SIEMENS
Ingenuity for life

Materials

Company Core Technology

Background

In the future of industrial manufacturing, products will be created in a networked process that encompasses every step in the value creation process, from material selection to design to production. Materials and materials technologies will be integrated in this process and play a key role.

Innovations in materials will make possible new products with new functionality, longer service life and higher performance, all of which will result in enhanced customer benefits. For example, increased efficiency for gas turbines can only be achieved with highly specialized materials, and electric aircraft depend on lightweight materials. Innovations in materials can also contribute to cost reductions. For example, new insulating resins reduce the material usage in power plant generators.

Importance for Siemens

Materials technology is a key technology for many Siemens products and has a crucial effect on their competitiveness. The objective of our research activities is to achieve or safeguard technological leadership for Siemens in the fields relevant to our business.

Given the great importance of materials technology, this cannot be done by simply buying materials or upstream products, so Siemens develops proprietary materials and production solutions for components and systems. This also involves establishing our intellectual property rights. In addition, Siemens develops and supplies software and equipment for digital product creation with solutions for material-specific design and production processes, in particular for flexible and customized production with 3D printing systems.

Success stories and research focus

To ensure that innovative materials become profitable products, Siemens works on the entire value creation process, from materials processing to component production. To fully exploit the potential of these high-tech materials, components made of materials such as brittle ceramics or innovative fiber-reinforced composites are designed appropriately, with modeling and simulation playing a central role. In many cases, new materials facilitate resource conservation and more efficient production processes.

Gas turbines are an example of the crucial role materials play in system performance. The efficiency of these machines, and consequently the cost-effectiveness of electricity generation, is highly dependent on the combustion temperature. Continuous improvements in metal alloys and ceramic protective coatings helped to increase the efficiency of Siemens gas turbines in combined-cycle operation to today's level of 62 percent. With the development of new materials, an increase in efficiency to more than 65 percent is expected in the coming years.

Another example is the use of carbon or glass fiber reinforced plastics. These composite materials feature a unique combination of high stiffness and strength with low specific weight, making them of particular interest for the rotating parts of turbines or motors. Their low weight reduces centrifugal forces, so parts can be made larger without overloading their mountings. This increases the efficiency of the machines. In electromobility, lightweight designs are a critical requirement for low energy consumption and long range.

For new generators, new insulating resins ensure longer service life and lower costs. The generators produce voltages of up to 27,000 volts. Discharges through the air can destroy them. Material systems that influence the electric field prevent such discharges. This allows a generator to be built more compact for the same output, resulting in the use of less copper and insulation.

Digitalization of materials technologies offers new opportunities, making it a focus of development. Digital 3D models increase the flexibility and quality of manufacturing for components such as those in gas turbines. Automated repair processes using specially developed materials help to reduce system down time and increase quality.

Further information

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