CCTY Tackles Humanoid and Industrial Robot Development

Reimagining motion control one application at a time

Matthew Jaster, Senior Editor

CCTY (Lake Zurich, IL) is a manufacturer of high-performance motion control and assemblies including spherical plain bearings, rod ends, mast guide bearings, self-lubricating bearings, tie rods, ball joints and more. CCTY is a full-service global engineering and consulting partner that helps customers quickly turn new product ideas into reality. *PTE* recently discussed the company's evolution with Yaman Obaid, a mechanical engineer specializing in robotics for CCTY.

Give us a brief history on CCTY. Where did you start as an organization and what do you hope to accomplish in the future?

CCTY specializes in the production of motion control products that include bearings, bearing assemblies and related components. The company was established in 1996 with a focus on research and development to provide individualized solutions for a range of industrial applications. Over the years, CCTY has expanded its expertise and product line to cater to additional sectors, including automotive, agriculture, and robotics.

The company's journey began with a commitment to quality and innovation, which remains at the core of its operations. CCTY is constantly investing in research and development to meet the customer's evolving demands.

Looking ahead, CCTY aims to continue its growth by advancing in the field of motion control technology. This includes contributing to the development of industrial and humanoid robots, which are becoming increasingly important in the modern world.

Describe the variety of motion control solutions (components and assemblies) CCTY provides to humanoid and industrial robotic applications?

CCTY specializes in designing and manufacturing motion control solutions tailored for both humanoid and industrial robotic applications.

Ball Bearing: These include radial, 4-point contact, angular contact, and flexible ball bearings, ideal for precise rotation in linear and rotary actuators and humanoid robot fingers. They are characterized by high precision, low clearance, low friction and the ability to handle both radial and axial loads.

Cross Roller Bearings: Located in the rotary actuators of humanoid robots and industrial arms, these bearings support axial loads from both directions, radial loads, tilting moment loads, and any combinations of loads. They boast high load capacity, high stiffness, precision, compact design, long lifespan, and low maintenance requirements.

Spherical Plain Bearings: Suitable for applications requiring three-dimensional motion, these bearings accommodate self-lubrication, high misalignment angles and offer near zero torque and clearance, with high precision.

Rod End & SPB Assemblies: Used in the joints of humanoid robots, particularly in linear actuator ends, rod ends allow for rotational freedom about all axes while maintaining a fixed point of contact. They are compact, optionally maintenance free, easy to mount, and can accommodate high misalignment angles, enhancing the robot's efficiency and durability.

RNN & Cage Needle Bearings: These bearings are utilized in planetary rotary actuators and wheel side reduction gears. They transmit torque and support radial loads while maintaining a compact design, reducing friction in robot arms and improving rigidity.

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What role do the bearings play in these applications? Why is a customizable approach to bearing design critical for these robotic applications?

Bearings are fundamental components in robotics, serving as the interface between moving parts. They transfer loads and facilitate smooth and controlled motion, allowing for precision in robotic applications. A customizable approach to bearing design is critical because each robotic application has unique requirements regarding load, speed, precision, and environmental conditions. Custom bearings can be tailored to meet these specific demands, ensuring optimal performance and longevity.

What are the benefits of samples?

Manufacturing short, application-specific runs, which we refer to as samples, allows for greater flexibility and customization. Samples enable rapid iteration and improvement of designs, which is essential in the fast-paced field of robotics where technology and requirements can quickly evolve.

Elaborate on the role that torque and clearance play in these applications as well as other areas where precision and reliability are critical to success.

Torque and clearance directly affect energy consumption and motion accuracy of robots. Torque or friction, the force needed to cause rotation, must be minimized to ensure efficient operation and reduce energy consumption. Clearance, the space between moving parts, must be carefully controlled to prevent excessive play, which can lead to imprecision, excessive wear and noise.

How does backlash fit into product design and the impact it has on humanoid movement?

Backlash, the looseness or play between parts, can significantly impact the accuracy and smoothness of humanoid movement. Minimizing backlash is essential to maintain precise control over the robot's movements, which is particularly important for tasks requiring high levels of dexterity and coordination.

What role do lubrication and seals play in robotic applications?

Lubrication and seals are crucial for the longevity and reliability of bearings in robotics. Lubrication reduces friction and wear, while seals protect against contaminants that can degrade the bearing's performance. Together, they ensure that the bearings operate smoothly and require less maintenance over time.

What challenges are manufacturers facing in the humanoid and industrial robot market segment and how can CCTY help solve many of these challenges?

In the humanoid and industrial robot market, manufacturers encounter many challenges, including the demand for precise motion control, increasing energy efficiency, and longevity. The bearings must meet stringent specifications, like near zero friction, minimal clearance, high accuracy, and long lifespan. CCTY is as much an engineering company as it is a manufacturer and is well equipped to tackle these issues. CCTY engineers work closely with customers, aiding in the design process to ensure optimal performance. Through specialized bearing design and sophisticated manufacturing processes, the company manufactures tailored solutions and conducts comprehensive on-site testing, ensuring that each bearing is perfectly suited to the unique demands of its application. This approach not only addresses the immediate challenges but also contributes to the longevity and reliability of robots.

How does CCTY's experience in bearing design help the organization develop full assemblies requested by the customer? What are the benefits of these full assembly solutions?

CCTY's expertise in bearings is drawn from years of experience designing, developing, manufacturing, and testing a variety of linkages and high-precision rolling and sliding bearings. With the advantage of an in-house forging, machining, heat treating, assembling, and testing facility, CCTY guarantees exceptional quality control and expedited sample turnaround times.

When customers opt for full assemblies can expect a multitude of benefits, as follows:

- Design optimization for reduced weight and size
- Minimized tolerance stack-up for improved accuracy
- Reduced friction/torque for enhanced energy efficiency
- Minimized clearance for precise motion control
- Incorporate a seal and lubrication to prevent rust and contamination
- Integrate the bearing into surrounding components to facilitate cost reduction

Customers who request full assemblies can benefit from a more streamlined assembly process and supply chain, coupled with enhanced component performance. These full assembly solutions, meticulously optimized for performance, reflect CCTY's commitment to delivering superior, ready-to-integrate components that advance the capabilities of the robots into which they are incorporated.

How will humanoid and industrial robotic applications evolve in the coming years?

The evolution of humanoid and industrial robotic applications is likely to focus on increased autonomy, adaptability, and integration into human-centric environments. Bearings will play a crucial role in this evolution, with ongoing advancements in materials and engineering contributing to more sophisticated and capable robotic systems.

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