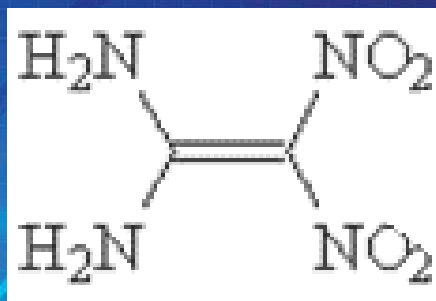


# FOX-7 and its potential applications

Johan Dahlberg and Per Sjöberg

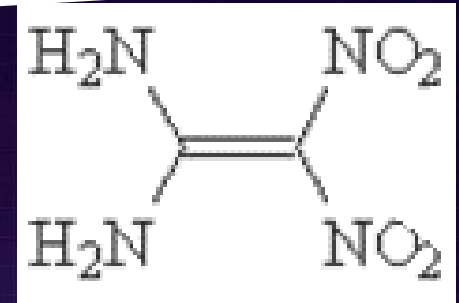
**EURENCO Bofors AB**

NDIA Meeting, San Francisco, CA. November 14 – 17, 2004



1,1-diamino-2,2 dinitroethylene (1,1-diamino-2,2 dinitroethene)  
DADE or DADNE

Pioneered and characterized by FOI  
Pilot scale production at EURENCO Bofors



**Heat of Formation**  
**Crystal density**  
**Activation energy**  
**Compatibility**

**-32 kcal/mole**  
**1.885 g/cm<sup>3</sup>**  
**58 kcal/mole (40 for RDX)**  
**Inert**

**Calc. Det. Velocity**  
**Calc. Det. Pres.**  
**Det. Vel.**

**8870 m/s (RDX 8930 m/s)**  
**34 GPa (RDX 34.6 GPa)**  
**8335 m/s (1.5 % wax, 1.756 g/cm<sup>3</sup>)**

**Drop-weight test**  
**SSGT (1.65 g/cm<sup>3</sup>)**  
**Koenen test**  
**SCB PBX 70% FOX-7**

**126 cm (38 cm for RDX)**  
**6.22 mm (9.33 RDX )**  
**6 mm type F (RDX 8mm)**  
**Bomb intact (Comp B exploded)**



- **On step synthesis of FOX-7 (2 step for TATB)**
- **FOX-7 is soluble in several organic solvents**
- **Optimal particle size distribution can be obtained in cost effective recrystallization (Today we provide 20 – 300 microns)**
- **Price is today includes our R&D costs**

# LOVA-propellants at Eurenco Bofors AB

## 1st Generation

- Is produced in manufacturing scale for Bofors 40 and 57 mm automatic gun.
- The propellants are based on NC, CAB, RDX and inert or energetic plasticizers.



40 mm Naval Gun

## 2nd Generation

- Is presently tested in different applications.
- The propellants are based on NC, FOX-7 or FOX-12 and low-sensitive energetic plasticizers.



New Formulations



# FOX – Background

- FOX = **FOI** Explosive, developed at the Swedish Defense Research Establishment.
- FOX 7 and FOX 12 are manufactured in pilot/production scale at EURENCO Bofors.
- FOX 7 and FOX 12 are the present base for the development of new low-sensitive propellants.



FAK 40 mm

# Propellants containing FOX-7

- Compositions containing FOX-7, RDX, NC and NENA
- FOX-7 compositions perform as a high-energy DB propellant
- FOX-7 is suited for high performance tank guns
- Ignitability is easier than RDX-LOVA
- Flame temperature significantly lower than RDX-LOVA
- Temperature dependence lower than RDX-LOVA
- Extensive testing underway for 40 mm kinetic round
- Produced in existing solvent-less process

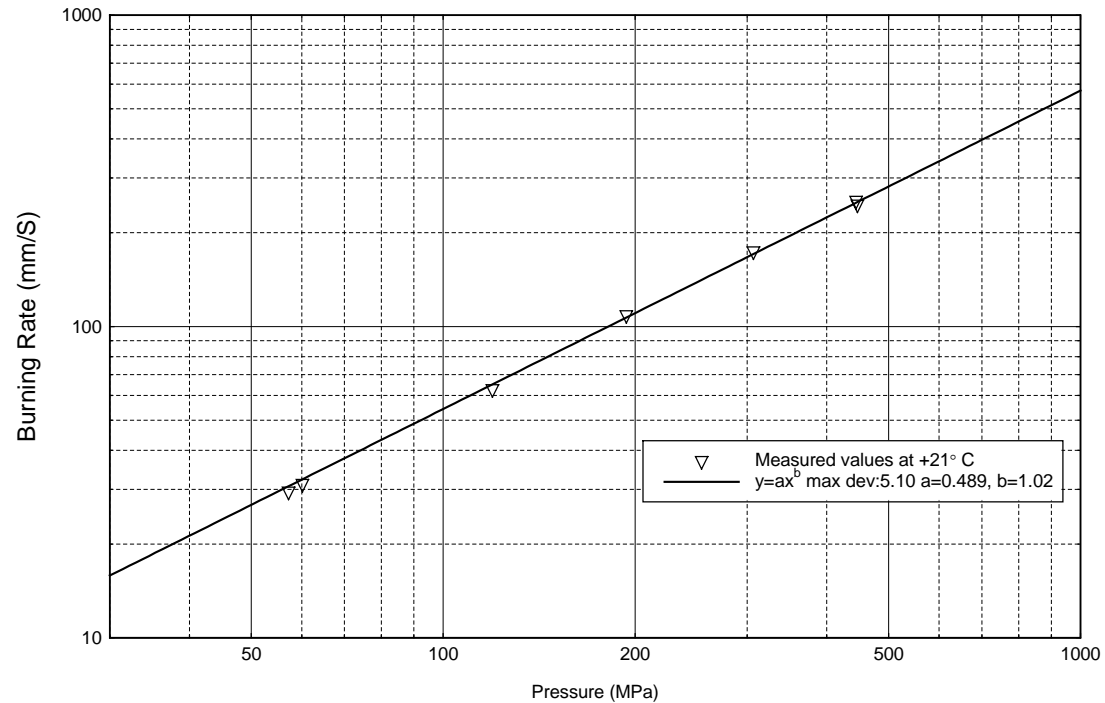


FOX-7 propellant



# Propellants containing FOX-7

Date: 2003-11-11 Powder: NZK5261 Lot: 2003-6203



# DADNE for the 40mm ETC-round



Multiperforated monograin of NZK5258

## Advantages:

Propellant contains low sensitive DADNE.

- Low sensitive propellant.
- Extreme progressivity.
- Extreme loading density.
- 10% increase in muzzle velocity.
- Easy to ignite.



# LOVA Research - Summary

- 12 compositions have been manufactured containing RDX, FOX7 and FOX12 in combination with NC and energetic plasticizers of NENA-type. They have all been tested on stability, sensitivity and ballistics.
- 2 selected compositions are now adapted to fit applications in artillery and tank-guns.
- Presently a 3rd generation, low sensitive propellant with a GAP/NENA-binder system is tested.





# Next FOX-7 Conference in Karlskoga April 12-13, 2005

