Reprinted with permission from the Jan/Feb, 2022 issue of ...

Sharing Resources to Optimize SMT Production

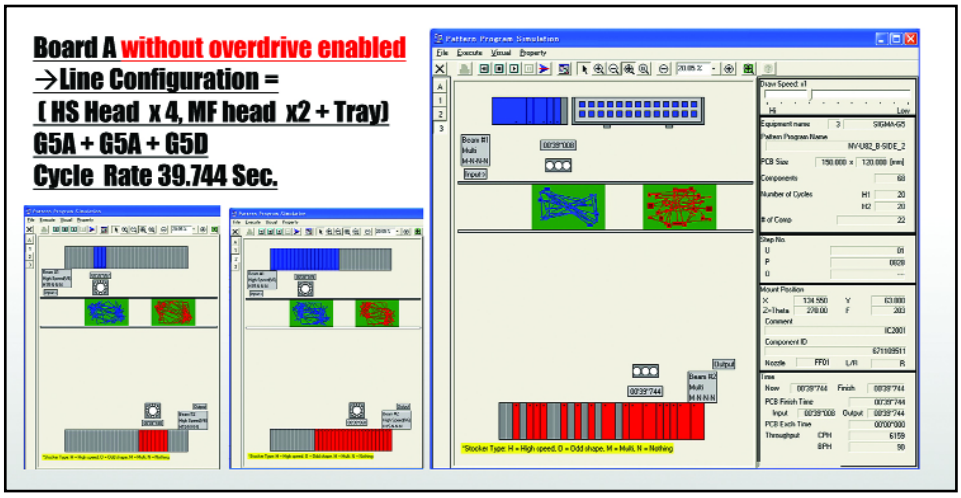
By Matt Wyglendowski, YAMAHA Motor Corporation U.S.A.

According to the laws of physics, no two objects can occupy the same space at the same time. But, with Yamaha's new "Overdrive" functionality, a resource-sharing process, two placement heads can nearly simultaneously perform in the same space.

Overdrive is an optimization process that allows two heads, e.g., High-Speed (HS) and Odd-form or Multifunction (MF) on either side of a placement machine to simultaneously place in the same head space as each other. In addition, valuable resources, such as a high resolution camera, can be shared across the machine.

Streamline Production

The shared resources functionality on modular mounters allows one head to pick from the opposite feeder bank as well as its own. This provides great flexibility to a mounter with two heads with each having widely varying strengths or characteristics, speed for one, flexibility for another. These strengths can now be shared across the machine, and of course the enabler is powerful software.



Board A without "Overdrive" enabled.

Consider this: with conventional pick and place machines, in particular dual beam machines, where you've got a front and a back side, and they're both placing onto the same circuit board or PCB area, for all of the conventional machines in the market, you have opposing heads that are basically waiting on each other to place components onto the PCB. But for systems equipped with shared resources functionality, there is no waiting.

Time saved that would otherwise be lost waiting is now time used in active placement, increasing overall throughput and CPH. So in fact it is a means of adding capacity without having to add more capital equipment. Shared resources functionality doesn't double output necessarily, but it can make the difference between having to buy a duplicate machine, which may be more capacity than is needed, and accommodating increased volume demand with the existing placer footprint.

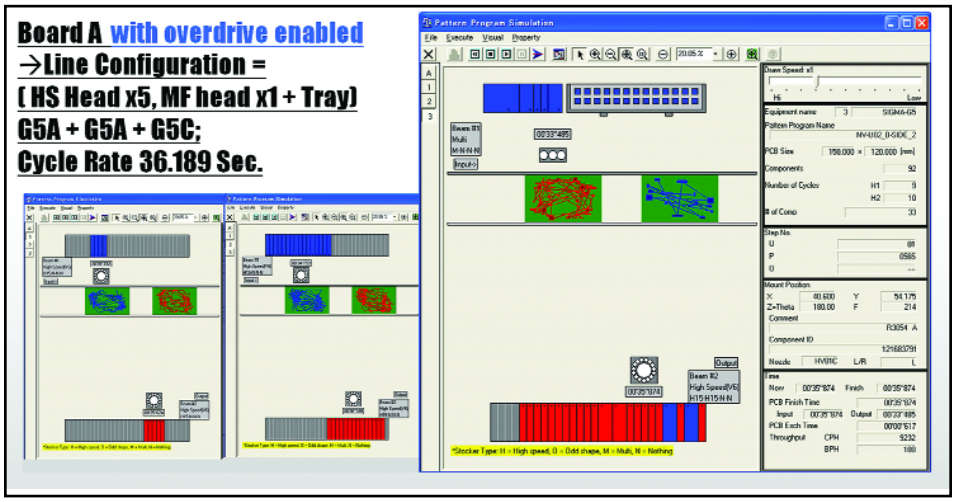
The placement heads are not going to hit each other; ever since the introduction of shared resources functionality, there have been no collisions, due in part to the system's very robust algorithm. For example, if you've got a conveyor area 700 mm long, and in that area you've got a placeable area of 6" x 10", a single large board, both heads, through the optimization process, can place on that same board simultaneously based on the optimization of where the components are to be placed. The optimization will determine, for example, that head "A" can place certain components while head "B" is placing another selection of components without any interference.

By Contrast

In another scenario without shared resources functionality, if you are running a placer with dual staging, two boards are in the conveyor area at one time. Head "A" will place its parts and Head "B" has already picked up all of its parts and is ready to place them, but it still has to wait for head "A" to move out of the way so that it can begin to place, and so forth. With shared resources functionality, both heads can actually place simultaneously at the same time without any interference or risk of collision.

Shared resources functionality offers the ability to share physical functions on the machine. Initially, we knew that individual heads had the ability to go to the opposite side of the machine and share the same nozzles. Because 'shared resources functionality' involves more than just placement head resources, new possibilities are emerging. A new function has been introduced, one that what we term electrical component verification, or LCR. It's essentially capacitor resistor and inductor electrical testing.

It's a somewhat costly option, and a comparable feature on competitive systems, but for example, if you've got 10 modules, e.g., in line, you've got to have that function on 10 different modules in that line if you don't have shared resources functionality. With shared resources functionality, one would only need that option 5 times instead of 10 because you're able to share that functionality front and back, using both heads "A" and "B". There is no need for one head to 'wait' for the other to finish placing its parts and move out of the way and you don't need additional systems to deliver the same throughput capacity.



Board A with "Overdrive" enabled.

For applications that involves a restriction of component placement capability, e.g., your machine has a head that can only place components up to a certain dimension in the Z-axis, five, 10, 15mm tall; and then if the opposing head can place taller components, the tradeoff is that usually taller components are going to come out of wider tapes and wider tapes consume more feeder slots on everyone's machine.

There is no way to avoid that. Now, if you're placing a lot of larger components but you still have a requirement for speed in order to achieve a desired cycle rate, there could be a problem. You required one head with the capability of placing these taller components, but then you run out of feeder slots on your machine to accommodate all the components that you need.

It's a no-win situation; either you're going to take a hit on your cycle rate and add two odd-form or Multifunction head machines or configure odd-form heads in a single platform, or else you're going to have to add another machine in-line in order to meet that cycle rate because you don't have enough feeder positions to accommodate all of your larger feeder positions for that odd-form head.

Shared resources functionality negates the need for this compromise. If you have open feeder positions on the opposing head to your odd-form head, one that has taller component capacity, you can fill them with the tall component feeders because now, that head with the taller component placement capability can drive across the machine to the opposing feeder bank, use those empty slots on that side and pick components from that side of the machine and then place them on the PCB.

In that respect, therefore, you are saving floor space or production area and you are saving a dramatic amount of money on the investment of another machine that would only have been needed because you didn't or don't have enough feeder positions on the first machine. Those are perhaps the biggest benefits of

shared resources functionality and what it can improve for the user.

Emerging New Systems

Emerging placement systems, in particular the new YRM20, incorporate an enhanced version of shared resources functionality and a split rail configuration that, simply explained, minimizes the "Y" distance travel for both heads so that the machine can place at optimum speed.

The machine will utilize both overdrive and split rail functionality, delivering the best of both worlds. Through optimization, the placer will instantly determine, based on component density and wide distance travel, whether the shared resources functionality feature or the split rail will provide the bigger benefit in any particular instance.

Ongoing developments with YAMAHA's shared resources functionality have enabled its mounters so equipped to share resources and space in ways that were never possible before, conserving machine work area and factory floor space, minimizing equipment investment, speeding up performance, and eliminating the need for duplication of optional modules and resources. Sharing space and sharing resources cuts down on cost of ownership and yields a faster ROI for the PCB assembler.

Contact: Yamaha Motor Corp., U.S.A. IM Division, 3065 Chastain Meadows Parkway, Marietta, GA 30066 ☎ 619-301-5802 E-mail: george_babka@yamaha-motor.com
Web: www.yamaha-motor-im.com ❒

See at IPC APEX, Booths 1114 and 1701