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## Hypertherm Challenge Introduction

Have you ever looked inside an electronic device like a computer or a television ? Unless it was a very simple product, you probably saw a printed circuit board, or PCB. The first large scale PCB manufacturing began in the 1940s and through the 1950s, PCBs replaced manual point-to-point wiring, allowing the manufacturing of electronic devices to become highly automated.

In modern circuit board manufacturing, computer controlled "pick and place" machines rapidly choose the electronics components and place them in correct position on the board. All the connections can be soldered at once in a process called wave soldering.

In wave soldering, the board first travels on a conveyer into a flux zone, where flux is applied to the board to prevent oxidation of the metal and to allow the solder to wet the metal surface. The board then enters a preheating zone and finally the soldering zone. Here waves of liquid solder bathe the bottom surface joining all of the electronic components to the board at the same time.

If you've ever soldered connections by hand, you know there's a lot that can go wrong. If the solder doesn't wet the joint it can ball up and just sit there. Sometimes if you move the iron around you can make spikey joints, or the solder can quickly oxidize and turn dull and powdery looking. With so much that can go wrong on dozens of joints being made at the same time, wave soldering machines must be capable of controlling many variables to produce a consistent result. If problems do arise, engineers must use structured problem solving techniques to ensure that the root cause is found and remedied.