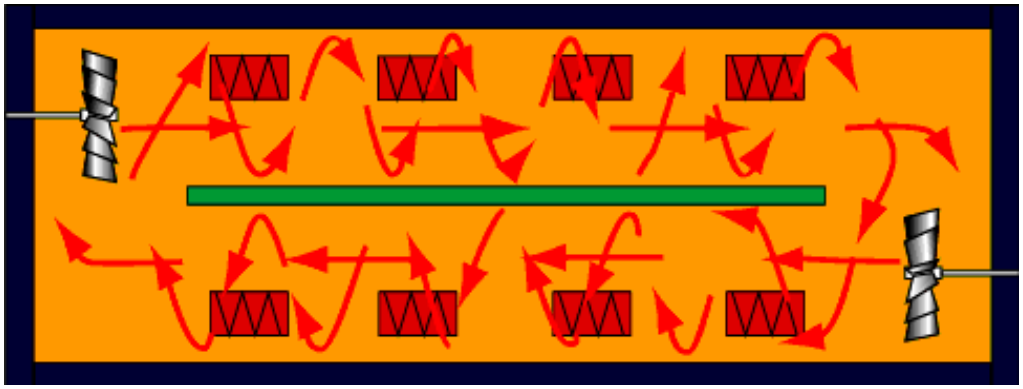
Horizontal Convection Reflow Technology Defined

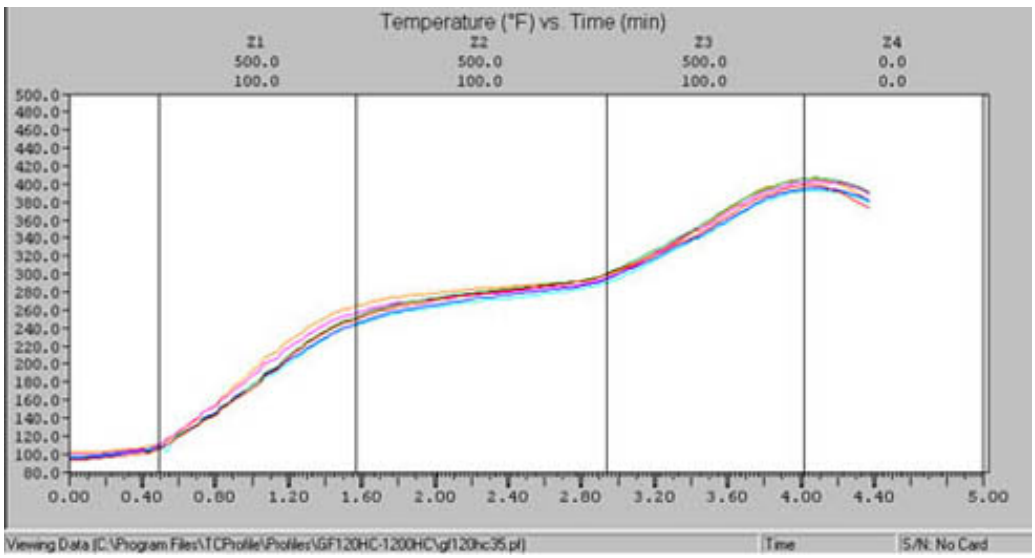
Leading up to the development of lead-free soldering alloys, Horizontal Convection* was developed for the reflow process. Getting the correct temperature profile, with the narrow process window in lead-free applications, is now more important than ever. In each chamber or zone , air is circulated toward one side of the oven above the PCB and toward the opposite side of the oven below the PCB, forming a cyclone around the board. The forced air circulation results in a uniform temperature profile along the entire circuit board assembly. This technology is ideal for the precise profiles needed for lead free soldering.

*Patent 6,936,793



Cross-section of a GF-120HC horizontal convection oven. Air is recirculated within the confines of each chamber as shown

HORIZONTAL CONVECTION Defined



Profile taken in a GF-120HC 3 zone oven showing actual board temperatures recorded with 6 thermocouples evenly positioned across the board.

HORIZONTAL CONVECTION Defined

1. The main difference between Horizontal Convection * and traditional oven technology:
In traditional reflow ovens air currents are introduced vertically from above and below on the PCB while in Horizontal Convection air is circulated horizontally in one direction across the top of the board and in the opposite direction beneath the board. This is key. This prevents hot spots and because of this parallel "angle of attack" the air stream's ability to infiltrate the spaces underneath component bodies such as BGAs and J-leaded devices is enhanced. Temperatures across the entire PCB front to back are virtually identical.

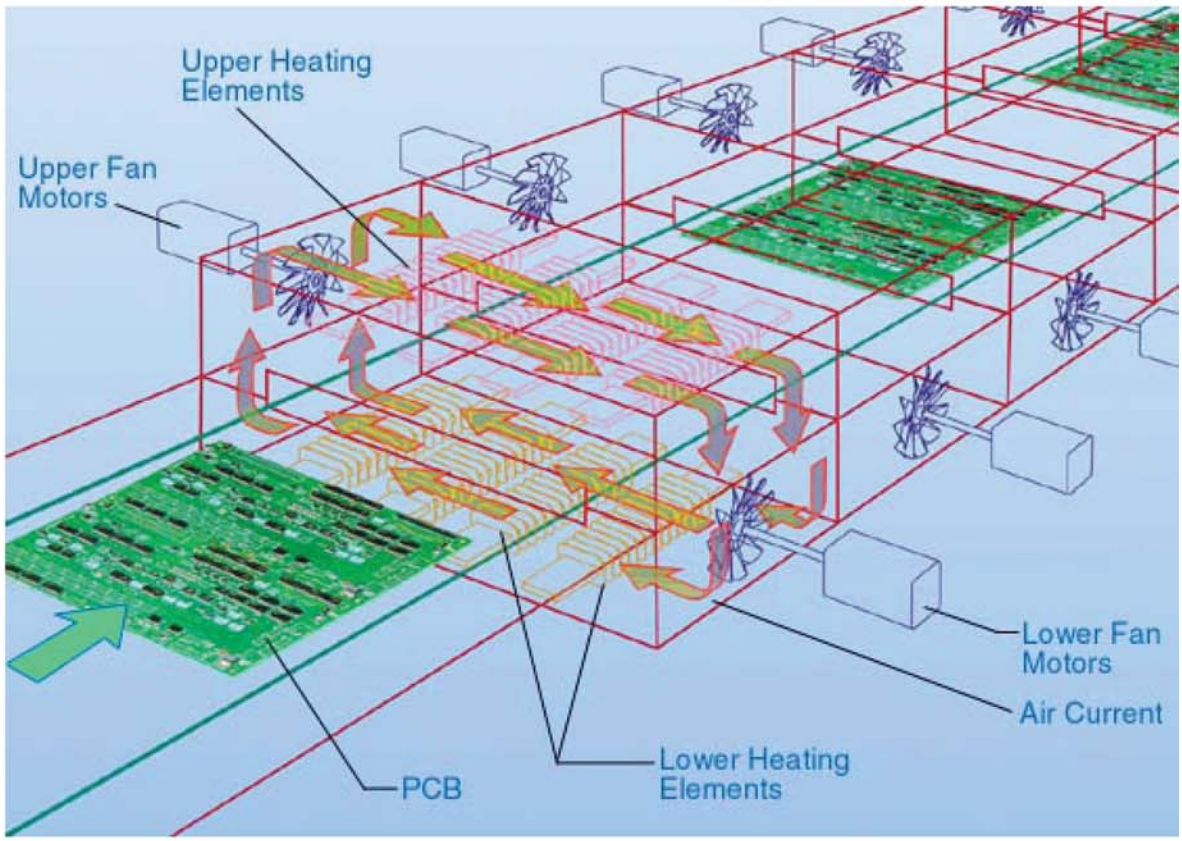
2. Lower overall equipment cost and operation cost:
Because the Horizontal Convection system requires neither plenum nor air reintroduction apparatuses, it is (due to its simplicity) more reliable and less costly. There is no need for costly flux management systems as there is no sticky flux residue in the oven which greatly reduces the need for constant cleaning, maintenance and servicing.

3. Eliminates hot spots across the board:
By controlling the air flow around the board by having consistent temperature, air pressure, air velocity, volume and direction across the board, temperature uniformity is ensured. The top and bottom of the board receive the air from the outsides toward the center, which acts to counter the center hot-spot/cool-outside condition. This minimizes thermal stress to PCB materials and components.

4. No flux management system is needed:
There is no flux residue because the air is recirculated within the confines of each chamber. Chambers each contain all the elements needed to be self sufficient: heating elements, fan blades, inert gas suffusers and exhaust ports. The air never comes in contact with cooler surfaces and thus does not condense anywhere within the oven.

5. Uses less nitrogen in inert atmosphere applications:
An advantageous side effect of the system is an ability to produce low oxygen ppm (parts per million) levels when purging with inert gas, because the volume of space to be affected includes only the confines of each chamber. In traditional oven design, by contrast, the chamber as well as the upper and lower plenums must be purged.

6. *The best profiles*... Period!
There are multiple reasons for this claim. Heated air within each zone is extremely controllable and precise. Temperatures across the board are uniform with no hot spots because air is circulated horizontally in a circular or "cyclone" motion around the PCB. Temperatures across the entire PCB front to back are virtually identical. Novastar is willing to compare its superior profiles to any other profiles in the industry. Let us prove it. Send us your PCB assembly. Then compare our horizontal convection profile with any other oven's profile.



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