

## Commodore SX-28S Thermoformer Flexibility of a Narrow Web with Output of a Wide Web

In foam tray thermoforming equipment is a large component of having fast cycle times, along with quality sheet and tooling. Reaching high volume cycles per minute is important, but the effort will be lost if trim accuracy and the quality of the mold impression is not held. Through decades of knowledge running our own foam plant, Commodore can provide a proven complete solution from extrusion to thermoforming, grinders, auxiliary equipment and a complete range of tooling solutions.

Commodore has improved its SX-28S thermoformer to reach speeds of 190 CPM. The technology allows users to increase output without significantly increasing cost. Due to the narrow width of the 28" sheet, the machine is best suited for low to mid-range volume applications. Narrow molds and trim tools can be exchanged quickly. Since there are fewer units per mold, set up time is decreased and scrap is minimized. Capital costs for narrow molds and trim tools are much lower than a wide-bed application. With the increased speed, production output is similar to larger, wider thermoformers but with the benefits of a flexible narrow line.

### Trim Station Improvements

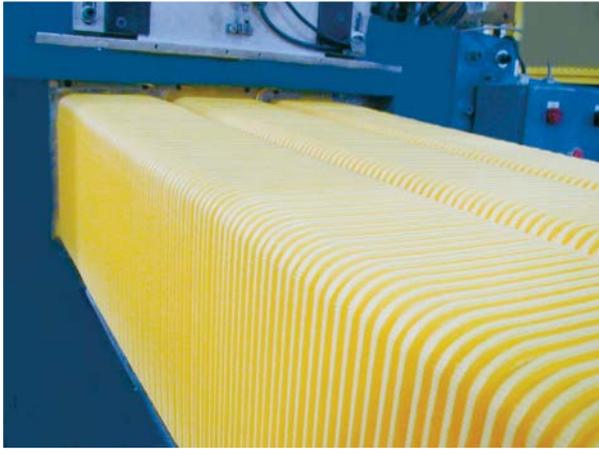
The trim station was the performance constraint within the narrow thermoforming system. The challenge was to increase CPM without impacting trim accuracy. The reciprocating motion of the trim treadle created vibration when the cycles increased thus causing trim accuracy issues. Utilizing accelerometers and FEA (finite element analysis) modeling tools, Commodore was able to analyze localized vibrations within the trim press. Several actions were taken to eliminate these vibrations. The tubular frame was stiffened in strategic areas to compensate for flexing. Eventually the frame was replaced with solid boiler plate sides which not only improved the machine's stiffness, it also improved the manufacturability of the machine by eliminating several welding steps. A variable counterbalance was incorporated to compensate for the inertia generated when the reciprocating motion ended its stroke. The balance keeps the machine from vibrating excessively and helps to increase output through better machine stability. Utilizing a servo motor, the speed of the trim press remains consistent throughout the entire trim



cycle. Furthermore, a power canopy is utilized to present the formed sheet to the trim tool feeder rather than attempting to pull the entire sheet from the form station over the canopy to the trim tool. Having an intermediate step to stage the sheet reduces tension on the material which improves trim accuracy.

### Form Station Improvements

Along with the trim station, the form station has also been updated to work at speeds up to 50 forming cycles per minute by utilizing servo technology. Replacing the hydraulic cylinders in the form station with servo driven



linear actuators has increased speed and precision. In the spirit of lean manufacturing, the need for hydraulics is completely eliminated from the machine thus reducing maintenance, improving cleanliness and making it quieter. Since the hydraulic actuator has been essentially replaced with a powerful servo driven linear actuator, the need for toggles on each corner of the platens is not required. This keeps the cost of the equipment down while also eliminating the need to maintain 8 toggles per machine.

### **Continuous Improvement**

Further improvements to the series SX-28S includes an

extended oven which increase the number of heat indexes before the forming station which allows a more gradual build-up of heat. The oven length can also be adjusted to ensure uniform shots during heating. Increased vacuum capacity helps to improve forming. These items combine to improve the forming accuracy while ensuring success to form open cell absorbent trays.

### **Necessity is the Mother of Invention**

The need to update Commodore's thermoforming machinery originally came from the demand within our own foam plant to increase production without increasing our footprint. Many of our customers are small- to medium-sized businesses facing the same situation. Our machine makes it affordable to increase production by doubling output with a cost increase of just 10% while maximizing existing floor space. Some of the performance improvements have been retrofitted to Commodore's existing thermoformers allowing output gains of 20%. We also found that while maximizing efficiency in our narrow web machine, our results were coming close to the same output as our large web machine with the added benefits of reduced set up time, lower scrap rate, less maintenance, lower cost molds and trim tools. |