2003 Secretary of Defense Environmental Award

Pollution Prevention – Industrial Installation

Warner Robins Air Logistics Center
Robins Air Force Base, Georgia

Multi-Faceted & Advanced Pollution Prevention
Greater Stewardship & Sustainability

INTRODUCTION

Robins Air Force Base (AFB) is located in Central Georgia near the City of Warner Robins. The base is located on 8,435 acres and is home to the Warner Robins Air Logistics Center and more than 60 other units that make up an integral part of the U.S. Air Force (AF) war fighting team. These units, along with the greater community of Middle Georgia, make up Team Robins Plus, which is dedicated to protecting the environment while providing affordable combat superiority, readiness and sustainability to the war fighter. Robins mission includes:

- worldwide management and engineering responsibilities for the F-15 Eagle Fighter; C-130 Hercules and C-5 Galaxy Transport Aircraft; the U-2 Dragon Lady Surveillance Aircraft; and all Air Force helicopters;
- repair, overhaul and modification of all special operations aircraft and related systems;
- Analytical Condition Inspections for the C-17 Globemaster III;
- worldwide management responsibility for a fleet of more than 126,000 vehicles; and
- support for tenants, such as Headquarters Air Force Reserve Command, E-8 Joint STARS Aircraft of the 116th Air Control Wing, KC-135 Stratotankers of the 19th Air Refueling Group, 5th Combat Communications Group and the Defense Logistics Agency.

Robins AFB is the largest industrial complex in Georgia, employing a work force of more than 25,500 civil service employees, military members and contractors. The center drives the economics of the region and contributes more than $4.1B annually to the area's economy. As one of Georgia's largest generators of hazardous and non-hazardous waste, Robins maintains one of the biggest and most pro-active environmental programs in the nation.

BACKGROUND

Pollution prevention principles and practices are integrated throughout the installation. The momentum for this management philosophy originates with the Air Logistics Center Commander, is strengthened through the activities of the Environmental Protection Committee (EPC) and the Pollution Prevention (P2) Team and continues with each base employee.

The diverse P2 team includes Environmental Management, Maintenance Environmental, Safety and Health Office, the AF Corrosion Prevention and Control Office, Advanced Alternative Power Technology Transformation Office, Civil Engineering and base wide unit environmental coordinators. All team members contribute to implementation and compliance with P2 policy and procedures.

The P2 team meets on a regular basis as the P2 Integrated Process Team and reports to the EPC. Robins EPC, chaired by the center vice commander, meets quarterly to track the status of environmental issues and provides an open forum to discuss P2 challenges and solutions. Each of the center's directors and commanders is an active member of the EPC. They are committed to protecting precious resources and the environment, while providing affordable combat superiority readiness and sustainability to the center's primary customers – the war fighters.

An Environmental Management System was implemented base wide, including all depot maintenance and repair facilities, logistics operations and major tenants. This comprehensive program provides a management process that incorporates environmental quality issues into daily mission planning and execution and conforms to the

ISO 14001 Environmental Management System Specification Standard.

The Compliance Through Pollution Prevention process to reduce compliance cost and environmental, safety and occupational health risks was prototyped at Robins. One of the principal methods of achieving these goals has been the implementation of a dynamic Compliance Site Inventory (CSI) that relates cost and risk factors to regulated activities. The CSI database facilitates linking environmental factors to process groups. Environmental factors include: hazardous materials, hazardous waste, air emissions, wastewater flows and pollutant concentrations. Compliance sites are grouped into processes that represent the activities using hazardous materials and the activities are ranked according to cost and risk burdens. The CSI is a decision tool used in planning and programming process assessments and projects. Process assessments are the foundation for developing exemplary, environmentally sound and cost-effective P2 solutions.

Another outstanding initiative called Lean Depot Repair, identifies P2 opportunities while reducing process cost, cycle time and process waste while improving schedule performance. Lean Depot Repair applies the Toyota Production System approach to maintenance, repair and overhaul.

Robins marshaled a superior Affirmative Procurement Program for acquisition of recycled products that uses Environmental Protection Agency (EPA) and AF procurement guidelines. The Integrated Solid Waste Management Plan provides guidance on all current EPA-designated items.

PROGRAM SUMMARY

The primary objectives of the Robins AFB P2 program support the war fighter by:

- promoting P2 as an integral part of the mission;
- maintaining a positive posture and leadership role in interacting with local communities on common P2 issues;
- meeting DoD, USAF, federal, state and local pollution reduction goals;
- reducing compliance burden (cost and risk) with respect to federal, state and local environmental laws; and actively contributing to identifying, implementing and evaluating novel ideas and innovative technologies to reduce hazardous and non-hazardous materials use and waste generation.

Team Robins Plus far exceeds these objectives. The P2 team aggressively targets both hazardous and non-hazardous waste generation reductions through material substitution and process change, with a secondary focus on reuse, recycling and treatment. The P2 Team focuses on reductions in hazardous materials, hazardous waste, air emissions, Ozone Depleting Substances (ODS) and solid waste. The base excels in the reduction of hazardous waste generation, solid waste and Toxic Release Inventory chemicals ahead of targeted schedules.

ACCOMPLISHMENTS

Since 1995, Robins garnered six DoD level P2 awards, several state awards and most recently the Air Force 2002-2003, General Thomas D. White Environmental Award for Pollution Prevention. Recent initiatives include: the expanded use of Flashjet resulting in an additional 40% reduction in methylene chloride; solid waste reduction efforts resulting in a 53% diversion rate; and a design phase Leadership in Energy and Environmental Design certification for the new main gate and visitor center. Robins' phenomenal P2 achievements produce tangible results.

Material Substitution

Team Robins Plus spearheaded a thorough analysis of all materials and processes in Technical Order 1-1-8, *Application and*

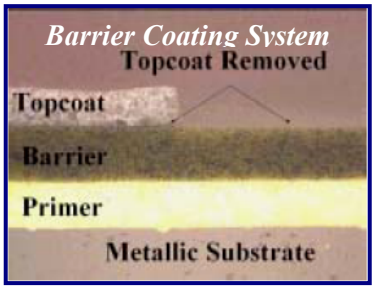
Removal of Organic Coatings, Aerospace and Non-Aerospace Equipment that produced outstanding results. The analysis identified and evaluated many new environmentally compliant materials, equipment and improved processes that were incorporated into the Technical Order requirements. This significant P2 analysis achieved reductions in consumption of hazardous material, generation of hazardous waste from painting operations and personnel exposure to hazardous materials.

The resourceful research, testing and purchase of a new degreaser using n-propyl bromide (nPB) dramatically aided in eliminating perc (perchloroethylene) from vapor degreasing operations. More than 13,300 pounds of perc was avoided in 2003. nPB is neither a Hazardous Air Pollutant carcinogen, nor an ozone depleting substance, therefore its use eliminates both National Emission Standards for Hazardous Air Pollutant requirements and safety concerns.

Team Robins Plus adroitly initiated testing of three non-acrylic and one acrylic media for use in dry media blast operations. These products do not leave a residue like the Type V acrylic media currently used, therefore the hand wiping of the entire surface with a 50/50 blend of methyl ethyl ketone and acetone is eliminated. The benefits from this action are three-fold: depainting operation costs are reduced; countless man-hours are saved; and 4,130 pounds of volatile organic compounds (VOC) are eliminated.

Process Modification Or Improvement

Always looking for ways to improve processes, Team Robins Plus is currently flight-testing F-15 and C-130 aircraft painted with an innovative Barrier Coating System developed at the Air Logistics Center that will save the AF $75M. The barrier coating encapsulates the chromated primer allowing the selective removal of only the polyurethane topcoat. With the barrier coat in place, only the topcoat is stripped using either medium pressure water (8,000 to 10,000 pounds per square inch) or a dry media that does not remove the barrier that is protecting the primer. By leaving the primer in place, the use of alkaline wash, acid etch, chromate conversion coating and chromated primer during every depot maintenance is dramatically reduced. Generation of chrome-containing waste is essentially eliminated. In addition, the water or dry media used in the depaint process is recyclable. The system demonstrated improvements in cleanability, color/gloss retention and erosion resistance. This system is projected to reduce hazardous waste by 97%, decrease manpower by 30% and reduce the materials used for paint and depaint by 65%.



Another process improvement involved optimizing the sludge dewatering process that resulted in an annual savings of $151K and reduced the volume of sludge and chemical use by 25%. Improvements to the two industrial wastewater treatment plants included a new filter press, holding tanks, process tanks and chemical feed system.

An innovative design and construction of a prototype unit that separates water from oil as it is removed from vacuum units, reduced flight line vacuum waste associated with aircraft maintenance by 33%. The former waste collection process generated 250,000 pounds of waste per year with disposal costs of $204K. The new process generates only 168,000 pounds of waste per year at a disposal cost of just $97K. Prior to the change, wastes collected in vacuum units were transported to a centralized location for manual

draining, cleaning and waste transfer to drums for hazardous waste disposal. The new unit sends the water directly to the industrial wastewater treatment plant and only the waste oil is pumped into drums for disposal as hazardous waste, resulting in a $100K+ annual savings. A follow-on project will determine if the waste oil can be classified as used oil instead of hazardous waste therefore facilitating sale of the oil to a recycling company to further reduce costs.

Protecting the environment is the #1 priority for the Robins P2 team. To this end, an environmentally friendly bullet trap was installed at the Small Arms Range This eliminates restoration cleanup costs and minimizes maintenance and lead contaminated soil waste. Approximately 3,000 pounds of lead per year will be recycled, reducing firing range employee exposure to lead and saving an average of $35K a year.

The Robins P2 team initiated installation of a thermal spray coating process called High Velocity Oxygen Fuel that will result in an 80% reduction in hexavalent chrome electroplating on C-130 propeller blades. Surpassing electroplating techniques for durability, this process eliminates hazardous material usage and wastes, chrome emissions and process wastewater.

Expert implementation of a powder coating booth eliminated 500 pounds of VOC emissions. A Thermoset powder coating process improved coating quality and reduced process time while providing environmental benefits. This application was prototyped and replaced solvent-borne coating processes used in pressurized cylinders such as oxygen and fire vessels that are maintained by the Hydrostat Shop. The new process eliminates all VOC emissions, an incredible 94% of hazardous air pollutants and hazardous wastes from the previous process. This coating process is so successful it is now being prototyped on other parts to expand the use of this environmentally friendly technology.

Another process, the Flashjet paint coating removal system, resulted in a reduction of methylene chloride usage by an additional 40% (78,000 pounds) in the last two years with an annual cost savings of $900K. Flashjet uses pulsed light energy from a xenon flash lamp and a carbon dioxide pellet cleaning system. First implemented in April 2000, the system workload continues to increase as organizations recognize its dramatic benefits. Hazardous waste disposal was reduced to near zero and there are no volatile hazardous air pollutant emissions generated. This process lessens damage to the composite substrate thereby extending the life of aircraft radomes and composite parts. Previously, these parts were stripped using methylene chloride-based paint removers. Residual coatings were removed with methyl ethyl ketone. Flashjet proved its weight by eliminating hand sanding of a special C-130 radome that previously took two weeks to perform. This process removes the coating in just two days with no damage. Flashjet is primarily used on F-15 radomes, F-15 speed brakes, C-130 Combat Talon II radomes and C-130 nose cones. Every year, 250 radomes and 1,000 parts are processed through the facility. Mission critical manpower is freed up, product life is extended, worker exposure is eliminated and it is approved for use USAF-wide.

Flashjet Depainting of F-15 Radome

Personnel also championed the purchase of new enclosed paint gun cleaners that reclaim 90% of original solvent, leaving only 10% for disposal, thus reducing hazardous waste disposal costs.

Improved Material Management

The first-line of defense to limit the acquisition of hazardous materials, identify hazardous air pollutants and toxic release inventory chemicals is the Hazardous Material (HazMat) Cell. This program diligently tracks and manages all of the hazardous materials used on Robins AFB.

Taking advantage of every opportunity, Team Robins Plus saved $78K in 2003 through the "freebies" program by eliminating hazardous materials from being disposed as waste. Base organizations with excess hazardous materials report to the HazMat Cell. The material is advertised to other authorized users on the base via the HazMat bulletin board. If a user needs the material, it is transferred to their inventory for use. If no users are found within 30 days, the material is sent to the Defense Reutilization and Marketing Office for resale or disposal.

Leading by example, Robins developed the first functional Compliance Site Inventory in Air Force Materiel Command. This inventory provides a systematic approach to reducing compliance costs and associated risks. Nearly 2,800 compliance sites were assigned to 169 process specific groups to associate hazardous materials and wastes, air and water pollutants, safety and health concerns, mission impacts and past audit findings. The system is an outstanding method of identifying, ranking and programming pollution prevention projects.

Compliance with Executive Order (EO) 13148, (revokes EO12856), "Greening the Government Through Leadership in Environmental Management," April 21, 2000

Executive Order 13148 updated the reporting, record keeping and notification requirements of the Emergency Planning and Community Right-to-Know Act. The Toxic Release Inventory Alternative Development program works to minimize overall use of EPCRA chemicals. Robins enthusiastically meets these requirements through a variety of efforts.

Team Robins Plus eliminated the use of CFC-113, a Class I ozone-depleting substance, in the gyroscope repair facility by substituting HFE-71DE through the Toxic Release Inventory Alternative Development process. A 99.9% drop in the use of CFC-113, from approximately 5,000 pounds per year to just one pound per year, was realized.

An important aspect considered in pollution prevention initiatives is worker safety. Replacement of ODS and toxic solvents resulted in environmental benefits and a safer working environment. The successful completion of the Gaseous Oxygen Cart Cleaning System production-ready prototype eliminated Class I and II ODS and EPA-17 chemicals. These actions also helped ensure a pristine environment for the servicing of liquid/gaseous aircraft oxygen systems. An added benefit is that the servicing equipment is contaminant free to preclude cart fires.

Long before the production and importing of HCFC-141b, a Class II ODS, ceased in January 2003, Robin's personnel aggressively searched for a replacement chemical cleaner for the Low Altitude Navigation and Targeting Infrared for Night pod. Preliminary work identified nine possible replacement chemicals, with five targeted for further investigation. The process was optimized since one of the chemicals, HFE 72DE, has no ozone depleting potential and cleans as well or better than the original product. Test protocols are in development and future laboratory testing, demonstration and validation will complete the selection of the substitute with appropriate technical data changes.

Compliance with EO13123, "Greening the Government through Efficient Energy Management," June 3, 1999

As concerned taxpayers themselves, Team Robins Plus employees actively identify and implement energy conservation measures in an effort to save money by reducing energy consumption, reducing emissions that

contribute to air pollution and global climate change and implementing sustainable construction "green building" requirements in design/build construction projects.

Personnel enthusiastically adopted the Leadership in Energy and Environmental Design (LEED) concept with requirements included in new construction design projects. The first project that includes LEED requirements is a new main gate and visitor center. This project is now being designed for certification and is ahead of Air Force pilot project requirements. LEED requirements are now institutionalized through training of architects, engineers, contracting officers and construction project managers to apply green principles to the siting, design and construction of new facilities.

Excellence in sustainability was demonstrated as a Robins AFB fire station was chosen as a beta test site for a DoD initiative to demonstrate that fuel cell residential applications in combined heat and power units are efficient, clean and quiet.

Recycling Program

Robins has an incredibly diverse recycling program that includes hazardous and non-hazardous waste diversion. Mandatory recycling accounted for the diversion of more than 14,000 tons of materials from Robins solid waste stream and 856 tons from the hazardous waste stream.

Facility Recycling Collection Center

During the last two years, Robins extraordinary P2 efforts resulted in the recycling of 496,037 pounds of used oil, 23,080 pounds of fluorescent bulbs, 8,642 pounds of hand wipe cleaning rags, 1,089,440 pounds of industrial wastewater sludge and 95,048 pounds of lead acid/NiCad batteries, significantly reducing hazardous waste.

Personnel spearheaded a new base-wide, oil-water separation process that saved more than $19K. Waste oil is now recycled and sold for reuse thereby avoiding hazardous waste disposal costs.

In addition to the successful reduction of hazardous waste, Team Robins Plus also diverted 53% of solid waste from landfills through composting, reusing, reducing and recycling. More than 137 tons of tires, 3,600 tons of yard and horse stable wastes and 1,621 tons of cardboard were diverted.

Closing the recycling loop on Robins AFB includes an on-base composting facility currently in construction for yard and stable waste. Robins' beautification projects use the compost thereby totally closing the recycling circle for these waste streams.

A specialized, base-wide Recycling Integrated Process Team provides an information cross feed mechanism. This information transfer ensures concepts, methods and successes are shared throughout the base, reducing redundancy and guaranteeing effectiveness. Base leaders are committed to recycling and institutionalized a mandatory recycling policy, signed by the installation commander that illustrates the commitment of top officials.

A highly extensive source reduction program emphasizes office waste prevention, focusing on using two-sided copying, electronic mail, reusable internal envelopes and other methodology.

Robins recycling policies are interwoven throughout the base and housing areas. User-friendly curbside wheeled recycling containers are provided for housing residents. The

recycling contractor collects materials weekly and source-separates them at the curb.

Exploring every recycling avenue available, toner cartridges are remanufactured through the Federal Prison Industries and subsequently purchased by base organizations once again "closing the loop" for this waste stream.

Affirmative Procurement

Robins AFB is committed to closing the recycling loop through the Affirmative Procurement (AP) process. Preference for buying environmentally friendly, recycled-content products, rather than products made only of virgin material is encouraged in new contracts. EPA and Air Force procurement guidelines are used. Robins "goes the extra mile", spearheading many proactive AP actions.

Affirmative procurement begins with education. Environmental managers teamed up with base contracting personnel to train nearly 800 government credit card holders in AP requirements. The Integrated Solid Waste Management Plan provides complete details of the requirements, both in hard copy and on the environmental management web site.

As a result of this on-going education process, only re-refined motor oil was purchased for the base fleet and only reused, antifreeze, recycled by an on-base reclamation unit, was used in base vehicles and ground support equipment.

Park benches, recycling and trash bins, aircraft wheel chocks, copier paper and trash liners, all made from post-consumer materials, were purchased and are in use over a broad spectrum, from office buildings to the flight line.

Education, Outreach, and Partnering

Recognizing that education and information dissemination are key to success, the Robins P2 team undertook a massive program reaching both on and off base. Recycling efforts would not be successful without the help and cooperation of personnel living and working on Robins' facilities. With an on-base population of more than 25,500 individuals alone, education in environmental matters is both a necessity and an opportunity.

The proactive integration of pollution prevention into Lean Depot events had tangible results. Forty hazardous material Point-of-Use sites were installed across the base, providing more efficient access to the worker while maintaining compliance.

Ensuring all organizations are involved in pollution prevention, requirements are included in all host-tenant support agreements. Requirements to recycle hazardous and non-hazardous materials and reduce hazardous and non-hazardous waste are included and require tenants to comply with affirmative procurement requirements.

Proving that "refrigerator art" works, recycling efforts are enhanced by providing refrigerator door magnets and "how to recycle" details in new resident welcome packages.

Reaching across the spectrum to gain every recycling advantage possible, a household hazardous product reuse program provides guidance to residents on how to share unwanted and unneeded products with friends and neighbors.

Guaranteeing every individual access to P2 and recycling information relating to the base and its facilities, the team developed an environmental educational website detailing the entire P2 program that is available to base personnel and the general public.

Team Robins Plus motivates personnel both on and off base in the pollution and recycling arenas. Ten contractors supported education initiatives with displays and environmentally

oriented handouts. Environmental managers displayed P2 projects and provided additional outreach opportunities to grade school children from the base and local communities. This event provided practical information and usable tools to families throughout the area.

In 2003, with the support of numerous businesses, environmental managers held a fishing rodeo at a Robins lake. This event included informative displays and provided recycling and P2 information to a host of children, as well as the opportunity to do some hands-on projects, such as making pinecone bird feeders and planting seeds.

Partnering with the local community resulted in all yard and horse stable wastes being composted off base and the compost marketed locally by the contractor.

The Air Force Advanced Alternative Power Technology Transformation Office and environmental management team partnered with Middle Georgia communities to develop the Middle Georgia Clean Cities Coalition. Robins' installation coordinator directed the development stages that resulted in Middle Georgia being designated as a Clean City in April 2003 by the Department of Energy.

A "team atmosphere" was displayed when the base participated in the debut of the Middle Georgia Odyssey Day with local communities that promoted the use of alternative fueled vehicles. Robins is also an active, dedicated participant in the Keep Warner Robins Beautiful Commission.

Team Robins Plus exported its lessons learned and superb P2 tools, including construction and demolition waste studies, beyond base and county boundaries by sharing them with other military and federal agencies at the Pollution Prevention, Hazardous Waste Conference and the Environmental Protection Agency/DoD Region 4 Annual Conference.

The base recycling program receives top down attention from the Environmental Protection Committee, ensuring heightened awareness of recycling efforts and offering insight to interested parties.

Research, Development, and Technology Demonstration/Validation

Robins has a very active research, demonstration and technology evaluation program for implementing pollution prevention into weapon systems. Numerous routes are taken to find partners such as the AF Corrosion Prevention and Control Office and the Advanced Alternative Power Technology Transformation Office to share in the development and to find applications for new technology. Robins has 7 propane, 35 electric, 33 compressed natural gas and 9 hybrid alternatively fueled vehicles in operation. These vehicles provide lower emissions, lower environmental impact, multi-mission capability, less maintenance and less cost than conventionally fueled vehicles. They demonstrated sustainability in transportation operations across the base and mission. The hybrid electric vehicles show a 10 to 50% increase in fuel economy over conventional, internal combustion-powered vehicles.

Supporting the Army, Robins AFB is pursuing the use of a hybrid high mobility multi-wheeled vehicle with grid-connected technology. Once these vehicles are placed in service, they can provide electric power to facilities, such as tents or buildings, by plugging into the facility's electrical grid. This could alleviate the need for separate generators, resulting in a reduction of equipment as well as personnel and spare parts needed on deployments and bare-base setup

operations. Should this hybrid/grid connecting technology prove effective on the hybrid high mobility multi-wheeled vehicle, it could be adapted to aircraft tow vehicles.

The plating shop proactively demonstrated a method of recycling hexavalent chrome by using an Anion Liquid Exchange technology. The technology demonstrated it could replace the expensive chemical treatment of plating shop wastewater and reclaimed/recycled hexavalent chrome from expended plating baths. At the same time, hazardous sludge generation and waste management and disposal costs will significantly decrease.

Reductions Achieved

First applying the principles of source reduction, Robins AFB achievements demonstrate a top-notch, diverse program that includes superior management of depot level industrial processes, aircraft operations, administrative and residential areas. Outstanding stewardship results in outstanding results achieved in pollution prevention, solid and hazardous waste reduction, recycling and energy conservation.

During 2003, an assessment of an electroplating shop process assessment identified 72 pollution prevention opportunities. With weapon system owner concurrence, the top five alternatives were selected for further study and implementation. Using PLATO, a commercially available predictive model, a plating shop baseline was developed that refined the top alternatives and ensured a guaranteed payback while securing mission readiness/transformation. The five candidate options were split into two phases for shop installation. Projects range from rinse and ventilation system upgrades to process chemistry enhancements. The reduction of hazardous waste generation, air emissions, wastewater generation and environmental burden will result in lowering operational and environmental costs by approximately $421K per year. Not only will the plating shop reap benefits, PLATO is also being considered for use in establishing a paint/depaint baseline.

SUMMARY

Robins AFB is committed to environmental excellence, community stewardship and sustainability of base operations. Through an aggressive, proactive Compliance Through Pollution Prevention effort, the team continually improves industrial processes, complies with environmental regulations and reduces compliance requirements. The team remains focused on reducing or eliminating the use of hazardous materials and releases of pollutants.

The Robins premier Environmental Management System leads the way in the DoD and incorporates environmental quality issues into daily mission planning and execution. The installation mandatory recycling program diverted 53% of generated solid waste from landfills. Flashjet, an innovative paint coating removal system, applicable to all of DoD, saves Robins $900K annually. Additionally, a total of $75M will be saved at Robins with implementation of an innovative, barrier coating process.

Over $496K in hazardous waste is diverted yearly from disposal by recycling. Each year, $151K is saved in industrial wastewater treatment costs as a result of the implementation of the sludge reduction project. Class I and Class II ODS were replaced and an additional 20,000 pounds per year of VOC were eliminated. The Robins' P2 Team makes pollution prevention, waste reduction, conservation and recycling a part of everyday life for all personnel.

Robins Air Force Base environmental professionals, working together with regulators and community organizations, are dedicated to protecting the environment, while providing affordable combat superiority, readiness and sustainability to the war fighter.