Advances in Precision Positioning and Motion Control by Piezo

Article published on April 5th 2012 | Advertising

Precision motion control and high accuracy positioning systems are at the heart of almost any production and test system in vital high-tech industries such as semiconductors, bio-technology, nanotechnology and aerospace technology.

More and more industrial processes require precision positioning equipment of increasingly higher accuracy to satisfy the ongoing demands of miniaturization, improved efficiency and higher packaging densities.

Sub-micron precision, once found in physics and optics labs is now state-of-the-art even for commodity industries such as automotive. Leading automotive suppliers have to keep up with the ever increasing demands on efficiency and lower emissions and have found answers in building parts with much tighter tolerances to reduce friction and at the other end of the spectrum high-pressure injection valves are now manufactured by precision standards that were once good enough for the first generation of semiconductor fabs.

Recent advancements in the design and manufacture of precision linear motion stages and rotary positioning systems have a big impact on what motion engineers and instrumentation builders have at their disposal to design new machinery and production processes.

In addition to miniaturized precision positioning systems driven by high-accuracy ball screws and monitored by nanometer-precision optical linear encoders, new piezo ceramic linear motors are now available for special applications where conventional linear motors are too big or consume too much energy.

These piezo ceramic linear motors have several advantages for precision micro-positioning equipment. Not only are they significantly smaller than conventional electromagnetic motors, they also feature an intrinsic break functionality, i.e. once a position has been reached the motors auto-clamp and hold the position precisely to nanometers without any jitter and without consuming power or generating heat.

Miniature translation stages with sub-micron to nanometer precision are now available in the size of less than a matchbox. Some models can move as fast as 20â€• /second and accelerate with 10 gâ€™s. Novel interferometric, high resolution linear encoders provide sub-nanometer level position feedback to the motion controller. For maximum precision highly specialized PID servo-controllers are required that can adapt to the motion properties of the ceramic piezo motors. These are quite different from conventional linear drives and controllers may include dynamic adaptation of different gainsets, or switch between stepping mode and a highly dynamic linear mode.

Another recent advancement is the advent of hexapod parallel kinematic positioning systems for multi-axis precision positioning applications. Conventional multi-axis motion systems consist of stacks of single-axis positioners. While the system precision of these stacks may look good on a spec sheet, in reality, accumulation of errors due to runout and flexing of the individual components, as well as resonances and vibrations have a negative impact on the outcome. When sub-micron and nanometer level precision is required, nothing can be left on the table. With hexapod systems and parallel kinematics the workpiece is actuated simultaneously by multiple actuators, rather than taking a stacked approach. This increases the stiffness, reduces resonances and can also increase the responsiveness and overall multi-axis accuracy of a precision positioning system. However, design and control of these parallel structures is not simple and requires experience and well-

trained technicians for the manufacturing and assembly process. Credible manufacturers also specify both the accuracy of a single strut as well as the overall accuracy of the complete multi-axis precision positioning system.

Article Source:
http://www.articleside.com/advertising-articles/advances-in-precision-positioning-and-motion-control.htm - Article Side

Piezo - About Author:
Technology has always fascinated the technician inside me. And writing about the latest in technologies and mechanisms in usage has been my forte over the last few years. Follow my write ups to know about the latest in technologies and mechanisms this season for one. This fall a Precision Positioning and motion control are very much in demand among the technical and mechanical industries across the world. Keep yourself updated on these products exclusively from USA.

Article Keywords:
precision positioning

You can find more free articles on Article Side. Sign up today and share your knowledge to the community! It is completely FREE!