

**AWARD CATEGORY FOR:  
FY2005 CNO Environmental Awards Program  
“POLLUTION PREVENTION-INDUSTRIAL INSTALLATION”  
Naval Air Depot (NADEP), North Island, San Diego, CA**

## **1.0 INTRODUCTION**

The first Federal facility to successfully register to ISO 14001, the Naval Air Depot (NADEP) North Island is a manufacturing, maintenance and repair facility for aircraft (F/A-18 Hornet A-F, E-2 Hawkeye, C-2 Greyhound, SH-60 Seahawk, and the AH-1 Super-Cobra), aircraft and ship components. One of 32 tenants of the North Island Naval Air Station, NADEP occupies 63 buildings including over 2 million square feet of workspace on 358 acres, and employs approximately 3300 civilian and military personnel to complete its mission.

The NADEP mission includes a complete range of depot level rework operations on designated weapons systems, accessories and equipment, manufacturing parts and assemblies, providing engineering services, and assisting in resolving aircraft maintenance and logistics problems.

The facility is located in the City of Coronado. It is bordered on the north and west by San Diego Bay, on the east by residential neighborhoods of the City of Coronado, and on the south by the Pacific Ocean.



## **2.0 BACKGROUND**

**2.1 Environmental and Pollution Prevention Challenges.** The NADEP operates in one of the more stringently regulated areas of the United States. The City of Coronado is an influential retirement and resort community with citizens who have the time, resources and knowledge to involve themselves in community issues. As a result, we receive our fair share of scrutiny of our industrial operations. We are inspected semi-annually by the San Diego Air Pollution District, annually by the San Diego County Department of Health Services, the Environmental Protection Agency, the Regional Water Control Board, the San Diego Metropolitan Industrial Waste Program.

In tandem with the stringent regulatory compliance requirements, the NADEP utilizes many major industrial processes and equipment in a variety of applications including; painting, abrasive blasting, chemical stripping, electroplating, chemical cleaning and degreasing, metal spray, jet engine testing, machining, non-destructive testing, composite repair, heat treating and foundry. In addition, there are several hundred minor processes in the shop areas that utilize hazardous materials and generate waste streams as a result of daily repair and manufacturing activities.

Because of the amount and variety of industrial activities being performed at NADEP with the multitude of environmental regulatory drivers for the different environmental media areas, and because the “low hanging fruit” pollution prevention projects have been implemented for some time the process of identifying, prioritizing, budgeting and implementing relevant Pollution Prevention (P2) projects is challenging. Increasing this challenge are constrained budgets and the process of coordinating a multitude of command functional groups and shop areas within the NADEP to agree on solutions that improve the environment (reduce pollution) while ensuring that all other command criteria for projects are satisfied for mission success.

In summary, The NADEP’s operation as both the largest industrial facility and the largest metal plating facility in America’s 6<sup>th</sup> largest city poses an array of challenges for everyone involved in the Pollution Prevention and Environmental Compliance Programs.

**2.2 Staffing.** The NADEP Environmental Program Office (EPO) currently consists of 29 individuals. The EPO is designed to functionally consolidate program resources and responsibility under a single manager. With the focus on Pollution Prevention, in conformance with the Navy Environmental Quality Initiative (EQI), the

EPO provides an integrated multimedia approach to Air Quality Management, Hazardous Waste and Materials Management, Pollution Prevention, Recycling, Energy and Water Conservation, Storage Tanks and Site Remediation. The management structure provides for the empowerment of each media project engineer and his-her supporting staff. In addition, the EPO staff of 13 hazardous material handlers who implement the collection of hazardous and industrial wastes from the production shops in addition to chemical additions and process cleaning services. They are integrated into the process of preparing, packaging, inspecting and tracking all waste containers and shipments.

**2.3 Program Management Approach.** The NADEP utilizes the precepts of the ISO 14001 Environmental Management System (EMS). It is basically the “Plan, Do, Check, Act” concept in a formalized process. It essentially allows the EPO the advantage of forward deployment of the environmental planning process. The Strategic Business Units (SBUs) identify their own objectives and targets. The process requires that the SBUs consider the associated environmental impacts and identify them in a standardized project plan. These objectives and targets are reviewed and screened by a multi-disciplinary team of subject matter experts, called the Environmental Improvement Team (EIT) who provides their input to management. The process ensures that all necessary approvals are documented, including the Executive Steering Committee (ESC or top management) if necessary. The EMS management representative certifies the process at each step. In addition, the EPO utilizes the EIT as an integrated process action team to solve environmental compliance issues/concerns and to identify and implement pollution prevention initiatives. This is all part of the “Plan” step in the EMS. Stakeholder interaction is accomplished via the ESC as required for projects in the Plan step.

The documented project plans are maintained in a shared database available at all times to all pertinent parties. It includes a time-line with milestones. This is monitored as part of the EMS process and drives the “Do” step in the management system.

The EMS includes an internal audit component that not only monitors the status of the various EMS program components, but also ensures that “continual improvement” is actually occurring. The process contributes to a dynamic sharing of knowledge across various competencies in the organization as auditors are pulled from all parts of the organization. As the EMS emphasizes continual improvement, the Pollution Prevention (P2) program benefits. This is all part of the “Check” step in the EMS.



The “Act” step consists of management reviews and identified corrective actions. The ESC reviews the performance and status of the EMS several times a year and contributes to the continual improvement of the system.

The entire process is prefaced with the Statement of Environmental Policy signed by the Commanding Officer. In addition, an independent third-party auditor validates the EMS every six months.

**2.4 Pollution Prevention Focus Points for Sustainability.** The NADEP has developed a table “Zero Discharge” Pollution Prevention (P2) focus points for sustainability applicable to any governmental or commercial organization. Table 1 below summarizes this approach developed at NADEP to achieve zero discharge and includes all the potential activity inputs and outputs in relationship with the generation of pollution. The NADEP EIT approves specific projects for implementation. Selected projects are managed for implementation with the NADEP ISO 14001 EMS process (see above section 2.3).

**Table 1 - Zero Discharge Pollution Prevention EMS Focus Points for Sustainability**

Activity Inputs	Solution	P2 Program Management	Activity Outputs	Solution
Raw Materials	Green Procurement – use of less toxic unto humanly safe materials	<u>VISION</u> Sustainability. Zero Discharge. Restored Ecology.	Hazardous and Non-Hazardous Waste	Reduce, Reuse, Recycling and Compost
Energy	Renewable Energy, Efficiency Projects		Air Pollutant and CO2 Emissions	Air Controls to reduce emissions
Water	Efficiency projects	<u>STRATEGY</u>	Waste Water	Reuse and Recycle

Ozone Depleting Products	Alternatives	Solutions. Data Driven. Results Orientated.  <u>EMS</u> Continual Improvement. Plan-Do-Check-Act. Close the Loop. Implement.	Thinning Ozone	Alternatives
Vehicles	Advanced Energy Storage, Green Fuels, Bio-lubrication		Air Pollutant and CO2 Emissions	Air Controls to reduce emissions
Historical Pollution	Ecological Restoration		Various Waste Streams from Cleanup and Restoration Process	Treat on and off site

The above table works to satisfy all the pollution prevention regulations, executive orders and other direct and related environmental requirements and moves an organization regardless of size and mission to zero discharge for sustainability.

The EIT, consisting of a command representative for each area deemed critical for implementing projects (i.e. equipment, facilities, safety, environmental, etc) ranks all P2 projects via the EMS system. Selected projects are implemented via the EMS. Activity mission is foremost considered in the EMS ranking process and includes product turn around time, quality, capital cost, simple payback, environmental compliance, pollutant reduction, energy and water conservation, safety compliance. Objective point papers are written to address specific details essential to the mission at NADEP. The ESC makes the final decision for major projects while taking the stakeholder into consideration.

### 3.0 POLLUTION PREVENTION PROJECTS

**3.1 Pollution Prevention and Energy Conservation Teaming for Success (Innovative Program Management Approach).** The NADEP Energy Conservation Program is integrated with the Pollution Prevention Program at NADEP for a unique program management approach in a time of constrained budgets for mutual program benefits to implement projects that benefit both the reduction of pollution and energy conservation (energy efficiency). During the past two fiscal years (FY 04 and FY 05), NADEP has applied for and received energy grants to implement projects that save energy and reduce pollution shown in table 2 below and table 3 on the next page.

**Table 2 – FY 04 Pollution Prevention and Energy Conservation Projects**

Project	Cost	Cost Avoidance	Payback (yrs)	Energy Benefit (kilowatt hours per year saved)	P2 Benefit	Technical Merit
Premium Efficient Motors	\$443,654	\$193,474	2.3 yrs	1612	NA	NA
Heat Treat	\$951,439	\$163,188	5.8	1360	More Efficient Quench Process	State-of-the-Art Computer Controlled Equipment
Chrome Tanks	\$229,584	\$176,711	1.3	1473	Eliminate Chrome Air Emissions	First in DOD. Meets new OSHA requirements and eliminates chrome air emissions allowing for continued mission success
Night Time Load	\$144,266	\$58,000	2.5	483	NA	NA
Plate-Clean Shop Filtration, New Mixing and Direct Digital Control	\$930,743	\$231,351	4.0	1928	Reduced Chemical Use	State-of-the-Art Direct Digital Controls with better mixing system and added filtration
Engineering Oversight	\$1.2 Mil	\$0	NA	NA	NA	NA
<b>TOTAL</b>	<b>\$3.9 Mil</b>	<b>\$823,346</b>	<b>4.8</b>			

**Table 3 – FY 05 Pollution Prevention and Energy Conservation Projects**

Project	Cost	Cost Avoidance	Payback (yrs)	Energy Benefit (kilowatt hours per year saved)	P2 Benefit	Technical Merit
Auto Tank Cover (demo)	\$45,000	Proof of Concept	NA	Potential 2083 when connected to new stacks and direct digital controls	Methylene Chloride Replacement with Turco 5668L	Combine direct digital controls with tank cover to reduce ventilation airflow. Source Reduction P2 project.
Compressed Air & Direct Digital Control	\$300,000	\$400,000	0.75	3333	NA	Direct digital controls working with compressed air
Turbo-cor Chillers and Direct Digital Control	1 Mil	\$125,000	8	1042	No lube for motor or bearings and CFC free.	First in DOD. Magnetic bearings used with an electric centrifugal motor.
Tombstones	\$257,000	\$17,000	15.0	141	Fire Prevention	Standard Equipment
Efficient High bay Lights	\$16,000	\$2,000	8.1	16	NA	Latest in light technology
Engineering Oversight	\$871,000	\$0	NA	NA	NA	NA
<b>TOTAL</b>	<b>\$2.67</b>	<b>\$477,000</b>	<b>5.6</b>			

The following projects are shown with a photo as recent accomplishments for the P2 program utilizing energy funding for this award write-up (taken from table 2 and 3 above). These projects both reduced pollution and conserved energy. In addition, these projects have technical merit as projects that may be exported to other DOD industrial installations and private industry as leading edge technology. The projects are listed as follows:



Figure 1 – New State-of-the-Art Heat Treat Equipment at NADEP

The NADEP heat treat shop replaced three World War II era furnaces and an endothermic gas generator that were on 24 hours per day, 7 days per week. A furnace, tempering oven and wash stations with automated controls and Personal Computer (PC) interface for real time nitrogen and methanol stations to complete the heat-treat work load at NADEP. This equipment is state-of-the-art reducing both pollution (quench oil) and conserving energy (1358 Kilowatt-hours per year). This equipment is universal in application for heat-treating and may be utilized in other DOD applications or in industry.

Figure 2 – Existing Chrome Plating Tank Push Pull Air Ventilation (l) and Air Pollution Controls (r)



The NADEP chrome plating shop currently utilizes 5 chrome plating tanks with “push-pull” air ventilation systems and a related outdoor air pollution control device on continuously to minimize chrome emissions shown in the photograph right. The system left requires no continual ventilation for zero chrome emissions to the environment and meets the upcoming February 06 hexavalent chrome personnel exposure requirements set by OSHA allowing NADEP to continue the chrome plating operation. This technology is now being demonstrated and is first in the DOD.



Figure 3 – New Chrome Cover with Exhaust System Left in Photo



The Plating Shop tank pictured left is typical of the plating shop tank retrofit with a more effective mixing system replacing the energy intensive air bubble system. The new mixing system utilizes the fluid pumped through the yellow eductors pictured at the bottom of an empty tank (left photo) for more effective mixing. In addition, automated (direct digital controls with Personal Computer (PC) user friendly interface) heating controls and filtration for chemical bath life extension has been installed. This technology may be applied at other activities.

Figure 4 – New Mixing System Eductors Installed in an Empty Plating Tank



The new automated cover pictured right in the down (top photo) and up (bottom photo) position serves a two-fold purpose. (1) This cover is being demonstrated to retrofit the entire shop to turn the tank ventilation down when the tanks are not in use for significant energy savings. The direct digital controls panels pictured left (bottom photo) and indoor exhaust stacks (top photo left) were implemented in prior years with other funds to work with the new covers. (2) The installed cover will be used to meet the San Diego Air Pollution Control requirements for the methylene chloride paint stripper replacement chemical Turco 5668L (Source Reduction P2). Turco 5668L is approved for use as a replacement for methylene chloride and is less toxic. This technology is being used at Boeing Aircraft.

Figure 5 – New Exhaust Stacks Cover (top) and Programmable Direct position Digital Control Panels (bottom)



Figure 6 – New Automated Cover in the closed and open

The last project to be presented in this write up is the new turbocor compressor used in two chiller applications at NADEP. This system utilizes magnetic bearings that levitate the shaft when moving requiring no lubrication. When not powered, the shaft is supported by carbon composite touchdown bearings. The centrifugal compression motor offers higher aerodynamic efficiency compared to other compressor designs and requires no oil or lubrication. The chiller system utilizes a CFC free HFC-134a substance for cooling. The benefits fit multiple criteria for sustainability from the NADEP table with cost benefit paid for with an environmental grant. This project replaced chillers that were breaking down with an energy grant with P2 benefits while sustaining two command operations (primary standards and materials lab) essential to the mission.

Other applications utilizing the turbocor motor will be investigated to utilize the energy savings to parlay with maintenance savings and P2 benefit. The EIT will address technical aspects and the ESC will involve stakeholders and make budgetary decisions for continuous environmental improvement.

**3.2 Pollution Prevention Through Contracted Recycling.** Contracts are accessed to recycle on and offsite utilizing existing hazardous waste disposal funds alleviating the investment requirement to recycle hazardous waste. The following priority waste streams are included in table 4 below for contracted recycling:

**Table 4 – Pollution Prevention Projects through Contracted Recycling**

Waste Commodity	Annual Amount (lbs)	Pathway	Status
<b>CONTAINERIZED WASTE</b>			
All Abrasive Blast Media	130,889	Direct Contract	Implemented
Batteries	1,650	DRMO Contract	Implemented
<b>INDUSTRIAL WASTE</b>			
All Wastewater for Direct Reuse	8,893,651	Direct Contract	Innovative Technologies* identified to reduce cost 40% (\$400,000) for direct reuse.
<b>BULK ORGANIC WASTE</b>			
Mixed Oil	80,000	Navy Public Works Contract	Implemented
Solvent	14,200	DRMO Contract	Implemented
JP-5 Fuel	51,480	DRMO Contract	Implemented
Ethylene Glycol	1,815	DRMO Contract	Implemented
Calibration Fluid	1,925	DRMO Contract	Implemented
Filters w/Oil	515	DRMO Contract	Implemented
<b>NONHAZARDOUS SOLID WASTE</b>			
Paper	1,250,000	DRMO Contract	Implemented
Metals	979,000	DRMO Contract	Implemented

\*Note - Flash Distillation and or super sorbtive carbon used with mobile chemical treatment for direct wastewater reuse in all applications (included are the plating and cleaning shops, paint strip and painting shops and all other wastewater at NADEP). Electronic Coagulation may also be used. Other commands may utilize this technology for cost savings and direct wastewater reuse.

**3.3 Pollution Prevention through Green Procurement.** Green procurement is practiced at NADEP for office products. The recent innovative green procurement implemented at NADEP base wide is as follows:

**Table 5 – Innovative Green Procurement Pollution Prevention Projects**

Product	P2 Benefit	Life Cycle Cost Assessment	Status
100% Post Consumer Fiber Paper	40 boxes saves 24 trees, 4100 kilowatts energy, 7000 gallons water, 60 pounds air pollution	100% PCFP - \$17-\$18 30% PCFP - \$21-\$22	Implemented (note - This project is exportable to all federal agencies and industry)

## 4.0 SUMMARY OF RESULTS

**4.1 Pollutant Reductions, Energy and Water Conservation, Recycling and Renewable Energy Increases.** The following table provides the subject information at NADEP over the last decade.

**Table 6 – Pollution Prevention Categories, Results and Zero Discharge Goals for Sustainability**

Pollution Prevention Category for Reductions	CY 1994	CY 2004	Actual % Reduction	% Reduction Goal
Containerized Waste (Million lbs)	1.679	0.714	57.5	100%
Industrial Waste (IW) (Million Gal)	181	1.48	99.2	100%
Extremely Hazardous Waste (10,000 lbs)	55	43	21.8	100%
Toxic Release Inventory (TRI) (10,000 lbs)	96	86	10.4	100%
Priority Highly Toxic Air Emissions (lbs)	15	0.5	96.7	100%
Priority Toxic Air Emissions (10,000 lbs)	30	20	33.3	100%
Ozone Depleting Substances (Tons)	10	0.3	97.0	100%
Energy Conservation (Million MBTU)	150	135	10.0	25%
Water Conservation (Million Gallons)	35	25	28.6	50%
<b>Environmental Improvement Category for Increases</b>			<b>Actual % Increase</b>	
Recycling Metals (Thousand Pounds)	1300	979	-24.7	100%
Recycling Paper (Thousand Pounds)	350	1,250	257.1	100%
Renewable Energy Use	0	0	NA	100%