ENVIRONMENTAL ENGINEERING SENIOR DESIGN PROJECT
AIREKO ENVIRONMENTAL MANAGEMENT SYSTEM

Department of Civil and Environmental Engineering and Land Surveying
Polytechnic University of Puerto Rico

Authors: Lolivone De La Rosa, Andrés Febres, Enrique Lucca, Orlando Nieves, Mónica Ruibal
Mentors: Cristhian Villalta, PhD & Eng. Iván Ortíz

Abstract

The Environmental Management System (EMS) was created for AIREKO to define and manage the significant environmental aspects of the company, in order to ensure compliance with the environmental regulations and lower the negative impact on the environment and public health. The EMS was created with the guidance and in accordance with the standard ISO 14001.

Objectives

AIREKO will focus on the planning, construction, and servicing activities that have been defined as having the most environmental impact. AIREKO has identified certain objectives to dedicate their resources in order to comply with regulation and become a more environmentally conscience company. These objective, as defined in the EMS are:

- Reduce Construction Waste
- Reduce Paper Consumption – 20% in one year
- Reduce the fails in the runoff and sediment control systems
- Increase the use of Green Products
- Achieve Zero Violations

Methodology

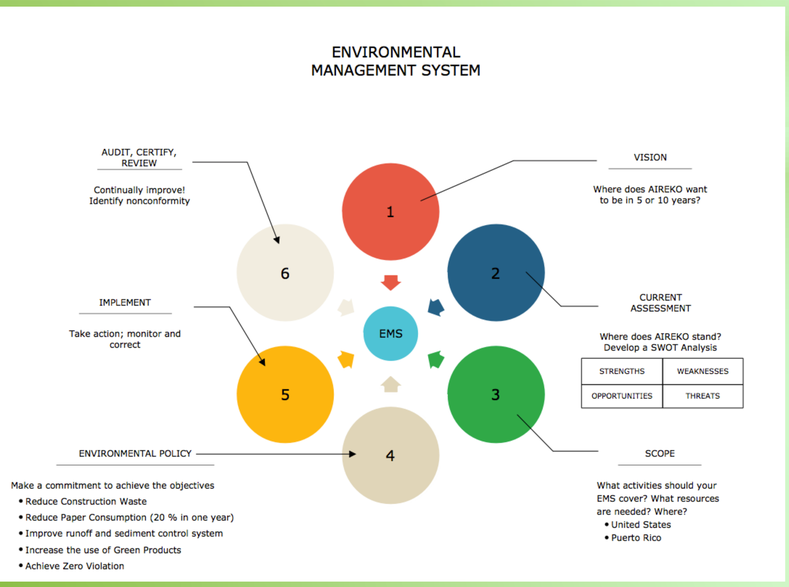

Table of Impacts

Environmental Risk	Regulation	Activities	Best Management Practices
SOIL			
Top soil removal / Land Cut & Fill (Erosion)	Permisos CES (JCA)	Excavations or land movements Fill	Only needed when impacting more than 900m^2 or 40m^3 of soil Soil stabilization (temporary or permanent) Gravel Verify that the soil being used isn't already contaminated
Oil and Fuel Storage/handling	40 CFR Part 110 and 112 EPCRA	Maintenance of contruction vehicles or any other large equipment	SPCC Plan (Spill Prevention, Control, and Countermeasure) Applies only if handing oil storage capacity of more than 1,320 gallons in above ground tanks or 42,000 gallons bellow ground tanks
PCB	40 CFR Part 761	electrical debris (oil transformers,capacitors)	Regulation only applies if PCB concentration is above 50 ppm Remove any PCB containing fluorecent bulbs and proper disposal in a chemical landfill (for Region 2 of EPA, this is located in Model City, New York)
Lead	40 CFR Part 745	Demolition	

Environmental Risk	Regulation	Activities	Best Management Practices
WATER			
Runoff	Storm water Permit SWPPP Clean Water Act NPDS Notice of Intent (NOI)	Contruction in any area exposed to the elements	Retention pond Infiltration measures Vegetable Swales and natural depressions
Oil and Fuel Storage/handling	40 CFR Part 110 and 112 EPCRA	Maintenance of contruction vehicles or any other large equipment	Recycled (use of distillation) SPCC
PCB	40 CFR Part 761	electrical debris (oil transformers,capacitors)	Regulation only applies if PCB concentration is above 50 ppm Remove any PCB containing fluorecent bulbs and proper disposal in a chemical landfill (for Region 2 of EPA, this is located in Model City, New York)
Waste Water	NPDS	pipes reparations	Disposal in approved facility / Cannot go to municipal landfill
Lead	40 CFR Part 745	Demolition	Proper handling and storage Close container trat as hazardous waste

Environmental Risk	Regulation	Activities	Best Management Practices
OTHER			
Flora & Fauna	Endangered Species Act (ESA)	Any project done in a prestine area	Employee Training (Where to find list of endangered species and proper treatment of these)
Hazardous Waste	RCRA & CERCLA 40 CFR Part 261 (List of hazardous waste)	boilers cleaning, demolition debris with contents of asbestos and lead, broken solar panels	Labeling Store no more than 180 days Record Keeping (Hazardous waste manifest) Segregation Employee Training Quantity Minimization Qualify Transporter (DOT, JCA) Selection of Treatment or Disposal Facility LDR Forms (40 CFR Part 268) Track signed TSDF copies (35 days: LQG, 60 days: SQG) Satelite accumulation - More tha 55 gallon? Store no more than 3 days Contingency Plans
Noise	Clean Air Act (Title IV – Noise Pollution) The Noise Control Act of 1972 (42USC7641) JCA - Reglamento para el Control de la Contaminación por Ruido (Reglamento núm. 4318 del 24 de febrero de 1987)	Working with loud machinery Project near a sensitive area (school, residential area, etc.)	Work Schedule Buffer Zone Insulation (For generators and other machinery) Barriers
Universal Waste (Bateries, Bulbs, Pesticides & Mercury-containing equipment)	40 CFR Part 273 RCRA & CERCLA	Demolition	Segregation from Source Employee Training Quantity Minimization Manifest Qualify Transporter (DOT, JCA) Recycling
Archeological	National Historic Preservation Act (NHPA)	Any project done in a prestine area	Employee Training and comunication (instituto de cultura) Planificacion
Solar Panels	*****HAZARDOUS WASTE*****	Installation of Solar panels, broken solar panels	Send back to manufacturer (if small quantities) Proper disposal (hazardous waste)

Environmental Risk	Regulation	Activities	Best Management Practices
AIR			
Asbestos	40 CFR Part 61 (m) 40 CFR 63 40 CFR Part 763 (g) Clean Air Act	Demolition / Remodeling	Assessment and Risk Determination Encapsulation Removal Call the appropriate trained personnel to manage ACM Employees Awareness Training Disposal in qualified land fields
Fugitive Dust / Particulate Matter	40 CFR 49.126 Clean Air Act NAAQS - National Ambient Air Quality Standards PFE - Reglamento para control de la contaminacion atmosferica del 1995 (JCA)	Any project in exposed earth Demolition Work wit excavation or fill of project area	Water Suppression Wind Speed Reduction Chemical Stabilization (Calcium chloride or Magnesium chloride 35% Solution) Vegetative stabilization Gravel Traffic control (Acces control and Speed Limits) Silt Fencing
Solvents	40 C.F.R. 51. 100	Painting Concrete casting	Use solvents that are not flamable, toxic or volatile Better pouring techniques Train employees (not smoking, no spark, have a fire control system)
Motor Vehicles	40 CFR Part 86, 89 & 1039	Any contruction project/ daily services operations	Constant inspection Proper Maintenance
Internal Combustion Equipment (generators, etc.)	"PFE - Reglamento para control de la contaminacion atmosferica" (JCA) NESHAP & MACT CAA	Any Contruction project, headquarters, any aireko facilities with power generators	Use of cleaner fuels or additives Catalytic Control Technologies PM filter
Abrasive Blasting	MFHAP 40 CFR 63.11517(b) - fugitive emision	Paint removal	Dust control techniques - Blast enclosures, Vacuum blasters, curtains, Wet blasting
Spray Painting	NESHAP - For Paint stripping and miscellaneous surface coating operations	Painting	Motor vehicle or mobile equipment surface coating operations may petition the Administrator for an exemption from this subpart if you can demonstrate, to the satisfaction of the Administrator, that you apply no coatings that contain compounds of chromium (Cr), lead (Pb), manganese (Mn), nickel (Ni), or cadmium (Cd).
Boiler		boilers cleaning	Asegurar que esten los permisos y mantenimiento Adiestrmeinto de personal
Ammonia ***In Aireko, this is used for cleaning of closed systems and is found in some refrigerants***	40 CFR Part 68 ANSI/ASHRE Standar 15 & 34-2007 ASHRE Standard 147-2002	Repair or replacement of Air conditioners Removal of old air conditioners Antibacterial cleaning of closed equipment	Collect and Recycle
CFC's	40 CFR 82 Subpart B, F CAA Sectrion 608 and 609	Air Conditioners refrigerants	Trained and EPA certified Technicians Color Code and DOT Cylinders EPA Compliance Recuperation Equipment Recycling of Refrigerant Work Quality Checks and Monitoring (Follow-up checkups on work done) Technician service certification (en PR)
Lead			
Refrigerant Handling	40 CFR.82 Subpart B, F CAA Section 608 and 609 ASHRAE Standard 34 & 147	Repair or replacement of Air conditioners Removal of old air conditioners	Trained and EPA certified Technicians Color Code and DOT Cylinders EPA Compliance Recuperation Equipment Recycling of Refrigerant Work Quality Checks and Monitoring (Follow-up checkups on work done) Technician service certification (en PR)

Conclusion

- Major environmental impacts were identified for AIREKO's operational actions.
- Mitigations programs were created to reduce the environmental impacts of AIREKO.
- Responsibilities were assigned to AIREKO's employees to oversight and ensure compliance with the EMS.
- The ISO 14001 requirements were accomplished in accordance to AIREKO's necessities.

Matrix

	Lead	Stormwater	Energy Consumption	Noise	Fugitive Dust	Waste water	Asbestos	Solid Waste*	Total
Regluatory Compliance	2	5	1	2	5	2	5	4	26
Community Expectations	4	3	5	5	5	3	5	4	34
Employee Expectations	5	3	3	5	3	1	4	4	28
Client Expectations	5	4	1	2	4	1	5	3	25
Environmental Impact	5	5	2	1	5	5	5	5	33
Public Health Impact	5	3	1	2	5	3	5	4	28
Public Image	4	4	4	4	5	3	4	5	33
Remediation Cost	2	5	1	1	2	5	4	3	23
Environmental resources and limitations	5	5	1	1	5	5	2	5	29
Employee knowledge	3	3	1	1	4	3	5	4	24
Total	40	40	20	24	43	31	44	41	

Legend:

Value	Risk Level
5	HIGH
4	MID-HIGH
3	MID
2	MID-LOW
1	LOW

Comments:

- Stake holders: clients, employees, and the public should be considered.
- *Solid waste includes Hazardous Waste and Universal Waste.

Acknowledgements

The authors would like to express their appreciation to the Polytechnic University of Puerto Rico professor, Dr. Cristhian Villalta, and AIREKO Environmental Health and Safety Manager, Eng. Iván Ortíz, for their mentorship throughout the development of the Environmental Management System; the Department of Civil and Environmental Engineering and Land Surveying personnel for their assistance during the Environmental Engineering Senior Design Project completion; the professors of the Polytechnic University of Puerto Rico for sharing their knowledge with us in the time of study; and all our classmates for their fellowship.