National Aeronautics and Space Administration

Industrial Productivity

Spinoffs

As NASA designs new components for its aeronautics and space missions, engineers are developing needed processes and materials to accomplish this cutting-edge work. Oftentimes, these innovations find direct application in the commercial industrial realms, allowing manufacturers to save money and time, improve the quality and lifespan of products, and rework the ways products are designed and assembled. NASA's innovations have, among other things, led to the development of machines that run hotter and longer, created stronger joints and fittings, and made industrial products lighter and more efficient.

Open-Lattice Composite Design Strengthens Structures

IsoTruss, a lightweight grid structure developed with support from NASA, is as much as 12 times stronger than steel, inexpensive, and fully recyclable. It can be used for utility poles, reinforcement of concrete structures, prostheses, and sporting goods.

High-Temperature Powdered Lubricant Saves Millions of Dollars

PS300, a high-temperature, solid lubricant coating developed for use in oil-free turbomachinery, is capable of operating at high temperatures with increased reliability, lowered weight, reduced maintenance, and increased power. PS300 has found wide-spread industrial application and is saving the manufacturing industry millions of dollars.

Textiles Conduct Electricity

Seeking lightweight alternatives to heavy copper wiring, NASA partnered with industry to develop hybrid metal-polymer wire that is now replacing signal wiring in commercial electronics and could potentially create electrically conductive "smart" garments.

Computational Modeling Develops Ultra-hard Steel

A NASA helicopter test rig provides fatigue testing and evaluation of gears. Using this rig, an industry partner tested and developed steel that outperforms current alloys used for aviation gears. Uses for this new class of steel are limitless.

Ultrasonic Monitor Enables Industrial, Medical Applications

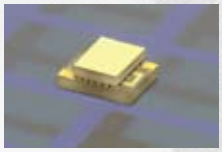
A radio frequency monitor for testing tension and high pressure loads on bolts and fasteners is now used for nondestructive evaluation of railroad ties, groundwater analysis, and as a medical device to assess internal swelling and pressure. Applications for this device continue to expand.

Sensors Increase Productivity in Harsh Environments

NASA licensed robust, silicon carbide pressure sensors—developed to improve jet engine testing—to a company that is now exploring the sensors' use in commercial jet testing, deep well-drilling, and in automobile engine combustion chambers.

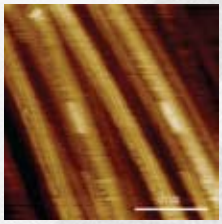
Innovative Tools Advance Revolutionary Weld Technique

Friction stir welding (FSW) creates a superior weld to traditional methods but leaves a hole when the rotating pin, which creates the weld, exits the joint. The solution—a NASA-invented auto-retractable pin tool—is now featured on commercial FSW machines used to construct piping, armor plating, and rockets.



Thermoelectric Devices Cool, Power Electronics

NASA thermoelectric technology developed for powering deep space missions now enables thin film thermoelectric devices that can act as either coolers for powerful, tightly packed microchip components or generators for medical implants and wireless sensor networks.



Methods Reduce Cost, Enhance Quality of Nanotubes

An efficient new process for mass manufacturing carbon nanotubes—a remarkable material that may lead to lighter, stronger spacecraft—may soon supply nanotubes for advanced body armor, printable electronics, and "green" innovations like more affordable solar panels and low-energy lighting products.

'NASA Invention of the Year' Controls Noise and Vibration

NASA's Macro-Fiber Composite—designed to control vibration, noise, and deflections in composite structural beams and panels—is now part of a commercial line of actuators used by major automobile and appliance companies and incorporated into audio speakers, microphones, and sports equipment.

For more information about NASA spinoffs, please visit **spinoff.nasa.gov**.

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