

The Outcome is Only as Interesting as the Process

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The year has started strong for AGMA's Emerging Technology activities, with some of the highest registration numbers to date. (Recordings of all webinars are available for free at: agma.org/events-education/on-demand-webinars). I'd like to highlight our March webinar, where we debuted the committee white paper "The Near Future of Mechanical Drive for Humanoid Robots" alongside a panel of experts who contributed to it.

The paper examines the recent surge in investment, projections, and technological advancements in humanoid robotics over the last eight months of 2024. Its primary focus is how the mechanical components market could be impacted if these ambitious forecasts come to fruition, especially in actuators and gearboxes.

Special thanks go to the paper's author, Jacques Lemere, Principal at PBD Consulting, and the Robotics Committee Chair, Robert Kufner, President and CEO of SDP/SI-Designatronics, Inc., along with the content specialists and Robotics Committee members who provided valuable input throughout the process.

One of the highlights of my role is the off-camera conversations during committee meetings. At our most recent Robotics Committee meeting, one member made a compelling point: it's unlikely that one machine can handle every task. Drawing from his expertise in consumer products, he noted that we don't design products to do everything. Expecting humanoid robots to walk on two feet and handle tasks as varied as folding clothes and assisting elderly parents is like designing a car to drive, fly, and float—it's inefficient. The discussion was lively, with some passionate comments, and I left with greater insight. I'm grateful to the committee members for their time and expertise. I encourage you to join us for a committee meeting to contribute to these important discussions.

The paper addresses two key questions:

What will it take to meet the production numbers forecasted in recent economic reports?

How can manufacturing scale to meet these demands, particularly regarding gear components?

It starts with a brief history of humanoid robots and the evolution of drive components used in biped models. It then outlines two major differences between humanoid and industrial robots:

Power Source—Humanoid robots will be battery-powered, unlike DC-motor-powered industrial models.




Backdrivability—Since humanoid robots will interact with humans, safety is crucial. Consumer product laws will guide these requirements.

The paper also explores current gearbox designs in humanoid systems and how they may need to evolve. It examines emerging technologies that could address these challenges, including plastic gears, nanocomposite coatings, integrated actuation systems with low gear ratio planetary gears and affordable mechanical joints.

AGMA's Emerging Technology initiatives continue to drive important conversations within the robotics community. The white paper provides a thorough examination of the rapidly advancing humanoid robotics sector and its potential impact on mechanical components. The passionate discussions at committee meetings underscore the complexity of balancing technological innovation with practical, cost-effective solutions. As the industry moves forward, key challenges such as safety, reliability, and cost must be addressed to enable the successful deployment of humanoid robots.

The secret to a great committee meeting is passionate conversation. We encourage you to engage with these discussions and help shape the future of humanoid robotics by joining future webinars and committee meetings.



		
MOTION	BEHAVIOR	MECHANICAL DESIGN
Predictive safe motion Advanced computation	AI supervision and decision making	Low weight, low inertia, back-drivability, backlash errors, reliability

Humanoid failure categories.