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# THK:

## Shaping the Future of Service Robotics

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Since the early 1960s, robots have been automating “dirty, dangerous and dull tasks” in factories.<sup>1</sup> Because of their inability to adapt to variations in their environment, industrial robots typically operated in highly controlled spaces and executed precise commands. However, with the emergence of 3-D sensors, artificial intelligence, machine vision and other technologies, robots now can safely work alongside humans, opening up new possibilities for robots to be used in manufacturing and non-manufacturing applications.

Coinciding with the advancements in robotics technology, demand for non-manufacturing robots, or service robots, is surging. Annual shipments of personal service robots are projected to rise from 6.6 million units in 2015 to 31.2 million units worldwide by 2020.<sup>2</sup> Professional service robots are experiencing a growth spurt as well: The global market for medical robots is expected to surge from \$4.2 billion in 2015 to \$11.4 billion by 2020,<sup>3</sup> while the market for agricultural robots is

forecast to grow from \$3 billion in 2015 to nearly \$74 billion by 2024.<sup>4</sup>

To tap into the rapidly growing market for service robots, manufacturers need a partner with the expertise and technology to help them maximize the performance of their products, while minimizing costs and simplifying their operations. This case study shows how THK is helping robotics manufacturers on these fronts.

## DEFINITIONS

**Industrial robot:** An automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in industrial automation applications.<sup>5</sup>

**Service robot:** A robot that performs useful tasks for humans or equipment, excluding industrial automation applications. The classification of a robot is made according to the robot's intended application.<sup>6</sup>

- A **personal service robot** is a service robot used for a non-commercial task, usually by laypersons. Examples include household cleaning robots, lawn-mower robots, personal-assistant robots, automated wheelchairs, pet-exercising robots, and toy and educational robots.
- A **professional service robot** is a service robot used for a commercial task, usually by a properly trained operator. Examples include delivery robots, firefighting robots, robot-assisted surgical and treatment systems, driverless tractors and unmanned aerial vehicles. In this context, an operator is a person designated to start, monitor and stop the intended operation of a robot or a robot system.

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## Building the Next Generation of Service Robots

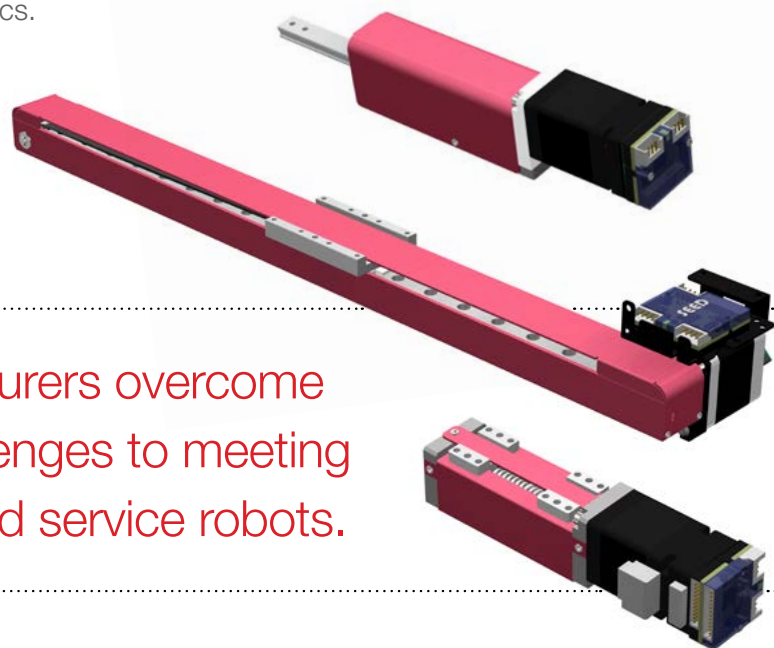
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PwC points to several factors setting the stage for “radical growth” in the service-robot industry: continuous technological innovation; wider awareness and acceptance of robotics applications; rising costs for human service labor; and the emergence of modular, open-source software platforms.<sup>7</sup> But manufacturers still face a number of technical hurdles when delivering on the promise of service robots. Those hurdles include improving manipulation capability, ensuring human safety, making robots simpler to use, and reducing the cost and size of robots.

THK is helping manufacturers overcome some of the critical challenges to meeting the demand for advanced service robots. Building on its groundbreaking linear-motion technology that has been a catalyst for innovation in manufacturing, medicine, security, construction and other fields, THK recently developed a set of components to help shape the future of medical robotics.

Collectively known as Seed Solutions, the technology includes actuators, an operating system, sensors and network communications capability. Increasingly, manufacturers, designers and researchers are leveraging Seed Solutions to accelerate their efforts to develop the next generation of service robots.

Seed Solutions is driving progress in advanced service robotics on several fronts. The miniaturized actuators and operating devices fit neatly inside the robot, eliminating the need for the large external control boxes commonly used to operate conventional robots. The programs governing the robot’s movements are stored inside as well, enabling the robot to move independently. Also, the modular design of the robotic systems provides a simpler and more efficient way to build the right robot for the task.



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In addition to Seed Solutions, THK's portfolio of rotary actuators and components is playing a key role in developing the next wave of advanced service robots.

For example, robotics makers are specifying the THK Micro Cross-Roller Ring RAU as a cost-effective alternative to conventional angular contact ball bearings. Because one cross-roller ring provides more rigidity than a double-row angular contact ball bearing — in a more compact package — the THK Cross-Roller Ring enables manufacturers to produce smaller, lighter robots, while reducing their machine tolerances and simplifying procurement. The RAU and other THK components — such as the Double-Row

Angular Contact Roller Ring RW — offer another key advantage. Because of their integrated design structure, the inner and outer rings have mounting holes. They allow the component to be directly mounted to the machine without a presser flange, saving time and money on installation and labor.

Since its inception in 1971, THK has been leveraging original technology and inventive ideas to transform the products and processes that propel human progress. In keeping with its legacy as an innovator and a trailblazer, THK is working closely with the R&D facilities, government agencies and OEMs that are developing the next generation of service robots.



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## Conclusion

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Until recently, the notion of a robot mowing the lawn or delivering a toothbrush to a hotel room might have seemed like the stuff of science fiction. But thanks to a convergence of emerging technologies and market forces, robots are making their way into everyday life — and creating new opportunities for robotics manufacturers.

Supporting its mission of developing innovative products and accelerating trends that support a higher quality of life, THK is playing an important role in launching the next generation of advanced service robots. With components and systems that enhance performance while reducing the size and cost of robots, THK is helping bring the next generation of advanced robots out of factory cages and into homes, offices, hospitals and hotels around the world.



THK is the pioneer of Linear Motion Systems. Today, our LM Guide is an indispensable component of mechanical and electronic systems in a wide variety of industries. The versatility of our products and their wide use across applications have made us an industry leader with sales upward of \$2.6 Billion. Learn more at [www.thk.com/us/resources](http://www.thk.com/us/resources).

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<sup>1</sup> [“Service Robots: The Next Big Productivity Platform,”](#) Vinod Baya and Lamont Wood, PwC

<sup>2</sup> [“Nearly 100 Million Consumer Robots Will Be Sold During the Next 5 Years,”](#) Tractica, Nov. 23, 2015

<sup>3</sup> [MarketsandMarkets](#), November 2015

<sup>4</sup> [“Driverless Tractors and Drones to Be Among the Key Applications for Agricultural Robots,”](#) Tractica, Jan. 20, 2016

<sup>5</sup> [International Federation of Robotics](#)

<sup>6</sup> [International Federation of Robotics](#)

<sup>7</sup> [“Service Robots: The Next Big Productivity Platform,”](#) Vinod Baya and Lamont Wood, PwC

