

## Incident at AN solution preparation tank funnel

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# MULTIBLEND – Our main activity



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# EPC Nordic



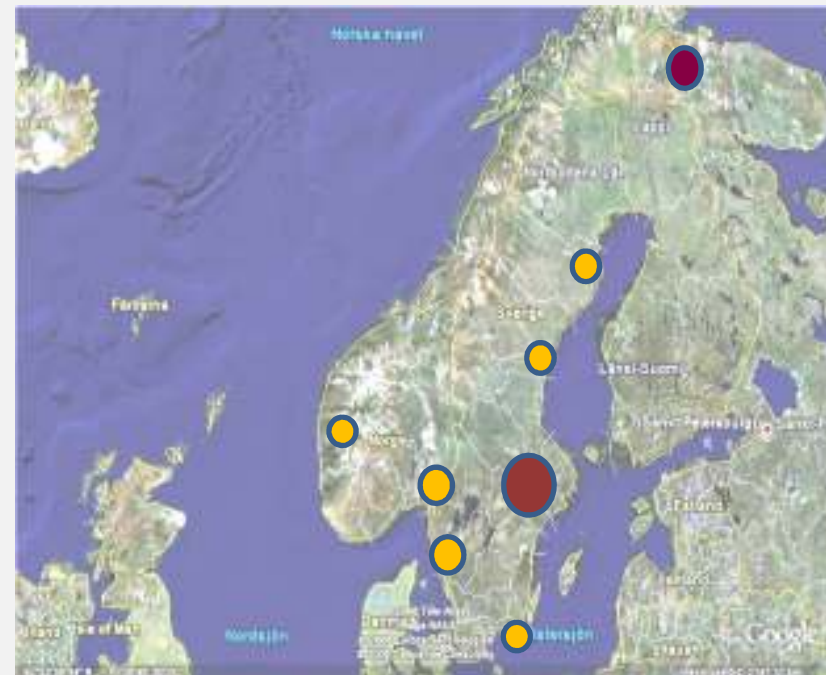
EPC Sverige AB  
EPC Norge AS

Eskilstuna Sweden:  
Production site for  
Blendex matrix and ANFO

Sydvaranger Mine, Norway  
Production plant for Blendex  
Matrix

12 MEMU's

50 people



# Site Location Eskilstuna Sweden



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## Eskilstuna site



- Head office for EPC Sverige AB
- Matrix for Blendex
- ANFO explosive - KIMANOL
- Storage and distribution of cartridged explosives and detonators.



## Incident – What happened?



- It was an unexpected chemical reaction in the funnel to the AN solution tank.
- The reaction created smoke, smell and glow.
- Afterwards we couldn't see any remains or damage.
- The reaction could be repeated in lab tests.



# AN Solution preparation room



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Preparation tank 15 ton

Deliveries in 13 ton batches from  
Yara, Köping

Cooled down from 110 to 80 °C  
by adding solid ANE



An-solution preparation tank  
Inlet funnel is located  
outdoors 2<sup>nd</sup> floor level

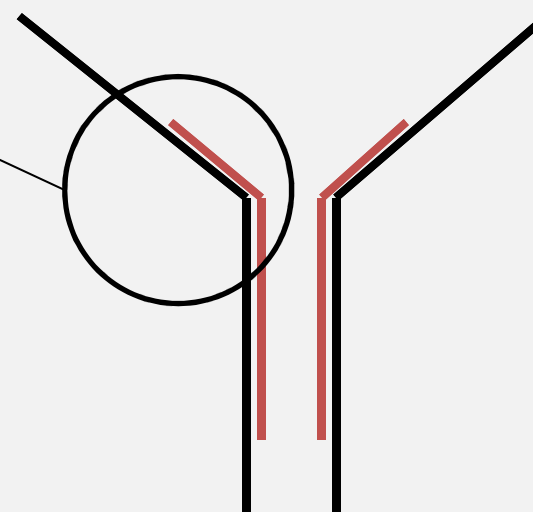
Adding:

ANE for cooling  
Sulphamic acid  
Sodium Thiocyanate





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Due to the cold climate at winter there was no water flush system installed.

Pipes freeze and floor can be icy and slippery.

Cleaning was by scraping the funnel once or twice a week.



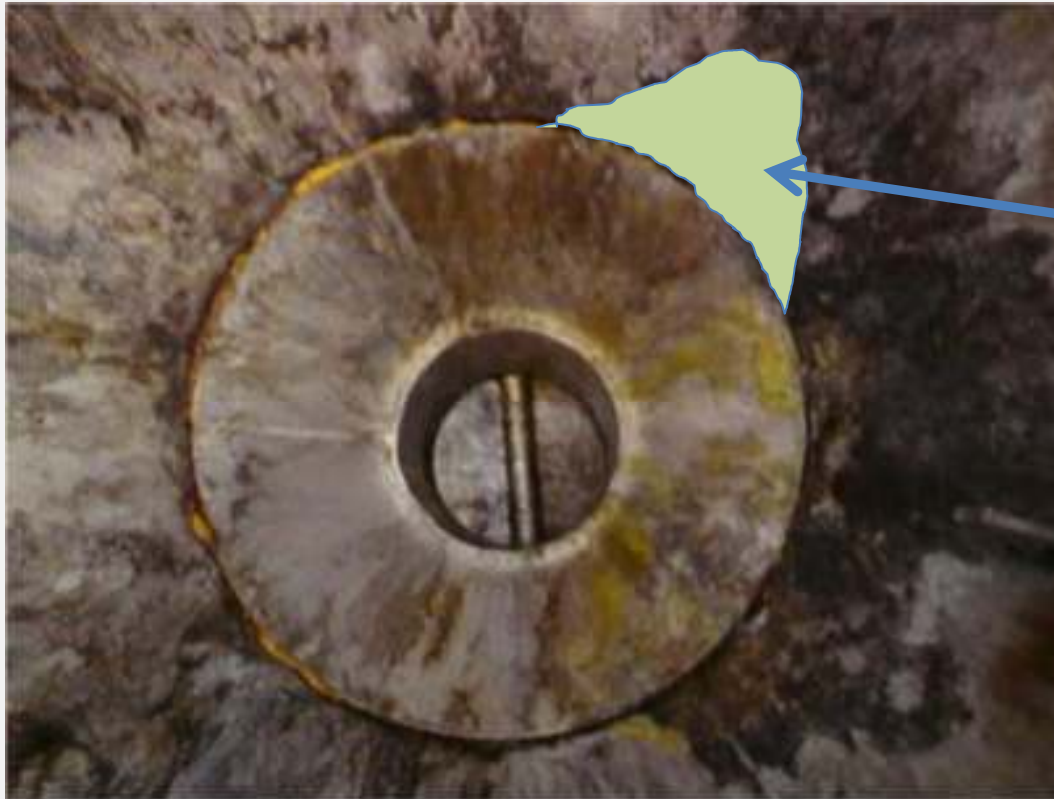
## 26th of May 2009



- The Operator prepared 15 T solution of solution the day before
- He began at 7:00 with start up and checks
- At 7:30 he started the production of matrix
- By 9:30, he had used all the oxidiser solution
- At 11:00, the truck arrived with AN solution (YARA)
- The driver transferred the AN solution to the tank over 20 min .
- At 11:45, Operator supposed to add ANE in big bag for cooling to ca 80 °C
- Downstairs, Operator smelled something unusual
- He fixed the AN bag to the overhead crane and walked up the stairs in order to lift the ANE up to the platform
- He saw smoke and steam and went up to see what's happening



# "Glowing" funnel

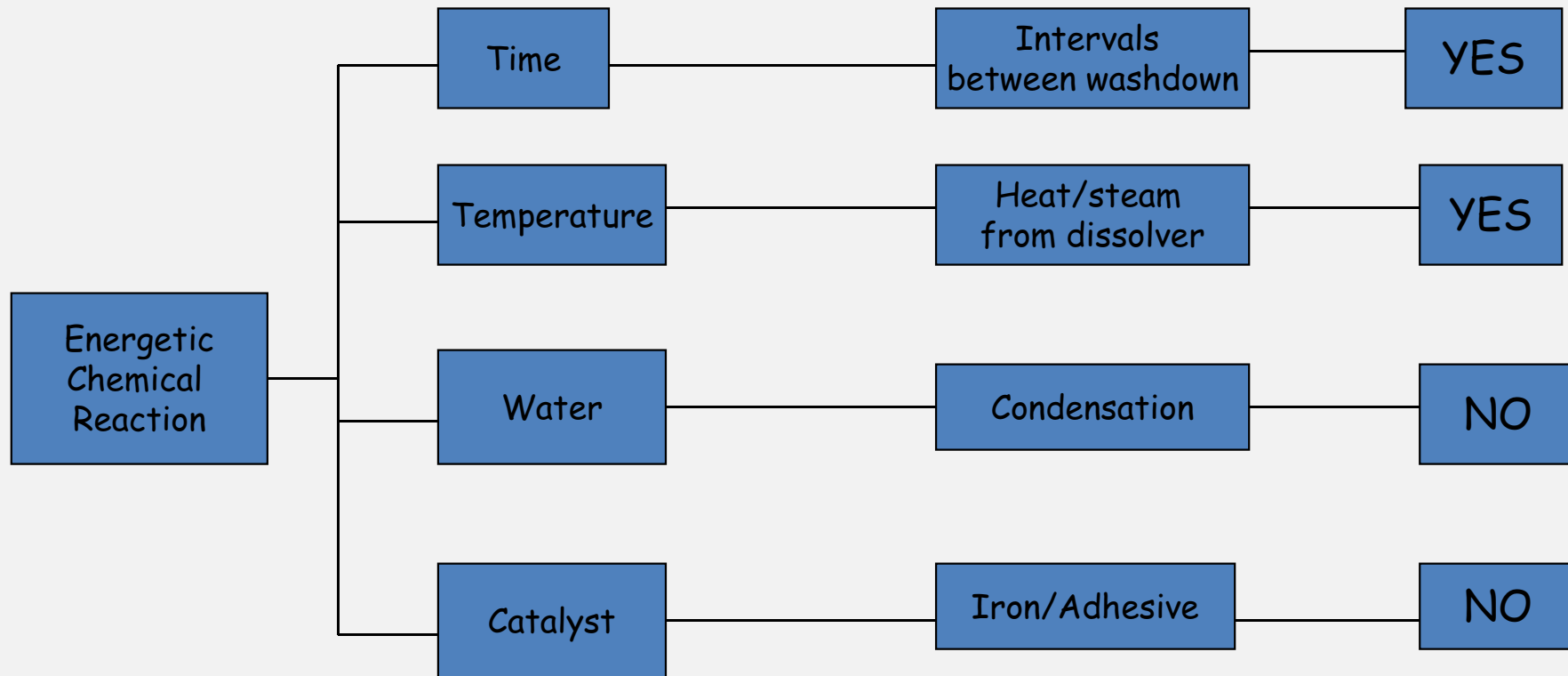


Reaction area

•NOT a fire but something glowing.

- **The Operator emptied the fire extinguisher on the glow with no success.**
- **He went down the stairs and picked up the fire water hose. Returned up again and after some seconds flushing the glow reaction ended.**
- **No marks or other evidence of the reaction could afterwards be seen in the funnel.**
- **No other damage could be seen.**

# INCIDENT ROOT CAUSE



# Laboratory test

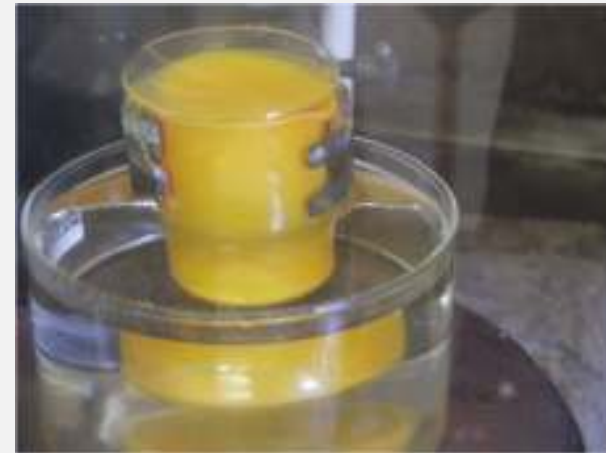


- The test used a 1:1:1 mixture of AN: NaSCN:H<sub>3</sub>NSO<sub>3</sub> totalling about 3 g altogether. This mixture, in a glass beaker, was put in a boiling water bath with a watch glass on top of the beaker.
- *“ Within a fairly short time there was a significant reaction, splattering the sides of the beaker and the underside of the watch glass with a yellow material. At the time I was turned away, washing out the mortar and pestle which had been used to grind the mixture. I was alerted by a glass noise, probably the watch glass lifting up and coming down on top of the beaker, and turned to see the yellow coating on the beaker and some fumes evolving. After turning the heating off and adding cold water to the bath, I went to get a camera. So these pictures were taken about 5-10 minutes after the reaction occurred.”*



# Laboratory test




The first picture shows the beaker still in its test position (the set up is inside a fume cupboard).



The second picture shows the inside of the beaker. The original 3 g, a white powder, was just a layer on the bottom of the beaker.

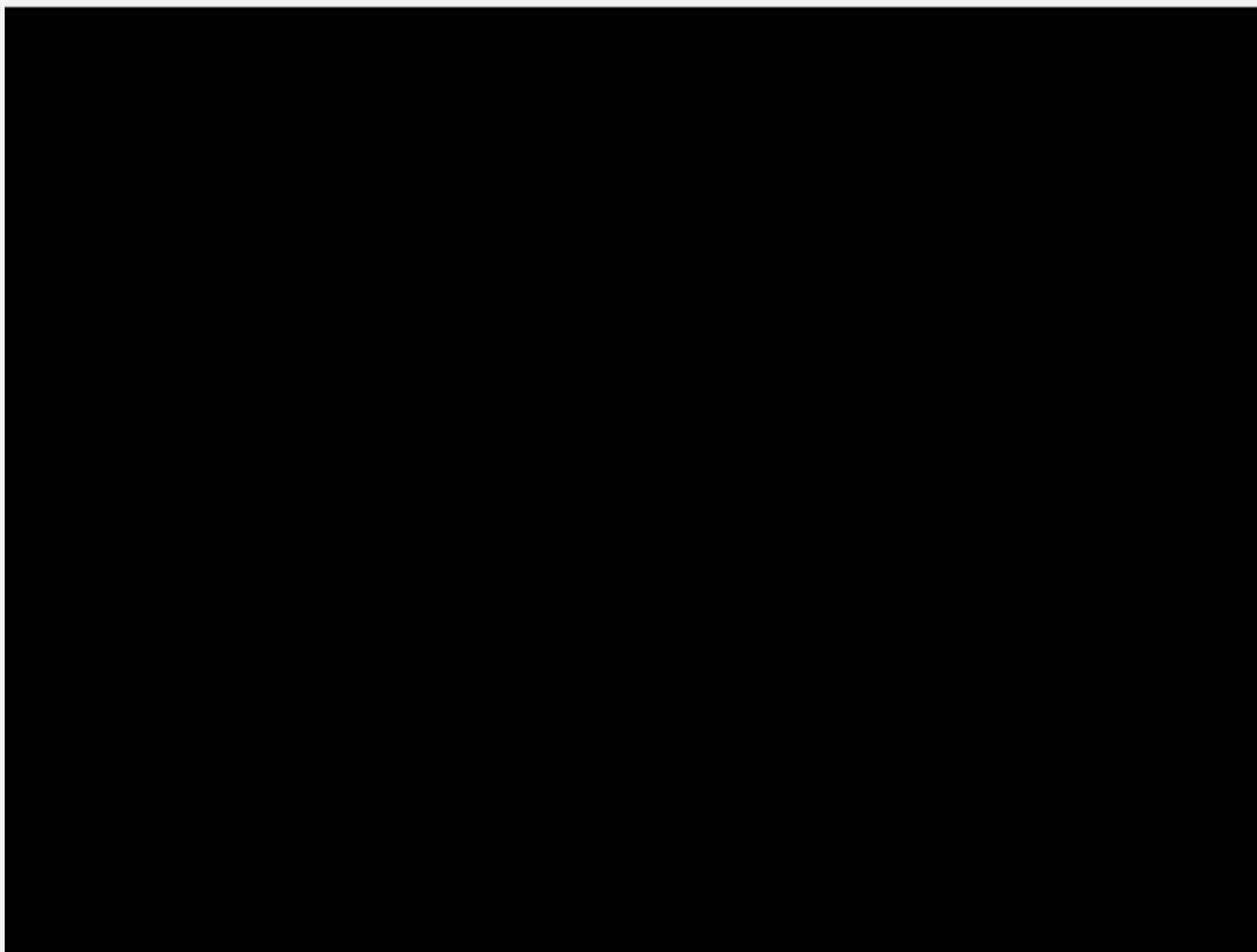


# Test results

Mix No	LT1	LT2	LT3	LT4
Nominal ratio AN:NaSCN:NH <sub>4</sub> SCN	0:1:0	1:1:0	1:0:1	1:1:0
Actual Weights				
AN	-	1.128	1.127	1.125
NaSCN	1.115	1.111	1.103	1.121
NH <sub>4</sub> SCN	1.117	1.121	1.114	1.084
Citric acid	-	-	-	-
Comments on solid reaction	White mix turned yellow in water bath. No significant reaction, but loss in weight shows por was evolved	Mix started to react vigorously in a fairly short time, ~1 min. Fumes were evolved and the sides of the beaker and the watch glass were coated in a yellow solid. The beaker cracked	Mix goes yellow on heating. Some bubbles formed. No vigorous reaction.	Reaction was videored [5]. Mix started to react vigorously in a fairly short time. Fumes were evolved. The sides of the beaker and the watch glass were coated in a yellow solid. (see table 3)
Comments on washings from Mortar	Solution was a pale red. When put in the water bath the solution bubbled and went colourless			Washings from Mortar were slightly red
Photograph				



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## Changes made



- New funnel installed.
- Easier to keep clean.
- Installed a flushing system that can be drained.
- Flushing after each solid feed.
- Replaced Sulphamic Acid with Citric Acid for pH adjustment.

