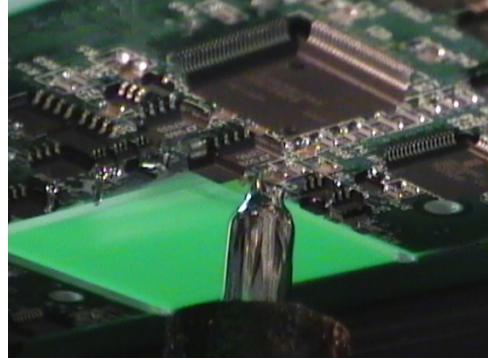


Listening to Customers Drives Product Improvement, Higher Yields, and a Better Bottom Line

Production equipment developers and suppliers rely on customer feedback to make their equipment better, more efficient, and better suited to meeting the challenges of advancing technology and serving a broader range of applications. This is particularly true of selective soldering equipment, which was originally developed to do what neither hand soldering nor wave soldering could do – automate the soldering process for individual components or groups of components. Thus, selective soldering emerged to fill a need, and that technology continues to develop with the advice and valuable input from users who are actually engaged in day to day production soldering operations using selective soldering equipment.



ACE product development engineers, service technicians and applications engineers have learned to be listeners, and they apply user feedback to subsequently generate ACE's development objectives. Some of the most recent advances in selective soldering performance – in this instance reduced cycle time – are the direct result of customer input.

It's no surprise that selective soldering customers are always seeking faster cycle times; higher throughput volumes per shift directly impact the profitability of an operation. In particular, users of ACE KISS selective soldering systems inquired if there were some way to speed cycle time by studying the various motions of the equipment in operation. ACE engineers responded by doing precisely that, and found a way to create a shorter soldering cycle by trimming unnecessary motion where it would make the greatest impact without sacrificing quality or precision.




ACE selective soldering systems utilize a traveling mini wave; this wave is mounted above a 30lb. solder pot, which carries a soldering nozzle and flux head that moves in the X, Y and Z axes.

A typical soldering program consists of commands that direct the solder delivery system to apply solder to specific X/Y locations at pre-programmed speeds. The amount of thermal energy required to solder specific component locations is dictated by the thermal mass of the electronic components and the PCB substrate. X/Y travel speed, solder pump speed and solder dwell time (the amount of time that solder flows to a particular location) are fundamental parts of the soldering cycle time equation.

Z-axis Travel – The Necessary Annoyance

For every X/Y program segment there is also a Z travel segment which directs the solder delivery system to rise to the soldering position, and then subsequently to lower to a travel position. However, the Z travel stroke does not contribute to the process, and in fact negatively impacts the cycle time! Consequently, improvements to cycle time are limited minimally to X/Y travel paths, which can be complicated, or faster Z moves.

By studying the hundreds of soldering programs generated by ACE’s process development group, it became obvious that 20% to 30% of any given soldering sample cycle time is wholly given to moving the solder pot up and down. Thus, we realized that if we could speed up the Z motion, we could improve cycle time. The results are summarized below in **Table 1:**

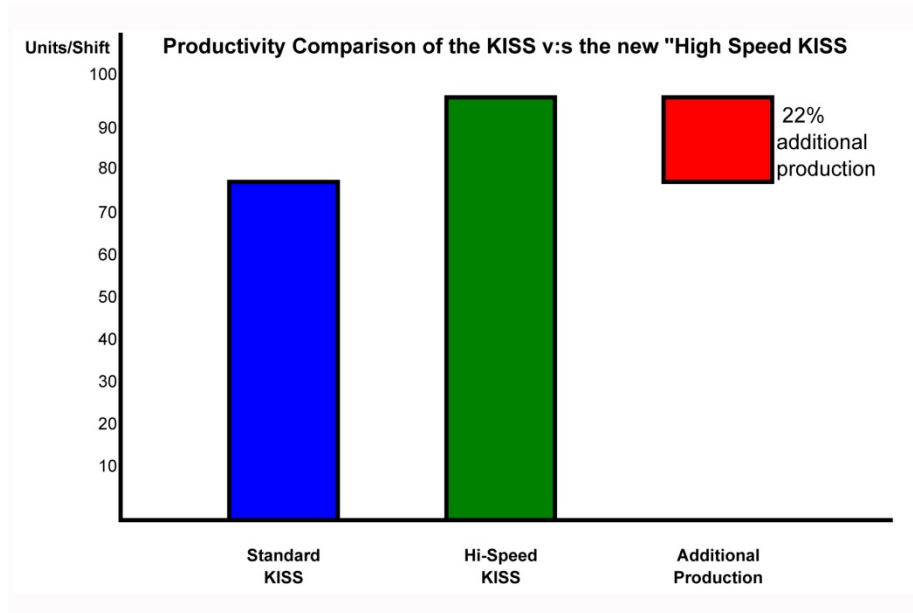


On the sample board there are 34 sites to solder that require a Z motion to move the solder wave to and away from the solder site. In this analysis, a travel distance of .500" is used for each direction to avoid certain SMT and T/H components. The new machine travels at 5"/second, or up to 10 times faster than the current machine. The total time saved is subtracted directly from the process time of the standard machine.

Total soldering time in minutes for the standard KISS machine for all sites on the sample board	Standard KISS total "Z" time for the sample PCB in seconds	Quantity of boards in a 7.5 hr. shift
5.7 minutes	74	79

Total soldering time in minutes for the standard KISS machine for all sites on the sample board	Hi-Speed KISS total "Z" time for the sample PCB in seconds	Quantity of boards in a 7.5 hr. shift	Amount of additional boards run in the same 7.5 hr. shift	% increase in productivity
4.7 minutes	15	96	17	22%

Lighter motion components, a new drive system, and motors that allow precise control of Z acceleration and deceleration profiles have been designed into the new ACE Z motion system, which has significantly cut time from the cycle and resulted in a 'high speed' KISS selective soldering machine offering a significant 22% increase in productivity, as shown in the graph in **Figure 1**, below.



As an added benefit, the improvements to the Z assembly also inspired a better method of removing and exchanging solder pots (another customer requested improvement).

In conclusion, listening to customer suggestions always pays dividends to both the equipment supplier and the customer, with resultant better equipment, higher productivity, and better profitability for all.

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