

EKOVAR:

An Indigenous Ammunition Recycling Solution

- Customer's stockpile 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 EKOVAR Kirikkale/Turkiye
- Complete demilitarization and Recycling processes according to international, European and Turkish Environmental Regulations. Full accountability and traceability throughout all processes
- Recovery, Recycling and Reuse (R3 applications) of energetics where permitted, and recovery and recycling of metals
- Certificate of Destruction and close-out paperwork



Ammunition Recycling Services

The market demand for the demilitarization of munitions within defense communities has steadily increased over the last 25 years. EKOVAR specializes in handling excess, outdated and obsolete conventional ammunition and explosive items. Our facility in Kirikkale/Turkiye ensure the highest standards of safety and environmental consideration is applied within our processes; not only do these processes comply with Turkish laws and regulations, but in many cases, they exceed them. Long-term partnerships supplement EKOVAR'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.



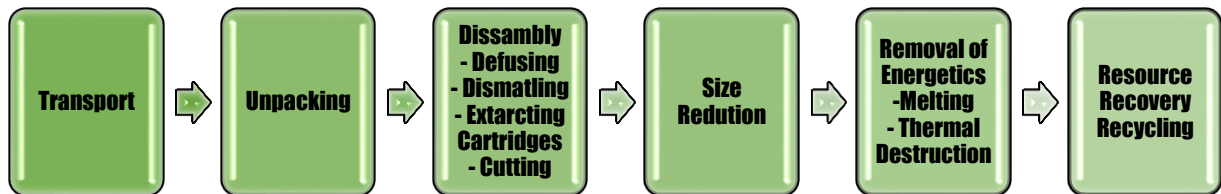
EKOVAR's Know-How

EKOVAR is able to safely, rapidly and cost-effectively dispose of stockpiled obsolete or surplus ammunition while minimizing damage to the environment. Our expert teams have a experience of continuous project and process improvements, We always seeking innovative solutions to the complex challenges of today's demilitarization market. We are constantly at the forefront of demilitarization capabilities and technological advances in Turkiye and in the Middle East. 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 Friendly Countries. Our technical experts can conduct customer stockpile surveys and offer guidance on how best to run the demilitarization and recycling process.



EKOVAR'S 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 military and civilian market. This is known as the R3 Philosophy and stands for Resources,



Safety Is Our Value

Safety operations (remote operations) are behind explosion-shielding barriers and concrete walls. This allows for safe disassembly operations to take place and for explosive removal operations to be conducted with minimal risk.

Capabilities include

- Multiple disassembly processes including unscrewing/cutting/defuzing/pulling
- Automatic and semiautomatic processes
- Pollution Controlling Systems
- High volume energetic material melt out
- Industrial recycling capabilities
 - EKOVAR's R3 Philosophy
 - Scrap recovered and sold
 - Recycle revenue can offset demilitarization cost



5,000 tons
per year
capacity

Process in
NATO
standards

%95
Recovery,
reuse and
recycling

Flexible
equipment
for other
types of
munitions



Ammunition&Explosive Demilitarization and Recycling Capabilities

175 mm, 155 mm and 105 mm HE projectiles,

60 mm, 81 mm, 120 mm HE Mortar rounds,

90 mm, 105 mm, 120 mm tank ammunition,

57 mm, 75 mm, 90 mm, 106 mm recoilless gun ammunition

2.75-inch, LAW, 89 mm Rockets and 107 mm, 122 mm MLRS systems, (similar types rockets can be demilitarized)

76 mm, 40 mm, 35 mm anti-aircraft ammunition,

Aircraft Bombs

All types bulk High Explosives (HE) and pyrotechnics,

All types of grenades,

Fuzes, detonators and primers,

All types of small arms ammunition.

Ammunition&Explosive Demilitarization and Recycling Factory Workshops

Explosive Disposal Workshop

Bulk Energetic Processing and Thermal Treatment Workshop,

Ammo Without Cartridge and Mortar Dismantling Workshop,

Ammo With Cartridge and Mine Dismantling Workshop,

Rocket and Missile Disassembly Workshop,

Final Process Workshop,

Explosive Waste Incinerator & Rotary Kiln Workshop,

Fuze Disassembly Workshop,

Open Burning and Detonation Disposal Site,

EKOVAR Safe disposal and Recycle Techniques

- **Disassembly and pre-treatment;**
 - Techniques providing access to the energetic material or size reduction prior to further treatment.
- **Removal**
 - Techniques for removing energetic material from munitions.
- **Disposal**
 - Techniques for destroying energetic material or converting it to less toxic and energetic products; and
- **Resource Recovery and Recycling**
 - Techniques particularly related to Resource Recovery and Recycling.



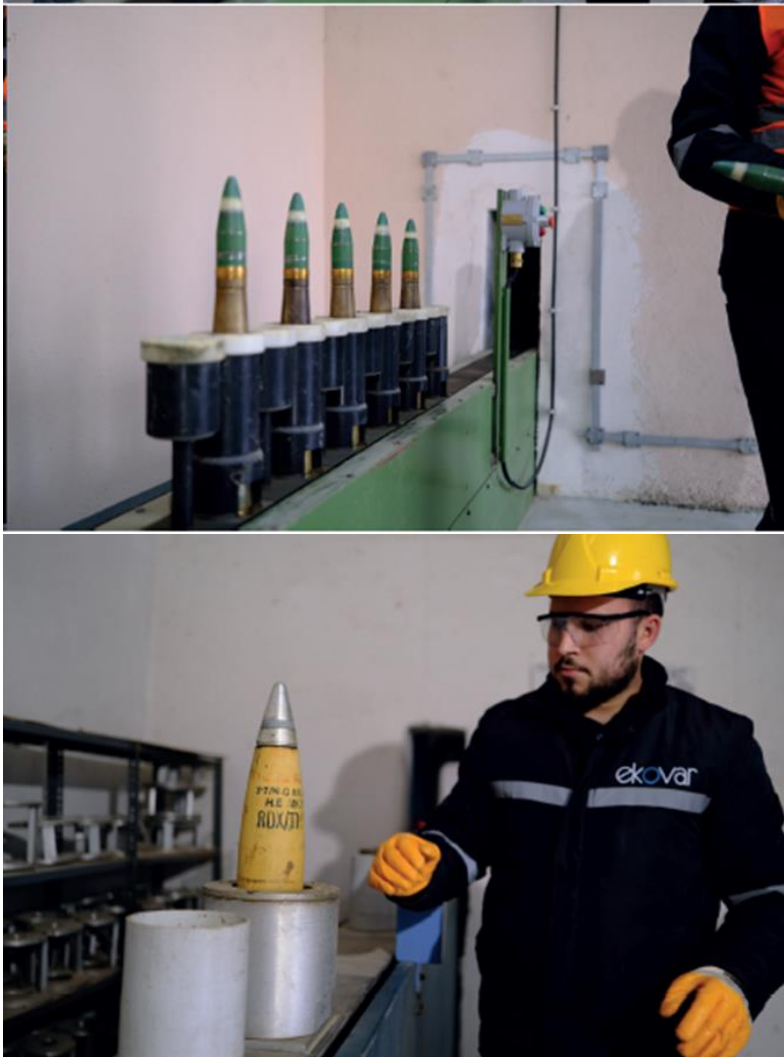
Munition Disassembly

Opening the ammunition and extracting the explosive is a necessary pre-processing step before performing any other procedure to reuse or recover the energetic materials. EKOVAR's Techniques involve some combination of disassembly and punching or cutting to gain access to the energetic materials.

- **Manual Disassembly**

This technique involves the use of human resources to manually dismantle the munitions using simple and safe hand tools. EKOVAR has well-trained technical experts who can conduct demilitarization process manually.
- **Mechanical Disassembly**

EKOVAR Mechanical disassembly capabilities involve the use of mechanical systems to physically dismantle the munitions. The conventional treatment for munitions includes the reverse assembly or reverse engineering with specialized equipment, such as automated robots. The separation of the projectiles from the cartridges, the defusing and the removal of the explosives from the projectiles are carried out. EKOVAR's the other mechanical system is pull apart which can remove the cartridges from the war heads and fuzes and primers from the munition.



Size reduction-Removing the explosive from the casing

➤ Explosive Waste Incinerator/ Rotary Kiln

EKOVAR's Explosive Waste Incinerator (EWI)/Rotary Kiln manufactured by a Turkish Engineer Company and EKOVAR can handle a wide variety of bulk explosive and propellant wastes and small caliber cartridges up to 20 mm cartridges. EKOVAR's EWI made of three chambers bolted together. The sections are lined and armored steel up to 80mm thick, to resist detonations and suppress fragment throw from small items.

Disassembled components of artillery rounds, military flares, fuzes, primers, boosters, and prepared projectiles can also be processed through the Rotary Kiln. The EWI can process nitrocellulose; explosives including TNT, RDX, and HMX; propellants including single base, double base, and triple base; and composite propellants.

Internally EKOVAR's EWI contains spiral flights that move the waste through the retorts as the kiln rotates. The flights allow the kiln to be operated continuously and discourage sympathetic interactions between materials. Varying the rate of rotation allows the residence time for the waste to be altered so that different types of munitions can be easily dealt with. A typical residence time is around 30 minutes. The burner for the kiln will run on natural gas and provides a gas temperature inside the kiln in the range 316 – 820°C.



Rotary Kiln Incinerator subsystems

- Feed Systems
- Discharging System
- Automated Lead Recovery System
- Air Pollution Control System (PCS)

➤ **Pollution Control Systems (PCS)**

EKOVAR's EWI has a Pollution Control System (PCS) to meet the emission levels set down by Turkish National Legislation and EU Regulations. EKOVAR PCS meet regulatory temperature requirements and to handle a range of pollutants including:

- Volatile Organic Compounds (VOC),
- Particulate matter,
- Acidic gases (NO_x and SO₂),
- Heavy metals and
- Dioxins.

➤ **Autoclave and Steam Melt-out**

EKOVAR's melt out technique is used to remove the explosives and fillings from ammunition that is filled in the molten state in production process. The most common example is TNT and TNT derivatives, such as TNT/RDX, that are melt poured at a temperature of 80.35° Celsius or above. EKOVAR's melt out technique is suitable for all TNT based munitions. The ammunition is processed an additional Car Bottom Furnace heat treatment to make it Free From Explosives (FFO)



EKOVAR Recovery, Reuse and Recycling (R³) Applications

➤ Scrap Metal Recovery

One of EKOVAR's resource recovery is the reuse of scrap metal from munitions casings. The scrap metal is safe for reuse. "Flashing" is used to remove traces of energetic materials or toxic substances from scrap metal before it is sold. This involves the heat treatment of the metal at approximately 400°C and flashing furnace is used for the process. Before scrap metal can be released to commercial use, EKOVAR provides "Free from Explosives" certificates to be met customer's requirements.



➤ **Energetics Recovery**

EKOVAR has developed a resource recovery and reuse (R3) plan for explosive waste. Some basic features are;

- First, the safety of all personnel involved in the processes is ensured.
- Second, the processes that we have improved which enables recover valuable energetic materials for reuse and/or produce high-value by-products.
- Third EKOVAR has well-trained technical experts can conduct safely energetics recovery process.
- Forth, our processes are environmentally safe, i.e., no discharge of toxic materials to the environment – ground, water or air

One of EKOVAR's potential reuse application is for recovered energetics to be used in new munitions. EKOVAR melt out technique meets the qualification requirements for new explosives. This is likely to be most practical for high value explosives such as TNT.

In addition, energetic materials removed by EKOVAR melt out technique can be reused as commercial explosives rather than destroyed. EKOVAR's reclamation, reuse and/or recycling of explosives applications saves a lot of money versus the production of new material. These savings do not include the intangible environmental impact mitigation achieved by not destroying explosives by burning. Moreover, the use of reclaimed materials in lieu of new materials results insignificant time and effort reductions as well as negating the addition of materials to an already overburdened demilitarization stockpile



EKOVAR Environmental Considerations

Many munitions and propellants are harmful to the environment. Demilitarizing large quantities of ammunition requires the rigorous control and processing of toxic substances such as ammonium perchlorate, mercury fulminate, WP, and lead compounds. In addition the packaging material can also require handling and treatment to contain the heavy metals and persistent organic pollutants that were often used as preservatives in wooden ammunition packaging before it was banned.

Some of the demilitarization processes themselves generate additional environmental hazards, such as air pollutants, pink water, and other hazardous secondary materials. EKOVAR's demilitarization and recycling processes ensure appropriate control of the materials at all stages, and particularly the final disposition of any hazardous waste stream. EKOVAR's demilitarization and recycling processes have been the subject of Turkish Environmental Regulations such as noise, air, water, and land emissions, as well as waste management and recovery.

EKOVAR Demilitarization and Recycle Process Standards

- NATO STANAG 4518
- NATO Manual on Safety Principles for the Storage of Ammunition and Explosive (AASTP-1).
- Organization for Security and Cooperation in Europe (OSCE) of Small Arms and Light Weapons (SALW),
- The International Mine Action Standard (IMAS) 11.10.

