

# Guntonal – an Insensitive Melt Cast for Underwater Warheads

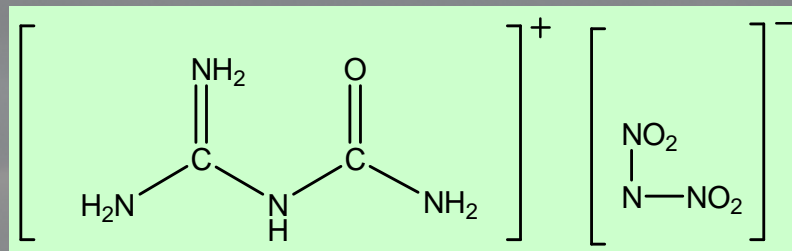
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# FOX-12 (GuDN)



## KEY FACTS:

Registered in REACH as non-toxic

Density 1.74

$H_f = -85$  kcal/mol

$T_{\text{onset}} = 212-215$  °C

**insensitive as sugar !**

**100 J**

**FOX-12  $\phi=54$ mm  
95% TMD**

**NO Detonation**

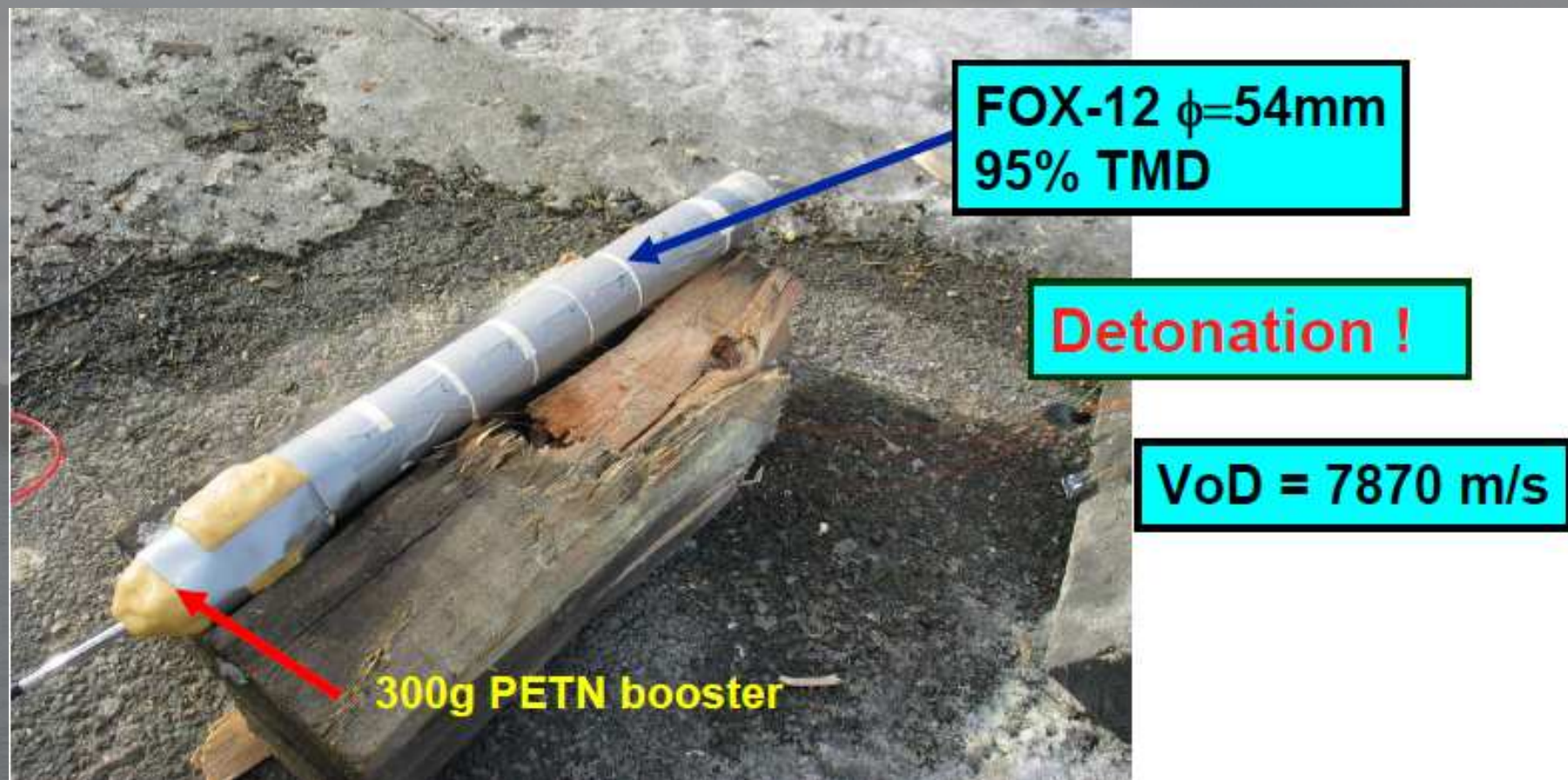
**60g PETN booster**



**EURENCO**  
GROUPE SNPE

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# FOX-12 = High Explosive



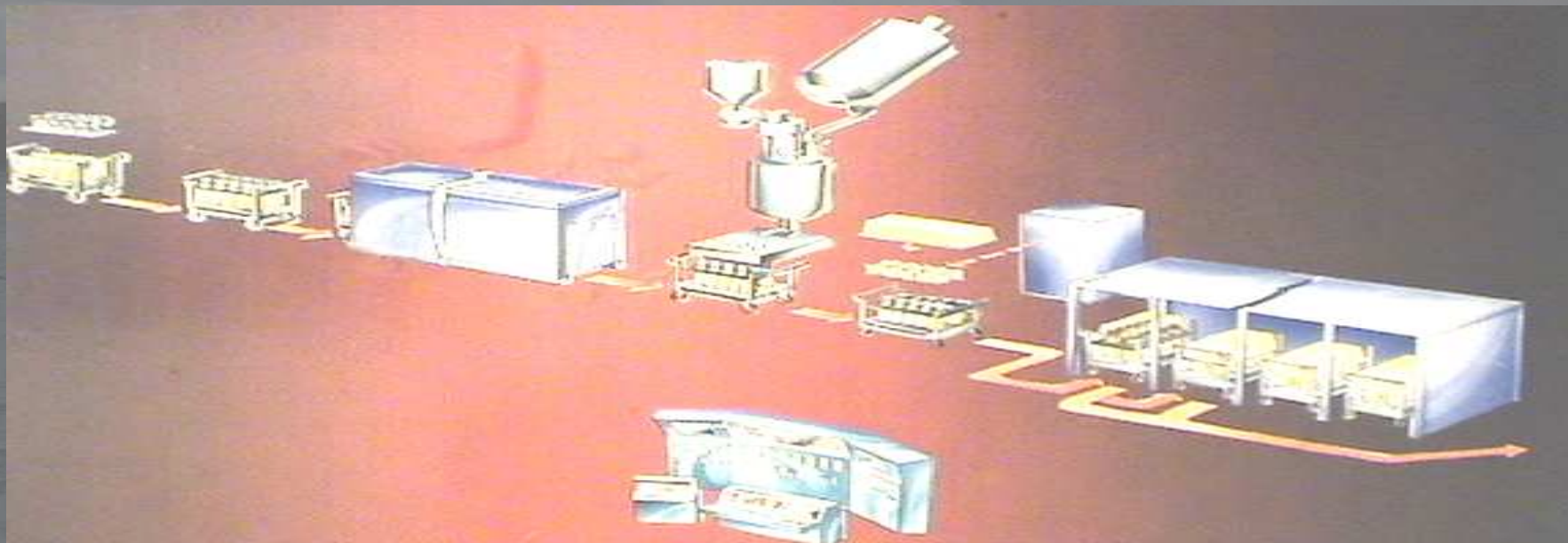


# FOX-12 in Melt Cast

GUNTOL = A Melt Cast based on FOX-12 and TNT  
Hexotol & Octol

GUNTONAL = GUNTOL + Al  
Hexotonal

A Conventional Melt Cast plant for Hexotol/Octol/TNT



# PERFORMANCE

## GURNEY

Composition	RDX	HMX	TNT	Al	FOX-12	Binder	Gurney
PBXN 109	65	0	0	15	0	20	1.88
PBXN9		92				8	2.4
PBXN5		95				5	2.43
PBXW11		96				4	2.46
GUNTOL			55		45		2.07
GUNTOL w RDX	25		40		35		2.31
GUNTOL w HMX		25	40		35		2.44
GUNTONAL w RDX	15		35	15	35		2.23



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# SENSITIVITY

SSGT water

Composition	FOX 12	TNT	HMX	Inert	Al	Gap mm	P kbar
Octol	0	30	70			18.7	19.9
GUNTOL	45	45	6	4		1.0	70
GUNTONAL	45	35	5		15	3.4	54
GUNTONAL	35	35	15	7.5	7,5	3.5-5.7	53.7
GUNTOL	40	35	25			11	35.5
PBXN110			85	15		10.2	40



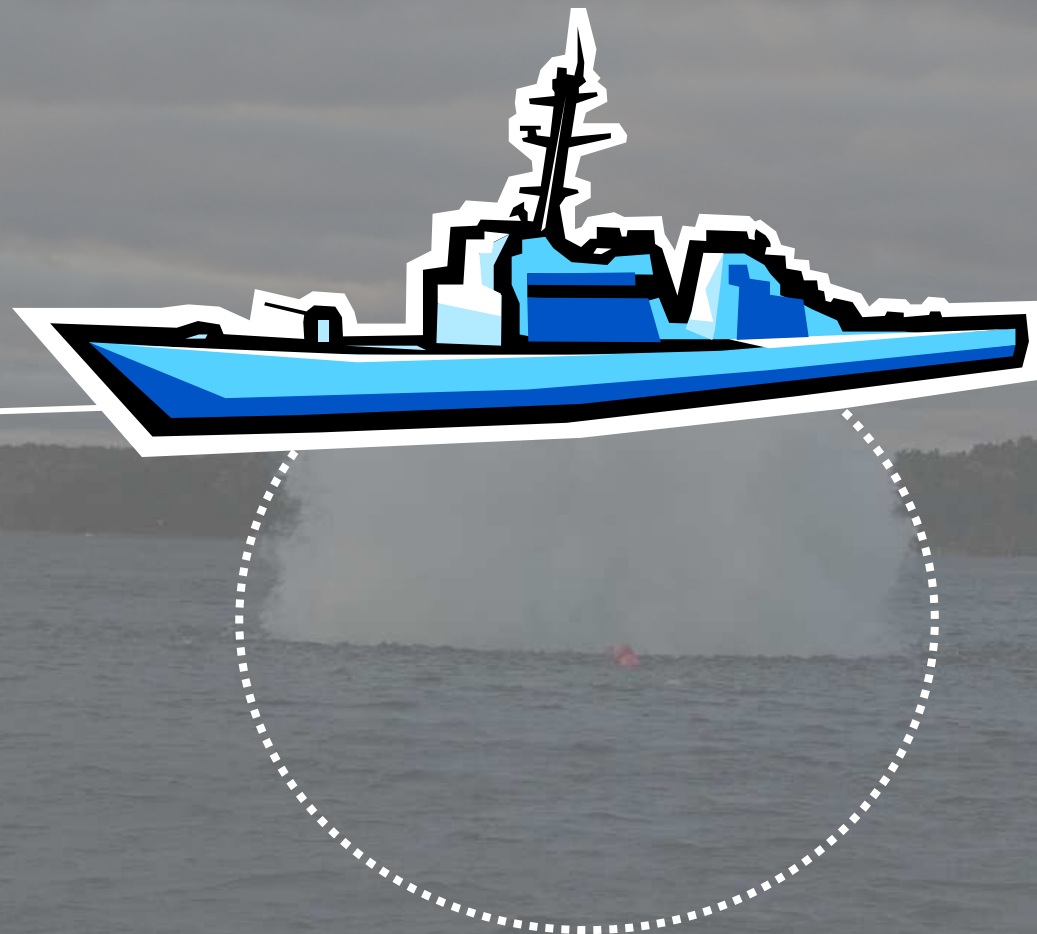
# OBJECTIVE

How does GUNTONAL compare with i.e. HBX in a underwater warhead?



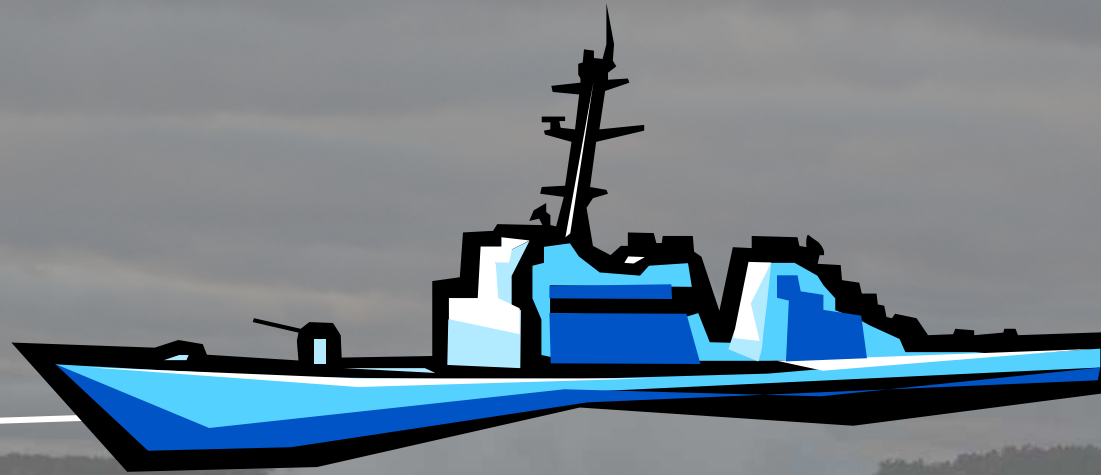
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# Shock Wave





# BUBBLE ENERGY

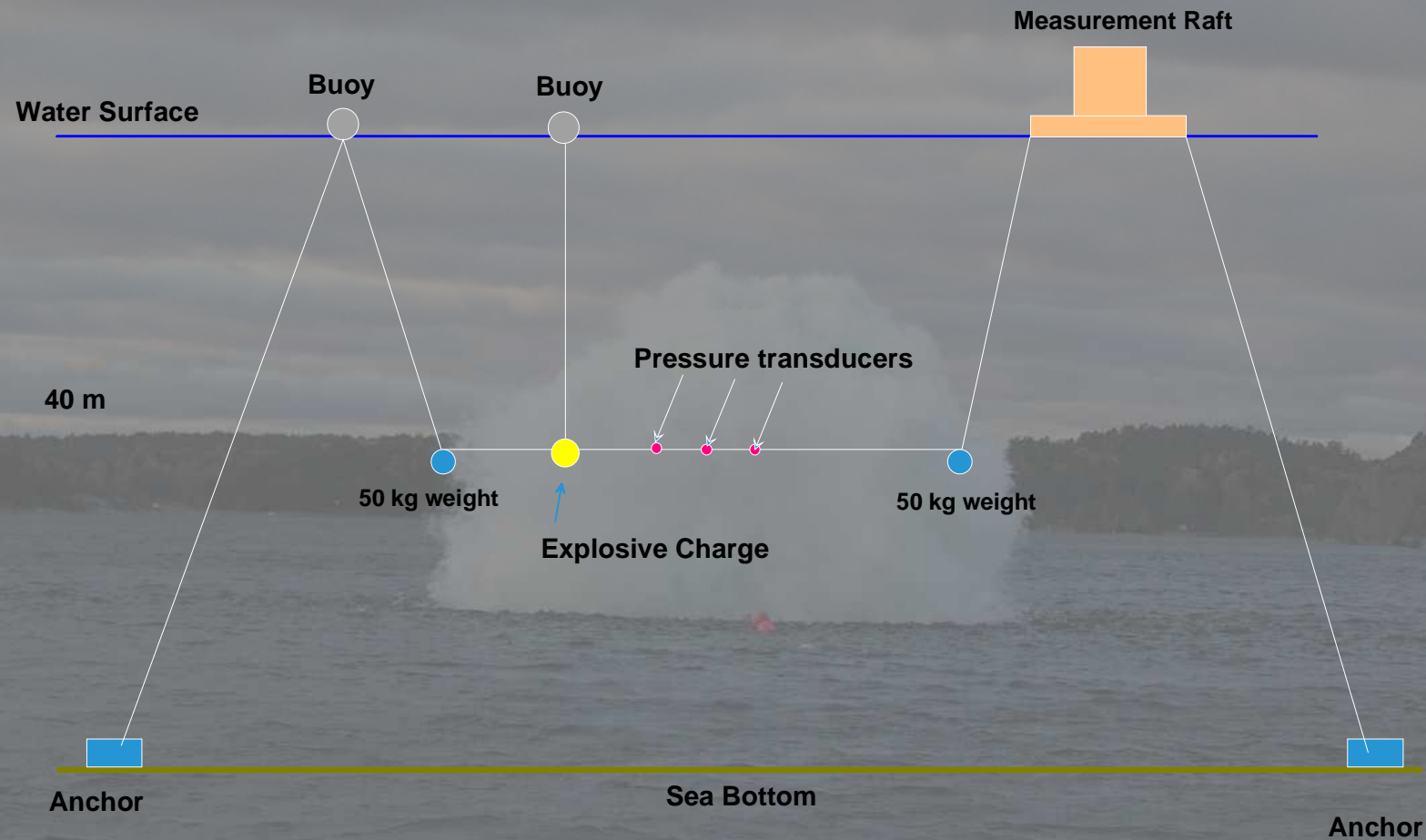


$$PV=nRT$$



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# EXPERIMENTAL SET UP





# Results

Composition	FOX 12	TNT	HMX	RDX	Al	Wax lecithin	Bubble Energy MJ/dm <sup>3</sup>
HBX-1		40.4		37.8	17.1	4.7	4.64
GUNTONAL	30	40	10		20	0	5.57

Conclusion: GUNTONAL has higher performance

# Availability

FOX-12 is available in industrial scale

+ GUNTOL & GUNTONAL

Pricing is available  
i.e. GUNTOL has been offered for 35 Euro/kg  
i.e. GUNTONAL has been offered for 45 Euro/kg



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# Acknowledgements

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# Bubble Energy Measurements

$$e_b = \frac{4\pi}{3} \frac{R_{\max}^3 p_h}{Q}$$

$$t_b = k \frac{\sqrt[3]{Q}}{z^{5/6}}$$

$$E_b = \left( \frac{k}{k_{TNT}} \right)^3$$



# UV Shock and Bubble Simulation

