Case Study

SencorpWhite (Hyannis, Massachusetts) is a leader in thermoforming machinery and their latest achievement is the Ultra 2, said to be the largest production steel rule die inline thermoformer in the global plastics industry. On the machine, which has a footprint of 50' x 11', the process tonnage of 35 tons for form and 130 tons for trim is generated entirely by electric servo motors. The steel rule die inline arrangement results in faster changeover and an overall cost only 10% of conventional punch & die systems, according to company sources. Onboard, 44 heating zones are being controlled by a heat control system supplied by Siemens (Atlanta, Georgia), who also supplied the servos and other motion control components for this machine.

The genesis of this machine, as Brian Golden, product manager for thermoformers at SencorpWhite, explains, “...was a market analysis we did, where we determined a distinct need among our major industry segments for a more precise thermoformer with optimum control of form and trim operations, as well as a large forming area to increase production. The Ultra 2 boasts a 34” x 48” forming area. Typically, such a large machine would involve major challenges in motion and heat control, especially when running at higher production speeds.” As a result, Golden notes, the SencorpWhite engineering team, led by Greg Danti, turned for assistance to its longtime supplier Siemens.

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The Siemens plastics industry group, headed by Mathias Radziwill and the SencorpWhite account manager, Hue Lieu, connected with the customer’s team to review all the parameters of the project. As Lieu explains, “We were challenged from the outset, as SencorpWhite was looking for a faster thermoformer to do higher-end work. Likewise, they were seeking ways to achieve faster assembly, faster operation on the machine, overall cost reduction in various areas of heat and motion control, plus finally a greater throughput due to their newly designed steel rule die and proprietary off-loading system. Just another day at the office,” Lieu mused.

Overall, this machine was in development approximately 2-1/2 years, with the bulk of the engineering focused on the electrical and electronic controls. Radziwill notes, “The Siemens team brought our unique TIA Portal to the challenge. This system enables complete access to the entire suite of products and software available, allowing machine builders to engage in a totally digital enterprise during machine development, performance evaluations, simulation scenarios, build stages and commissioning, plus it has full diagnostic and energy management tools. Many builders view TIA Portal as their gateway to Industry 4.0,” he said.

The key to the machine form and trim tonnage, Lieu further explains, “...was the implementation of electric servos, which eliminated an array of mechanical components, with their obvious cost and assembly time expense for the customer. The servos also run the indexers on the rail system, which upped the productivity of the machine by 40% or so.” Greg Danti, SencorpWhite Director of Engineering, confirmed this fact. “With the industry trending towards higher performance electric servos, we elected to move away from our previous reliance on pneumatics and hydraulic solutions for generating our tonnage.”

Siemens also assisted in the development of the proprietary off-loading system on the Ultra 2, introducing the SencorpWhite team to its Simotion D motion controller, which runs the system in 100% servo mode. By use of the supplier’s Scout system, the builder here was able to “test drive” a number of drives to select the optimum combination of features and price point. This new system utilizes stationary motors, driving the need for coordinated motion control. The Scout system provided the technical solution for this requirement.

Typical parts produced on the Ultra 2 include packaging for health & beauty aids, food, medical, and hardware products.
Parts produced on the Ultra 2, given its combination of volume, speed, and accuracy, range from HBA and medical packs to clamshell and high-capacity containers or very high-volume jobs, where the increased number of parts per shot has tactical market advantages for customers.

In production, the inline steel rule dies allow faster changeover for the SencorpWhite customer, “...in hours not days,” according to Greg Danti, director of engineering for the Builder. The original design called for an electric motor drive, but Hue Lieu, the Siemens account manager, explains, “Servos were ideal for this application and, once we walked through the updated architecture with the guys, we all saw the light bulbs going off. The combination of less manufacturing time, fewer components, and the increase in speed with the desired accuracy won the day.”

On the HMI side, the selection of the Panel Pro IP67 gave the SencorpWhite team the optimum solution for a display that could withstand any anticipated working environment.

For heating control on the machine’s 44 temp zones, the choice was the Siplus HCS4300 control system, with detailed diagnostics that can detect internal faults in the load circuit, blown fuses, and a defective heater cable. Network voltage and internal temperatures are also monitored per zone. The heating on the machine is radiated top and bottom, with individually controlled zones for form and trim.

All communication is run over ASI Profinet. CAT3 safety compliance is provided.

On the proprietary off-loading station, SencorpWhite achieves a 99.5% breakout of the web and the off-loader feeds a parts stacker via a specially designed 5-axis servo and 3-conveyor motion handling system.

Brian Golden concludes, “At the end of the day, we want our customers to have more good quality parts in the box, with less waste, less energy consumed, and a lot more profit in their pocket. Simple, really,” he muses.
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