The Boeing Company approached Bastian Solutions with requirements for a custom automated storage and retrieval system. They needed to store (20) large composite forming tools each 40 foot in length weighing over 7,000 pounds. The system was required to automatically load and unload tools from storage locations and convey them onto and off customer provided carts. In addition to the mechanical challenge of handling 40 foot long and 7,000 pound tools, the equipment needed to limit deflection of the forming tools to less than 0.05 inches over 10 foot lengths of the part.

Bastian’s solution to this project was a two tower vertical lifting system with a custom, pivoting carriage between the two towers. The drive system for the vertical travel of this unit is powered by (2) electric gearmotors, each equipped with a high resolution encoder wired to an advanced Variable Frequency Drive (VFD) allowing for synchronous motion and position control within specified tolerances. Position of the carriage is guided via precision linear bearings. Integrated into the carriage are (3) pairs of telescoping conveyors which interface directly with the tools. All telescoping conveyors are synchronized for simultaneous motion and extend over 4 feet to either side of the carriage to store and retrieve the tools. The racking is a custom design and was manufactured in compliance with seismic certifications required based on the installation location of this equipment. Each location in the storage rack is outfitted with custom leveling features to ensure that the minimal deflection requirement is met. An integral conveyor is incorporated into the base of the system for powered removal and insertion of the forming tools. The entire system is controlled by means of an integrated HMI which monitors system status and includes incorporated diagnostic and maintenance functionalities.

This project presented several unique challenges. Handling and storing (20) forming tools of this size in an area with seismic activity required our engineers to complete multiple Finite Element Analyses to ensure that the final design had the required integrity. Additionally, maintaining the specified tolerances required the incorporation of precision bearings and advanced electrical synchronization technologies into this equipment.
Applications
• Custom vertical storage units of all sizes and capacities

Specifications
• Overall dimensions: 48’ long x 25’ high x 12’ wide
• (20) unique storage locations
• 7,000 lbs. lifting capacity / 140,000 lbs. storage capacity
• 22’ of vertical travel
• Synchronized telescoping actuators
• System must minimize product deflection to less than 0.05” over 10’

Features
• Automatic storage and retrieval of the product in less than 3 minutes
• Smooth and level lifting by means of (2) synchronized electric motors
• (3) electronically synchronized motors power telescoping actuators
• Two sided storage system with central carriage which services both sides
• Integral conveyor system to transfer tools in and out of the system
• Storage and system inventory controlled via Human Machine Interface (HMI) & barcode scanning system

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