

Selective Soldering Boosts Yields and Throughput over Hand Soldering, Delivers Faster ROI" by Michael L. Martel of MMC, Inc.

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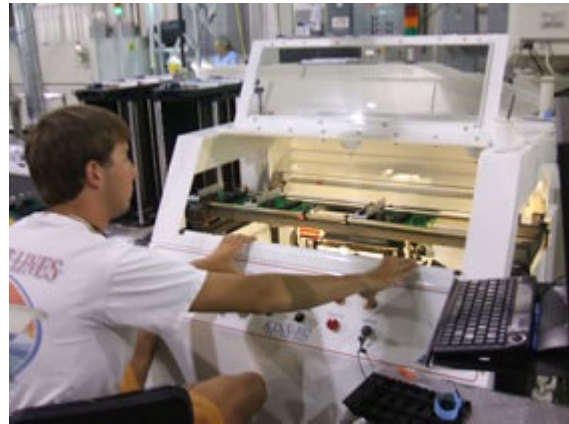
One of the paradoxes facing many electronics assemblers today is the need to increase production through the addition of automation, while keeping valuable, skilled employees who are long-time assets to the company.

There has long been a false perception that adding automation puts employees out of work, while in fact the opposite is true.

At the same time, manufacturers realize that in order to increase productivity volume, and achieve greater product consistency, automating certain processes, such as soldering, is a must.

During a recent installation of a selective soldering machine at **Alpha Technology, Inc.** in Anderson, SC, both supplier (**AI Cable**, President of **ACE Production Technologies**) and the new customer agreed to

collaborate to collect real-time data on selective soldering with ACE's **KISS-102** machine versus hand soldering, with the goal being to estimate the ROI of the machine purchased.



For decades, well back to the beginnings of electrical products, manufacturers depended on skilled personnel to conduct hand soldering operations. Well before the invention of the printed circuit board in the 1950's, skilled operators with soldering irons assembled entire products such as early radio sets using point to point soldering techniques.

Skilled hand soldering personnel have always been the backbone of electronics assembly operations. They can complete connections that are problematic for machine soldering, and are essential to the rework and repair department. However, in terms of production, hand soldering is slow and inconsistent. The quality of the results is entirely dependent upon operator skill, and can vary from day to day and hour to hour.

As circuit boards have become more complex and difficult to manufacture, due to miniaturization and/or topography, more and more individual, offline, or challenging soldering operations are being achieved through the use of selective soldering machines.

This is especially true for high-mass assemblies or components that simply cannot be effectively hand-soldered. Selective soldering machines, semi-automated or automated, offer the features and consistency needed to handle a high product mix with challenging individual soldering tasks, such as connector attachment. They also require trained operators.

At Alpha Technology, following the installation of the machine and training of their chief process engineer, **Tom Clawson**, Cable agreed to run production for them for an eight-hour shift to collect data. Clawson actually programmed the board himself, Cable says, and adds "I then showed him multiple process tips and how to optimize the board for the quickest possible cycle time while keeping quality and consistency as a first priority.

I made an agreement with **John Tate (CEO)** to run the boards, as they were in a situation whereby it just so happened that they needed to get this batch of boards out as quickly as possible. The product was for one of their top customers."

So it was not merely a practice run; with ACE's president directing the operation of the machine, they were going to do a critical job for a key customer, first time out, and it had to be right.

"The complete job consisted of 164 boards" Cable continues. "John stated if we could get 80 boards out they would be in great shape. The board had approximately 300 solder points. Keep-away areas were not extremely tight, but they did require that I use a 6mm nozzle. As a result I, consider the comparative data conservative, since a larger nozzle would allow a faster run time."

Cable had discussions with three different individuals who had all hand-soldered this particular board. The quickest time offered was thirty minutes, and that was "on my best day". After setup and programming the KISS machine, Al Cable was able to reduce the complete runtime on the board to 4:34.

"They normally assign 4 to 8 people to this project depending on how quickly they need to turn the job around. In this case, they would have used 4 people to hand solder these boards in two days with a 10 hour shift (80 hrs). They normally work 10 hour shifts. I was unable to obtain qualified data on yields from the hand soldering process. However, the quality personnel told me they normally have a lot of touch-ups and inconsistent solder joints after inspection."

Using the ACE machine, they now completed 80 boards in an 8-hour shift. The verbal response from quality department, after the first twenty boards, said it all: "It looks as though you'll beat 99%, and the solder joints look great!"

This was a tin/lead application using Kester products SN63PB37 solder & 2331-ZX WS flux. John Tate, Operations Manager for Alpha Technology, said "The ACE machine proved its value in a remarkably short time. As a result, we have every intention of acquiring another machine from them in the not so distant future."

The implementation of a selective soldering machine brings higher productivity and more consistent product quality through fewer soldering defects. Even though less labor is required in soldering, inspection, rework/repair, technicians are simply reassigned to other tasks, and are needed to handle the higher productivity that the shop is now capable of producing.

Assemblies are completed many times faster, and at a fraction of the cost. Additionally, the customer's ability to automate the process has brought greater consistency to the resulting solder connections, since the quality of the connection is no longer dependent on operator skill and variability.

For Further Information On ACE PRODUCTION TECHNOLOGIES, Please Visit <http://www.ace-protech.com>