GOOD ENVIRONMENTAL MANAGEMENT PRACTICES FOR THE INDUSTRIAL GAS INDUSTRY

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KEYWORDS

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- ACETYLENE
- CARBON DIOXIDE
- HYDROGEN

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1 Introduction

This document is a practical guide to good environmental managment practices in the industrial gases industry and has been developed in conjunction with the US Compressed Gases Association who publishes this guidance as P37 - 2002. It can be used on its own or in conjunction with EIGA publication TN 515/95 Environmental Management.

This publication updates many of the practices mentioned in TN 515/95 and where there are any differences this document represents the most up to date advice.

The environmental managment system standard ISO 14001 requires organisations to review their environmental aspects and put in place practices to minimise and control their impacts. This document provides a standardised list that can be used in any industrial gas company.

2 Scope and purpose

2.1 Scope

This document provides guidance on good environmental management practices to industrial gas facility managers. This document does not give specific advice on health and safety issues, however consideration must always be given to these issues when conducting operational risk assessments before undertaking any activity.

Industrial gas facilities have distinct activities and associated environmental aspects that can impact the environment. This document covers activities at Air Separation and Helium Production facilities, Hydrogen and Carbon Monoxide facilities, Carbon Dioxide facilities, Truck Maintenance and Distribution, Acetylene Manufacturing, Cylinder Fill Operations, Specialty Gases Operations, and Customer Installation (Bulk Tanks) activities

2.2 Purpose

This document identifies typical industrial gas industry activities and associated environmental aspects and corresponding practices that can minimize or eliminate those impacts.

Environmental aspects can include wastes, discharges and releases (i.e. solid/hazardous waste, air emissions, wastewater discharges, noise, etc.) generated at various industrial gas facilities.

For each activity, environmental aspects, potential environmental impacts, and good environmental management practices (GEMPs) have been identified that can be used to prevent pollution, minimize the generation of wastes, discharges and releases, properly manage any residuals and use of energy, raw materials, water and land

3 Definitions

3.1 Environmental Aspect

These are elements of an organization’s activities, products or services that can interact with the environment.

3.2 Environmental Impact

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization’s activities, products or services.

3.3 Good Environmental Management Practices (GEMPs)

These are suggested practices that can be used to minimize or eliminate potential environmental impacts.

4 Good Environmental Managment Practices

4.1 Implementing Good Environmental Management Practices

Companies should periodically and systematically review processes and operating practices to identify waste, discharge and release reduction opportunities and to optimise the use of resources.

Conducting an inventory will assist in targeting pollution prevention opportunities. When conducting an inventory the following information should be gathered for each waste, discharge or release to assist in prioritising opportunities:

- Source of each major waste, discharge or release
- Rates of generation
- Toxicity or hazard characteristics
- Disposal method and costs

When implementing GEMPs, preference should be given to the following waste minimization hierarchy:

- Reduce at source (most preferred)
- Reuse or recycle
- Treatment and/or energy recovery
- Disposal (Least Preferred)

Objectives and targets for improvement should then be set for the priority items and these targets should be monitored, measured and reviewed on a regular basis.

To the extent practical, companies should systematically identify and implement GEMPs applicable to their operations. Where laws and regulations have requirements more stringent than those found in this document, they should be followed.

Site Managers should promote employee awareness and conduct training of GEMPs that apply to their site. Periodic feedback and suggestions should be solicited from employees on ways to minimize wastes, discharges and releases. Employees should be recognized for significant ideas that improve environmental performance, reduce the generation of wastes, discharges and releases.

4.2 How to use the Appendices

The following appendices identify GEMPs applicable to pollution prevention opportunities at the following types of facilities, processes and operations.

Not every facility or operation will have every source, waste, discharge or release listed in each applicable appendix. Site Managers should use the appendices as a ”library” to identify those sources of potential pollution that do apply to their facility and then implement the recommended, applicable GEMPs to the extent practical.

Appendix A lists non-process-specific sources of wastes, discharges and releases common to many industrial gas facilities. One or more of the remaining Appendices may also apply depending on the specific processes at the site.

- Appendix A - Good Environmental Management Practices for All Facilities
- Appendix B - Good Environmental Management Practices for Air Separation Units (ASU) and Helium Production Facilities

- Appendix C - Good Environmental Management Practices for Hydrogen/Carbon Monoxide (HYCO) Units
- Appendix D - Good Environmental Management Practices for Carbon Dioxide Production and Dry Ice Facilities
- Appendix E - Good Environmental Management Practices for Truck Maintenance and Distribution Terminals
- Appendix F - Good Management Environmental Practices for Acetylene Manufacturing Operations
- Appendix G - Good Management Environmental Practices for Cylinder Fill and Cylinder Maintenance Operations (including Specialty Gas Operations)
- Appendix H - Good Management Practices for Customer Installations
- Appendix I - Good Management Practices for Nitrous Oxide Plants

APPENDIX A - GEMP FOR ALL FACILITIES

Activity/Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Batteries	Heavy metals	• Waste Disposal	• Segregate and recycle to the extent feasible.
Boilers, hot water heaters, emergency generators (Fossil fuel-fired)	Particulate matter, carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide	• Air • Energy	• Operate in accordance with air permit, where applicable. • Operate and maintain equipment to be efficient • Use fuel with low sulphur and solids content.
Boiler blow-down	Wastewater, corrosion inhibitors, acids, caustics, oxygen scavenger	• Surface water	• Discharge through a permitted outfall or sewer connection. • Avoid excessive chemical feed through tight control of water chemistry. • Run boiler at optimum concentration cycles to minimize chemical loss, wastewater discharges, and makeup water consumption • Purchase water treatment chemicals in returnable /recyclable containers, where practical
Boiler water softener regeneration	Wastewater, salts	• Surface water	• Discharge through a permitted outfall or sewer connection. • Reuse wastewater, if feasible
Building	Heating, lighting and air conditioning	• Energy use	• Monitor energy use • Set improvement targets • Use energy efficient lighting and equipment • Conduct energy audits • Train employees to conserve energy
Building, floor drains	Solvents, oils, detergents, chemicals	• Surface water • Soil • Groundwater	• Keep solvents, oils, and other hazardous materials out of floor drains through proper storage and handling. • Use floor drain plugs in areas of high spill potential or seal drains that are not needed. • Maintain an adequate supply of spill kits in areas of high spill potential. • Avoid hosing down areas. Use dry cleanup techniques.

APPENDIX A – GEMP FOR ALL FACILITIES

Activity/Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Building and insulation materials	Asbestos	• Air • Waste Disposal	• Notify the appropriate agency, as required, in advance of any asbestos demolition or renovation • Use only qualified asbestos removal contractors when removing or repairing asbestos. • Contractors must remove asbestos materials according to regulatory requirements. Place waste in double-lined plastic bags or in drums with proper labels. Wet down asbestos during removal, handling and disposal. • Dispose of asbestos through an approved disposal contractor.
Chemical and waste loading/unloading areas	Diesel fuel, heating oil, acetone, lubricating oils, solvents, bleach, sulphuric acid, biocides, ethylene glycol, propylene glycol, water treatment corrosion inhibitors, caustic, used oil, and similar chemical or waste-like materials	• Soil • Surface water • Groundwater • Air	• Avoid positioning transport vehicles near or over storm drains. • Have spill kits, booms, sewer block mats readily available. • Check integrity of transfer hoses, fittings, and connections. • Ensure the correct fill lines and containers/tanks are identified prior to loading/unloading. • Illuminate unloading areas if material transfer occurs at night. • Use drip pans and buckets to catch small leaks from transfer hoses and fittings. • Prevent overfilling of storage tanks during deliveries through procedural or engineering controls. • Report and clean up any spills or leaks immediately. • Develop and implement a Site Emergency/Spill Plan.

APPENDIX A - GEMP FOR ALL FACILITIES

Activity/Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Chemical and waste storage areas	Diesel fuel, heating oil, acetone, lubricating oils, solvents, bleach, sulphuric acid, biocides, ethylene glycol, propylene glycol, water treatment corrosion inhibitors, used oil, and similar waste-like materials	• Soil • Surface Water • Groundwater • Air	• Store liquid chemicals in proper containers, preferably on an impervious surface with secondary containment. • Periodically check container integrity for signs of deterioration or damage. Document if required • Periodically check containment areas for leaks. Document if required. • Keep containment valves closed except to drain uncontaminated rainwater. • Keep containers closed when not in use. Prevent exposure to rainfall, use drum rain caps for drums stored outside. Store outdoor containers off the ground (e.g. on wooden pallet) to prevent bottom corrosion, possible leakage, and assist in visual inspection. • Minimize and consolidate chemical inventories. Don't buy larger quantities than needed simply to get a "price break". Disposal costs will often exceed savings. • Use up existing chemical inventories before switching to another supplier. • Redeploy excess chemicals for use at another facility. • Place drip pans beneath drum dispensing valves. • Report and clean up any spills or leaks immediately. • Prevent overfilling of storage tanks during deliveries through procedural or engineering controls. • Develop and implement a Site Emergency/Spill Plan. • Designate separate areas for waste storage and chemical storage. • Do not mix hazardous and non- hazardous wastes. • Post signs for designated hazardous waste storage areas.
Demolition and construction debris	Concrete, asphalt, metal, misc.	• Waste disposal	• Identify and remove any asbestos materials before demolition. • Recycle concrete, asphalt, and scrap metal where outlets are available. • Dispose of through an approved disposal contractor. • Reuse surplus soil to landscape site if feasible.
Drums (Empty)	Recyclable materials	• Use of Natural Resource • Waste Disposal	• Purchase chemicals in bulk form or use recyclable/ returnable" containers, where practical. • Remove chemical residuals to the extent possible. • Return empty drums to original supplier or recycle through an approved drum reconditioner.

APPENDIX A - GEMP FOR ALL FACILITIES

Activity/Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Equipment and parts cleaning	Solvents and detergents	• Soil • Surface Water • Groundwater • Air	• Advice on cleaning for oxygen service can be found in CGA Pamphlet G-4.1 Cleaning Equipment for Oxygen Service and EIGA Document 33/97 (adopted as AIGA 012/04) • Minimize solvent/chemical purchases and use. Don't buy and use more than needed. • Keep containers and parts cleaners closed when not in use • Use drip pans to collect solvents. • Collect spent solvents for recycling or disposal through a licensed vendor. • Do not pour solvents down any drains or on the ground. • Do not mix spent solvents with used oil or other chemicals. • Report and clean up any spills immediately and follow emergency procedures. • Determine if spent detergents can be discharged to sanitary sewer.
Fluorescent light fixtures	Mercury, PCB ballast	• Waste Disposal	• Recycle/dispose lamps and ballast via approved recycling/disposal contractor. • Replace with mercury-free or low-mercury lamps.
Fuelling island	Diesel fuel, gasoline	• Soil • Surface Water • Groundwater • Air	• Check fuel dispenser sump routinely for leaks and product /water accumulation • Maintain adequate supply of spill absorbent at fuelling station. • Where present, periodically check oil/water separator. • Check housekeeping. Remove any oil stained gravel. • Avoid topping off vehicle fuel tanks. • Avoid unattended filling of vehicles. • Avoid hosing down area. Use dry cleanup techniques. • Minimize rain/storm water run-on into fuel island area. • Install canopy, where practical, to keep rainfall off fuelling island.
Halon fire suppression systems	Halon	• Depletion of ozone layer	• Maintain system to avoid leaks. As suitable halon replacements are identified, recover halon and place in halon banks. • New systems must be designed without halon.
Mercury switches and other mercury-containing devices	Mercury	• Waste Disposal	• Recycle via approved recycler. • Have mercury spill kits available.

APPENDIX A - GEMP FOR ALL FACILITIES

Activity/Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Oil contaminated soil/debris	Oily rags, leak/spill cleanup materials, oily soils	• Soil • Surface Water • Waste disposal	• Dispose of through an approved disposal contractor. • Recycle through an approved asphalt batching plant when available. • Clean up oil stained soil/gravel promptly.
Oil Water Separators	Oil, oily water, oily sludge	• Surface Water • Soil • Groundwater	• Minimize solids from going into drains routed to an oil/water separator. • Periodically clean out separator to maintain optimum oil removal efficiency. • Routinely remove accumulated oil and sludge and recycle through an approved oil recycler. Test sludge for hazardous constituents. • Do not mix solvents or other chemicals with used oil. • Periodically inspect integrity of separator.
Painting of buildings and equipment	Paint residue, solvents, abrasive blasting material	• Air • Soil • Surface water • Groundwater • Waste Disposal	• Use water-based paints to the extent possible • Analyse old paint, before removal to determine if toxic metals such as lead, chromium, or cadmium hazard exists. • Collect abrasive-blasted wastes. At the end of each day secure wastes in appropriate containers. • Monitor paint contractor's operations, including material storage areas, and have contractor provide temporary spill containment around portable equipment containing diesel or gasoline. • Dispose of paint chips, abrasive blasting material, and associated painting supplies (e.g. tarps, brushes, rollers, rags, empty paint cans) as solid or hazardous wastes (depending upon analytical results) using an approved disposal contractor. All residual paint must be dry before disposal. • Use brush or roll-on paints instead of aerosol paints, where practical. • Dispose all solvent-based paints and thinners through an approved disposal contractor.
Power supply, transformers and capacitors	Mineral oil, PCB oil	• Soil • Surface water • Groundwater • Waste Disposal	• Periodically check equipment for leaks. • Promptly clean up any leaks. • Replace PCB transformers or PCB capacitors. • Always test equipment for presence of PCBs before disposing of oils or equipment. Never assume there are no PCBs. • Arrange for disposal of mineral oils or PCBs through an approved disposal contractor.

APPENDIX A – GEMP FOR ALL FACILITIES

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Product venting, compressors, traffic, etc.)	Noise	• Community	• Design and install, compressors, expanders and other equipment in accordance with local noise requirements. • Use appropriate noise-attenuation measures as required (sound insulation, noise curtains, buildings, walls). • Select sites with adequate land and distance to buffer noise. • Site equipment in a location that will minimize the noise impact to neighbours. • Minimize nighttime noise-generating activities. • See EIGA document on Noise
Sanitary waste (Foul) systems	Sewage	• Surface water • Soil • Groundwater	• Do not dispose of chemicals down sinks, drains, or toilets. • Dispose of sanitary wastes through permitted municipal sanitary sewer, septic tank, or onsite package treatment. • When onsite package treatment unit is used, conduct appropriate preventive maintenance and testing. Keep operator certifications current, where required.
Scrap metal, including cylinder valves, cylinders (except acetylene cylinders) used equipment, etc.	Recyclable materials	• Natural resource • Waste disposal	• Purge any gases from scrap cylinders. • Remove any fluids contained in equipment. • Check any coatings or insulation on the equipment for asbestos and if present remove before scrapping equipment. • Recycle through scrap metal dealer.
Storage tanks – aboveground (ASTs)	Heating oil, diesel fuel, acetone, used oil, gasoline	• Soil • Groundwater • Surface Water • Air	• Provide secondary containment for tank and fill port. • Provide overfill protection. • Obtain regulatory approvals • Install barriers to protect tank from vehicular traffic. • Provide spill kit near tank. • Prepare emergency plan to handle accidental discharges.

APPENDIX A - GEMP FOR ALL FACILITIES

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Storage Tanks Underground tanks (USTs)	Heating oil, diesel fuel, acetone, used oil, gasoline	• Soil • Groundwater • Surface Water • Air	• Conduct and document monthly release detection monitoring specified for the site's UST system. • Periodically inspect spill collar/fill port. • Periodically check spill/overfill devices. • Conduct regular inspection of tank and line release detection system using a qualified contractor to ensure proper operation. • Periodically inspect cathodic protection systems using a qualified contractor. • Report suspected leaks immediately. • Avoid unattended filling of storage tank. •
Transportation – Employees	Noise Exhaust fumes Fuel consumption	• Air • Global Warming • Community	• Set up company transport plans to minimize the need to travel • Use of email, voice mail and video conferencing • Use Car pooling/sharing, public transport • Training for vehicle drivers
Transportation - Product	Fuel, oil, grease, antifreeze.	• Air • Water • Noise • Land use • Energy use	• Consider best supply option, e.g. on-site production • Minimize transportation distances • Purchase and maintain vehicles to be fuel efficient and minimize air emissions • Avoid truck routes through residential neighbourhoods and minimize nighttime transport through residential neighbourhoods.
Trash (Plant Non Hazardous Waste)	Waste, Recyclable materials	• Use of Natural Resource • Waste Disposal	• Segregate and recycle materials to the extent feasible. (Waste paper, aluminium cans, cardboard, wood pallets, packing materials) • Dispose of waste through an approved disposal contractor.

APPENDIX B - GEMP FOR AIR SEPARATION UNITS AND HELIUM PRODUCTION FACILITIES

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Argon Production	Ammonia (if NH3 dissociation method used)	• Air emission	• Regular maintenance to minimize emissions • Switch to hydrogen supply, where practical
Cold box insulation	Rock wool, perlite, vermiculite	• Waste Disposal • Energy efficiency	• Check for ice spots • Replace insulation on shut down • Reuse perlite and vermiculite as a soil conditioner, where allowed. • Recycle, where possible. • Dispose of as solid waste through an approved disposal contractor.
Compressors and vacuum pumps	Lubricating oil	• Soil • Surface Water • Waste Disposal • Groundwater	• Minimize leaks through preventive maintenance • Where present, keep foundation curbing and drains free of debris for effective drainage to oil/water separator. • Use absorbents to minimize oil seepage off of foundations that are not tied to an oil/water separator. • Where practical, install roof over compressors to prevent contaminated storm water. • Recycle used oil, and where possible, saturated absorbents through an approved oil recycler. • Do not mix solvents or other chemicals with used oil. • Used oil contaminated with freons or solvents requires special disposal. • Return empty drums to original supplier or recycle through an approved drum reconditioner, where practical.

APPENDIX B - GEMP FOR AIR SEPARATION UNITS AND HELIUM PRODUCTION FACILITIES

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Compressor - condensate	Low pH (acidic), copper, nickel, lead	• Surface Water • Groundwater	• Do not discharge onto the ground. • Discharge through a permitted outfall or sewer connection. • Reuse as makeup to cooling tower, where feasible. • Treat any excessive levels of metals. • Neutralize low pH before discharging.
Compressor - vents	Lubricating oil mists	• Air • Soil • Surface water	• Install oil demisters to collect oil mist emissions. • Recycle the collected oil through an approved oil recycler.
Cooler system - chemical wash	Acids, metals, solids, chelants	• Surface Water • Waste Disposal	• Dispose of spent chemical cleaning solutions through an approved disposal contractor
Cooling systems – closed loop	Ethylene glycol, propylene glycol, and similar heat exchange fluids	• Soil • Surface Water • Waste Disposal • Groundwater	• Minimize leaks through preventive maintenance. • Maintain proper level of corrosion inhibitors to extend life of solutions. • Recycle glycols via approved recycler. • Dispose of spent solutions through an approved disposal contractor.
Cooling tower - blowdown	Biocides, acids, corrosion inhibitors	• Surface water • Natural Resource	• Discharge through a permitted outfall or sewer connection. • Avoid use of chromate-based or zinc-based corrosion inhibitors. • Avoid excessive chemical feed through tight control of water chemistry. • Run cooling tower at optimum concentration cycles to minimize chemical loss, wastewater discharges, and makeup water consumption. • Purchase water treatment chemicals in bulk or returnable containers instead of drums, where practical. • Return empty drums to original supplier or recycle through an approved drum reconditioner, where practical. • Use of existing supplier of chemicals and obtain any necessary permit modifications before switching chemicals.

APPENDIX B - GEMP FOR AIR SEPARATION UNITS AND HELIUM PRODUCTION FACILITIES

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Cooling tower - mists	Legionella risk	Legionella	• Planned maintenance and disinfection of cooling systems • Regular testing of systems for Legionella.
Cooling tower - sidestream filter backwash	Solids	• Surface water	• Treat if required before discharge through a permitted outfall or sewer connection.
Cooling tower - sludge	Solids, heavy metals (chromium, copper, zinc)	• Waste Disposal	• Test for presence of heavy metals to determine if a hazardous waste. • Dispose of through an approved disposal contractor.
Electricity	Indirect	• Energy use • Air • Water • Solid waste	• Design, purchase and maintain equipment to operate efficiently and minimize energy use. • Conduct energy audits to identify potential opportunities to improve energy efficiency. • Train employees to conserve energy.
Fuel-fired vaporizers and Temperature Swing Adsorption units	Particulate matter, carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide	• Air • Energy	• Operate in accordance with air permit, where applicable. • Operate and maintain equipment to be efficient • Use fuel with low sulphur and solids content.
Ion mobility analyzers, Helium Ionization Detectors, Alnor Dewpointers	Radioactive materials	• Waste Disposal	• Return radioactive cells to manufacturer. • Do not throw in normal (waste) trash. • Report all pending transfers of radioactive materials to and from the site to applicable regulatory agencies. • Perform wipe tests for leaks, where required. • Maintain all warning labels on analyzers. • Obtain appropriate regulatory approvals to own and use radioactive materials.
Pre-purification units	Silica gel, molecular sieve, alumina, activated charcoal	• Waste Disposal	• If feasible, recycle, reuse or regenerate molecular sieves. • Dispose of as solid waste through an approved disposal contractor.

APPENDIX B - GEMP FOR AIR SEPARATION UNITS AND HELIUM PRODUCTION FACILITIES

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Process refrigeration - ammonia systems	Accidental release, fugitive release	• Air	• Minimize leaks from valves, flanges, etc., through PM, using Enviroseals, etc. • Use purging systems designed to minimize refrigerant releases. • Recover ammonia to the maximum extent possible during maintenance, through receivers. • Use water-scrubbing systems to treat major ammonia releases.
Process refrigeration - Freon systems	Freons (CFCs, HCFC, HFCs, PFCs),	• Ozone Depletion • Global Warming	• Minimize leaks from valves, flanges, etc., through preventive maintenance. • Monitor and document the rate of consumption of freons and ammonia to detect leaks. • Repair leaks promptly. • DO NOT vent freons to atmosphere. Evacuate freons to prescribed levels before major maintenance and servicing using certified technicians and approved recovery and recycling equipment. • Reuse excess freon inventories at other facilities or recycle through an approved recycling contractor. • Where practical, retrofit units with more environmentally friendly refrigerants.
Product Storage and Transfer	Nitrogen, oxygen, helium, argon	• Energy use	• Minimize venting of cryogenic gases
Product venting, Compressors, traffic, etc.)	Noise	• Community	• Design and install, compressors, expanders and other equipment in accordance with local noise requirements. • Use appropriate noise-attenuation measures as required (sound insulation, noise curtains, buildings, walls). • Select sites with adequate land and distance to buffer noise. • Site equipment in a location that will minimize the noise impact to neighbours. • Minimize nighttime noise-generating activities. • See EIGA document on Noise
Used filters	Filters with dust deposits	• Waste disposal	• Change out filters as part of planned maintenance to maintain efficiency • Test for presence of radioactivity, if warranted, or other dust contaminants to determine if a hazardous waste, where appropriate

APPENDIX C - GEMP FOR HYDROGEN/CARBON MONOXIDE UNITS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Amine adsorption system	Monoethanolamine	• Surface water • Soil	• Contain equipment leaks. • Discharge through a permitted outfall or sewer connection, if allowed. • Dispose of through an approved disposal contractor.
Catalysts (SCR, High/Low Temp Shift, Reformer, Prereformer, Hydrotreater	Various metals (Titanium, vanadium, tungsten, iron, chromium, copper, molybdenum, cobalt, nickel)	• Waste Disposal	• Recycle through approved recycling contractor, where feasible. • Where not feasible, dispose of through an approved disposal contractor.
Compressors and vacuum pumps	Lubricating oil	• Soil • Surface Water • Waste Disposal • Groundwater	• Minimize leaks through preventive maintenance • Where present, keep foundation curbing and drains free of debris for effective drainage to oil/water separator. • Use absorbents to minimize oil seepage off of foundations that are not tied to an oil/water separator. • Where practical, install roof over compressors to prevent contaminated storm water. • Recycle used oil, and where possible, saturated absorbents through an approved oil recycler. • Do not mix solvents or other chemicals with used oil. • Used oil contaminated with freons or solvents requires special disposal. • Return empty drums to original supplier or recycle through an approved drum reconditioner, where practical.
Compressor - condensate	Low pH (acidic), copper, nickel, lead	• Surface Water • Groundwater	• Do not discharge onto the ground. • Discharge through a permitted outfall or sewer connection. • Reuse as makeup to cooling tower, where feasible. • Treat any excessive levels of metals. • Neutralize low pH before discharging.

APPENDIX C - GEMP FOR HYDROGEN/CARBON MONOXIDE UNITS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Compressor - vents	Lubricating oil mists	• Air • Soil • Surface water	• Install oil demisters to collect oil mist emissions. • Recycle the collected oil through an approved oil recycler.
Cooling tower - blowdown	Biocides, acids, corrosion inhibitors	• Surface water • Natural Resource	• Discharge through a permitted outfall or sewer connection. • Avoid use of chromate-based or zinc-based corrosion inhibitors. • Avoid excessive chemical feed through tight control of water chemistry. • Run cooling tower at optimum concentration cycles to minimize chemical loss, wastewater discharges, and makeup water consumption. • Purchase water treatment chemicals in bulk or returnable/recyclable containers instead of drums, where practical. • Return empty drums to original supplier or recycle through an approved drum reconditioner, where practical. • Use of existing supplier of chemicals and obtain any necessary permit modifications before switching chemicals.
Cooling tower - mists	Legionella risk	• Legionella	• Planned maintenance and disinfection of cooling systems • Regular testing of systems for Legionella
Cooling Water - sidestream filter backwash	Solids	• Surface water	• Treat if required before discharge through a permitted outfall or sewer connection.
Cooling tower - sludge	Solids, heavy metals (chromium, copper, zinc)	• Waste Disposal	• Test for presence of heavy metals to determine if a hazardous waste. • Dispose of through an approved disposal contractor. •
Desulphurisation beds	Zinc oxide, zinc sulphide	• Soil	• Dispose of through an approved disposal contractor.

APPENDIX C - GEMP FOR HYDROGEN/CARBON MONOXIDE UNITS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Flaring	Noise, Air Emissions	• Community	• Design and install, flares, compressors, expanders and other ”noisy” equipment in accordance with external requirements or internal engineering standards. • Use appropriate noise-attenuation measures as required (sound insulation, noise curtains, buildings, walls). • Select sites with adequate land and distance to buffer noise. • Install noisy equipment on site in a location that will minimize the noise impact to neighbours. • Minimize nighttime noise-generating activities.
Fugitive emissions from compressors, valves, flanges	Hydrocarbons	• Air	• Where required, implement leak detection and repair program to control fugitive emissions from valves, flanges, and compressors. • Repair leaking components promptly.
Process boiler - blowdown	Corrosion inhibitors	• Surface water • Energy • Natural Resource	• Discharge through a permitted outfall or sewer connection. • Avoid excessive chemical feed through tight control of water chemistry. • Run boiler at optimum concentration cycles to minimize chemical loss, wastewater discharges, makeup water consumption, and energy consumption. • Purchase water treatment chemicals in returnable/recyclable containers instead of drums, where practical. • Return empty drums to supplier or recycle through an approved drum reconditioner.
Process Boiler - Feedwater Pretreatment (RO Reject, softener reject, demineralizer regeneration, filter backwash)	Wastewater containing salts, solids.	• Surface water	• Discharge through a permitted outfall or sewer connection. • Reuse wastewater, were feasible.

APPENDIX C - GEMP FOR HYDROGEN/CARBON MONOXIDE UNITS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Process condensate	Wastewater, methanol, ammonia, temperature	• Surface water • Air • Energy • Natural resource	• Reuse as boiler feedwater makeup, where feasible. • Reuse as cooling tower makeup, where feasible. • Control dearator vent emissions, when used as boiler feedwater. • Discharge to a permitted outfall or sewer connection.
Pressure swing adsorption system	Silica gel, molecular sieve, alumina, carbon, Noise	• Waste disposal • Community	• If available, recycling through original manufacturer. • Dispose of through an approved disposal contractor. • Use appropriate noise-attenuation measures as required (sound insulation, noise curtains, buildings, walls). • Select sites with adequate land and distance to buffer noise. • Install noisy equipment on site in a location that will minimize the noise impact to neighbours. • Minimize night time noise-generating activities • See EIGA document on Noise 85/02
Pressure Swing Adsorption Purge Gas	Hydrogen Carbon Monoxide Noise	• Air • Community	• Use as supplemental fuel source in steam methane reformer or customer fuel system • Install silencer
Steam condensate return, steam traps	Wastewater, corrosion inhibitors, low pH, temperature	• Surface water • Energy • Natural resource	• Reuse as boiler feedwater makeup, where feasible. • Discharge to a permitted outfall or sewer connection.
Steam Methane Reformer	Particulate matter, carbon monoxide, hydrocarbons, nitrogen oxides, sulphuric dioxide, methanol, ammonia	• Air	• Operate in accordance with air permit. • Use low NOx burners, steam injection, flue gas recirculation, other NOx control technology, where required. • Where present monitor performance of SCR catalyst/NOx control system. • Periodically replace SCR catalyst to maintain NOx destruction efficiency.

APPENDIX D - GEMP FOR CARBON DIOXIDE PLANTS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Catalytic Oxidation	Used Catalysts	• Waste disposal	• Recycle through approved recycling contractor if feasible • Where not feasible dispose of through approved contractor
Compressors and vacuum pumps	Lubricating oil	• Soil • Surface Water • Waste Disposal • Groundwater	• Minimize leaks through preventive maintenance • Where present, keep foundation curbing and drains free of debris for effective drainage to oil/water separator. • Use absorbents to minimize oil seepage off of foundations that are not tied to an oil/water separator. • Where practical, install roof over compressors to prevent contaminated storm water. • Recycle used oil, and where possible, saturated absorbents through an approved oil recycler. • Do not mix solvents or other chemicals with used oil. • Used oil contaminated with freons or solvents requires special disposal. • Return empty drums to original supplier or recycle through an approved drum reconditioner, where practical.
Compressor - condensate	Low pH (acidic), copper, nickel, lead	• Surface Water • Groundwater	• Do not discharge onto the ground. • Discharge through a permitted outfall or sewer connection. • Reuse as makeup to cooling tower, where feasible. • Treat any excessive levels of metals. • Neutralize low pH before discharging.
Compressor - vents	Lubricating oil mists	• Air • Soil • Surface water	• Install oil demisters to collect oil mist emissions. • Recycle the collected oil through an approved oil recycler.

APPENDIX D - GEMP FOR CARBON DIOXIDE PLANTS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Cooling tower - blowdown	Biocides, acids, corrosion inhibitors	• Surface water • Natural Resource	• Discharge through a permitted outfall or sewer connection. • Avoid use of chromate-based or zinc-based corrosion inhibitors. • Avoid excessive chemical feed through tight control of water chemistry. • Run cooling tower at optimum concentration cycles to minimize chemical loss, wastewater discharges, and makeup water consumption. • Purchase water treatment chemicals in bulk or returnable containers instead of drums, where practical. • Return empty drums to original supplier or recycle through an approved drum reconditioner, where practical. • Use of existing supplier of chemicals and obtain any necessary permit modifications before switching chemicals.
Cooling Tower - mists	Legionella risk	• Legionella	• Planned maintenance and disinfection of cooling systems. • Regular testing of systems for Legionella
Cooling tower - sludge	Solids, heavy metals (chromium, copper, zinc)	• Waste Disposal	• Test for presence of heavy metals to determine if a hazardous waste. • Dispose of through an approved disposal contractor.
Electricity	Indirect	• Energy use • Air • Water • Solid waste	• Design, purchase and maintain equipment to operate efficiently and minimize energy use. • Conduct energy audits to identify potential opportunities to improve energy efficiency. • Train employees to conserve energy.
Fuel	Burning to produce product	• Natural Resources	• Use natural sources of CO2 or byproduct streams as feed, where possible
Process refrigeration - ammonia systems	Accidental release, fugitive release	• Air, impact of ammonia	• Minimize leaks from valves, flanges, etc., through PM, using Enviroseals, etc. • Use purging systems designed to minimize refrigerant releases. • Recover ammonia to the maximum extent possible during maintenance, through receivers. • Use water-scrubbing systems to treat major ammonia releases.

APPENDIX D - GEMP FOR CARBON DIOXIDE PLANTS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Process refrigeration - Freon systems	Freons (CFCs, HCFC, HFCs, PFCs),	• Ozone Depletion • Global Warming • Air, impact of ammonia	• Minimize leaks from valves, flanges, etc., through preventive maintenance. • Monitor and document the rate of consumption of freons and ammonia to detect leaks. • Repair leaks promptly. • DO NOT vent freons to atmosphere. Evacuate freons to prescribed levels before major maintenance and servicing using certified technicians and approved recovery and recycling equipment. • Reuse excess freon inventories at other facilities or recycle through an approved recycling contractor. • Where practical, retrofit units with more environmentally friendly refrigerants.
Venting	Carbon Dioxide emissions	• Air • Global Warming	• Optimise plant efficiency • Avoid venting where possible

APPENDIX E - GEMP FOR TRUCK MAINTENANCE AND DISTRIBUTION TERMINALS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Brake shoes	Asbestos	• Waste • Air	• Do not use asbestos brake shoes • Replace existing shoes • Dispose of as hazardous waste to authorized contractor
Cleaners - engine, brake and other specialty maintenance products	Various chemicals, aerosol cans	• Soil • Air	• When using specialty-cleaning products apply product to rag then apply the product containing rag to surface being cleaned. • Minimize overspray, drips, and residues. Use absorbent materials to collect excess. • Do not mix spent specialty products with parts washer solvents. • Empty aerosol cans (contents no longer under pressure) before discarding into non hazardous waste (trash), if permitted. • Do not clean parts over ground or drain. Use drip pan.
Motor oil changes	Used oil, oil filters	• Soil • Surface water • Waste Disposal	• Puncture filter dome end and hot drain used oil for 24 hours. • Recycle used oil filters, where service is available. • Recycle used oil through an approved oil recycler • Do not mix solvents or other chemicals with used oil. • Do not pour oil on ground or down drain.
Motor Vehicle Air Conditioners	Refrigerants (CFCs, HCFC, HFCs)	• Ozone Depletion • Global Warming • Air	• Minimize leaks through preventive maintenance. • Repair leaks promptly. • DO NOT vent freons to atmosphere. Recover freons to the maximum extent possible during maintenance and servicing by certified technicians using approved recovery and recycling equipment. • Where practical, retrofit units with less harmful freons that are approved by an environmental representative.
Radiator servicing	Ethylene glycol, Propylene glycol, and similar heat exchange fluids (e.g. DowTherm)	• Soil • Surface Water • Waste Disposal	• Recycle spent antifreeze via approved recycler. • Dispose of spent solutions as a last resort through an approved disposal contractor. • Do not pour antifreeze on ground or down drain. Use drip pan to collect.

APPENDIX E - GEMP FOR TRUCK MAINTENANCE AND DISTRIBUTION TERMINALS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Truck emissions (fuel economy	Carbon monoxide, nitrogen oxides, hydrocarbons, particulates (diesel)	• Air • Energy	• Optimise route scheduling and routes • Maintain vehicles to operate efficiently while minimizing emissions. • Minimize trips and distances travelled to extent possible by maximizing load volume going out and minimizing load volume returned. • Purchase energy-efficient vehicles that meet regulatory emission standards. • Use low sulphur fuel and particle traps where feasible. • Use different fuels e.g. LNG hydrogen, CNG • Measure and monitor fuel consumption and set targets
Truck batteries	Lead, sulphuric acid	• Soil • Waste Disposal	• Return used batteries to dealer when purchasing new batteries. • Protect batteries from severe cold to prevent freezing and release of battery acid. Store batteries indoors on impervious surfaces, whenever possible. • Store batteries on wooden pallets (one battery high). • Do not throw batteries in normal waste (trash) container. • Do not try to break open and reclaim lead from batteries on site.
Truck tires	Tyres	• Waste Disposal • Fuel Use	• Recycle used tires back to dealer when purchasing new tires. • Use re-treaded tires, where appropriate • Maintain proper tyre inflation
Truck breakdowns and accidents	Diesel fuel, antifreeze, motor oil, hydraulic oil	• Soil • Surface water • Waste Disposal	• Where appropriate, keep spill kits stocked on each truck. • Report and cleanup spills immediately. • Take cleanup debris from small incidents back to home terminal for disposal. • Use cleanup contractor for larger spills. Contact an environmental representative for assistance.

APPENDIX E - GEMP FOR TRUCK MAINTENANCE AND DISTRIBUTION TERMINALS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Vehicle washing	Oils, greases, detergents, suspended solids, salts, sludge residual	• Surface water • Soil	• Wash vehicles in wash bays or other designated areas. • Discharge through a permitted outfall or sewer connection. Discharging to a storm water drain is prohibited. • Remove accumulated solids/sludge from wash bay sump or grit chamber regularly. • Wash bay areas that do not have a solid collection sump, use a fabric drain filtering device to prevent accumulated solids/sludge from wash bay from entering and accumulating in oil/water separator. • Use only non-phosphate, non-emulsifying detergents quick oil release detergents. • Treat wash water through a solids separator prior to discharge • Do not discharge detergents to an oil/water separator.

APPENDIX F - GEMP FOR ACETYLENE MANUFACTURING OPERATIONS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Acetylene Generator	Silica, Ferro Silica, Carbon	• Waste Disposal	• Minimize impurities in purchased carbide • Clean generator regularly • Dispose of residuals to an authorized contractor as non hazardous waste
Acetylene generator and lime pit area	Calcium hydroxide (lime) scale/deposits, acid wash water used to remove lime scale build-up	• Waste Disposal	• Dispose of through an approved disposal contractor. • Collect acid wash water and reuse as a first rinse wash water the next time acid washing is needed. • Combine with lime slurry where possible. • Neutralize with lime before discharge. • Periodically check integrity of lime pit.
Carbide lime slurry	Calcium hydroxide (lime) solids, water	• Surface water • Soil • Waste Disposal	• Decant water from solids. • Reuse decanted wastewater back in acetylene manufacturing process. • Reuse co-product lime as raw material for offsite wastewater treatment, agricultural/soil amendment, etc. • Refer to CGA Pamphlet 1.5
Compressors and vacuum pumps	Lubricating oil	• Soil • Surface Water • Waste Disposal • Groundwater	• Minimize leaks through preventive maintenance • Where present, keep foundation curbing and drains free of debris for effective drainage to oil/water separator. • Use absorbents to minimize oil seepage off of foundations that are not tied to an oil/water separator. • Where practical, install roof over compressors to prevent contaminated storm water. • Recycle used oil, and where possible, saturated absorbents through an approved oil recycler. • Do not mix solvents or other chemicals with used oil. • Used oil contaminated with freons or solvents requires special disposal. • Return empty drums to original supplier or recycle through an approved drum reconditioner, where practical.

APPENDIX F - GOOD ENVIRONMENTAL MANAGEMENT PRACTICES FOR ACETYLENE MANUFACTURING OPERATIONS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Compressor - condensate	Low pH (acidic), copper, nickel, lead	• Surface Water • Groundwater	• Do not discharge onto the ground. • Discharge through a permitted outfall or sewer connection. • Reuse as makeup to cooling tower, where feasible. • Treat any excessive levels of metals. • Neutralize low pH before discharging.
Compressor - vents	Lubricating oil mists	• Air • Soil • Surface water	• Install oil demisters to collect oil mist emissions. • Recycle the collected oil through an approved oil recycler.
Cooling water	Wastewater	• Natural Resource • Surface water	• Reuse as makeup to acetylene generator
Cylinder painting	Paint, paint thinners, paint cans, aerosol cans, paint rollers and brushes, volatile organic compounds, paint booth filters	• Air • Waste Disposal • Soil	• Use water-based paints or paint with low VOC content. • Discharge water-based paint rinsewater through a permitted sewer connection. Do not pour on ground or in storm sewer. • Install paint booth for high volume painting. (An air permit may be required) • Use aerosol can puncture system to release propellant and drain liquid. • Do not throw liquids in trash dumpster. Allow empty paint cans, paintbrushes and rollers to dry before disposing. • Collect used paint, paint thinners for disposal via an approved disposal contractor. Do not mix with other wastes or pour on ground.
Cylinders - venting	Acetylene	• Air	• Vent gas back to generator or gas holder for recovery • Only vent cylinder gases allowed by air permit, air regulations or air permit exemption. • Vent flammable gases to appropriate control device(s). • Refer to EIGA 30/04 Disposal of Gases and CGA P-22
Cylinders - scrap	Acetone, asbestos	• Air • Waste Disposal	• Drain acetylene from cylinder. • Remove and recover acetone, to the extent possible. • Dispose of through an approved disposal contractor. • Refer to CGA P-22. and EIGA 05/00
Carbide dust	Nuisance, dust	• Air	• Minimize by using closed filling system • Return to generator • Dispose of in lime pit

APPENDIX F - GEMP FOR ACETYLENE MANUFACTURING OPERATIONS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Cylinders - surface preparation	Abrasive blasting media, lead, chromium, particulates, silica, paint chips	• Air • Waste Disposal	• Conduct surface prep operations in accordance with air permit or air permit exemption. • Control particulate emissions through dust collector. • Test waste for toxic metals, such as lead, chromium, cadmium, to determine if the waste is a hazardous waste. • Dispose of waste through an approved disposal contractor.
Cylinders - valve packing material	Asbestos	• Waste Disposal	• Dispose of through an approved disposal contractor. • Keep asbestos materials wet and keep in plastic bags prior to disposal.
Dryers	Silica Gel, Calcium Chloride	• Waste disposal	• Optimise dryer operation • Check for contamination before disposal • Dispose of through an approved disposal contractor
Gas Purification Media from high purity fill operations (e.g. Monkey Dust®)	Arsenic, mercury, chromic acid, sulphuric acid, Ferric Chloride, Ferric oxide	• Waste Disposal	• Use to maximum capacity of purification before switching out spent media Dispose of through an approved disposal contractor. • Test for hazardous constituents.
Stabilizers	Acetone, DMF	• Air • Waste disposal	• Recover the stabilizer to the extent possible • Refer to EIGA document 05/00 and CGA P-22

APPENDIX G - GEMP FOR CYLINDER FILL AND MAINTENANCE OPERATIONS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Compressors and vacuum pumps	Lubricating oil	• Soil • Surface Water • Waste Disposal • Groundwater	• Minimize leaks through preventive maintenance • Where present, keep foundation curbing and drains free of debris for effective drainage to oil/water separator. • Use absorbents to minimize oil seepage off of foundations that are not tied to an oil/water separator. • Where practical, install roof over compressors to prevent contaminated storm water. • Recycle used oil, and where possible, saturated absorbents through an approved oil recycler. • Do not mix solvents or other chemicals with used oil. • Used oil contaminated with freons or solvents requires special disposal. • Return empty drums to original supplier or recycle through an approved drum reconditioner, where practical.
Compressor - condensate	Low pH (acidic), copper, nickel, lead	• Surface Water • Groundwater	• Do not discharge onto the ground. • Discharge through a permitted outfall or sewer connection. • Reuse as makeup to cooling tower, where feasible. • Treat any excessive levels of metals. • Neutralize low pH before discharging.
Compressor - vents	Lubricating oil mists	• Air • Soil • Surface water	• Install oil demisters to collect oil mist emissions. • Recycle the collected oil through an approved oil recycler.
Cylinder - filling	Flammable/ Toxic Gases	• Air • Odour Nuisance	• Design and maintain filling equipment to minimize leaks. • When filling flammable/toxic gases, provide continuous/ periodic monitoring to ensure system integrity. • Properly train employees to conduct filling and follow filling procedures. • Consider suitable treatment before releasing gases containing flammable (generally) or toxic materials, in some cases, an air permit is required

APPENDIX G - GEMP FOR CYLINDER FILL AND MAINTENANCE OPERATIONS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Cylinder - painting	Paint, paint thinners, paint cans, aerosol cans, paint rollers and brushes, volatile organic compounds, paint booth filters	• Air • Waste Disposal • Soil	• Use water-based paints or paint with low VOC content. • Discharge water-based paint rinsewater through a permitted sewer connection. Do not pour on ground or in storm sewer. • Install paint booth for high volume painting. (An air permit may be required) • Use aerosol can-puncturing system to release propellant and drain liquid. • Do not throw liquids in trash dumpster. Allow empty paint cans, paint brushes and rollers to dry before disposing in trash. • Collect used paint, paint thinners for disposal via an approved disposal contractor. Do not mix with other wastes or pour on ground.
Cylinders - purging	Various inert, atmospheric, flammable, and toxic gases	• Air • Odour Nuisance	• Recover the product if technically and economically feasible • Only vent cylinder gases allowed by air permit, air regulations or air permit exemption. • Vent toxic and flammable gases to appropriate control devices. • Top fill cylinders whenever possible to minimize cylinder purging emissions. • Refer to EIGA document 30/04 Disposal of gases Or CGA P-22
Cylinders - requalification	Wastewater	• Surface water • Waste Disposal	• Recycle cylinder test water to the extent practical and feasible for quality reasons • Discharge through a permitted outfall or sewer connection. • Remove and dispose of any residue containing metals or other contaminants. • Render rejected cylinders unusable and discard as scrap metal.
Cylinders - surface preparation	Abrasive blasting media, lead, chromium, cadmium, particulates, silica, paint chips	• Air • Waste Disposal	• Conduct operations in accordance with air permit or air permit exemption. • Control particulate emissions through dust collector. • Test waste for metals (lead, chromium, cadmium) to determine if hazardous waste. • Dispose of waste through an approved disposal contractor.
Cylinder preparation	Plastic from packaging, shrink wrap, PTFE tape	• Waste disposal	• Send for recycling or recovery • Dispose of waste through an approved disposal contractor.

APPENDIX G – GEMP FOR CYLINDER FILL AND MAINTENANCE OPERATIONS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Cylinders - Unserviceable	Various inert, atmospheric, flammable, and toxic gases	• Air • Waste disposal	• Do not accept unknown cylinders and lecture bottles. • Keep problem cylinder inventories low by directing cylinders, on an ongoing basis, to appropriate locations for processing: • Atmospherics (Ar, N2, andO2) may be vented on-site, but only after contacting the Environmental expert to insure that local/state environmental regulations do not prohibit such venting.
Ion mobility analysers, Helium Ionisation Detectors, Alnor Dewpointers	Radioactive materials	• Waste Disposal	• Return spent radioactive cells to manufacturer. • Do not throw in normal non hazardous waste containers. • Inform Environmental Representative of all pending transfers of radioactive materials to and from the site. • Perform wipe tests for leaks, where required. • Maintain all warning labels on analysers.
Process refrigeration - Freon systems	Freons (CFCs, HCFC, HFCs, PFCs), Ammonia	• Ozone Depletion • Global Warming • Air	• Minimize leaks from valves, flanges, etc., through preventive maintenance. • Monitor and document the rate of consumption of freons and ammonia to detect leaks. • Repair leaks promptly. • DO NOT vent freons to atmosphere. Evacuate freons to prescribed levels before major maintenance and servicing using certified technicians and approved recovery and recycling equipment. • Reuse excess freon inventories at other facilities or recycle through an approved recycling contractor. • Where practical, retrofit units with more environmentally friendly refrigerants.
Scrap metal	Recyclable materials	• Natural resource • Waste disposal	• Purge any gases from scrap tanks, etc. • Remove any fluids contained in equipment. • Check any coatings or insulation on the equipment for asbestos and if present remove before scrapping equipment. • Recycle through scrap metal dealer.
Scrubber Effluent and Emissions	Waste alkali or acid scrubbing solutions, could contain metal ions	• Waste disposal • Water	• Design and run scrubber efficiently to minimize emissions the use of scrubbing solutions • Design and run scrubbing system to prevent leaks and spills • Treat liquid waste before permitted discharge or disposal through licensed contractors.

APPENDIX H - GEMP FOR CUSTOMER INSTALLATION OPERATIONS

Source	Environmental Aspect	Potential Impacts	Good Environmental Management Practices
Carbon molecular sieve, ceramic molecular sieve and alumina silica gel	Carbon, alumina	• Waste Disposal	• Plan ahead to make arrangements for disposal. Adequate lead time is needed. • If the customer is responsible for disposal, follow customers procedures.
Equipment and parts	Spent solvents and detergents	• Soil • Surface Water • Groundwater	• Purchase parts pre cleaned • Minimize solvent/chemical purchases. Don't buy more than needed. • Keep containers and parts cleaners closed when not in use • Use drip pans to collect solvents. • Collect spent solvents for recycling through an approved recycler. • Do not pour solvents down any drains or on the ground. • Do not mix spent solvents with used oil or other chemicals. • Report and clean up any spills immediately. • Use biodegradable detergents whenever possible. • Determine if spent detergents can be discharged to sanitary sewer.
Process refrigeration systems	Freons (CFCs, HCFC, HFCs, PFCs), Ammonia	• Ozone Depletion • Global Warming • Air	• Minimize leaks from valves, flanges, etc., through preventive maintenance. • Monitor and document the rate of consumption of freons and ammonia to detect leaks. • Repair leaks promptly. • DO NOT vent freons to atmosphere. Evacuate freons to prescribed levels before major maintenance and servicing using certified technicians and approved recovery and recycling equipment. • Reuse excess Freon inventories at other facilities or recycle through an approved recycling contractor. • Where practical, retrofit units with more environmentally friendly refrigerants.

APPENDIX I - GEMP FOR NITROUS OXIDE PLANTS

Source	Environmental Aspect	Potential Impact(s)	Good Environmental Management Practices
Scrubber Effluent	Waste alkali or acid scrubbing solutions, could contain metal ions Permanganate, sulphuric acid	• Waste disposal • Water	• Design and run scrubber efficiently to minimize the use of acid/alkali • Design and run scrubbing system to prevent leaks and spills • Treat liquid waste before landfill disposal
Alumina Silica gel	Carbon, alumina	• Waste Disposal	• Plan ahead to make arrangements for disposal. Adequate lead-time is needed.
Process refrigeration - Freon systems	Freons (CFCs, HCFC, HFCs, PFCs), Ammonia	• Ozone Depletion • Global Warming • Air	• Minimize leaks from valves, flanges, etc., through preventive maintenance. • Monitor and document the rate of consumption of freons and ammonia to detect leaks. • Repair leaks promptly. • DO NOT vent freons to atmosphere. Evacuate freons to prescribed levels before major maintenance and servicing using certified technicians and approved recovery and recycling equipment. • Reuse excess freon inventories at other facilities or recycle through an approved recycling contractor. • Where practical, retrofit units with more environmentally friendly refrigerants.
Cylinders - purging	Nitrous Oxide	• Air	• Recover the product if technically and economically feasible • Only vent cylinder gases allowed by air permit, air regulations or air permit exemption. • Top fill cylinders whenever feasible to minimize cylinder purging emissions. • Refer to EIGA document 30/04 Disposal of gases Or CGA P-22