

Amoeba Management: Fusing Technical Assets and Enabling New Technologies. What Lies at the Heart of Our Latest R&D in Transportation Infrastructure?

The Kyocera Group has produced a broad range of technologies primarily based on fine ceramics. Our goal is to bring these underlying technologies together to create new advances that contribute to society. One example of this is our new initiative in transportation infrastructure development begun this year.

Amoeba groups that pursue a common ideal

Since its founding in 1959, Kyocera Corporation has based its corporate management on the bonds shared by its employees. The common criterion for decision-making among our employees involves the question: "What do we consider to be the right choice as a human being?" As a result, Kyocera Group employees have been imbued with a spirit of support for each other, sharing one another's challenges and celebrations, which continues to this day.

Kyocera Corporation's unique 'Amoeba Management' approach was also born out of this philosophy. Under this system, each business segment, product line, and manufacturing process consists of many small, quasi-independent organizations, known as amoebas, which continually create what customers currently want and anticipate society will need in the future, based on a common sense of what is right. Amoebas evolve and can divide or co-exist alongside one another. Similarly, the amoebas that make up the Kyocera Group pursue their own goals, and collaborate with other amoebas when common goals are created.

This also applies to technology development. Throughout the history of the Kyocera Group, beginning with the development of the U-Shaped Kelcima used in early televisions, we have consistently expanded the applications for fine ceramic technologies in

support of global needs, developing bonds within our Group, and a spirit of cooperation and collaboration that has served us well over the years.

It must be said that, with rapid technological advancement, one technology is continually being supplanted by another. However, we never let accumulated expertise fall by the wayside. This is because we believe knowledge developed through tireless efforts over the years can serve society in new ways in the future.

Our pursuit of transportation infrastructure development, which goes beyond the amoeba framework, is one such example.

Bringing our technological assets to bear

Today society faces various issues concerning mobility, including inadequate public transportation for those who need it the most, continuing traffic fatalities, and the need to comply with environmental regulations. Can the Kyocera Group pool its existing expertise to develop new technologies that benefit people's lives? This question lies at the heart of our latest challenge.

The Kyocera Group has almost 30 years of experience in developing wireless communication technologies. We developed our first mobile phone in 1991. Following this, we developed our first wireless network equipment in 1994, and a new business was born for Japan's PHS system.

Our communications business served as a foundation for PHS infrastructure, developing a total of 400,000 base stations.

Following the reduction in scale of the PHS business over time, we shifted our attention to transportation infrastructure as an area where we could potentially utilize this communications infrastructure technology to serve society.

This highly developed technology can also be easily adapted to work with 5G networks, which began operating in many markets in the spring of 2020. While 5G allows for high-speed communications, multi-spot connections, and high-definition video, problems persist with coverage area. To solve this problem, Kyocera Corporation developed 5G Smart Routers, which can optimize data loads within our own local 5G systems.

The Group has also played a role in a broad range of business initiatives involving in-vehicle equipment. The Group provides our vehicle-centered society with a wide range of technologies, including optical components such as automotive cameras, displays, and lenses. We are currently developing an AI in-vehicle camera which uses deep learning to provide high-accuracy object recognition, and a millimeter-wave radar that integrates blind-spot detection sensors, parking assistance, and space-detection sensors.

We hope to help achieve a sustainable society in which all people enjoy enhanced

mobility freely and safely, with less environmental impact, using solutions developed by fusing diverse technologies. As a company that has relentlessly pursued technology development on a broad scale, we believe this is the next mission we should achieve.

Towards the development of a free and safe transportation network

We are currently pursuing two transportation infrastructure development projects.

One is a self-driving system for buses.

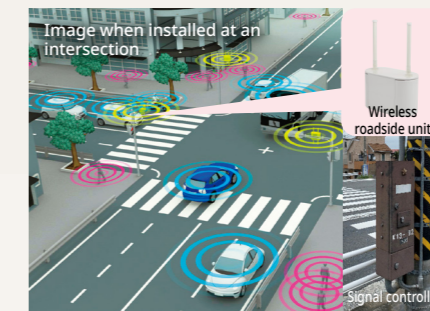


Autonomous driving relies on highly advanced sensing and communications technologies. Kyocera Corporation is involved in the Mobility Innovation Consortium backed by the East Japan Railway Company. Kyocera was responsible for road-to-vehicle communication as part of the self-driving bus trials held on Japan's Kesennuma Line BRT in FY2020. We installed Intelligent Transport System (ITS) roadside units and controlled road-to-vehicle communications. This project also involved verifying wireless communications on BRT roads, and testing autonomous braking systems when an obstacle is detected in bus's path.



We also participated in trials involving trucks in a convoy on the Shin-Tomei Expressway, where sensing solutions with millimeter-wave radar and stereo cameras proved to be of great benefit. Whether in rural or urban areas, public transportation will remain essential. We hope to help support this need in some capacity.

A second development project serves to promote the use of signal-cooperative roadside units and smart-pole ITS systems on public roads.



Wireless roadside units and sensors in traffic signals can transmit information to cars, assist self-driving vehicles, and prevent missed signals when a person is driving. Smart-pole ITS is a system that can be installed in street lamps and utility poles where traffic signals are not present. This system can alert drivers to danger in real-time, using peripheral sensing technologies to help prevent accidents at intersections that lack traffic signals. In the future, this system could also make self-driving safer by sending hazard information to autonomous vehicles, which would help support the adoption of autonomous driving.

We believe this system will ultimately become an indispensable part of our lives, with expanded functions to help emergency vehicles pass through congested traffic, prevent vehicles from entering railway crossings, supervise children in the neighborhood, and in help provide aid in the event of a disaster.

Companies exist for people

Ever since our founding we have hoped to see our ideas spawn unprecedented new technologies that contribute to society, and bring happiness to people worldwide by improving the safety and convenience of their daily lives.

Transportation infrastructure development represents just one of the initiatives we have adopted, with multiple divisions collaborating with countless amoebas, including planning and marketing, sales, operations, maintenance, production and quality assurance.

However, we do have a conviction. We firmly believe that each technology we develop serves not just as a company asset, but also as a seed from which other new technologies will one day spring, helping to change people's lives, and society, for the better.

The history of the Kyocera Group is a history of technological development. We hope to advance the extensive range of technological assets left to us by our forebears to develop a safe and secure transportation infrastructure that brings freedom of mobility to a new level. We will continue to rise to the challenge in pursuit of this social mission.

