Confined Burn Facility (CBF)
Project Overview and Demonstration Planning

2001 Global Demilitarization Symposium & Exhibition

May 14- 17 2001

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CBF OB Replacement Process/Technology

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- **Technology Requirements:**
  - Replace Open Burn (OB) Disposal
  - Retain Safety, Flexibility, and Capacity
  - Satisfy Regulatory Authorities

- **CBF Solution Characteristics:**
  - Practical, Simple, and Safe Open Burning Replacement
  - Customer Waste Handling Practice Unchanged
  - Retains Batch Burn Pan Loading System
  - Burn Containment Chambers Capture Combustion Gas for Treatment - 40 CFR 264 (RCRA Subpart X)
  - Burn Chambers Blast Hardened for Siting Requirements (1.1/1.3)
  - Burn Chambers Sized to Minimize Pressure and Explosive Gas Conc.
  - Gas Surge Accumulation Minimizes Treatment Equipment Size
  - Conventional Gas Cleaning Equipment

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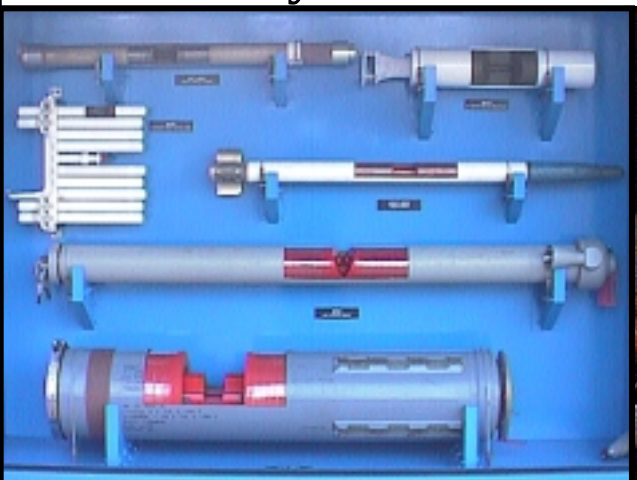
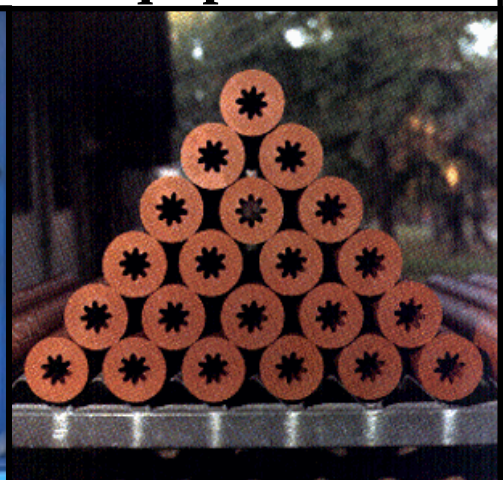
OB Ground Waste Profile

- Solids From 2 Micron Powders to Grains 10 ft. L., 29.5 in. dia., & 1200 lb
- Slummed liquid explosives
- Explosively contaminated solvents
- CADs/PADs
- Small Rocket Motors
- Medium Rocket Motors (Nozzle-less)
- Visually Contaminated Equipment





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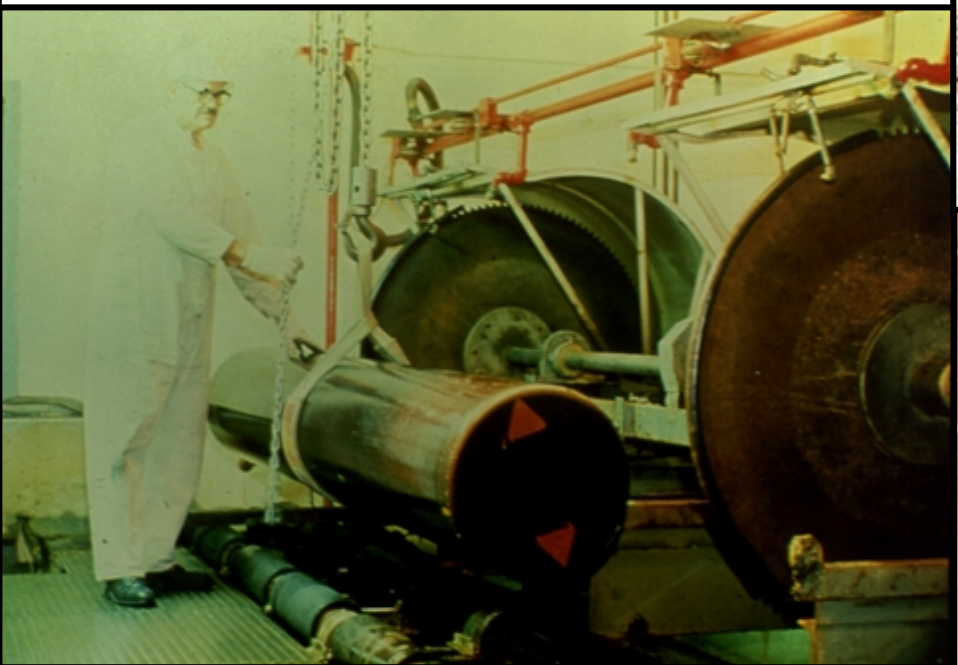
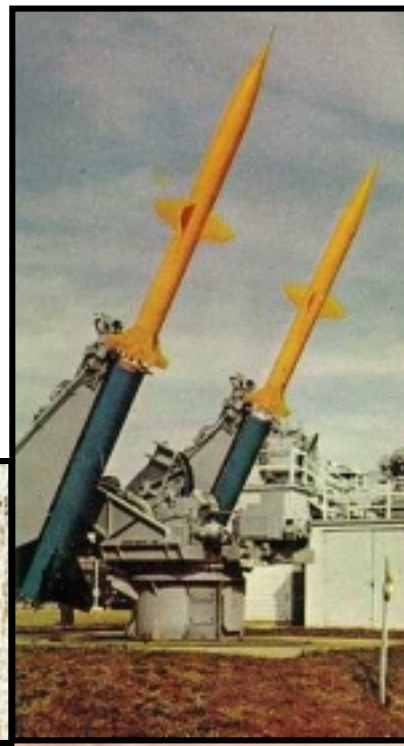
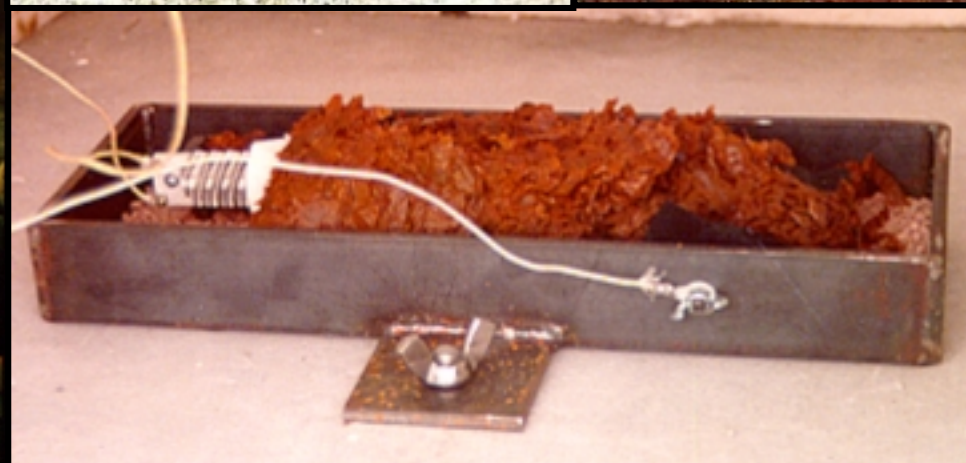
CBF Representative Waste Design Basis

- 1,000 lb. Propellant Machine Shavings
- 1,200 lb. Terrier Missile Booster Grain
- 50 lb. PBX High Explosive - No Significant Damage
- 1000 lb. 1.1 Maximum Credible Event - Damage Limited to One Chamber







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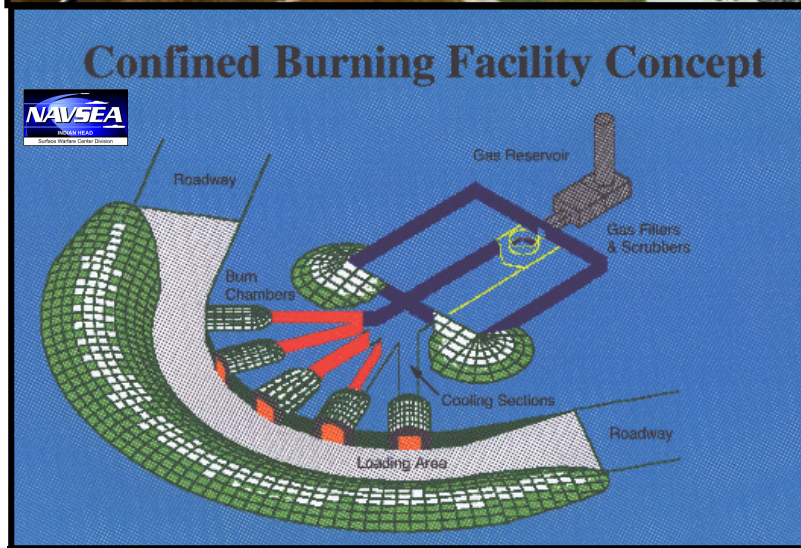
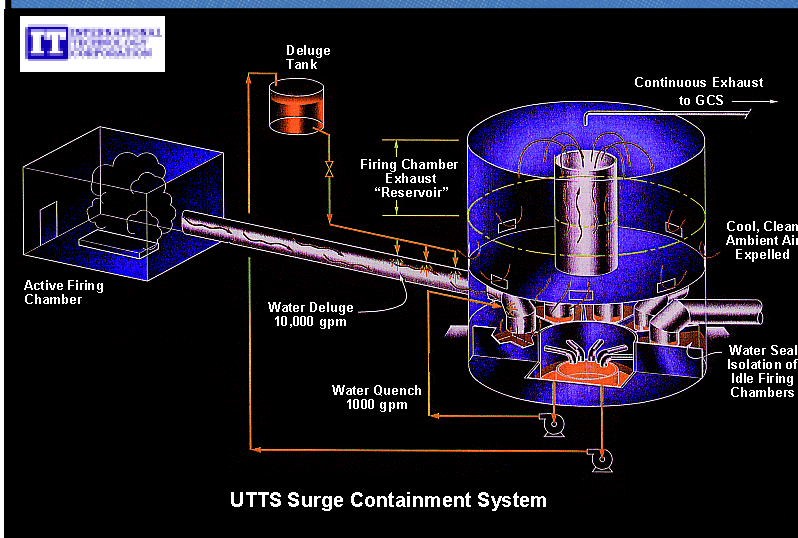
Technology Selection

- Evaluated
  - Navy's Original Confined Burning Facility (OCBF) Concept
  - 13 Existing Confined Firing, Burn, or Detonation Technologies
  - Uncoupled Thermal Treatment System (UTTS) Concept
- Selected
  - Combination of OCBF, High Altitude Rocket Motor Test Cells, and UTTS
- Sources
  - OCBF - IHDIV/NSWC
  - UTTS - IT Corp
  - Test Cells - Arnold Engineering Development Center (AEDC), AAFB





Confined Burn Alternative Technologies	Intended Use	Design Basis		Status
		Quantity	Reaction	
Arnold High Altitude Test Facility	SRM test firing	1 rocket	Static firing	Several facilities in use
China Lake/Lockheed Confined Burn With Scrubber	SRM motor firing	16,000 lb To Date (50,000 lb)	Low pressure firing	Second stage Poseidon and third stage Trident engineering verification tests successful in 1993 without scrubbing
LLL Contained Detonation	High explosives detonation testing and emissions containment	22 lb	Detonation	In use at LLL HEAF
LLL Contained Detonation	High explosives detonation testing and emissions containment	123 lb	Detonation	Scale testing complete; 1996 funding for construction
BOM Detonation Test Shaft	High explosives detonation testing and emissions containment	10 lb	Detonation	Expected start testing in July 1994
Sandia Bang Box	PEP emissions containment - characterization	5 lb	Deflagration	Used for AMCCOM OB/OD emissions characterization study; similar at Dugway Proving Ground
Olin Thermal Treatment Hearth	Pyrotechnics waste destruction	(100,000 lb/Yr 1.1 and 1.4)	Burning	In use for many years
Original NSWC/IHDIV CBF	PEP waste destruction	1,000 lb	Burning	Developmental
El Dorado Thermal Treatment Tank	PEP waste destruction	10 lb (60 lb Future)	Burning	10-LB Pilot system at TRW-Mesa; 60-lb parallel units planned for TRW
IT Electric EDC	PEP waste destruction	0.15 lb	Detonation & fragmentation	Developmental
EASE Negative Draft Facility	PEP waste destruction	60 lb or more	Detonation	Developmental, facilities in use for both electric arc furnace emissions and metalurgical coke pushing emissions control
Josef Meissner GMBH Reduction Unit	PEP waste destruction	100 lb	Burning	Developmental
Factory Mutual Research Test Center	Large scale fire testing	60 plus foot flame heights	Burning	27 years of daily use

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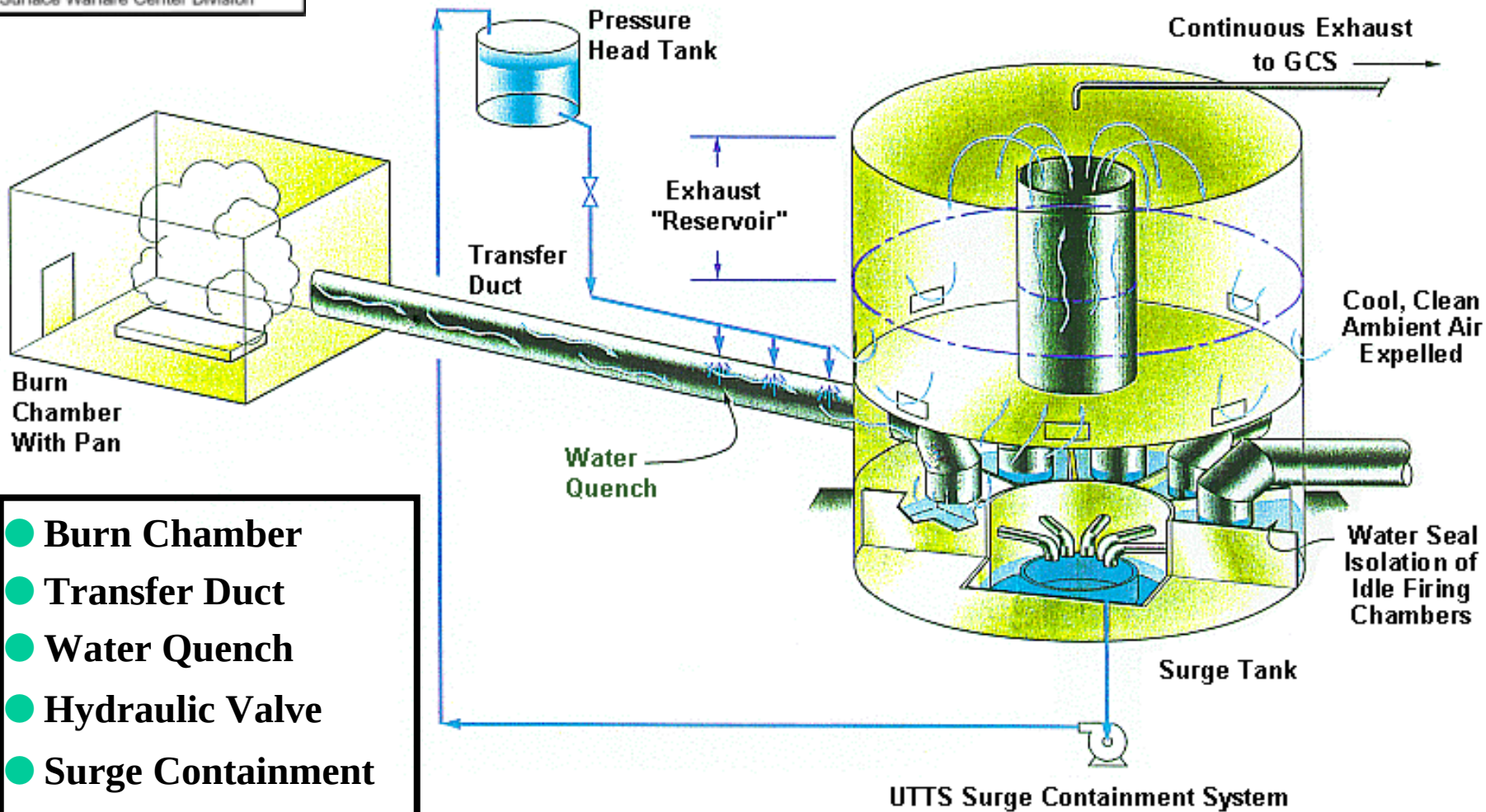
CBF Subsystems and Arrangement



- Burn Chamber
- Transfer Duct
- Water Quench
- Hydraulic Valve
- Surge Containment Chamber
- Gas Cleaning System

U.S. Patent Numbers
5,791,266 and 5,881,654

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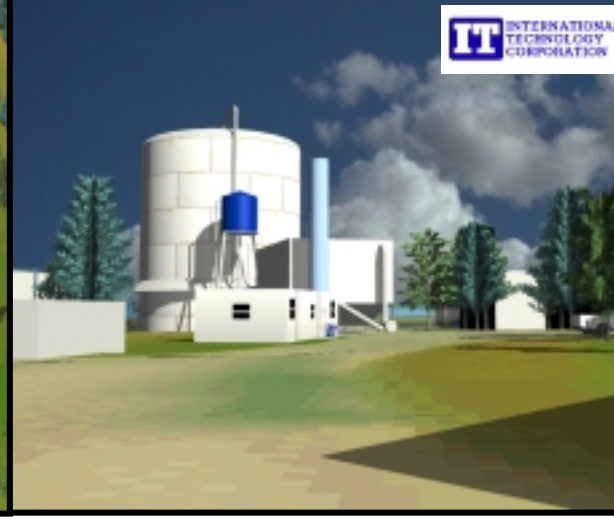
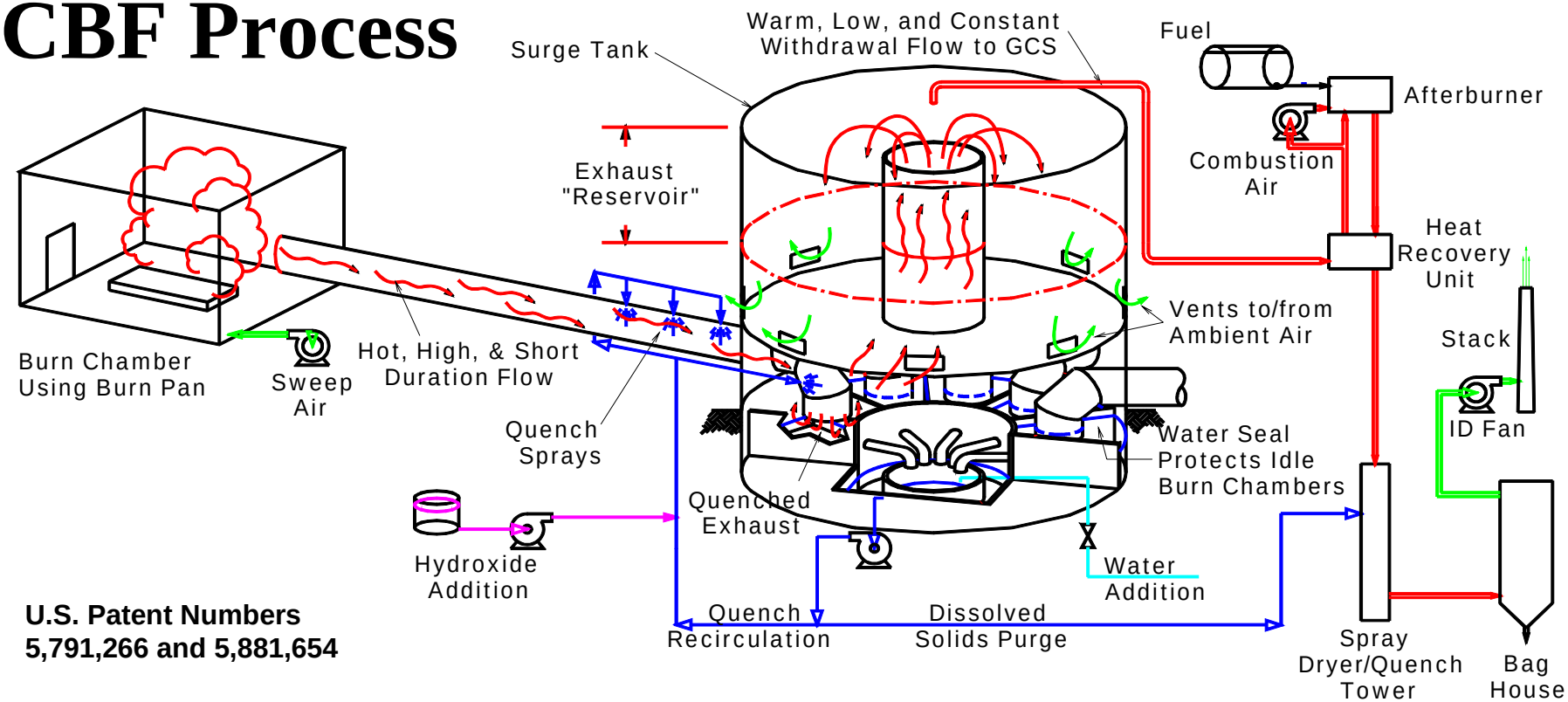


CBF Process



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CBF Completed Studies

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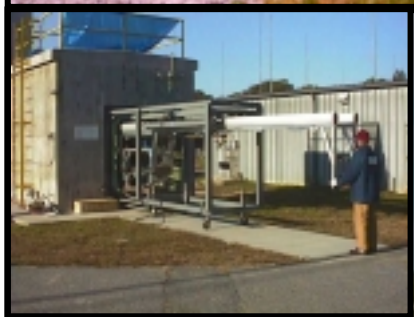
- **Bench-Scale CBF Studies**
  - 0.5 lb. Nom. Charge
  - 4 Types of PEP in 12 Test Firings
  - Results: 0.75 lb Burn Chamber Capacity
  - Analytical Shows Conventional APCE Sufficient
- **Pilot-Scale CBF Studies**
  - 10 lb. Nom. Charge
  - 9 Types of PEP in 28 Test Firings
  - 14.5lb DB and 20.2lb Comp. Burn Chamber Capacity
  - >20.2lb Surge Containment Capacity
  - Two Burns per Chamber per Shift Proven
  - Concept is Considered Ready for PEP Treatment Demonstration



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CBF Benefits/Payback

Data For IHDIV Scenario

15 Year Depreciation Term Case

		Open Burning (SATTP @ IH) 9000lb/day	CBF: 3-1200lb Chambers 6000lb/shift		
		1-Shift	1-Shift	2-Shifts	3-Shifts
Annualized Costs	$/lb	1.70	2.76	2.02	1.77
Dep. Term	years	15			
Capacity	Mlb/year	2.25	1.5	3	4.5
Capital Cost	$M	1.12	18.4		
Fine Range	$K/day	2.5 to 25			
Liability Range	$/lb	0.71 to 7.14	0		
Potential Annualized Costs	$/lb	$1.37 to $7.80	$2.76	$2.02	$1.77
Minimum Payback Time	years	Baseline	2.43	1.06	0.68

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CBF Benefits/Payback

Data For IHDIV Scenario

5 Year Depreciation Term Case

		Open Burning (SATTP @ IH) 9000lb/day	CBF: 3-1200lb Chambers 6000lb/shift		
		1-Shift	1-Shift	2-Shifts	3-Shifts
Annualized Costs	$/lb	1.70	4.40	2.84	2.32
Dep. Term	years	5			
Capacity	Mlb/year	2.25	1.5	3	4.5
Capital Cost	$M	1.12	18.4		
Fine Range	$K/day	2.5 to 25			
Liability Range	$/lb	0.71 to 7.14	0		
Potential Annualized Costs	$/lb	1.37 to 7.80	4.40	2.84	2.32
Minimum Payback Time	years	Baseline	3.61	1.24	0.75

CBF Project Structure

- **Phase 1 - Concept Development**
  - Scope and Industry Search
  - Feasibility Study
  - Conceptual Design
  - Preliminary Hazard Analysis
- **Phase 2 - Small Scale RDT&E**
  - 0.5 - lb Bench-Scale CBF (BCBF) Design
  - BCBF Construction
  - Testing
  - Report
- **Phase 3- Pilot Scale Up R&D**
  - 10-lb Pilot-Scale CBF (PCBF) Design
  - PCBF Test Plan
- **Phase 4 - Pilot Scale Up T&E**
  - 10-lb PCBF Construction
  - Testing/Report
- **Phase 5 - Tech Demo/Scale Up R&D**
  - 80-lb Demonstration Scale CBF (DCBF) 90% Integrated System Design
  - DCBF Demo Plan/Permitting

CBF Project Structure

- **Phase 6 - Technology Demo-Scale T&E**
  - 100% Design/IPT/Demo Plan
  - Construction/Permits
  - Start-Up Test Series
  - Shake-Down Test Series
  - Trial Burn Analog Test Series
  - Final and Cost & Performance Reports
- **Phase 7 - Technology Transfer**
  - Industrial-Scale Process Design Protocols
  - Industrial-Scale Special Detailed Designs
  - Military Handbook - CBF Design & Implementation Guide for DOD Activities

Plans to Completion RDT&E Phases

- Chamber Blast/Fragment Analysis - Dec 2001
- Demonstration-Scale CBF Validation @ IHDIV
- DCBF Design - May 2002
- DCBF Construction, Permitting, & Safety - Nov 2003
- DCBF Demonstration Begins - Nov 2003
  - 80 LB Nominal Charges - Inc./Dec. by 20lb as Necessary
  - Same 8 Types of PEP as PCBF Plus Selected DOD OB Samples
  - Testing During Winter, Spring, and Summer
- DCBF Demonstration Ends - Dec 2004

DCBF PEP Sample Selection

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- 9 Types of PEP Plus IPT Samples TBD
  - HEN-12 Sheetstock - Doublebase (DB) - High Surface - Capacity Tests - Compare to PCBF
  - ARP Chunks - DB - Compare to B and PCBF tests
  - ABL 917 Casting Powder - DB - High Surface/High NC - Capacity Tests - PCBF
  - CAP Cast DB - Aluminized DB (5%) - Capacity Tests - PCBF
  - NOSIH BC-10 - High Al (18%), AP Composite - B and PCBF
  - NOSIH-EC - High AP (85%) Composite - B and PCBF Tests
  - N-60 - High Smoke Composite (40% Zinc) - Low Ox Tests vs. Firing Chamber Vol. - PCBF
  - Explosive Slum - NG Cast. Solvent/Diluting Solvent/Sawdust w/Fuel Oil Soaked Excelsior - PCBF
  - TNT - Low Ox Class 1.1 Test - Bed of Excelsior Starter - PCBF

Validation Criteria

Pollutant	Averaging Period	Standard or Level ($\mu g/m^3$)	Source
PM_{10}	24-hr	150	NAAQS[1]
	annual	50	NAAQS[1]
NO_x	annual	100	NAAQS[1] but IHDIV is in a Non-Attainment Area
CO	1-hr	40,000	NAAQS[1]
	8-hr	10,000	NAAQS[1]
VOC as O_3	1-hr	235	NAAQS[1]
SO_2	1-hr	130	Maryland Screening Level [2]
	3-hr	1,300	NAAQS[1]
	8-hr	52	Maryland Screening Level [2]
	24-hr	365	NAAQS[1]
	annual	80	NAAQS[1]
Lead	8-hr	1.5	Maryland Screening Level [2]
	quarter	1.5	NAAQS[1]
HCl *	1-hr	75	Maryland Screening Level [2]
	1-hr	117	COMAR 26.11.15.13 Acceptable Ambient Limit
	annual	7	COMAR 26.11.15.13 Acceptable Ambient Limit

(*) Listed in Maryland as a Toxic Air Pollutant, (1) 40 Code of Federal Regulations (CFR) Part 50, (2) Maryland Department of the Environment, 1991.

Table 4-1. Ambient Standards and Screening Levels

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Transition Plan and Progress

- **Planning CBF IPT**
  - **Demonstration/Validation (DCBF) Sample ID Support**
  - **DOD CBF Site Identification Support**
  - **Pre-IPT Progress**
    - **MILCON P-144 @ NSWC Indian Head - Construction FY 2006 - Start-Up - FY 2007 - IOC - FY 2007 or 8 - MDE**
    - **MILCON to be submitted @ Crane/NSWC - Jim Hunsicker - Indiana**
    - **MILCON to be submitted @ Dahlgren/NSWC - Bill Goss - Virginia**
    - **Naval Station Roosevelt Roads - Showed Interest - Puerto Rico**
    - **NSWC IHDIV is Standing Up a CBF Web Site - IPT Support/Tech Intro**
      - http://www.ih.navy.mil/CBF

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DoD OB/OD Units

Roosevelt Rds

Transition Plan and Progress

- **DOD CBF Integrated Product Team (IPT) Members**
  - **Technical Lead: Tim Brennan, Code 2150J, Indian Head Division, NSWC**
  - **Admin Lead: Mark Hancock, Code MT1, Indian Head Division, NSWC**
  - **Regulatory Rep: Lois Bohne, Code OE5, NOSSA**
  - **Navy: Keith Sims: Code 4073, Crane Division, NSWC**
  - **JOCG/DAC/Army: Greg Olson, Attn: SIOAC-TDR, DAC**
  - **Air Force: Tomas Lorman, HQ AFMC/LGP-EV**
  - **Marine Corps: Deborah Morefield, Code LFL, Commandant of the Marine Corps**
  - **EPA Member - TBD**
  - **MDE Member - TBD**

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Additional Participation & Coordination Required

- Service Construction Activities - NAVFAC Navy
- DDESB Approvals
  - Specialized Blast Containment Structures
  - Operational Concept/Siting
- State Regulators/EPA
  - RCRA RDD Permit - DCBF
  - Probable RCRA Subpart X permit - MILCONs
- DOD OB/OD Units - Customers/IPT
- Environmental Protection Community
  - Public Notification
  - Comment Periods
  - Educate Interest Groups & Activity Neighbors

CBF Project Sponsors

- **Andy Del Collo - NAVFAC 15R Pollution Abatement Ashore Program Manager**
- **Dr. Frank Stone - OPNAV N-45G R&D Coordinator**
- **Dr. Jeffrey Marqusee Director ESTCP**
- **Dr. Robert Holst ESTCP Compliance Manager**
- **James Q. Wheeler - Director U.S. Army DAC and JOCG**

Environmental Security Technology Certification Program