

## **UNDERGROUND DETONATION – THE ENVIRONMENTAL AND SAFE PROCESS**

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### **ABSTRACT**

Due to its extremely solid rock, the old copper mine in Løkken Verk is most suitable for the purpose of underground detonation of ammunition to be disposed of. Such tests started in 1990, and the discontinued Løkken Verk copper mine company was transformed into the Nammo NAD (Norwegian Ammunition Disposal Company) in the same year.

The first years, Nammo NAD was owned by the Orkla company in Norway. Since 2002, Nammo NAD has been a part of Nammo's Demil Division. Today the number of employees is 14.

Ammunition is now prepared for detonation at the main level at 810 meters. The main process area (the demolition site) is at the level of around 930 meters. The ammunition is transported down to the level of 810 by an elevator. The demolition sites are parts of the mine's tunnel system. Air has to be pumped in and out of the mine by ventilation fans; approximately 35 thousand cubic metres an hour. The mine has a natural inflow of about 30 thousand cubic meters of water a year. This water is pumped out in four steps via four sludge separators, and into the Wallenberg mine, which is a closed mine but in use for collecting water from the complete mine system in Løkken Verk. As we deliver water to this system, we have to send in water samples for analysis to the Norwegian environmental department (NIVA).

Nammo NAD is an ISO 9001 certified company. The ISO 14001 standard will be implemented this year. The air and gas outlets from our activity are of no significance, and an outlet concession is not needed according to the Norwegian environmental authorities. Because of the detonations being performed deep down in the mountain, there is no human exposure to noise, fumes, dust, or vibration. All materials (empty boxes, etc.), which have to be moved back to the ground level from the production areas, are inspected and signed for. We have a very good lightning protection system; the work will be stopped if we get an alert for this. Our operators have to qualify through a basic ammunition handling course. This is a tough one, as indicated by the fact that only 50 % of the personnel pass the exam.