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Confined Burn Facility Bench-Scale Testing Results

Jeff Fleming-IT Corporation

and

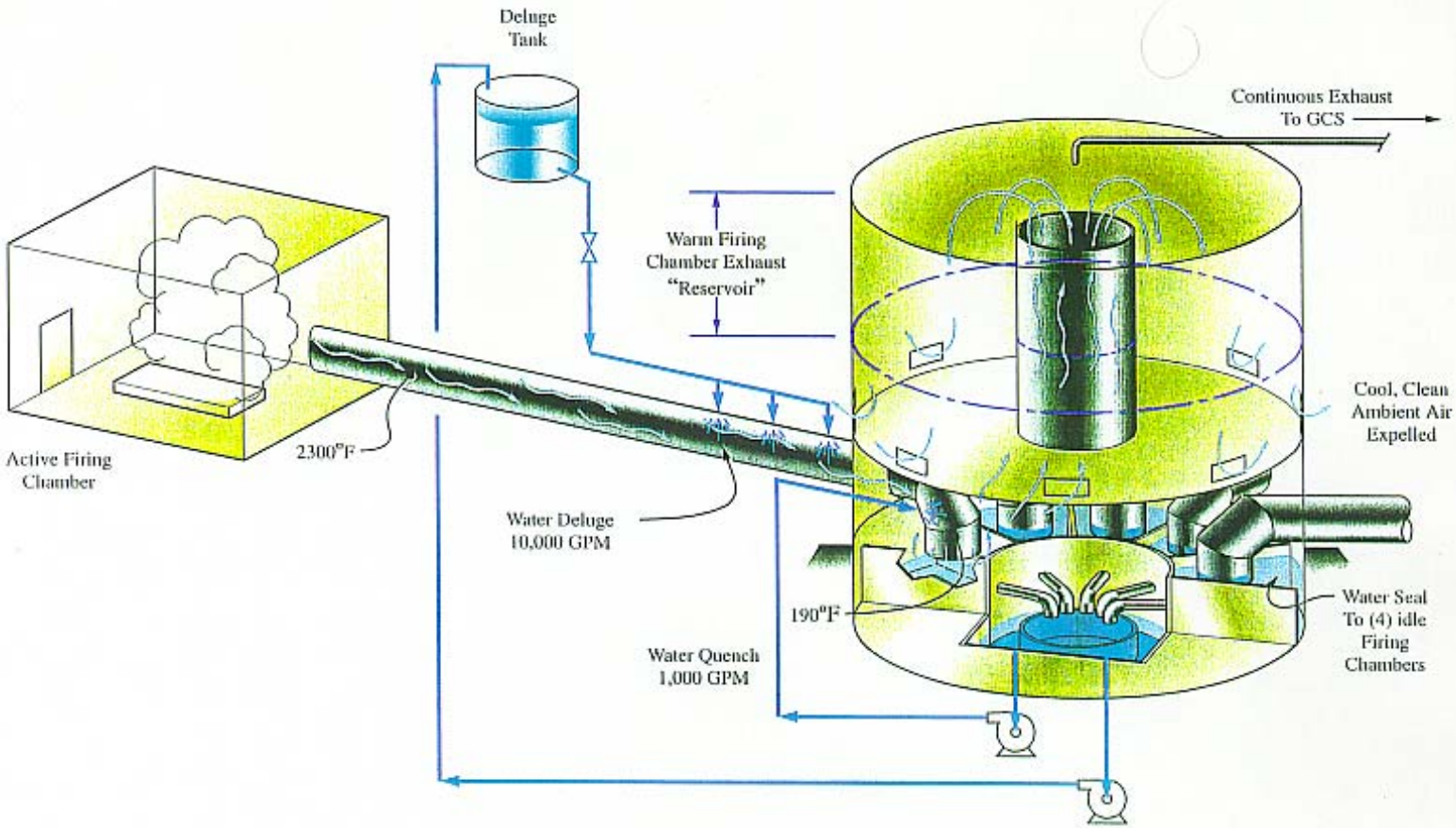
Tim Brennan-
IHDIVNAVSURFWARCEN

CBF Design Concept

- Treat in burn pans similar to current practice (OB)
- Applicable to energetics that do not transition to detonation
- Minimizes waste handling / provides safe disposal
- Allows treatment of combustion gas as required
- Provides temporary gas storage to reduce the size of required treatment equipment

CBF Subsystems

- Firing Chamber
- Transfer Duct
- Water Quench
- Hydraulic Valving
- Surge Containment Chamber
- Gas Cleaning System



UTTS Surge Containment System

Bench-Scale Test Objectives

- Define combustion gas characteristics
- Define combustion efficiency
- Demonstrate ability to contain fugitive emissions
- Confirm computer design models used for sizing
- Confirm assumptions regarding regulatory requirements

Bench-Scale Test Design

- Single firing chamber @ 1 / 2000 scale
- Scaled quench and surge chamber
- Full-range gas sampling & monitoring
- Hydraulic valving not required
- Off-gas treated with carbon
- Ignition using electric heating element

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Bench-Scale CBF & Sampling/Control Room

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Surge Tank & Barricaded Burn Chamber

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Burn Chamber

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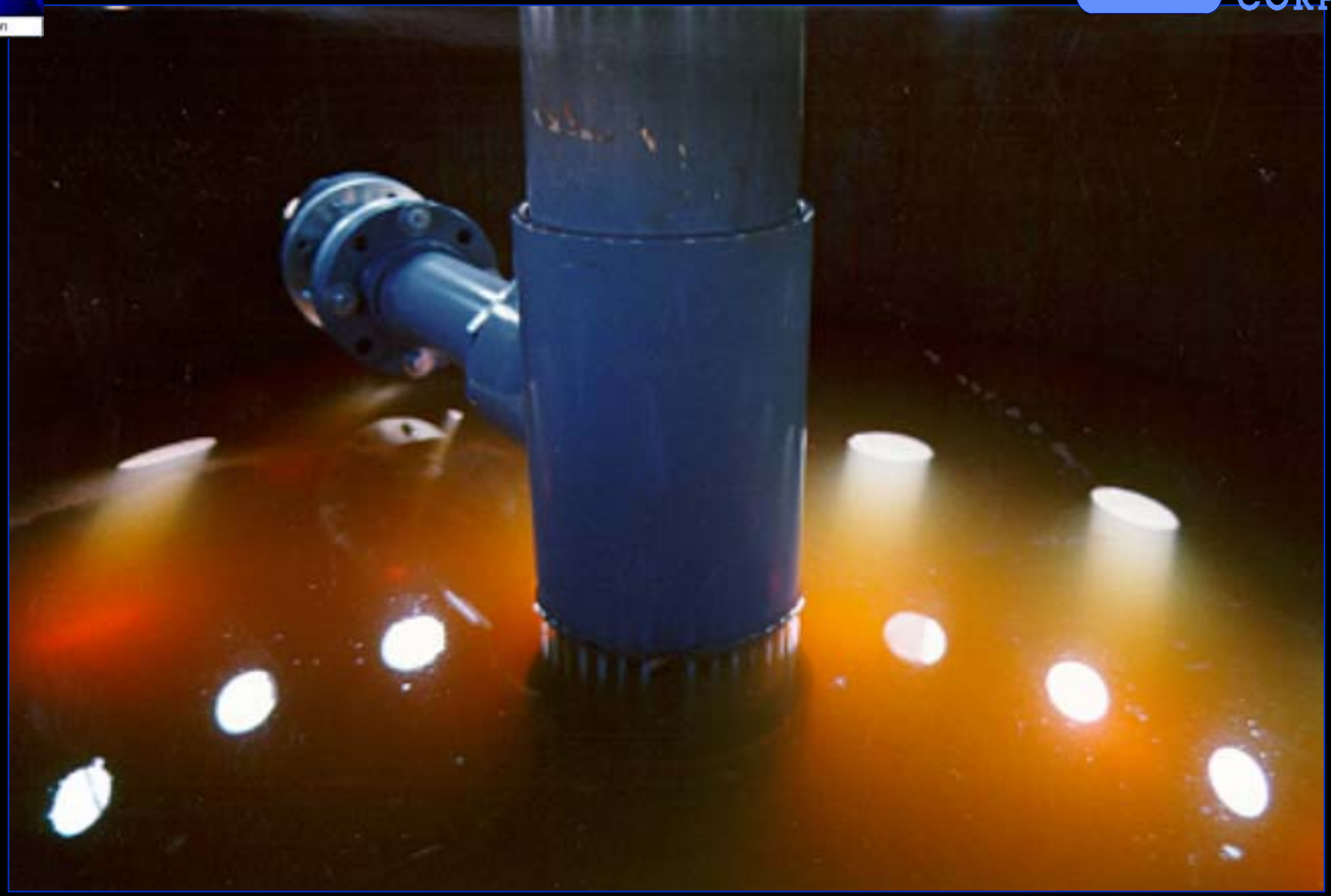
Burn Chamber Door

Clay Lined Burn Pan Inside Chamber

Surge Tank, Transfer Duct, Quench Pump, Sweep Blower & Burn Chamber



Surge Tank Internal Ducting & Sump

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Sampling/Control Room

Bench-Scale Tests Performed

- 12 Tests in 5 day period
- Charge sizes from 1/2 lb to 1 lb
- Wet HEN-12 shavings used for repeat tests
- Block DB & composite propellant tests
- Adjustments to quench flow

Bench-Scale Parameters Recorded

- Firing chamber temperature (4 positions)
- Firing chamber pressure
- Transfer duct temperature
- Transfer duct flow
- Surge containment chamber temperature (4)

Bench-Scale Parameters Monitored

- Oxides of Nitrogen
- Total Hydrocarbons
- Carbon Monoxide
- Carbon Dioxide
- Hydrogen (bag sample)

Bench-Scale Sampling Performed

- Volatile Organics
- Semivolatile Organics
- Metals
- Dioxins / Furans
- Chlorine / Hydrochloric Acid
- Cyanide & Particulate

HEN-12 Doublebase Propellant Machine Shavings

HEN-12 Burn Result

ARP Doublebase Propellant Blocks

ARP Burn Result

NOSIH EC Composite (85% AP) Propellant Blocks

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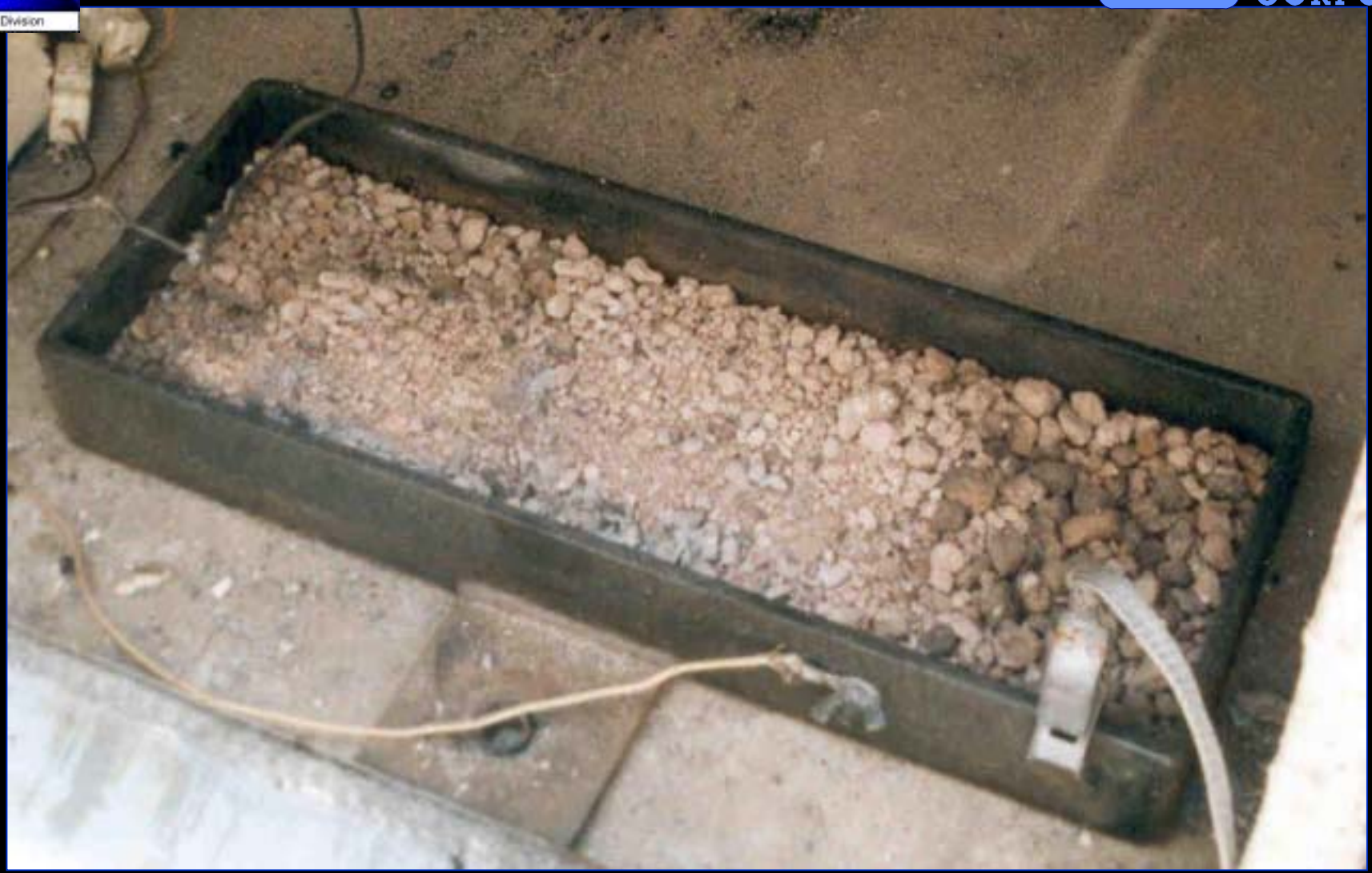
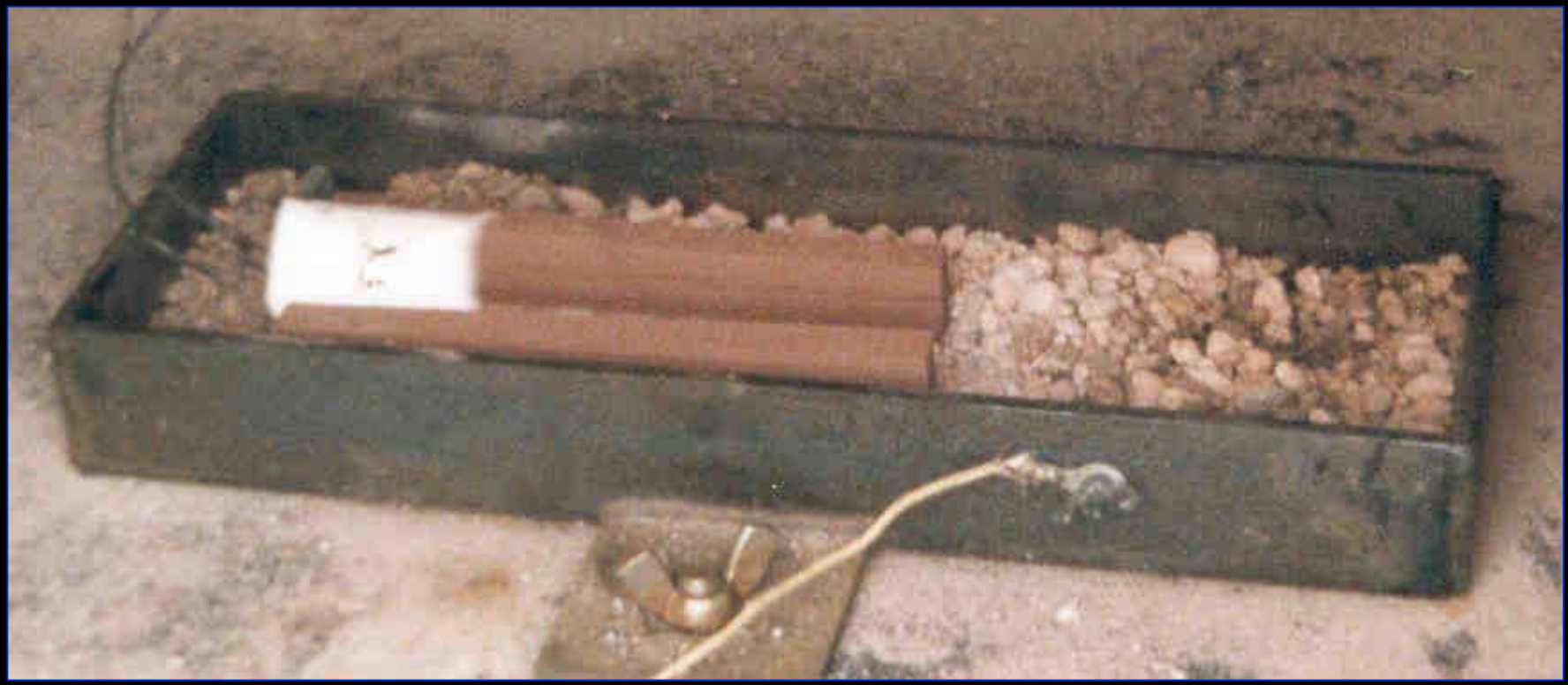


NOSIH EC Burn Result



NOSIH BC-10 Composite (18% Al) Propellant Blocks

NOSIH BC-10 Burn Result

Bench Test Results and Conclusions

- Surge containment adequate size / concept
- Requires wind screens
- Quench flow higher than required
- HEN-12 shavings inadequate for base sample
- NO_X higher than anticipated

Bench Test Results and Conclusions

- POLU model adequate for bulk combustion modeling, not for constituents
- Variable combustion gas composition
- Sizing assumptions somewhat conservative
- GCS will require lead, organics, and possibly NO_X removal (attainment status dependant)