Thermographic Inspections Save Skins and Prevent Blackouts

To help ensure the safety of the Nation's aging fleet of commercial aircraft, NASA's Langley Research Center developed "scanning thermography" technology that nondestructively inspects older aircraft fuselage components. Scanning thermography involves heating a component's surface and subsequently measuring the surface temperature, using an infrared camera to identify structural defects such as corrosion and disbonding. It is a completely noninvasive and noncontacting process. Scans can detect defects in conventional metals and plastics, as well as in bonded aluminum composites, plastic- and resin-based composites, and laminated structures. The apparatus used for scanning is highly portable and can cover the surface of a test material up to six times faster than conventional thermography.

NASA scientists affirm that the technology is an invaluable asset to the airlines, detecting potential defects that can cause structural failure, such as that of Aloha Airlines Flight 243 in 1988. According to the National Transportation Safety Board, the Aloha Airlines accident was caused by the structural separation of the pressurized fuselage skin. As a result of this separation, "an explosive decompression occurred, and a large portion of the airplane cabin structure…was lost."

An extension of NASA's scanning thermography now offers considerable value to the Nation's utility companies, as nondestructive inspection methods are becoming an increasingly attractive means of determining the condition of critical components. This would include power and process plant machinery, roads and bridges, and building structures.

In 1996, ThermTech Services, Inc., of Stuart, Florida, approached NASA in an effort to evaluate the technology for application in the power and process industries, where corrosion is of serious concern. ThermTech Services proceeded to develop the application for inspecting boiler waterwall tubing at fossil-fueled electric-generating stations. In 1999, ThermTech purchased the rights to NASA's patented technology and developed the specialized equipment required to apply the inspecting method to power plant components.

The ThermTech robotic system using NASA technology has proved to be extremely successful and cost effective in performing detailed inspections of large structures such as boiler waterwalls and aboveground chemical storage tanks. It is capable of inspecting a waterwall, tank-wall, or other large surfaces at a rate of approximately 10 square feet per minute or faster. The inspection results provide a computerized map of the wall thickness with high-resolution data equivalent to that of existing inspection methods. Prior to the development of this technology, existing inspection methods would only allow inspection of a limited area (less than 10 percent) of the entire structure, because they are typically either manually operated or mounted on small-scale robots. Now, with the development of the thermal line scanner, it is possible to inspect nearly 100 percent of the structure in approximately the same time it takes to perform the limited area inspection.

ThermTech Services' system benefits the electric utility industry, saving utility customers millions of dollars by reducing maintenance costs and downtime and improving power plant reliability.

ThermTech Services, Inc.'s robotic crawler scales the inside wall of a boiler at the Schuylkill Generating Station, Philadelphia, Pennsylvania. During the inspection, the initial call outs indicated 54 tubes in the superheat furnace rear wall should be removed. Upon removal, the 54 tubes were subjected to a boroscope exam, and the defects found by the crawler were confirmed visually.