

# CONTRIBUTION TO ADVANCED TECHNOLOGY INNOVATION

## Contributing to a Healthy and Long-Living Society

Super-aging society is already creating issues such as increased medical care expenses and elder-to-elder nursing. Extending healthy life expectancy without daily assistance or care is now an issue that our society faces.

Healthcare methodologies and techniques will likely change during the coming years. Examples of this shift include the development of diagnostic technologies for early detection of disease as well as advances in highly effective treatments and pharmaceuticals to treat serious diseases at early stages.

Speeding up the practical application of advanced therapies for quick delivery to patients—that's JSR's challenge.

### Medical Care Trends and JSR's Life Sciences Business Fields

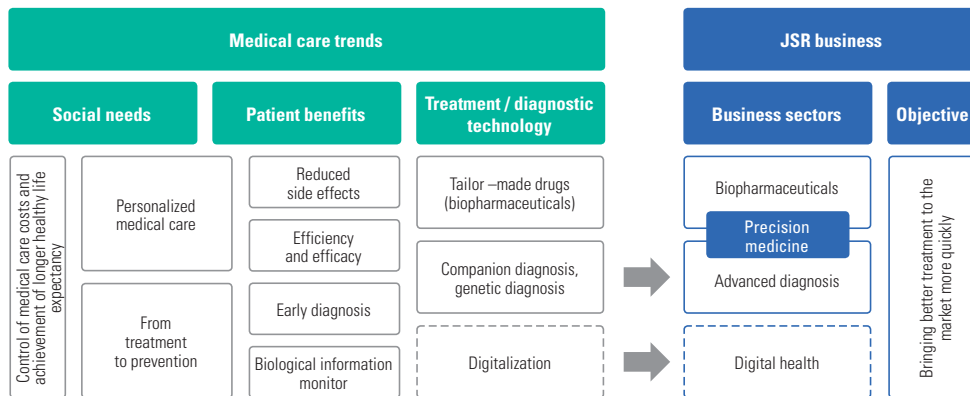
As drug development becomes increasingly sophisticated, the cost and time required to develop drugs is growing and becoming a major issue within the pharmaceuticals industry. It has been reported that, between 2006 and 2014, the

cost required for major pharmaceuticals companies of the world to commercialize one molecule as a drug was between 3.2 and 32.3 billion dollars (roughly between 300 billion and 3 trillion yen).<sup>\*1</sup> Moreover, the average length of time needed for a new drug to reach the market was 12 years.<sup>\*2</sup>

Advancements in innovation and analytical technologies as well as new understanding of biology have made drug discovery—and particularly the biologics and precision medicine fields—more complex. In accordance with such medical care trends, JSR Group is developing businesses centered on the bio-pharmaceuticals and advanced diagnosis fields. Moreover, we will continue working to raise treatment development success rates, shorten development periods and improve treatment efficacy in bio-pharmaceuticals-centered fields.

\*1 Source: Shuhmacher, Gassman, Hinder, Journal of Translational Medicine

\*2 Source: California Biomedical Research Association



## Contribution to Quality of Life and Happiness

The materials developed through our Digital Solutions Business contribute to the creation of newer and better computers, microchip-equipped electronics and digital communications devices, and these, in turn, add value to society.

As the ongoing digital revolution continues to evolve, we expect that such materials will have an important role to play in addressing the societal challenges embodied in the SDGs; thus, in order to contribute to a better quality of life and happiness for society, the JSR Group is expanding its business across the entire range of advanced materials essential to the digital revolution.

### Society and the Coming Digital Revolution

Today, when life without computers and the Internet is no longer imaginable, an even greater revolution is underway.

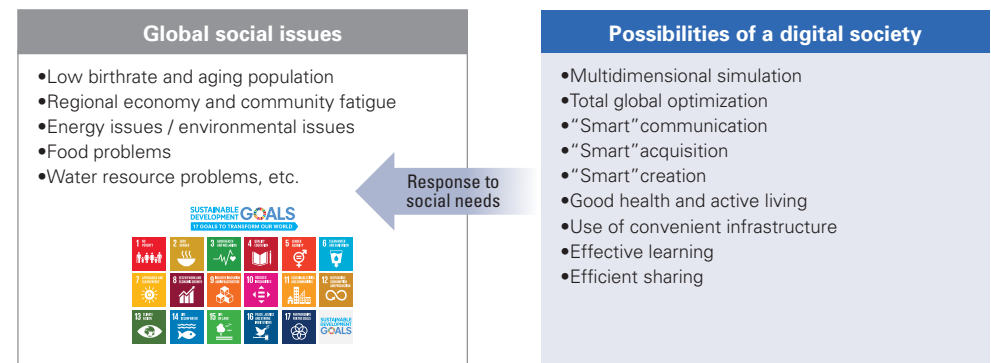
Internet of Things can connect the virtual world with people and things. Cloud computing collects an incredible amount of data (Big Data) in the cloud and the data can be stored and shared over the Internet. Artificial intelligence becomes dramatically smarter while learning an enormous amount of data collected, and it can also learn by itself (Cognitive Computing). Such technological innovation and data utilization will lead to the solution of global issues that could not be dealt with until now.

The digital solutions business of the cognitive computing age will need more than a materials-based approach whereby it simply supplies functional chemical products—specifically, differentiated high-value products. It will also require an approach that involves providing solutions that are matched to customers' needs. For this reason, JSR's Digital Solutions Business ascertains information and knowledge on cutting-edge social trends quickly and precisely as an organization, and with focus on the customer, it enables them to link to expeditious solutions. It provides added value for the resolution of social issues through products.

For example, to address the social issue of realizing a healthy and long-lived society, it is developing materials for wearable devices that will make constant health management possible. Also, to tackle the social issue of ensuring equal educational opportunities, it is developing e-book materials that will help to improve educational accessibility.\*

JSR's Digital Solutions Business will quickly respond to social change and contribute to the development of society utilizing IoT and Big Data. Our goal is to help bring about a more prosperous society for each and every person of the world.

\*Educational accessibility: The ability to access and use educational environments without physical, informational, institutional, or psychological impediments, regardless of disability or other physical or mental circumstances or living environment.



Source: Prepared based on materials of the Ministry of Economy, Trade and Industry's "New Industrial Structure Vision"

# CONTRIBUTION TO ADVANCED TECHNOLOGY INNOVATION

## Contribution to Global Environmental —Conservation Eco-Friendly Products—

Because both humans and innumerable other living things share this planet Earth, we must make an earnest effort to deal with environmental issues. JSR Group has adopted its E2 Initiative™ as a concept to simultaneously reduce environmental impact and create new business opportunities using the environmentally-friendly aspects of our products.

### Working to Solve Environmental Issues through the Deployment of E2 Initiative™

JSR Group's "E2 Initiative™" is a clear and important concept of "environmental value creation" that we constantly have in mind as we manufacture our products and develop our business.

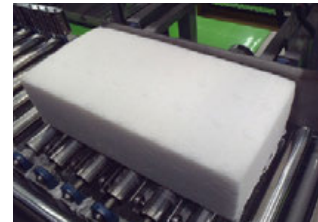
It is also used as a concept that allows us to work toward solving problems in environmental

burden, resources, and climate change when we carry out our business activities.

The E2 Initiative™ is based on "Eco-Innovation," which is designed to create business opportunities based on the environment, and "Energy Management," which is focused on reducing CO2 emissions. It is a concept that allows us to create value both in active and passive ways. As we shifted our concept of value from the conventional two approaches of "differentiation" and "cost," our new concept of "environmental performance" has become essential.

By using the "Life Cycle Assessment (LCA)" to evaluate the "environmental impact" of our products from the design stage in the product development to the use of the product, we are working to solve environmental problems throughout business operations.

### Contribution with Eco-Friendly Products — SSBR: A Synthetic Rubber for Low Fuel-Efficient Tires with Great Potential in the Effort to Solve Global environmental Issues



SSBR before packing

Fuel-efficient tires are environmentally-friendly products and yet maintain their ability to stop safely and securely. JSR Group's polymerization SBR (SSBR) solution has received positive feedback from customers. JSR Group designed SSBR using technology that more readily facilitates rubber molecules and tire reinforcing material molecules to bond tightly, which reduces internal friction and rolling resistance\*.

In addition, this is achieved without changing the characteristics of rubber that enable tires to stop. SSBR allows large reductions in environmental impact through the entire lifecycle of the tire, from the material selection and its usage to disposal.

Automobiles will still require tires even after automotive engines are replaced with electric motors. Thus, demand for SSBR is high both in countries and regions where environmental standards are high, such as Japan and Europe, and in emerging nations where reducing transportation-related environmental impact is an urgent issue. Amidst the rapid pace of automotive electric motor adoption, SSBR not only adds lower rolling resistance to tires, it also contributes to

wear resistance and durability, thereby helping to maintain long-term performance. In addition, SSRB helps in meeting the growing demand for all-season tires that can be used year-round by adding a degree of softness that ensures even tires with safe stopping performance in the summer can also provide reliable stopping performance on cold road surfaces.

Within the JSR Group, we are constantly working on delivering more of this sort of added value through the innovative SSRB products that we develop and bring to market.

The JSR Group currently manufactures SSBR in two countries: At the Yokkaichi Plant in Japan and JSR BST Elastomer in Thailand. Additionally, production is scheduled to start at JSR MOL Synthetic Rubber in Hungary in 2019. We will continue helping to solve global environmental issues by meeting the global demand for fuel-efficient tires.

\*Rolling resistance: Resistance in the direction opposite to the direction of tire rotation.



JSR MOL Synthetic Rubber Ltd.



JSR BST Elastomer Co., Ltd.

