

Innovative Design Solves Automotive Parts Assembly Challenge

Weiss North America, Inc. of Willoughby, OH has designed and produced rotary tables and other components for the automation industry for more than 45 years. When approached by Alpha Integration, Inc. of Murfreesboro, TN, a manufacturer of turnkey automated assembly, vision and testing systems, to provide a reliable turnkey solution for their 6-foot-tall automotive parts assembly machine, Weiss ‘tiered-up’ an innovative chassis and indexing table system solution.

In the process of laying out the plan of the machine, Alpha’s senior mechanical design engineer, Sam Westbrooks, knew he wanted an open-center indexer to mount the tooling towards the inside of the dial system on a stationary center plate. This design configuration would accommodate ease-of-loading for its 12 load stations, as well as pro-



This automated assembly machine produced by Alpha Integration, required an innovative design and custom approach from supplier Weiss North America.

viding clear viewing of the processes and easier maintenance.

Additionally, to facilitate the tooling, the indexer would have to be 5 feet off the ground, which would require the base frame/chassis to be uniquely structured.

Tiered-Up/Open-Center Technology:

The key to the Weiss solution involved the stationary center plate, dial plate, and base frames. These were all manufactured and machined complete by Weiss at their Willoughby, OH facility and delivered to the client as a one-source, preassembled system. This allowed Alpha to build the nest and station assemblies offline so that they could be integrated to the dial system with ease.

At the core of the fully integrated system was the Weiss TR1500 rotary index table ring with a large open center—which offered an extremely low profile design with a high level of accuracy. The TR1500 ring allowed for optimal design space in a robust mechanical design. This also reduced the overall footprint of the machine with improved accuracy and access to parts.

Even with Alpha’s machine featuring 12 clip install stations, it proved no problem for the Weiss TR1500 series, which offers ring diameters of up to 2,200 mm — providing more than enough scope for coupling with processing stations.

The height limitations of the chassis design were overcome by utilizing one base frame that leveraged two other riser frames to make up the rest of the height. The first riser attached to the top of the base frame and supported the TR1500 index table that featured a 90.5" diameter tool plate. The second riser frame was used to support the electroless-nickel plated steel stationary plate. Ultimately, the frame/riser system design was able to lift the index table up to the specified height require-

ments, with the final system structure resembling a ‘three-tiered cake’.

The majority of the machine’s 12 stations required a press station to be bolted on top of the 1" thick steel stationary plate. These press assembly stations apply down forces onto the nests that are carried by the index table’s aluminum tool plate. To overcome potentially debilitating force of approximately 900 lbs. acting on the 410 lb. center stationary plate and index table, Weiss’ design leveraged an intermediate riser weldment going through the indexer and bolting to the middle riser frame which by-passed the indexer totally—creating a ‘no-forces’ solution onto the index table that promotes longevity.



Because there is no tooling in the way, the dial system is wide open for ease of loading and allows for an easier view of the entire production process.

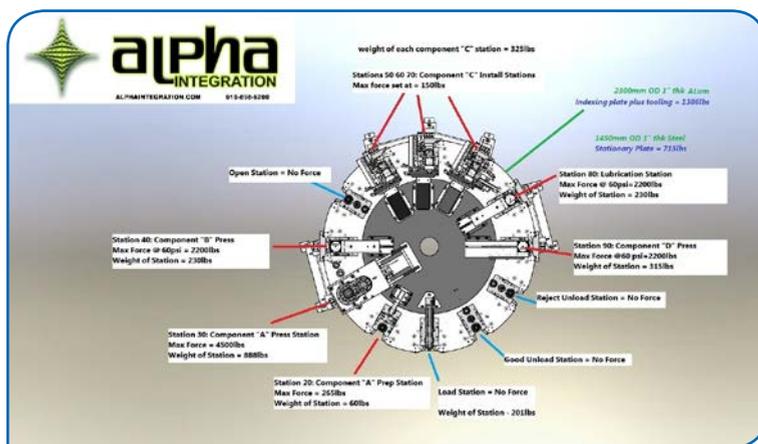
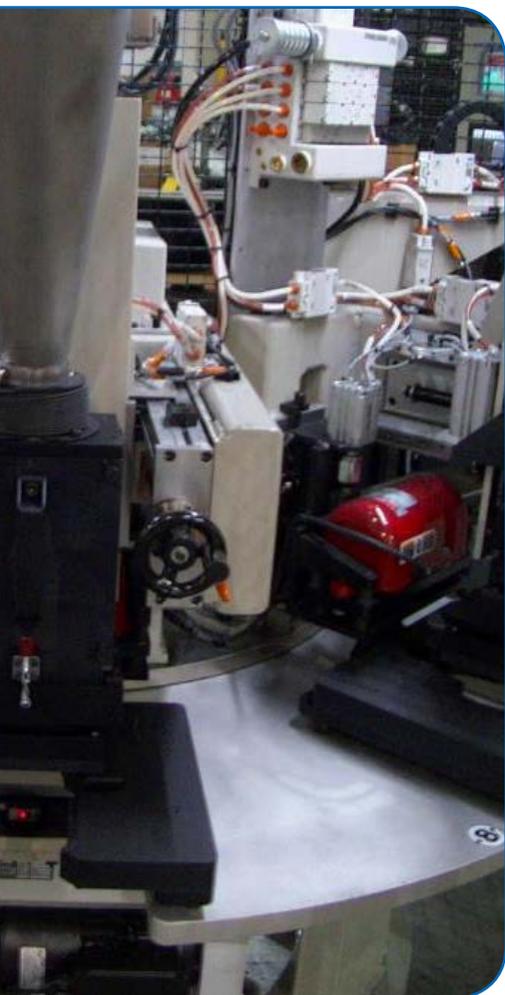
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All of the Weiss system's tables and rings offered accurate dowel holes on all mounting surfaces including the main casting for mounting to the machine base, the rotating dial plate for easy mounting of the tool plate, and on the center stationary plate. Alpha simply transferred Weiss' mounting hole pattern to their tool plate drawing, requiring no adjustment or reaming of dowel holes at assembly.

With the Weiss dial system design at the center of the assembly, Alpha was able to keep all of the tooling and mounting originating from the interior of the dial assembly—allowing servicing of the system to be much easier. Additionally, because there is no tool-



The system accommodates a wide variety of weights and loads while maintaining accuracy and long life.



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ing in the way, the dial system is wide open for ease of loading and allows for an easier view of the entire production process.

Even if Alpha had utilized a typical dial system design with a stationary center plate, the loads on the stationary center plates would have been extremely overhung and unstable—un-

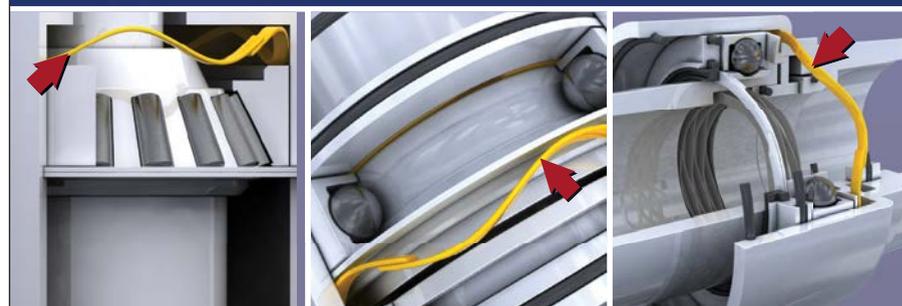
like what was achieved with the Weiss dial system.

Conclusion

The combination of robust construction and innovative, ‘open-center’ design allowed the Weiss engineering group to provide Alpha with a superior, one-source automotive parts assembly



To accommodate the downward forces generated by the assembly machine’s press stations, the Weiss design uses an intermediate riser weldment going through the indexer and bolting to the middle riser frame.



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solution—delivering a 26 second cycle time with an indexing speed of 2.3 seconds.

Finally, to facilitate the collaborative assembly design effort, Weiss’s engineers also used the same CAD/3D software (*Solidworks*) platform as Alpha Integration. According to Westbrook, “It was immensely convenient to send CAD files to and from Weiss to seamlessly share designs. It was like a breath of fresh air to work with a company that ‘spoke our language’ when it came to CAD/3D and design.”

Westbrook concluded, “By using Weiss for the complete system package, we don’t have to worry about getting plates or base frames made and finished. The system comes complete so the tooling can be installed immediately, which is efficient and convenient. Plus, the delivery times from Weiss were outstanding.”

Currently, three more of the same system configuration solutions are being manufactured and assembled by Weiss for Alpha Integration, Inc. **PTE**

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