EL DORADO ENGINEERING, INC.
DESIGNERS/CONSULTANTS

CAPABILITIES AND EXPERIENCE

INTRODUCTION

El Dorado Engineering, Inc. (EDE) is a high technology design and consulting engineering firm with extensive capabilities in mechanical, chemical, electrical, and controls engineering. Company personnel provide professional expertise in the areas of design, development, fabrication, installation and testing of many types of facilities, processes, machines, and associated controls. EDE personnel have designed, built, and tested hundreds of pieces of equipment and have performed operational and economic studies, for major system installations throughout the U.S. and overseas. EDE can perform turnkey or design/build projects that include fabrication and construction as well as providing engineering and consulting services.

In addition to traditional engineering expertise, EDE offers several areas of specialization, including:

- Explosive and ordnance equipment design, including demilitarization equipment and systems for chemical and conventional munitions.
- Air emissions modeling and pollution control.
- Environmental permitting
- Hazardous waste treatment
- Energetic material chemical conversion and recycling
- Robotics and automation.
- Safety and Hazards analysis
- New technology development

EDE has extensive experience and expertise in providing equipment and facilities, and developing technology for the handling, containment, detection, disposal, and treatment of explosives, ordnance, propellants, and explosive contaminated soil, and of related waste materials. EDE provides engineers, explosive specialists, and support staff for explosive and propellant related engineering operations. EDE is intimately familiar with both environmental and safety requirements regarding ordnance and explosive wastes. One of EDE's primary specialties is the development of equipment and systems for demilitarization of conventional and chemical munitions. EDE often uses our own extensive experience to develop "first of a kind" equipment and technology for demilitarization, ranging from simple jigs and fixtures up through complete explosive waste incineration facilities and sophisticated automated equipment. EDE is a recognized leader in Explosive Waste Incineration Technology and Thermal Treatment systems development including contained burning and flashing furnace technology. EDE continues to make significant new advances in these technologies each year. EDE has also developed extensive procedures for sampling, cleanup and closure of explosive contaminated facilities.

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COMPANY BACKROUND

EDE was founded in 1981 and is an employee-owned, small business headquartered in Salt Lake City, Utah. As designers and consultants, we work on projects worldwide in our specialties of demilitarization of conventional munitions, chemical munitions, and rocket motors, environmental consulting, permitting and restoration; and hazardous/explosive waste treatment and disposal.

EDE employs individuals who are recognized experts in the management and disposal of reactive hazardous wastes. EDE senior personnel have an average of over 20 years experience performing design and consulting in their engineering fields of expertise. In house technical disciplines include mechanical engineering, chemical engineering, electrical engineering, environmental engineering, and PLC/Controls.

TRADITIONAL ENGINEERING SERVICES

Machine Design. EDE has designed all types of machines and systems ranging from simple tool modifications to highly automated processes.

Utility Development. EDE has performed all types of utility designs including waste fired boilers, steam, heat and electrical distribution. EDE provided the electrical design for the development of the Utilidor system for Barrow Point, Alaska.

Water Treatment. EDE has provided several engineering designs for water treatment projects ranging in size from a water cooling tower filtration facility required to handle 400,000 gpm for a DOE gaseous diffusion plant in Kentucky, to a 25 gpm recycling, filtration and deionization facility in California, and a small batch treatment system for metal finishing operations in Utah.

Chemical Process Equipment. EDE has a wide range of process plant experience including design of hazardous waste incineration facilities and chemical plant processes including liquid nitrogen manufacturing and distribution.

Hydraulics, Pneumatics, Fluidics, Electronics. EDE personnel have experience in designing machines that operate on hydraulic, pneumatic, or electric power.

Controls and Monitors. EDE possesses experience with microprocessors, digital sequencers, and standard analog controls coupled with instrumentation for the recording/controlling of precision automated equipment. Experience with video systems, infrared and ultraviolet sensor systems, and special audio systems is available.

Strength of Materials and Selection. EDE can select required materials based on desired properties, strength, and corrosion resistance and fatigue analyses. EDE personnel have completed designs for high temperature and severely corrosive environments.

Material Handling. Designs for standard and specialized materials handling and conveying equipment have been developed, fabricated and installed utilizing all types of indexing and transfer mechanisms.

Lighting and Power. EDE personnel have had experience in the layout of lighting and industrial power distribution systems, both single and three phase.

HVAC. EDE has performed design development and installation of HVAC systems for all size buildings, dams, power plants, computer centers, and environmental test chambers.

Economic, Energy and Feasibility Studies. EDE has performed several studies for energy conservation, economic analyses, and waste to fuel studies, feasibility and optimization studies.

DETAILED SPECIALIZED CAPABILITIES AND EXPERIENCE

EDE is a small business with the flexibility to meet the client needs. EDE offers professional mechanical, electrical, and chemical engineering services along with each of our specialties described in more detail.

Figure 1: EDE Explosive Waste Incinerator, Germany

Incineration and Thermal Treatment

EDE has designed, installed and permitted many hazardous waste incinerators located worldwide (See Figure 1). These incinerators are designed to meet all current regulations. EDE has designed liquid and solid feed devices, pollution control equipment, storage and ancillary support equipment. EDE has also designed, developed, and installed non-incineration thermal treatment processes that are not encumbered by incinerator regulations (See Figure 2). EDE has designed and provided transportable thermal treatment systems used at many U.S. military sites (See Figure 3).

Tactical Rocket Motor Contained Burn System

Waste PEP contained Burn System

Figure 2: Contained Burn Systems

Figure 3: Transportable Flashing Furnace

Explosives and Ordnance Equipment and Technologies

EDE has designed all types of equipment for machines and processes regarding explosives, propellants and ammunition. EDE specializes in the handling, containment, detection, disposal and treatment of explosives, ordnance, propellants, and explosive contaminated soil, and of related waste and hazardous waste materials. EDE provides engineers, explosives specialists, and support staff for explosive and propellant related engineering operations. EDE is intimately familiar with both environmental and safety requirements regarding ordnance and explosive wastes. EDE personnel have an intimate knowledge of past operations regarding explosives and chemicals at military installations throughout the U.S.

EDE has designed all types of equipment and provided broad engineering support including environmental studies for chemical weapons demilitarization engineering support. EDE engineers have played key roles in programs for disposal, clean up, decontamination, testing, surveillance and maintenance of chemical and biological warfare items.

EDE is intimately familiar with size reduction problems associated with demilitarization (demil) or recycle of large propellant grains and munitions. EDE personnel have developed and tested shears, saws, punches, crushers, and other mechanical processes to access or remove explosives from munitions. EDE has also participated in a wide variety of projects that include steamout, washout, drillout, hogout, cavijet, microwave meltout, and cryowashout.

Figure 4: Punch Shear Operations

Figure 5: Slug Out

Environmental Permitting, Hazardous Waste Treatment
EDE has provided RCRA Part A & Part B permit applications for clients throughout the U.S. These have been for storage, treatment and incineration facilities including Subpart X open burning. EDE has also prepared air permit and PSD permit applications, RCRA closure plans, and subpart J, tank assessments.

EDE has direct experience in virtually all aspects of RCRA and CERCLA/SARA implementation, including facility assessments, remedial investigations, feasibility studies, remedial design, construction, operation and maintenance programs, and related NEPA documentation, including EA's and EIS's

EDE has broad base experience with applicable federal and state regulations, having performed services regarding explosive waste in virtually every section of the U.S. for the major explosive and propellant industries including Aerojet, Thiokol, United Technologies, Hercules, Honeywell, DuPont, Rockwell, Martin Marietta, Atlantic Research Corp., Tracor, Dyno Nobel, NASA, U.S. Army, U.S. Navy, and the U.S. Air Force in the assistance of permit preparation and environmental assessments regarding explosives and propellants.

EDE hazardous material experience includes: PCB's, PCP's, dioxins, furans, nerve agents, phosgenes, solvents, halogens, heavy metals, flammables, explosives, white phosphorus, Napalm, smokes, dyes, pyrotechnics, carcinogens, organotin paints, low level radioactive wastes, acids and corrosives, toxics, solids, liquids and gases. Our experience includes the preparation of closure plans for military installations, requiring Department of Defense Explosive Safety Board (DDESB) approval. EDE personnel also served on a joint services panel that surveyed Department of Defense military installations regarding explosive and chemical agent disposal operations and the impact of environmental regulations on these operations.

Robotics and Automation
EDE has developed robotic systems and automation to enhance production and worker safety on a wide variety of processes. EDE is not a robot manufacturer or representative of any particular brand of robot. We employ competent robotic experts who are adept at robot applications and at marrying standard robotic systems and peripheral equipment interfaces into a total robotic package. EDE personnel are experienced in solving client problems and providing cost effective and coordinated solutions.

Safety
EDE has provided clients with hazards analysis and risk assessment services for processes, procedures, and equipment. EDE engineers are accustomed to working with all DOD safety manuals including AMCR 385-100 (Army Safety) OP-5 (Navy Safety) and AFM 127-100 (Air Force Safety). The EDE staff are contributing authors to MIL-STD-398, the Health and Safety Manual for munitions facilities.

Air Emissions Modeling and Pollution Control

EDE has developed and validated a proprietary computer air model for open burning of explosives and static firing of rocket motors that is widely accepted in permitting these activities (See Figure 6).

EDE personnel have extensive experience with the design and development of both wet and dry air pollution control systems, including the design and selection of combustion chambers, duct work, fans, filters, NOx reduction systems, baghouses, scrubbers, heat exchangers, and controls.

Figure 6: EDE emissions model validation test, static firing Pershing rocket motor

New Technology Development

EDE has worked on developing and demonstrating several novel technologies, such as Microwave meltout of explosives from bombs for explosives recycling (See Figure 7.)

EDE has pioneered and fielded new technologies for treating explosive wastes including Transportable Flashing Furnace technology (Figure 3), Contained Burn Technology (Figure 2),

EDE personnel have extensive experience with most of the new technologies that have been researched and developed for application in the demil sector over the last 40 years and as such have a unique perspective in understanding what works and probably more importantly what does not work from a technical and economic perspective. EDE has firsthand experience to recognize technologies that can be successfully applied as well as recognizing foreseeable challenges associated with many new technologies.

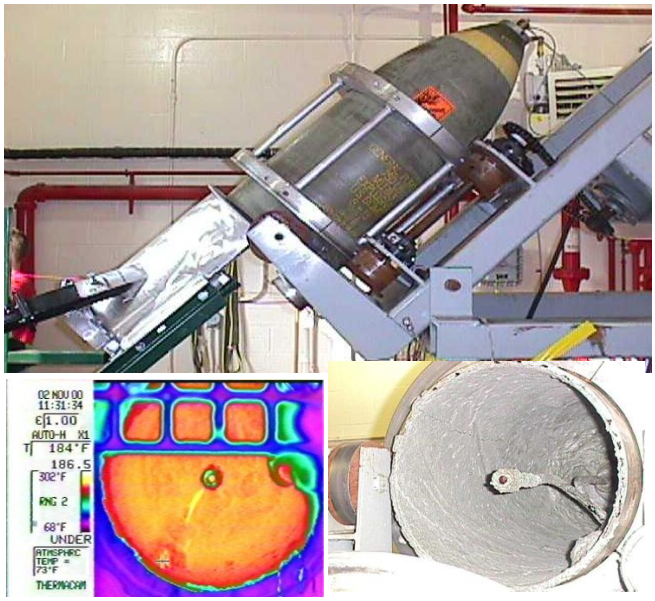

Figure 7: Microwave Meltout

HIGHLIGHTED PROJECTS

- Designed, provided, installed, and commissioned rotary kiln Explosive Waste Incinerators in Taiwan, Germany, Albania, United Kingdom, Korea, Ukraine, and Belgium.

- Designed and provided transportable flashing furnace (TFF) systems for decontaminating bomb cases, warhead parts, rocket motor bodies, range scrap, etc. and thermal treatment of small arms and iniating devices. EDE TFF systems have been deployed at Ravenna, Ohio; Anniston Missile Recycling Center, AL; Kaho'olawe HA; Vieques, PR; Hill AFB, UT; Talon, WV; Letterkenny Munitions Center, PA. Stationary systems have also been installed at multiple sites in North America and Europe.

- Assisted NASA with the Air and Environmental permits required for siting the space shuttle booster manufacturing and static test firing facilities.

- Assisted Demil International in demonstrating contained detonation systems and procedures for demil and UXO remediation.

- Provided the air modeling and risk assessment for static firing rocket motors for disposal as part of the U.S. INF Treaty.

- Used our understanding of combustion processes and atmospheric dispersion to consult with NASA on go/no-go launch criteria for Space Shuttle launches.

- Helped both Eco Logic and CH2M Hill provide separate total solution designs for non-incineration chemical munitions demilitarization for Blue Grass Arsenal using unique chemical process technologies.

- Developed a Pressure Test Relief Device for safely opening old ton containers of mustard agent for SAIC/Edgewood.

- Designed, built and installed a pilot system to remove melt-cast explosives for reuse from bombs and warheads using microwaves for Crane NSWC.

- Assisted the Ralph M. Parsons Company and Russian Federation in the design of a Chemical Munitions Demilitarization System, with a significant amount of work in Moscow.

- Designed and built a contained burn system to dispose of tactical rocket motors.

- Designed and built contained burn systems to dispose of commercial energetic wastes for several commercial clients.

- Prepared RCRA and air permits across the U.S. and supported environmental restoration projects across the U.S.

Knowledge of Facilities

EDE has installed equipment at over 30 military installations. EDE personnel have probably visited all of the military installations throughout the U.S. that store, handle, or process explosives and military chemicals and agents. EDE has also provided turnkey facilities at many foreign military installations including, throughout Europe and Asia.