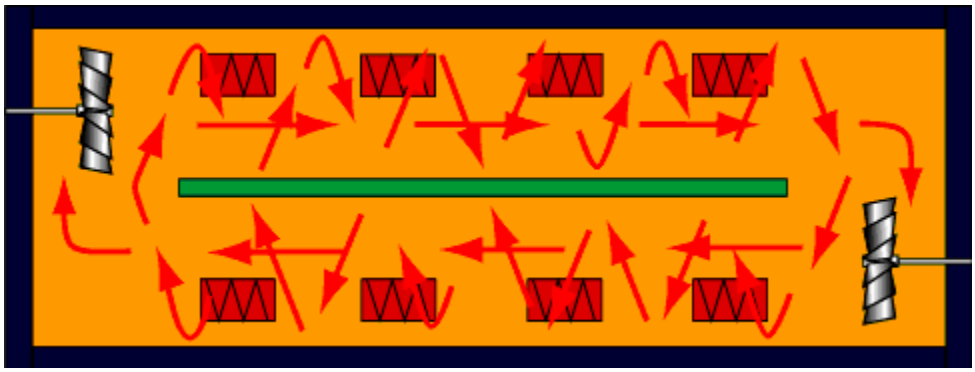
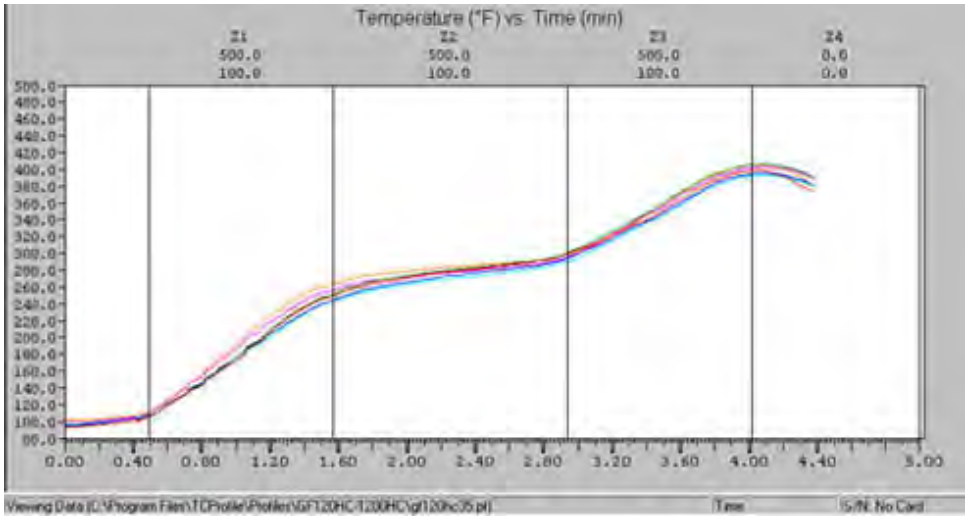
DDM Novastar
AUTOMATED PRODUCTION SYSTEMS

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 reflow chamber or zone, air is circulated toward one side of the oven above the printed circuit board (PCB) and toward the opposite side of the reflow 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.



Cross-section of a GF-120 reflow oven with Horizontal Convection. Air is recirculated within the confines of each reflow chamber as shown.



Reflow profile taken in a GF-120, 3 zone reflow oven showing actual board temperatures recorded with 6 thermocouples evenly positioned across the board.

* Patent # 6,936,793

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HORIZONTAL CONVECTION Defined

1. **The main difference between Horizontal Convection and traditional reflow oven technology.**

   In traditional reflow ovens, air currents are introduced vertically 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 spot 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 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 reflow 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 on anywhere within the reflow oven.

5. **Uses less nitrogen in inert atmosphere applications.**

   An advantageous side effect of the Horizontal Convection system is an ability to produce low oxygen ppm (parts per million) levels when purging the inert gas, because the volume of space affected include only the confines of each reflow chamber. In traditional reflow 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 reflow zone is extremely controllable and precise. Temperatures across the PCB are uniform with no hot spots because air is circulated horizontally in a circular or "cyclone" motion around the PCB.

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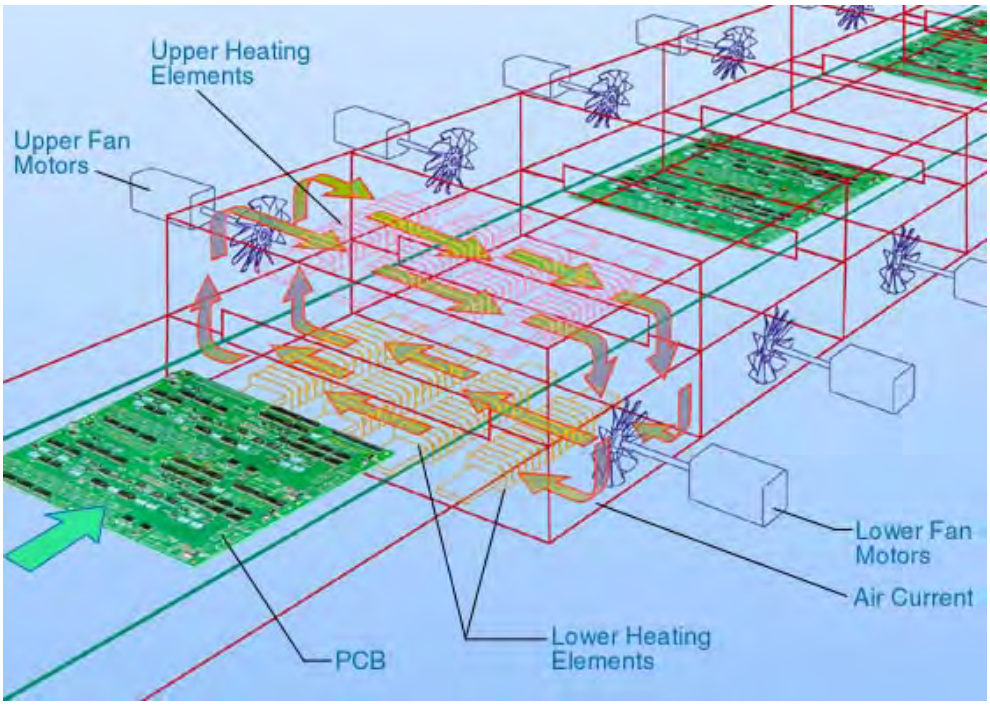
Temperatures across the entire PCB front to back are virtually identical. DDM Novastar is willing to compare its superior profiles to any other profiles in the industry. Let us prove it. Send us your PCB assembly. Then compare our Horizontal Convection profile with any other reflow oven's profile.



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