Thermische Behandlungsmethoden für den Einsatz auf Munitionsbergungsplattformen

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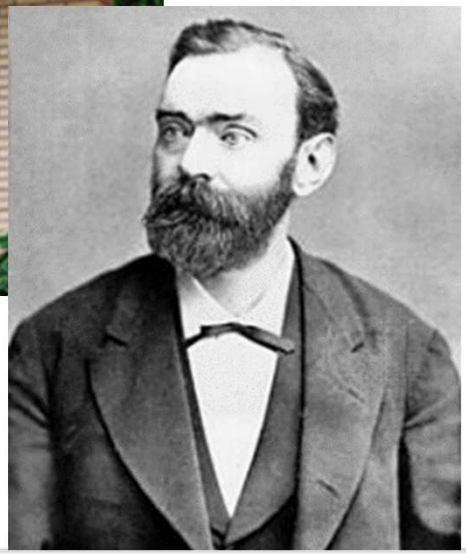
Dynasafe

- Headquarter is in Karlskoga, Sweden; offices in Langenselbold, Germany, Talladega, USA and Singapore
- Established in 1991
- 100M€
- Clients are defence contractors, governments, international organizations, and the private sector working on munitions and explosives disposal.



40 demilitarization plants & **350** explosive containment chambers in **70** countries

Company Overview

Protection

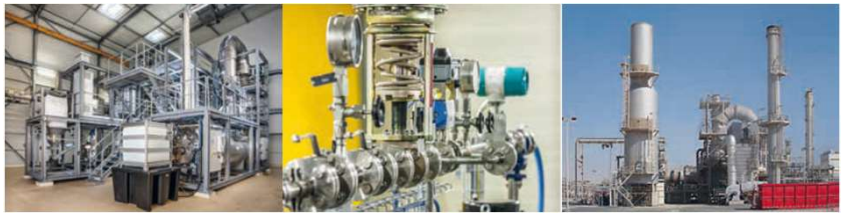
Explosive containment chambers

Demilitarization

Demilitarization of obsolete or outdated munitions

Environmental Systems

Specializes in flue gas cleaning systems and the thermal treatment of waste material.



Why do business with Dynasafe?

- Subject matter expert in the explosives and toxic materials industry
- Technology leader
- Significant environmental footprint
- Impeccable safety record
- Experience in fast mobilization and demobilization
- Strong R&D capabilities
- Global presence

Demil Systems - threats and solutions

Threats from explosive devices

Stockpile

UXO

Rockets

Fireworks

Selected Dynasafe solutions

Fixed site and Mobile plants :

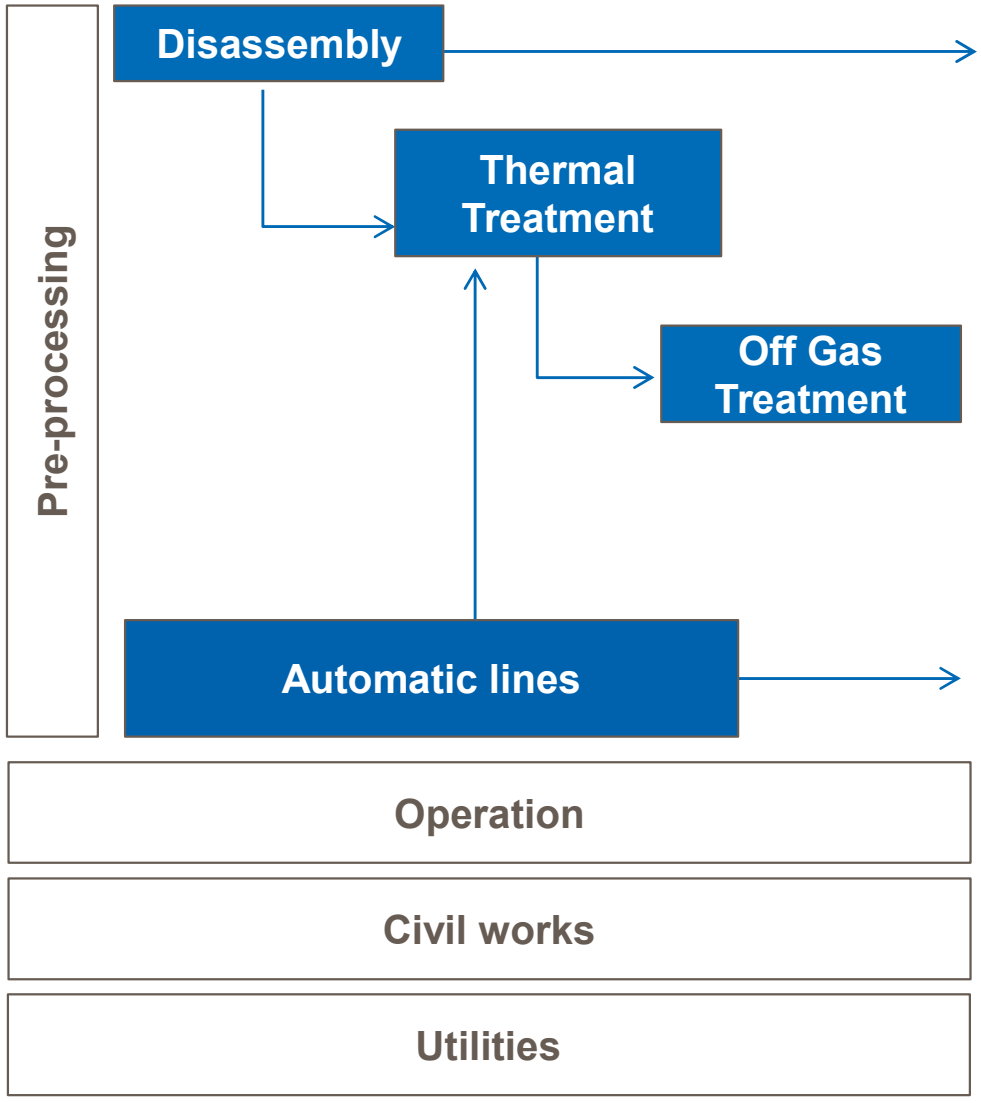
Plant modules:

Static Detonation Chamber (SDC)

Off Gas Treatment (OGT)

Disassembly & Automation Solutions

Main steps in a Demil Process



Result

Munitions Destruction - General

Main Challenge with respect to Destruction of Munitions

- The last 50 years have provided a large amount of experience and knowledge if it comes to destruction of munitions.
- Technologies have been applied which are ranging from manual disassembly, chemical treatment, cryofracture, explosive's recovery to thermal treatment.
- The goal in any destruction process is to minimize the manual handling as much as possible to reduce the risk for any explosion.
- However, destruction of munitions is a dangerous undertaking and safety of people involved has highest priority.

Demil technologies – pros and cons

- **Rotary Kiln**
  - Fast wear due to direct contact of the explosives with metal surface
  - Undestroyed explosives in waste
  - Huge amount of off-gas
- **Controlled Detonation**
  - Undestroyed explosives in waste
  - Additional donor charge necessary
- **Cryofracture**
  - Unexpected detonations
  - High Energy Consumption
- **Super Critical Water Oxidization**
  - A lot of secondary waste
  - A lot of wear & tear
- **OB/OD**
  - Environmental Unfriendly
- **Hot Detonation**
  - …?

Sea-dumped Munitions

Main Challenge with respect to Destruction of recovered sea-dumped Munitions

If destruction technology is applied for recovered munitions compared to the ones for stockpile munitions, different criteria or better conditions as a point of departure have to be taken into consideration:

- It is often difficult to differentiate between chemical and conventional munitions when they are recovered.
- Munitions may be corroded or otherwise physically damaged.
- Munitions often contain widely varying mixtures of various agents, decomposition products, and explosive material, for which it is difficult to model and implement standardized destruction procedures.
- Unstable explosive charges and fuses (e.g., picric acid) often mean that it is too dangerous to transport the munition.

Destruction Technology on platform

General “limitations” in application of a destruction technology for sea-dumped munitions on a platform

- Munitions caliber against size of the destruction unit – larger calibers against medium and small size
- Dismantling of conventional munitions and chemical munitions – pros and cons
- Maximum explosive load per feed against dismantling requirements
- Layout of Off-Gas Cleaning System – conventional munitions versa chemical munitions
- Equipment size against investment

Destruction Technology on platform

Requirements for munitions destruction technology to be applied on a platform

- Technology has to be proven to be mature
- Technology should be applicable for conventional munition and /or chemical munitions (pros and cons)
- Manual handling in the destruction process should be minimized
- Operation should be as automatic as possible
- Resulting wastes from destruction should be explosive/agent free
- Resulting off-gas from the destruction process should be cleaned to the actual legal limitations in place

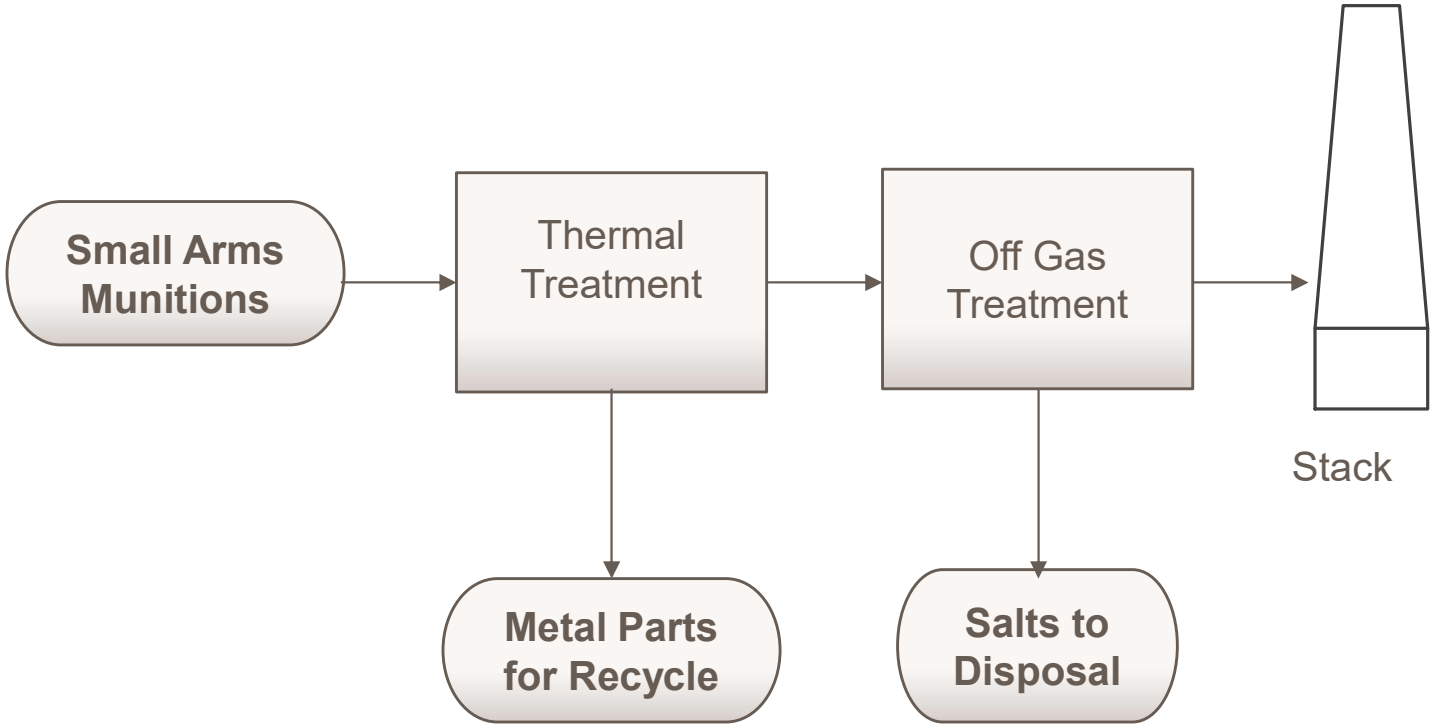
Mature Destruction Technologies - OCW

Two destruction technologies have been proved to be mature for application to the destruction of Old Chemical Weapons (OCW) in the last 25 years

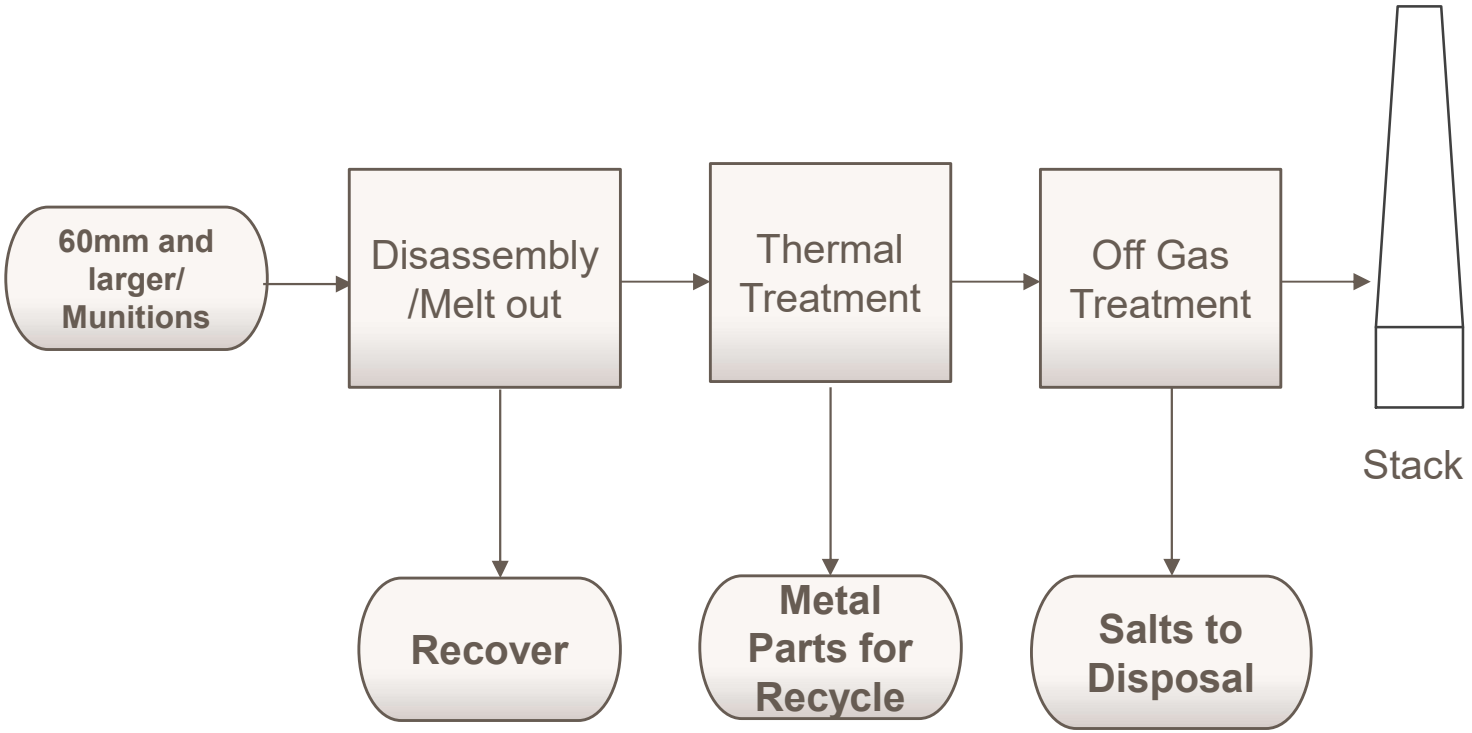
1. ***Cold detonation technology***. Explosive donor charge is placed around the munitions and is detonated in a containment system, creating conditions (pressure, fireball, and temperature) that allow the destruction of the explosives and most of the agent. The resulting off-gases are treated in an off-gas treatment system. Cold detonation technology is/will be applied to OCW in Belgium, China, Japan, China/Japan and France. Cold detonation technology is currently employed to support (a) explosive destruction systems (EDS), (b) transportable detonation chambers (TDC), and (c) the detonation of ammunition in a vacuum integrated chamber (DAVINCH).
2. ***Hot detonation technology***. Munitions are transported into a hot detonation chamber (500–550°C), where the temperature will lead to deflagration, detonation, or burning of the explosive filling of the munitions. In addition, if CW agents are contained these are will be destroyed. The resulting off-gases are treated in an off-gas treatment system. Hot detonation technology is (or has been) applied to the destruction of OCW as well as problematic stockpiled munitions in Belgium, China, Germany, Japan, China/Japan, Libya, and the United States. For this technology, the static detonation chamber (SDC) is currently in use.

The Dynasafe Static Detonation Chamber (SDC) Technology

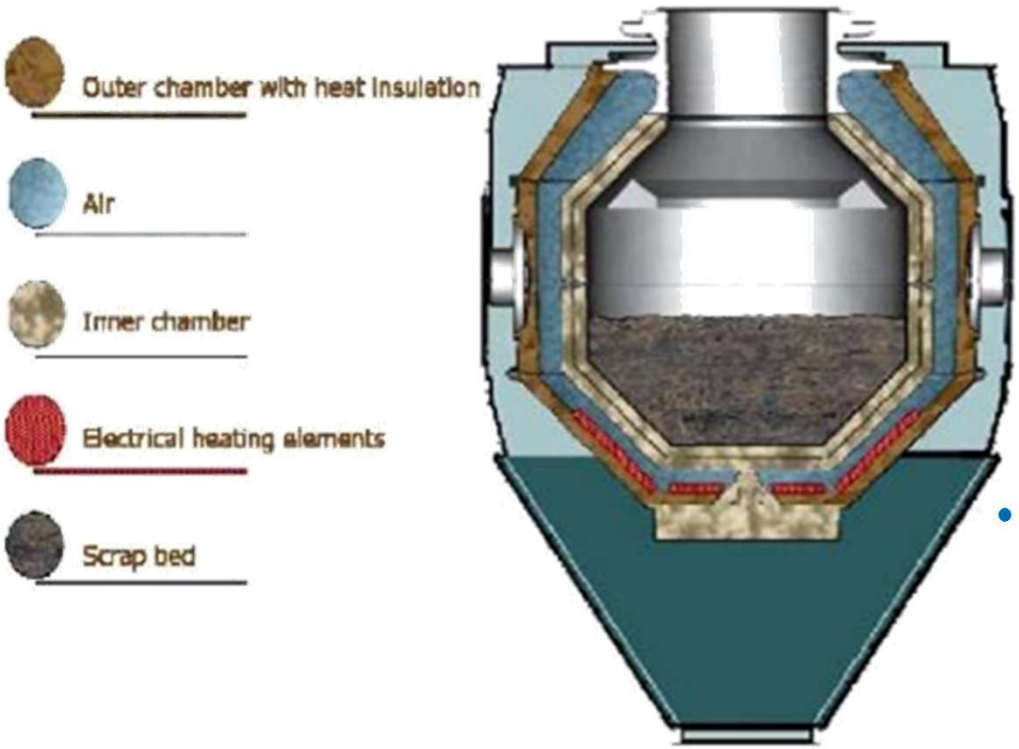
Small and medium arms Demil



60 mm and larger arms Demil



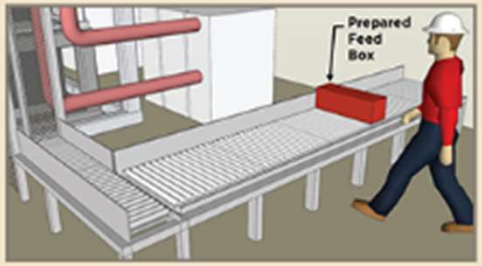
SDC Process Flow

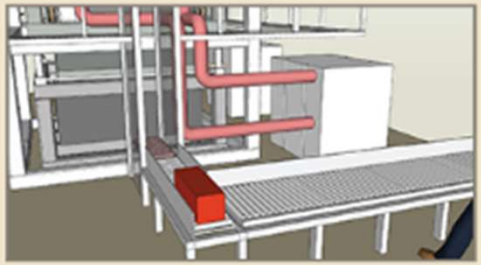


- Destruction is achieved by heating the items to their auto-initiation temperature which results in four possible events:
  - A full order detonation
  - Deflagration
  - Burning of the combustible material inside the munitions
  - Boiling liquid evaporating vapor explosion (BLEVE)
- Ensures COMPLETE destruction:
  - in one step
  - without dismantling
  - destroyed shells are free from explosives / chemical agents and can be recycled

SDC Process

Step 1

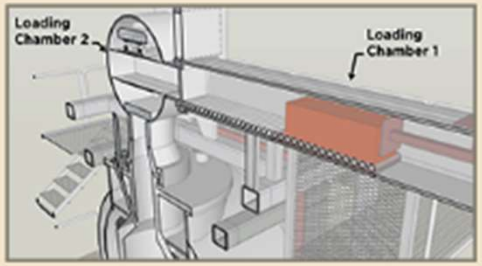


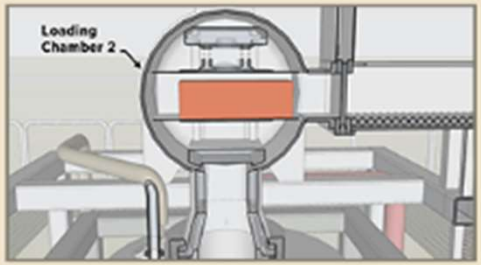


Workers place mustard projectiles in a feed box with aid of material-handling equipment

System allows for minimal handling of projectiles by workers

Step 2

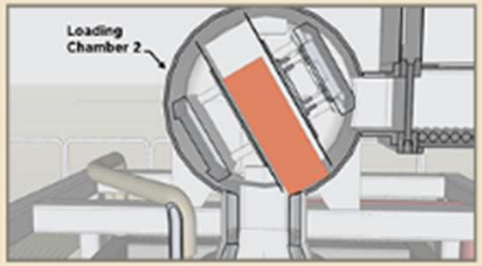


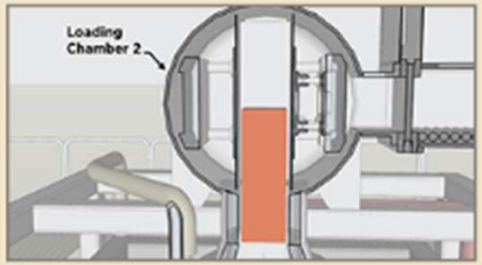


Feed boxes are conveyed to the top of the vessel and fed to loading chamber 1

For added safety, it is a fully automatic, double air-lock feeding conveyor system

Step 3

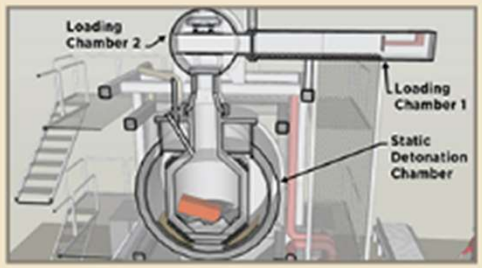




Loading chamber 2 rotates the feed box into the detonation chamber

Feed box drops into SDC

Step 4



High temperature detonates/deflagrates munition, and the mustard agent and explosive components are destroyed by explosion/thermal decomposition

Off-gases are treated by an off-gas treatment system

Conventional Demilitarization

Conventional Demil (SDC Base)

- Sweden
- Germany
- France
- Abu Dhabi
- Spain
- Portugal
- Taiwan
- USA
- Japan
- China

Chemical Demilitarization

- Germany
- Japan
- China/Japan
- USA
- Libya
- Belgium

Dynasafe cares about Environment- Off Gas Treatment

Dynasafe Technology “Additions”

Dynasafe - Melt-out/wash-out

Remove TNT from munitions

- Capable of processing munitions from the 60 mm mortar up to 900 kg bombs
- Recovered explosives are suitable for recycling or reprocessing


TNT recovery


Melt out with water

Thermal Systems

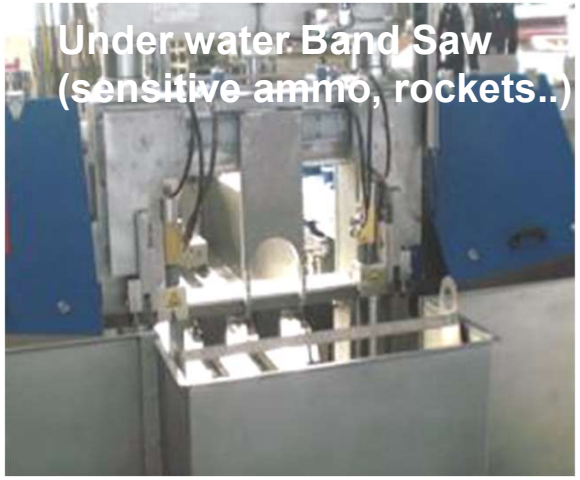
- Metal Parts Furnace (E/Fuel)
- Tunnel Furnace (150/600 kg/h)
- Rotary Kiln (direct/indirect heated)
- Liquid incinerators
- Clean burning chambers

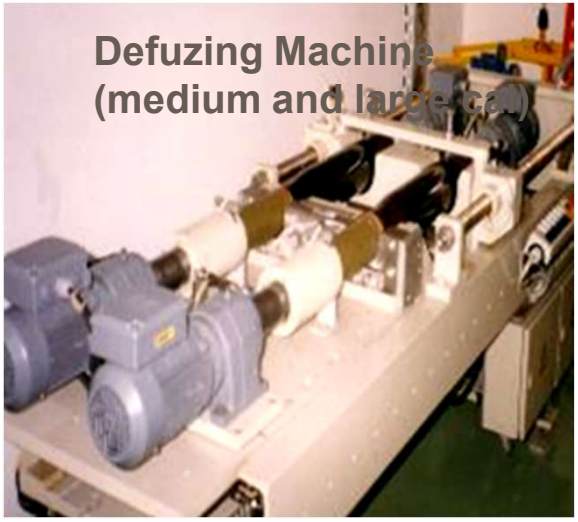
Solid Wastes Treatment

Scrap from Munitions

Metal Part Furnaces - Open munitions, munitions casing scrap and detonator caps from waste munitions with explosive trains fully disabled are placed in purpose-built metal containers. The containers fed into the furnace on heat resistant wheeled carriers in a specific order.

Disassembly Machines





Danke für Ihre Aufmerksamkeit

Für weitere Fragen bitte eine e-Mail an:

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