Technology Use at Tinker AFB

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At the onset of toxic release reporting in 1994, Tinker AFB generated 1.8M pounds of toxic releases to the environment. This was enough to make TAFB the largest emitter of toxics in the Department of Defense (DoD). Today, Tinker has reduced its emissions by more than 84 percent through aggressive pollution prevention actions. This paper addresses technologies used to reduce the Toxic Release Inventory (TRI) emissions for the base while allowing production needs of this aerospace maintenance facility.

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In the 20th Century, world markets for environmental technologies grew dramatically. Promoting these environmental technologies has been a high priority for Tinker AFB and an exciting opportunity to achieve environmental and occupational safety goals for the base. In addition, having a clean environment and being a good neighbor means a lot to us.

One area where technology insertion has been apparent is with our implementation of Executive Order (EO) 12856. This EO requires that federal facilities comply with all the provisions of the Emergency Planning and Community Right to Know Act (EPCRA) and the Pollution Prevention Act of 1990. In plain language the air force must take an inventory of over 600+ toxic chemicals and report their usage and release levels to the public. Aircraft maintenance and repair, such as that performed at Tinker AFB, involves four major industrial processes: Electroplating, Cleaning, Painting and Depainting. Over twenty-five toxic chemicals were reported to EPA under this program in the 1994 baseline year.

Tinker has taken giant strides by reducing some 84 percent or 1.5 million pounds of toxic emissions in just seven years. Much of the success is a result of our ability to seize leading edge technology many times in the developmental phase and implementing it in our critical processes. The maintenance or production areas at Tinker have been proactive in implementing these technologies, which have saved time, manpower and cost for environmental factors (e.g., disposal, material costs, etc). Furthermore, under the canopy of technology transfer these innovative improvements in production are continuously transferred among DoD, regulatory and scientific communities.

Tinker has led the AF in reducing ODC's and TRI chemicals. Through an active, close working relationship with the Environmental Protection Agency, HQ Air Force Material Command and other Air Logistics Centers the Air force has proven it's dedication to reducing TRI chemicals. Outstanding accomplishments in reducing TRI emissions include implementation of the following technologies:

- **Electromechanical Device Cleaning Systems**. During aircraft depot maintenance, effective cleaning operations to prepare parts for coatings and to degrease re-furbished parts are crucial. Parts washing cabinets that enable the use of high quality aliphatic hydrocarbon solvents are now in operation. Formerly, parts were cleaned through immersion in vats containing high concentrations of chlorinated solvents such as 111 Trichloroethylene and Chlorofluorocarbons. This more advanced technology has eliminated some 15,000 lbs of air emissions each year.

- **Electromagnetic Powder Deposition (EPD):** EPD is used to replace Chromium, Cadmium, Nickel and Silver plating. This process uses an electromagnetic field to accelerate particles from 2 to 30 kilometers per second. The kinetic energy is converted to thermal energy on impact; thereby melting the particles in a localized

area of impact. This process replaces the traditional plating process that utilized vats of very hazardous materials such as acid baths, cyanide, etc. The Electromagnetic Powder Deposition process reduced annual wastewater discharges by over 19 million gallons and reduced hazardous wastes by some 228 tons per year.

Electropowder Deposition

- **Pressure Spray Washers:** Fourteen vapor degreasers were replaced with pressure spray washers. The vapor degreasers had been used to clean aircraft parts. This alone reduced our hazardous waste by some 100,000 pounds/yr. Likewise, this action cut down our air emissions by about 130,000 pounds/yr.

High Pressure Aqueous spray washer

- **Acid Etch Rejuvenation:** Tinker, the Department of Energy and private industry joined forces to develop and apply an exciting new recovery technology to this process. Previously, attempts to separate the nickel residue and acid bath had proven far too costly. As a result, the acid and metal by products from acid etch solutions became hazardous waste, and required extensive and labor intensive disposal. The new technology combines simple, proven distillation techniques with advanced corrosion resistant materials. The resulting system reduces raw material and waste disposal costs while providing a clean, reusable acid solution. The process extends bath useful life, significantly reduces production costs while improving process quality. As if this alone were not good enough, waste acid has been reduced by 25,000 gallons/yr.

- **Environmentally Acceptable Strippers**: The use of an alternative chemical striper in place of Methylene Chloride and Phenol resulted in a reduction of over 500,000 lbs/yr of toxics. Tinker prototyped and selected an alternative two part stripper with a benzyl alcohol bas. This new chemical means that workers have a significantly reduced exposure to the know carcinogen-methylene chloride.

Stripping of KC-135 Aircraft using EA strippers

- **Dual Wire Arc**: A Dual wire arc process is being used to apply multiple metal coatings as a buildup repair for jet engine parts. A high voltage arc is struck between oppositely charged wires. Simultaneously, compressed air is forced through a gap between the ends of each wire. The force of the compressed air stream suspends and carries the molten drops of metal, hurling them against the surface to be plated. This builds up a useable layer of metal. The old process of dipping parts in a chromium and nickel solution was much slower and even more hazardous. Savings of some $89K per year have been realized by implementing this technology.

Twin Wire Flame Spray

An aggressive environmental program at TAFB has set the standard for defense installations everywhere. Tinker is poised for making the 21st century a success with newer better technologies to even further reduce dependence and use of toxic chemical.