Space Coatings for Industry

A line of lubricants and protective coatings derived from space technology heads a sampling of spinoff products and processes contributing to industrial efficiency and productivity

A spinoff coating helps control "outgassing"—material burnoff—in solar collection systems, thereby preventing loss of heat-collecting efficiency. The coating is used on the Sunpump Solar Energy System shown, which is produced by Entropy Ltd., Boulder, Colorado.

In the early 1960s, when space flight was in its infancy, NASA experienced a problem in developing a Sun-study spacecraft known as the Orbiting Solar Observatory (OSO). NASA's contractor for OSO—Ball Aerospace Systems Division, Boulder, Colorado—found that conventional lubricating materials, developed for Earth conditions, were unsuitable for use on satellite moving parts and instruments that would be exposed to the vacuum of space for months and even years.

So, to meet OSO requirements, Ball Aerospace first had to develop entirely new space lubrication technologies. From extensive company research on the requisite properties of spacecraft materials, there emerged a new family of dry lubricants specifically designed for long life in space, together with processes for applying them to spacecraft components in microscopically thin coatings. The lubricants worked successfully on seven OSO flights over the span of a decade and attracted the attention of other contractors, who became Ball customers.

At the same time, the company found that the lubricating properties needed for long service life in orbit offered advantages in many non-aerospace applications and began to explore those avenues. Over the years, the company acquired further space coating experience as builder of 10 satellites and participant in a number of other space programs. This work, along with parallel company research and development toward commercial applications, established Ball as a leader in the field of lubricants and protective coatings for both aerospace and non-aerospace use. The company has developed several hundred variations of the original OSO technology, generally designed to improve the quality and useful life of a wide range of products, or to improve the efficiency of the industrial processes by which such products are manufactured.

An example involves an old problem in glass container manufacturing. Hot glass sometimes sticks as it forms in the metal mold; to prevent that, a "release coating" must be applied to the mold. In the common procedure, an operator reaches into the high speed equipment periodically to swab coating material onto the hot mold, a method that subjects the operator to hazard; additionally, the swabbing material

Applied to metal molds used in manufacture of glass containers such as those pictured, a coating derived from space technology reduces adhesion between the molds and hot glass, contributing to improved process efficiency and fewer container rejects.

generally used generates copious fumes, which must be limited for health reasons.

In a variation of the space-derived technology, Ball Aerospace developed a bonded release coating to ease the problem. Marketed under the trade name HIPAK™, the coating is sprayed onto the molds and heat-cured before the molds are used. The HIPAK coating reduces adhesion between glass and molds, thereby reducing the number of hand-swabbing operations required. It offers increased operator safety, fewer container rejects and less exposure to fumes for those working near the machinery.

Another example stems from Ball's work on the Apollo Telescope Mount for NASA's Skylab program, for which the company developed special coating materials to prevent "outgassing"—chemical breakdown of materials which causes contamination of adjacent surfaces. Ball Aerospace is applying this technology to solar energy collection systems. Some materials outgas rapidly at the high temperatures in solar collectors; outgassing can contaminate the transparent covers of the collectors and reduce the system's ability to capture and transfer solar heat. By proper selection of coating materials—along with cleaning procedures, design, handling and storage techniques—outgassing can be controlled to help maintain maximum solar collector efficiency.

Other examples of Ball materials technology applied in non-aerospace usage include a spray-on preservative coating for protecting the sound fidelity of phonograph records; a coating for motion picture film designed to reduce film breakage; a lubricant used by meat processing companies to solve machinery breakdown problems experienced in "cold room" conditions; and a method of treating electric motor and generator brushes which sharply reduces brush wear rates.

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