

TRENDS IN MACHINING – 6-AXIS CNC MACHINING

MACHINING REINVENTED: MORE AXES MEANS MORE EFFICIENCY

The continued demand for high quality components, coupled with an industry-wide push to enhance operational efficiency and drive throughput, is driving the emergence of 6-axis CNC machining systems

6-AXIS CNC MACHINING OVERVIEW

Steadily growing demand for high quality components from precision-focused end markets (e.g., aerospace and defense, medical, etc.) has driven meaningful investment in multi-axis machining systems over the last few decades, with 5-axis machining systems fast-becoming the industry standard for precision and efficiency. However, as a progressively larger share of the machining industry has embraced lean manufacturing methods to drive operational efficiency and margin expansion, a more efficient machining technology has emerged and is helping to redefine machining operations – the 6-axis CNC machine.

BENEFITS OF 6-AXIS CNC MACHINING

Whereas a 5-axis CNC machine provides two axes of rotational freedom (X and Y), which provides for significant additional efficiency over 3- and 4-axis configurations, a 6-axis CNC machine provides for a third rotation axis, with rotational capability across X, Y, and Z axes. This additional axis of rotational freedom allows for certain tool movements and transitions to be performed with a higher degree of speed. In the right setting and with the appropriate configuration, a 6-axis CNC machine can reduce cycle times by as much as 75%, and by eliminating the need to move a given part across multiple machine tools, a higher level of precision and consistency can also be achieved. Further, a 6-axis CNC machine can accommodate highly complex part geometries, making the technology ideal for end markets such as aerospace and defense.

LIMITATIONS OF 6-AXIS CNC MACHINING

The primary limitation of a 6-axis CNC machine is cost. The additional rotational axis of a 6-axis CNC machine makes the machine meaningfully more complex than its 5-axis counterpart, which inherently renders the 6-axis a more expensive initial investment and further makes system use and maintenance more costly.

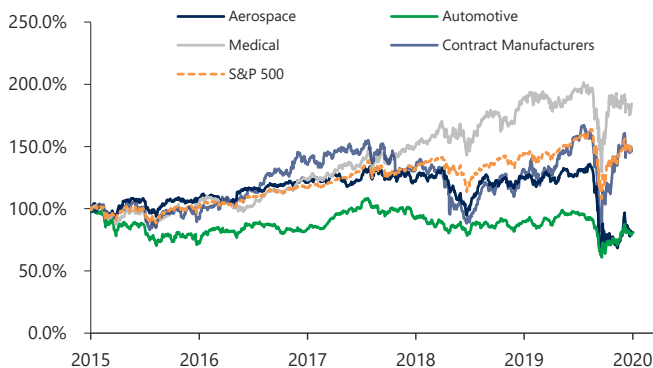
APPLICATION & OUTLOOK

To date, the application of multi-axis CNC machining systems (and particularly 5-axis and 6-axis systems) has been generally limited to machining operations that largely serve end markets that require extreme precision and complex parts. However, as other end markets require greater levels of precision, machining operations continue to embrace efficiency and lean manufacturing initiatives, and 6-axis system costs progressively decline, broader use of 6-axis technology is expected. Further, markets with significant production volume requirements (e.g., automotive) in which production speed is paramount are expected to drive adoption at a wider scale.

STOCK PRICES: KEY MANUFACTURING MARKETS VS. S&P 500

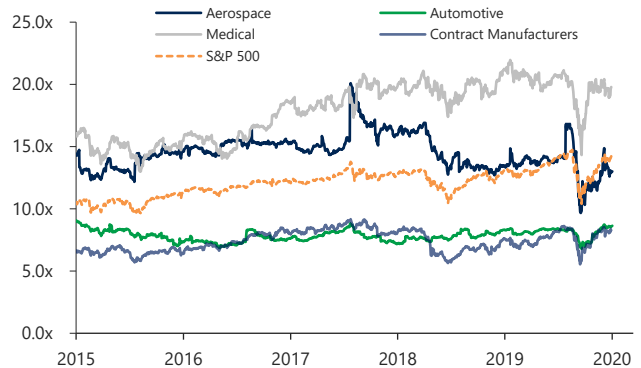
For the Five-Years Ended July 6, 2020

% change in share price



TEV / EBITDA VALUATIONS: KEY MANUFACTURING MARKETS VS. S&P 500

For the Five-Years Ended July 6, 2020



Sources: All3DP, Businesswire