

# SMARTER, SAFER DEMILITARIZATION

COST-EFFECTIVE AND ENVIRONMENTALLY RESPONSIBLE



**Nammo**  
SECURING THE FUTURE

# DEMILITARIZATION REDEFINED

**The Nammo Group believes in safe and secure demilitarization with a focus on environmentally responsible processes and production capabilities.**

We have more than 50 years of demilitarization experience with operational facilities at Nammo Sweden AB in Vingåker, and Nammo NAD AS at Løkken Verk, Norway. In addition to being an operational site, Vingåker houses our international project headquarters, and from here we manage complex projects often involving customer product assessment, logistics planning, shipping, system design, demilitarization planning, processes and recovery/recycling before a customer receives a Certificate of Destruction.

## SERVICES

The market demand for the demilitarization of munitions within defense communities has steadily increased over the last 20 years. Nammo specializes in handling excess, outdated and obsolete conventional ammunition and explosive items. Our sites ensure the highest standards of safety and environmental consideration are applied within our processes; not only do these processes comply with European Union laws and regulations, but in many cases, they exceed them.

Long-term partnerships supplement Nammo's teams of experts with key suppliers, such as waste management companies and international logistics providers, which means that we can offer customers a full project solution tailored to their specific needs.

## NAMMO: A COMPLETE DEMILITARIZATION SOLUTION

- ▶ Customer product survey, inspection and assessment
- ▶ Logistics planning, including product shipping (road or sea), licenses, export, import and other legal documentation, security assessment and implementation ensuring safe arrival at Nammo (Norway or Sweden)
- ▶ Complete demilitarization processes to international, European and local environmental regulations
- ▶ Full accountability throughout all processes
- ▶ Ability to completely destroy security sensitive ammunition natures at NAD Norway
- ▶ Recovery, recycling and reuse (R3 Philosophy) of energetics where permitted, and recovery and recycling of metals
- ▶ Certificate of Destruction and close-out paperwork





Our facility in Norway, Nammo NAD, offers a total destruction process suitable for sensitive munitions, which uses closed detonation facilities located approximately 900 meters below the surface in a disused copper mine. Typically, Nammo NAD can process up to 2.5 tons Net Explosive Quantity (NEQ) per day, making this a unique and extremely fast process.

Our site in Nammo Sweden AB specializes in ammunition disassembly, recovery and recycling of both energetics and components. Environmentally efficient, it operates to strict environmental regulations. With its recovery and recycling ability, this can make the demilitarization process very cost-effective.

**NORWAY**  
LØKKEN VERK

OSLO ●

STOCKHOLM ●

**SWEDEN**  
VINGÅKER



## KNOW-HOW

Disposing of stockpiled obsolete or surplus ammunition and explosives in a responsible manner is a principle that is shared by many countries. Nammo is able to safely, rapidly and cost-effectively dispose of such products while minimizing damage to the environment.

Our teams have a culture of continuous project and process improvements, always seeking innovative solutions to the complex challenges of today's demilitarization market. We achieve this through investment in research and development, ensuring we are constantly at the forefront of demilitarization capabilities and technological advances.

Our demilitarization abilities span from small caliber conventional munitions, right through to aircraft bombs and missile systems. If necessary, we will undertake a complete store-clearing program on behalf of clients. Our technical experts can conduct customer product surveys and offer guidance on how best to run the demilitarization process.

Our logistic experts are on hand to offer the best solutions for transportation by land or sea and will assist with licensing and permits where required. They are specialists in hazardous cargo movement and logistical handling.





## ENVIRONMENTAL CONSIDERATIONS

Nammo demilitarization plays a vital role in limiting the environmental and safety impact of outdated or obsolete munitions. Depending on customer requirements and the type of demilitarization project, we have the ability to recycle over 90 percent of all components that we handle. In addition, our sites meet and exceed all local and international environmental laws, and all sites prohibit any open burning or open detonation.



## AMMO: RECYCLED TNT

Purpose: Civil mining

Recycle: 100%

## NAMMO'S

# R3

## PHILOSOPHY

Our philosophy for processing the ammunition is to remove the explosive content and then, where possible, recycle materials including the energetics and use them for other purposes in the civilian market. This is known as the R3 Philosophy and stands for Resources, Recovery and Recycling.

Resources



Recovery



Recycling



# AMMUNITION DISASSEMBLY AND RECYCLING

NAMMO SWEDEN (AB) VINGÅKER

**Nammo Sweden AB has a world-class demilitarization facility close to Vingåker outside Katrineholm, approx. 45 km south-east of Örebro in Sweden, and has operated for over 50 years delivering safe demilitarization solutions.**

The plant was established in 1967 as an assembly and explosives casting plant for the famous Swedish Carl-Gustaf system.

Demilitarization operations started in 1970 and have grown to be one of the main activities at the site. The focus of demilitarization processing in our Swedish facility is safe, reliable and sustainable demilitarization. We endeavor to recover as much energetic material as possible that is then used in booster charges for the quarrying industry.

Nammo Vingåker has developed a number of innovative explosive removal processes and engineering solutions in disassembly equipment for all types of explosives and ammunition. Approximately 30 employees are directly involved in the demilitarization process at Nammo Vingåker.





### NAMMO SWEDEN'S CAPABILITIES INCLUDE:

- ▶ Multiple disassembly processes including unscrewing/cutting/de-fuzing/pulling
- ▶ Automatic and semi-automatic processes
- ▶ Pollution Abatement Systems
- ▶ High volume energetic material melt out
- ▶ Industrial recycling capabilities
  - Nammo's R3 Philosophy
  - Scrap recovered and sold
  - Recycle revenue can offset demilitarization cost



## SAFETY IS OUR PRIMARY CONCERN

Safety cell (bunker) operation means remote operations are behind explosion-shielding barriers and 600 mm steel-reinforced concrete walls. This allows for safe disassembly operations to take place and for explosive removal operations to be conducted with minimal risk.

### PROCESS:

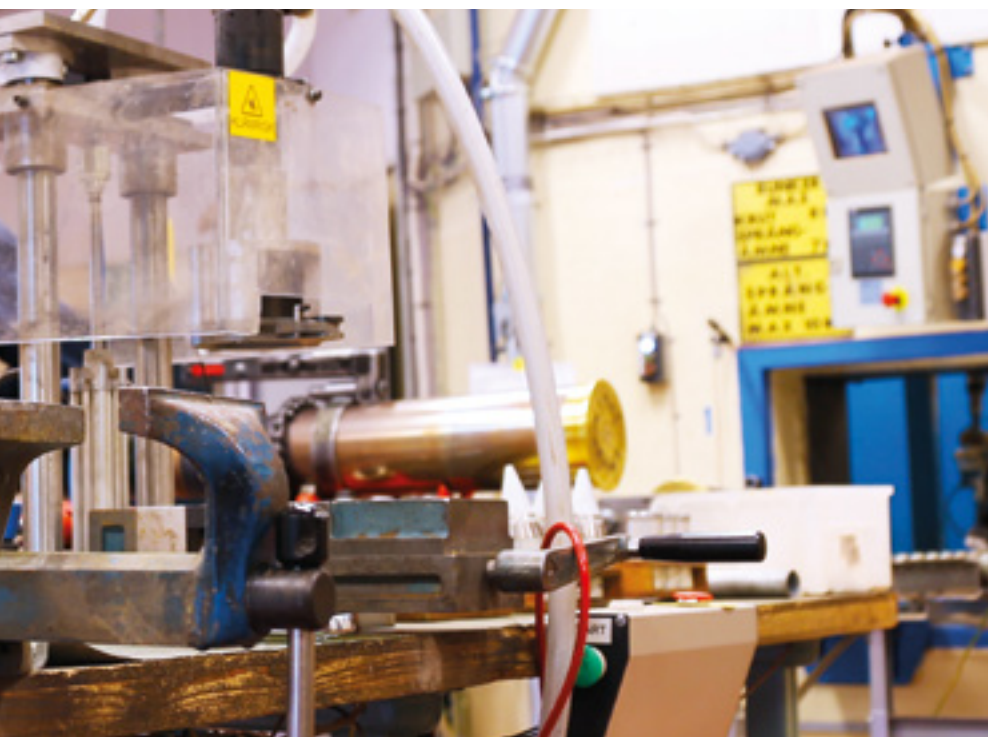
- ▶ High-speed disassembly and sorting equipment
- ▶ Semi-automatic disassembly equipment
- ▶ Thermal treatment
  - Incineration in a rotary furnace and/or static kiln
  - Off-gases go through cyclones, filters and afterburners before release (emissions as per EU directives)
  - Ideal for high volume low NEQ, such as small caliber or fuzes/igniters



### CONTAMINATED MATERIALS – TREATMENT PROCESSES:

Nammo's R3 Philosophy is especially applicable to Nammo Sweden's work ethic. Environmental protection, recovery and reuse are at the heart of the demilitarization operation. These include:

- ▶ Clean burn incineration
  - Off-gases go through cyclones, filters and afterburners before release
  - 5X level of decontamination
  - Scrap value recovered on sale of metal
- ▶ Wastewater
  - Water contaminated with TNT, RDX and/or HMX from processes
  - Three-step operation processes of contaminated "pink water"
  - Water is recycled into an adjacent lake as "pure" to EU and local emission laws



# CONTROLLED UNDERGROUND DETONATION

NAMMO NAD (AS) LØKKEN VERK

**Nammo NAD (Norwegian Ammunition Disposal Company) AS is located at Løkken Verk, some 60 km south-west of Trondheim in Norway, and is the world's largest closed detonation chamber.**

Nammo NAD AS has been involved with demilitarization since the beginning of the 1990s. A former copper mine, Nammo NAD is ideally suited to the destruction and disposal of obsolete ammunition and explosives, from small caliber through to large complex missile systems. Typically, munitions do not need unpacking or disassembly prior to controlled underground detonations in a secure closed detonation chamber some 900 meters below ground. Nammo NAD has performed daily detonations since becoming part of the Nammo Group in 1999 and has safely processed in excess of 10 000 tons of demil product.







- ▶ Provides high temperature and pressure over an extended time period, enhancing the complete disposal of energetic material and any inert components.
- ▶ Employs a simple, safe and environmentally considerate process. Tough granite rock gives the opportunity for reusing the chambers daily and offers environmental security supplemented with filtration processes.
- ▶ No unpacking needed.
- ▶ Able to process all types of ammunition and explosive product (although there are restrictions on smoke and illuminating).
- ▶ Detonations of up to 2.5 tons NEQ or 6 tons gross weight a day.
- ▶ On site "goods in", licensed explosive storage houses, workshops, detonation chamber and offices.
- ▶ A world-class unique facility.
- ▶ Ability to completely destroy security sensitive ammunition natures at NAD Norway.



# SITE PROCESS





## NAMMO NAD (AS) LØKKEN VERK

### CONTROLLED UNDERGROUND DETONATION

- ▶ Inspection and assessment – Nammo technical specialist assesses natures for demil process
- ▶ Licensing and logistics – Nammo logistics arrange all shipping, licensing and transport of demil natures
- ▶ Storage at NAD Norway is up to 565 tons NEQ
- ▶ Demil natures are transported to the detonation chamber 900 m underground
- ▶ Donor charges are laid and detonated, up to 2.5 tons NEQ per detonation
- ▶ A Certificate of Destruction is issued, packaging returned (if required) and contract closed out



## NAMMO SWEDEN (AB) VINGÅKER

### HIGH-SPEED DISASSEMBLY, RECOVERY AND RECYCLING

- ▶ Inspection and assessment – Nammo technical specialist assess natures for demil process
- ▶ Licensing and logistics – Nammo logistics arrange all shipping, licensing and transport of demil natures
- ▶ Storage at Vingåker is up to 4 000 tons NEQ
- ▶ High-speed disassembly, separation of components, melt out of energetic material
- ▶ Recovery and recycling of metal and energetic material
- ▶ A Certificate of Destruction is issued, packaging returned (if required) and contract closed out



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