



AIR POLLUTION CONTROL

EXPERIENCE COUNTS:

Carmagen’s staff has extensive, demonstrated expertise in a variety of environmental engagements including:

- Environmental Permitting
- Air Pollution Control
- Wastewater Treatment
- Solid and Hazardous Waste Treatment/Remediation

Our services include technology and process assessments, permitting, planning and design. We assist in preparing permit documents, project execution plans and equipment specifications, as well as assisting in defining environmental compliance requirements, performing safety reviews and project audits. Significant expertise is also available in troubleshooting and maintenance planning.

<p>AIR POLLUTION CONTROL SERVICES:</p>	<ul style="list-style-type: none"> • Evaluate existing equipment and/or control systems • Conduct conceptual design screening studies • Prepare basis of design and/or basic design packages
<p>TECHNOLOGY EXPERIENCE:</p>	<ul style="list-style-type: none"> • Hydrocarbon (VOC) Controls <ul style="list-style-type: none"> – Condensers, Thermal Oxidizers, Flares, Adsorbers, Scrubbers • NO_x Controls <ul style="list-style-type: none"> – SNCR, SCR, Scrubbers, LNB, ULNB • Sulfur Controls <ul style="list-style-type: none"> – Scrubbers (throwaway, regenerable), Adsorbers • Particulate Controls <ul style="list-style-type: none"> – Cyclones, Venturi Scrubbers, Filters, Electrostatic Precipitators



**TYPICAL PROJECTS
PERFORMED BY OUR
SPECIALISTS:**

- Prepared conceptual design studies on two (2) petroleum refineries of alternative de-NO_x technologies that could achieve new NO_x reduction requirements. Options included low-NO_x (LNB) and Ultra low-NO_x burners (ULNB) alone and in combination with Selective Catalytic Reduction (SCR) units. Applications included relatively 'dirty' service Fluid Catalytic Cracking (FCC) units. Additionally, amine treating options to desulfurize fuel gas and sulfur plant tail gas were included. (Studies were used to negotiate a Consent Decree.)
- Evaluation (i.e., hydraulic, radiation, KO and seal drums, smoke potential, noise, etc.) of an existing flare system to comply with process safety management requirements and allow for expansion at an existing petroleum/petrochemical complex.
- Designed Thermal Oxidizer system to process pyridine manufacturing waste gases and liquids high in organic nitrogen compounds. Unit design included steam generation and SCR components.
- Conducted a feasibility study of sulfur removal system alternatives designed to treat an existing Fluid Coker regeneration flue gas. (Study was used to negotiate a Consent Decree.)
- Designed a condenser and scrubber system to reduce hydrocarbon emissions from a pharmaceutical vitamin production facility.
- Conducted a feasibility study for a new multipurpose pharmaceutical facility of whether existing equipment used to treat VOCs from groundwater could be adapted or revamped to treat new vent streams. The study compared reuse/modifications needed with new equipment, including fume, recuperative, regenerative, catalytic and flameless thermal oxidizers and adsorption alternatives. A process design package was prepared specifying new equipment, and reuse and modifications/upgrades of some existing equipment to meet pharmaceutical MACT criteria. Prepared an air permit application in Radius format for submittal to NJDEP.



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**Plant Operations
Support**

**Process -
Environmental**



SOLIDS AND HAZARDOUS WASTE TREATMENT/REMEDiation

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SOLID AND HAZARDOUS WASTE SERVICES TREATMENT/REMEDiation SERVICES:

- Prepare RCRA permit applications
- Evaluate existing control equipment or systems
- Perform feasibility studies of control equipment
- Develop and interpret treatability plans
- Conduct conceptual design screening studies
- Prepare basis of design and/or basic design packages
- Develop operating plans for treatment facilities

TECHNOLOGY EXPERIENCE:

- Thickening of Sludge
- Liquid/Solids Separation
- Drying
- Bioremediation
- Incineration
- Solidification/Stabilization
- Thermal Desorption



Plant Operations Support

Process - Environmental

TYPICAL PROJECTS PERFORMED BY OUR SPECIALISTS:

- Prepared RCRA permit applications and developed process design specifications for a major Midwestern refinery remediation project including incineration, wastewater pretreatment and bioremediation alternatives. Wastes from process effluents, spills and stormwater were characterized and stored in onsite lagoons. Based on treatability results for different treatment options, treatment limits were established through negotiations with the regulatory agencies. A process design package was prepared for the selected bioremediation process and associated wastewater pre-treatment system. Project management, construction management, start-up and operation of the plant for about a year were also included.
- Prepared technology evaluation, treatability studies, conceptual design, and basic engineering design package with detailed cost estimate for bioremediation of refinery hazardous wastes in the Caribbean. Also prepared treatability study for land farming of hydrocarbon waste produced through accumulated spills and underground seepage.
- Prepared conceptual design, process design and permit applications for back-up environmental systems to process hazardous wastes at a New Jersey test facility for new and innovative processes.
- Managed operation of a wastewater treatment facility to remove heavy metals and BOD/COD at a NJ superfund site. Groundwater was intercepted and treated by equalization, physical/chemical treatment, biological treatment, carbon, and filtration.
- Designed groundwater treatment system that included a variety of technologies including phase separation, heavy metals precipitation, filtration, air stripping, and carbon adsorption. Spent air and soil venting air were treated in a regenerative Thermal Oxidizer.
- Performed operational risk assessments on alternative chemical demilitarization technologies that included supercritical water oxidation, hydrolysis, biotreatment and gas phase chemical reduction.
- Conducted performance evaluations of several innovative technologies for soil and groundwater remediation.



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WASTEWATER TREATMENT

EXPERIENCE COUNTS:

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- Wastewater Treatment
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Our services include technology and process assessments, permitting, planning and design. We assist in preparing permit documents, project execution plans and equipment specifications, as well as assisting in defining environmental compliance requirements, performing safety reviews and project audits. Significant expertise is also available in troubleshooting and maintenance planning.

WASTEWATER TREATMENT SERVICES:	<ul style="list-style-type: none"> • Evaluate existing equipment and/or control systems • Conduct conceptual design screening studies • Prepare basis of design and/or basic design packages
TECHNOLOGY EXPERIENCE:	<ul style="list-style-type: none"> • Primary Treatment <ul style="list-style-type: none"> – Equalization, Gravity Separation, Flotation, Neutralization, Stripping, Extraction, Physical/Chemical Treatment • Secondary Treatment <ul style="list-style-type: none"> – Biological (Fixed-Film, Suspended Growth, Powdered Carbon, etc.) • Tertiary Treatment <ul style="list-style-type: none"> – Filtration, Adsorption, Ion Exchange, Chemical Oxidation, Membrane Separation • Disinfection <ul style="list-style-type: none"> – Chlorination, Ozonation, UV
TYPICAL PROJECTS PERFORMED BY OUR SPECIALISTS:	<ul style="list-style-type: none"> • Designed an advanced wastewater treatment system for a large refinery to meet discharge requirements utilizing primary oil-water separation by segregating hazardous and non-hazardous sources in separate CPIs. System included induced air flotation and float emulsion breaking. Secondary biological treatment was designed to accommodate large load fluctuations, and high inert solids. Sludge was thickened and dewatered. High quality effluent was produced, suitable for plant service water.

**TYPICAL PROJECTS
PERFORMED BY OUR
SPECIALISTS, continued:**

- Designed cost effective wastewater treatment schemes for cogeneration and power plants to allow high degrees of recycle, minimizing discharge. This included use of a second cooling tower operating at high cycles of concentration. Blowdown required softening, membrane separation and filtration to control the discharge quantity and TDS to acceptable levels. The upgraded product water was reused at suitable locations.
- Integrated existing drainage/slop oil wastewater system in parallel with new equipment at an Asian Refinery to meet local discharge regulations.
- Developed upgrade and expansion wastewater treatment process design for processing ballast water, process wastewater, stormwater, miscellaneous hydrocarbon and non-hydrocarbon discharges, spent caustic and sour water for a South American refinery.
- Developed wastewater treatment basic engineering design package for partially segregated process streams and stormwater at a silicone monomer plant in Asia.



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**Process - Water
Treatment**