El Dorado Engineering, Inc.

Advanced Pollution Control Techniques for Explosive Waste Incinerators (EWI)

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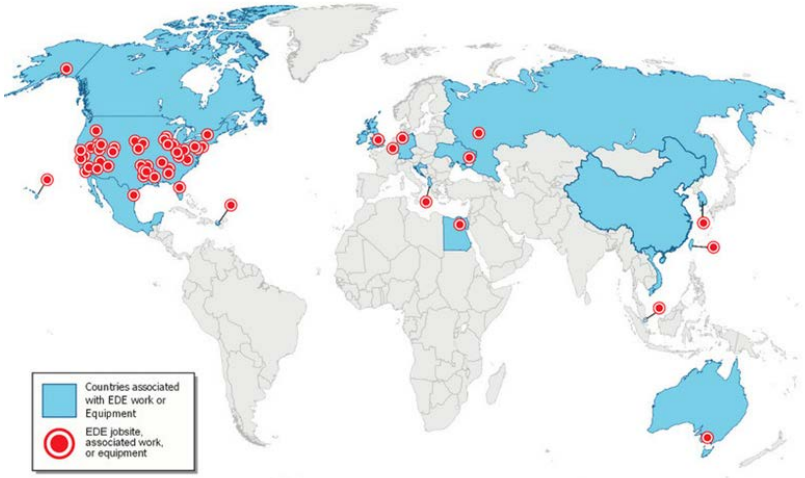
El Dorado Engineering, Inc.
Designers - Consultants

- Over 34 yrs. Specializing in the Demilitarization Industry, HQ in Salt Lake City, UT

- Capabilities Include:
  - Design
  - Consulting
  - Fabrication
  - Installation
  - Commissioning
  - Training
  - Permitting



- Specialize in demilitarization of conventional munitions, chemical munitions, bulk propellants, explosives, and pyrotechnics (PEP), and rocket motors
  - Thermal Treatment
  - Pollution Control Systems
  - Recycling/Conversion of energetic materials and munition related waste
  - Disassembly Machines
  - Environmental consulting, permitting and restoration, related to PEP

Take pride in record of safety, project cooperation, and client satisfaction

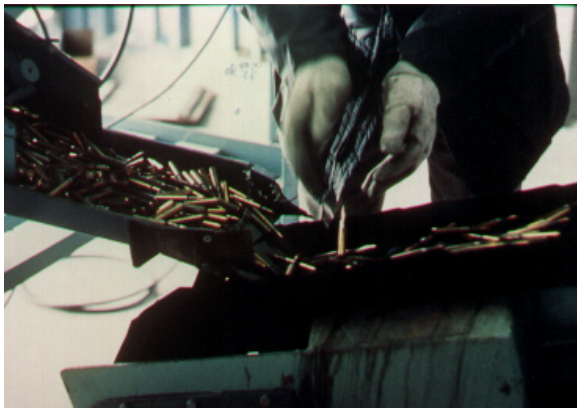
EL DORADO ENGINEERING
International Turnkey Rotary Kiln EWI Systems

Location	Client
Lubben, Germany	General Atomics
Kahosiung, Taiwan	Arsenal 203
Elbasan, Albania	NSPA/NATO
Shoeburyness, England	QinetiQ - formerly DERA
Republic of Korea	Kolon for ROK DOD
Donetsk, Ukraine	NSPA/NATO
Zutendaal, Belgium	Belgium MOD

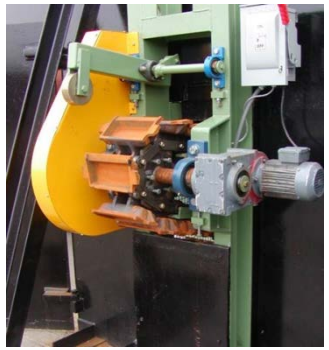
EDE: Explosive Waste Incinerator

Versatile workhorse of demil sector:

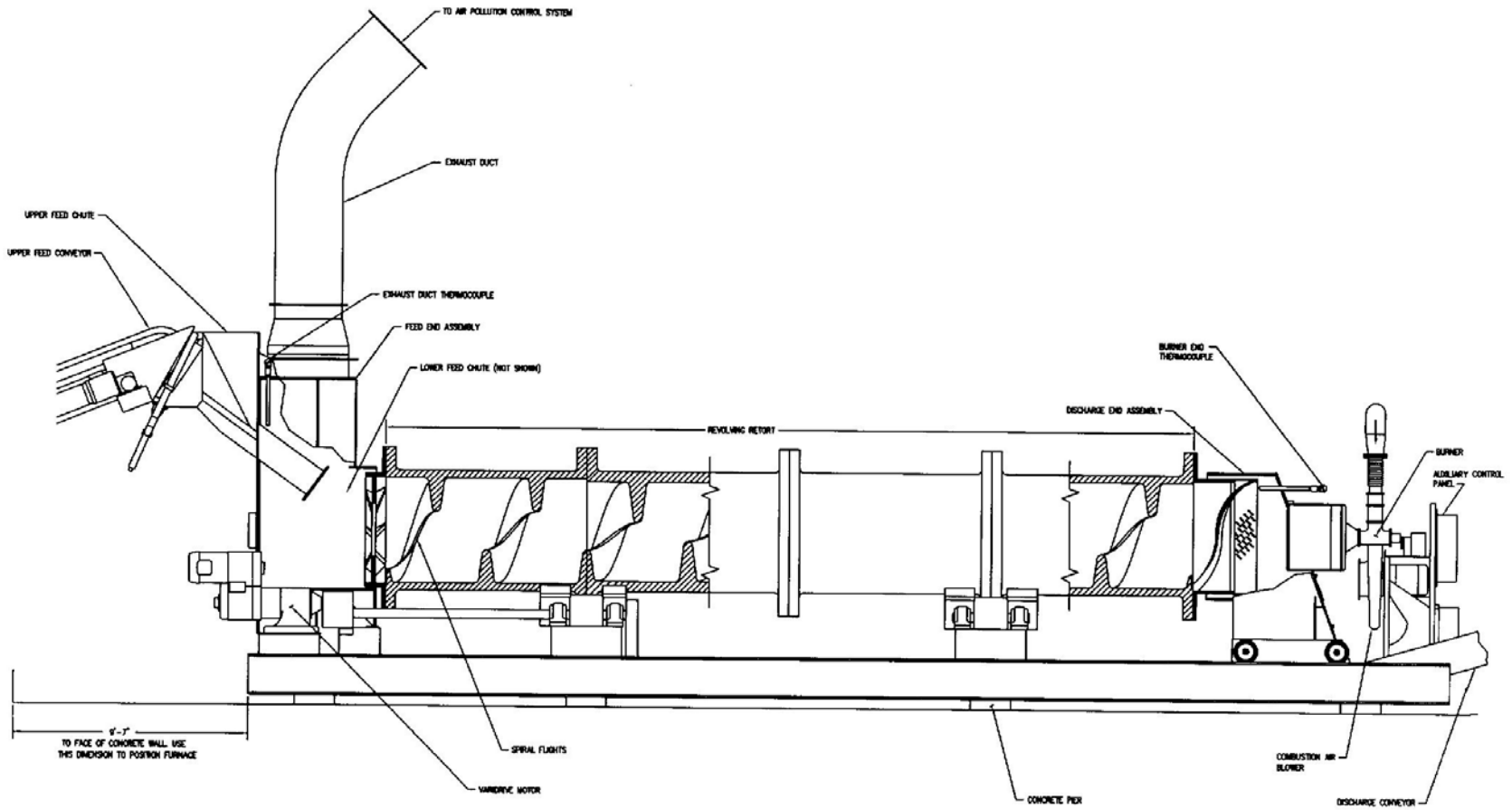
- 200-300 lb/hr NEW
- Configured items up to 30mm HE
  - SAA
  - Primers
  - Fuzes
  - Projectiles
  - Initiators, CADs and PADs
  - Bulk PEP
  - Tear Gas canisters
- Larger munitions >30mm, if explosive exposed by preparation (e.g. punched grenades, sawed large projectiles)
- Off Gas Treatment Tailored to Waste Materials and Applicable Requirements





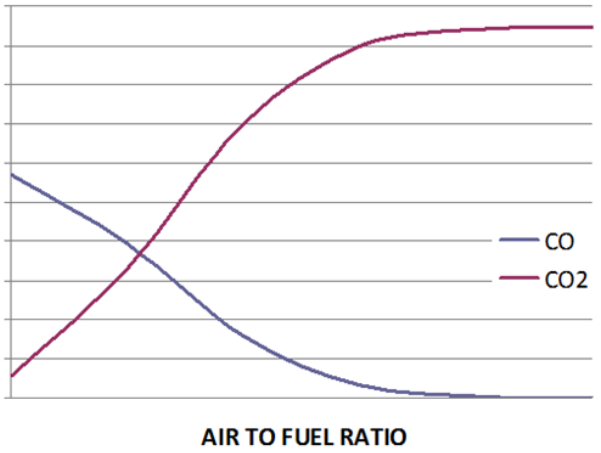



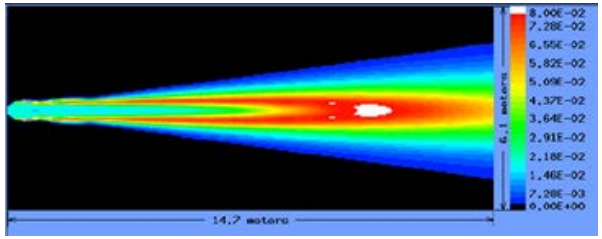
THEORY OF OPERATIONS
RETORT CUTAWAY

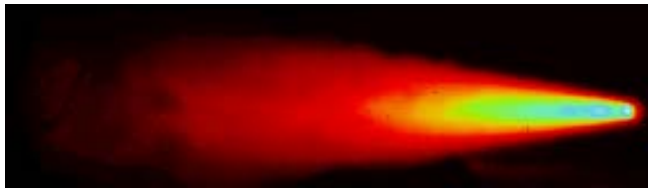


Formation and Control of Emissions

- Workload Chemistry
- Understanding of Combustion
  - Temperature
  - Time
  - Stoichiometry
  - Reaction Rates
  - Minimize pollutant formation when practical







CO, VOC, SVOC

- Can be minimized in primary furnace

HIGH TEMPERATURE AFTERBURNER

- Oxidize any unreacted species
- Eliminate organic compounds
- Temperature
- Residence Time
- Stoichiometry
- Mixing

Additional Developments

- Recuperator: fuel savings
- SNCR: NOx Reduction
- Dual Use: Flashing Furnace/CWP

Particulate and Heavy Metals

- **Cyclone (High Temperature)**
- **Gas Cooler**
- **Baghouse (Low Temperature)**
- **HEPA (Low Temperature)**

NOx

- Control Formation
- SNCR (Afterburner)
- SCR
  - Precious metal catalyst
  - >90% NOx Reduction
  - Proper Mixing/Stoichiometry
  - “Sponge” capacity to deal with peaks/valleys

Dioxin and Furan

- Control Formation
- Reaction and elimination in SCR
- Adsorption with Packed Bed

Mercury

- Generated from Mercury Fulminate in Primers
- Removed by Specialized Packed Bed Scrubber

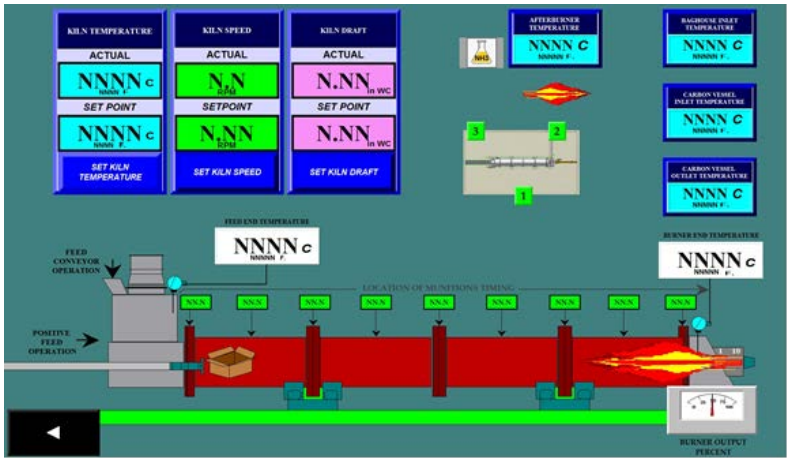
Acid Gases

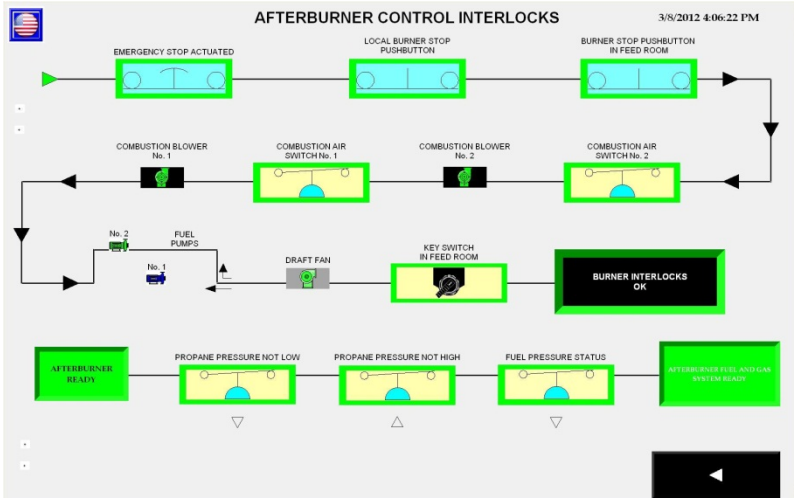
Options
- Dry Scrubber upstream of Baghouse
- Spray Dryer
- Wet Scrubber

Considerations
- Equipment design to prevent corrosion
- New vs. Retrofit
- Workload
- Stoichiometry
- Reagent Material Supply
- Effluent Disposal Options

Controls, Training, & Maintenance

- Burner Tuning
- Control Loops
- Intuitive HMI
- Interlocks/Alarms
- Diagnostics
- In Depth Training





Environmental Permitting

- Involve applicable regulatory authorities early
- Transparency with regulators
- Detailed understanding of equipment and processes
- Knowledge of common “gotchas” that can limit throughput or increase operating costs
- Understanding of emissions testing methods for acceptance testing
- Consideration of current and future workload requirements

El Dorado Engineering
Turnkey Belgium EWI - INES

ITEM	Average Feed Rate Items/Hr	Max Feed Rate Items/Hr	CEMS Average Daily Values				Stack Sampling Data	
			NOx (mg/m^3)	CO (mg/m^3)	TOC (mg/m^3)	Dust (mg/m^3)	Heavy Metals (mg/m^3)	Dioxin/ Furan (ng TEQ /m^3)
EU Directive Limits			200	50	10	10	0.5	0.1
20mm HE-I-T	900	1250	0.2	0.7	0.4	N/D	N/D	N/D
20mm SAP-I	1200	1250	0.0	2.1	0.4	N/D	N/D	N/D
7.62mm Ball	22700	25000	0.0	1.3	0.3	N/D	N/D	N/D
12.7mm API	5000	6600	40.0	0.1	1.1	N/D	N/D	N/D
PD Fuze M51 w/Booster	400	400	0.4	0.9	0.5	N/D	N/D	N/D
TNT Block	89 kg/hr	120 kg/hr	2.6	0.7	0.4	N/D	N/D	N/D
Bulk M6 Propellant	66 kg/hr	90 kg/hr	0.4	1.7	0.4	N/D	N/D	N/D