

GENERAL DYNAMICS

Ordnance and Tactical Systems



Thermal Treatment of NC Propellant: Answering the Need

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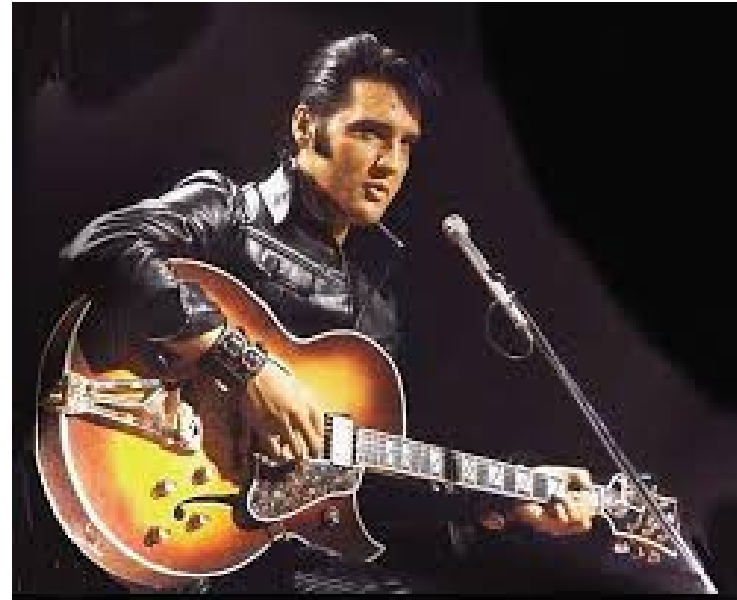
History of Nitrocellulose (NC)

- **NC, originally called guncotton, was discovered in 1846 by Christian Schönbein, a German chemist. He collaborated with Rudolf Böttger who had also discovered the process independently in the same year. By coincidence, a third chemist, F.J. Otto had also produced guncotton that same year and was the first to publish the process.**
- **A few years later John Hyatt used NC and plasticized it with camphor and developed a material called celluloid that was used to make photographic film.**



Uses for NC

- **Ping Pong Balls**
- **Nail Polish**
- **Compound W**
- **Liquid Skin**
- **Guitar Finishes**
- **Playing Card Coating**
- **Office Staples Binder**
- **Billiard Balls (First Thermoplastic)**
- **Gun Propellants**





NC Gun Propellant

- **NC Based – Single Based Propellant**
- **NC/NG (Nitroglycerine) – Double Based Propellant**
- **NC/NG/NQ (Nitroguanidine) – Triple Based Propellant**
- **Stabilizers**
 - **Diphenylamine**
 - **Ethyl Centralite**
 - **2-Nitrodiphenylamine**



Propellant Disposal Needs

- **Demilitarization**
- **Shelf Life Issues**
 - **Improper packaging or storage**
 - **Abnormal environmental exposure**
 - **Lot Integrity**
 - **Residual Effective Stabilizer (RES)**
- **Shrinking Recycle Market**
 - **Global Warming**
 - **Greenhouse Gas Emissions**
 - **Future of Coal use**



Disposal by Thermal Treatment

GD-OTS projects a market for disposal of NC based propellant going forward and are committed to provide that service.

As a licensed Hazardous Waste Treatment, Storage and Disposal Facility (TSDF) designed specifically to treat explosive waste, Muniton Services has disposed of various propellants. Types of propellants that we have incinerated in the past are:

- **Single Base (M1, M6, M10)**
- **Double Base (JA2, AA-2)**
- **Triple Base (M30)**
- **Clean Burning Ignitor (CBI)**
- **Ball Powder**
- **Smokeless Powder**





NC Thermal Treatment Project

General Dynamics Ordnance and Tactical Systems has recognized the need for a Thermal Treatment Process designed specifically for the disposal of NC based propellants to :

- **Meet the needs of our Customers**
- **Prevent stockpiling of propellant**
- **Improve the safety of propellant storage through less stored**
- **Reduce the cost of managing RES levels**
- **Remain compliant with Hazardous Waste Regulations**
- **Reduce loading and free up capacity in our Rotary Kiln Incinerator**
- **Reduce exposure to personnel involved in repack operations**
- **Provide faster disposal throughputs**
- **Increase demil capacity**



NC Propellant Thermal Treatment Design

- Single Base

- M10 DIGL

- Double Base

- M2 M5

- M26 JA2

- Triple Base

- M15 M17

- M30 M31



Additional propellants will be tested next year.



Planned Propellant Emissions Testing

- **Nitroglycerin**
- **Diethylene Glycol Dinitrate (DEGDN)**
- **Dibutyl Phthalate (DBP)**
- **Nitrogen Oxides (NOx)**
- **Particulate Emissions**



Proprietary System Design

Specifications:

- **Highest possible operator safety**
- **12,000 pounds of propellant per day**
- **Compliant with EPA emission regulations**
- **Low maintenance**
- **Easy to operate**
- **Remote processing**
- **Automatic feeding**
- **Multitude of propellants**



Basic Process Design

Propellant Feed System



- Performed in closed, vented chambers
- Vacuum Transfer System
- Static control, bonding and RH control
- High Speed Deluge Fire Suppression

- Weigh Feed System for accurate weights, industry standard LAP
- Proprietary Chamber Charging System





Basic Process Design

Thermal Treatment

- Proprietary Thermal Treatment Process
- Proprietary Air Pollution Control System
- Wet Scrubber Technology with proprietary water treatment



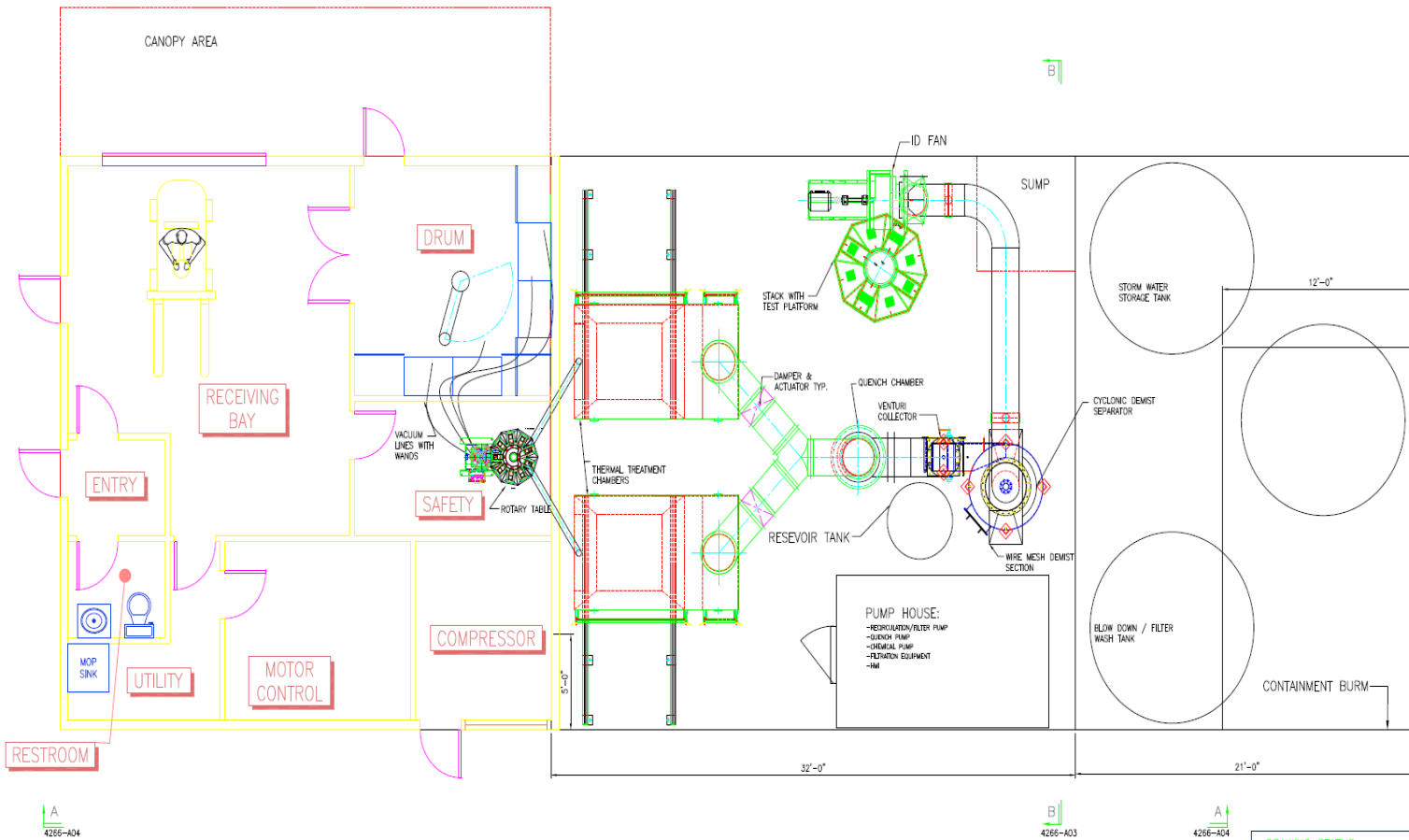


Process Safety Features

- **Safety Cell Design and Construction with Pressure Relief**
- **Vented Chambers for Propellant Vacuum Transfer**
- **NFPA Class II, Division 1 Electrical Compliant**
- **Bonding and Grounding per DoD 4145.26-M**
- **Remote Operator Control Station**
- **Safety Interlock Circuits on doors, chambers, equipment**
- **High Speed Deluge**
- **Video Monitoring**
- **Proprietary Computerized Process Control System designed to shutdown system upon any type of process failure**
- **Multiple Emergency Stop Stations**

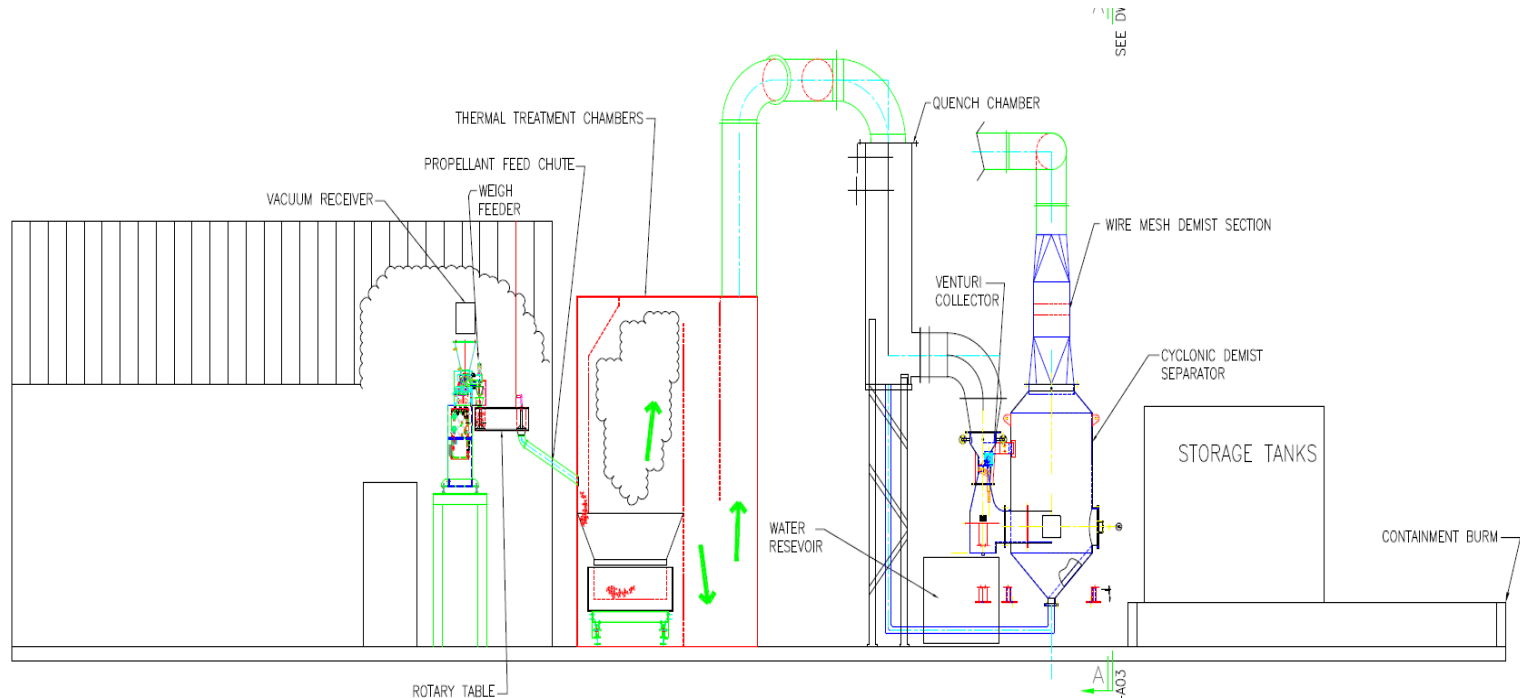


Design Plan View





Design Elevation View



ELEVATION VIEW
-FROM THIS DWG.
-WEST LOOKING EAST
-SOME EQUIPMENT REMOVED FOR CLARITY

SEE DW

SEE DWG 4266-403

DRAWING STATUS:
[Green Box] REVISED DRAWING - DESTROY ALL OTHER COPIES



Questions & Contact Info

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