



One Seven[®] MINING:
an innovative system for
firefighting and prevention in
mining

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...effective fire fighting systems!

The One Seven[®] System



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Where does the name come from ?

By adding a special foam concentrate and compressed gas to the water, the volume of 1 drop of water expands into 7 foam bubbles.



At the end you get a
CAF = Compressed Air Foam

The One Seven[®] Foam



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Properties of the One Seven[®] AM foam

The result of this process is a micro-cellular, homogeneous foam structure with reproducible properties:

- Excellent foam structure → Important on all sorts of fire
- Large bubble surface → Strong cooling capability (20⁰C/s)
- High energy content → High velocity and deep penetration
- Adhesive properties → Cooling the fuel
- Strong wetting Power → Penetration of foam solution into the fuel

The foaming agent is a surfactant (tenside) and not a flammable substance like phenol or polyurethane!!

The One Seven[®] Foam



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Videos Foam Discharge



The video shows the resulting throwing distance in a practical demonstration on a 100 m² kerosene fire in the UK.

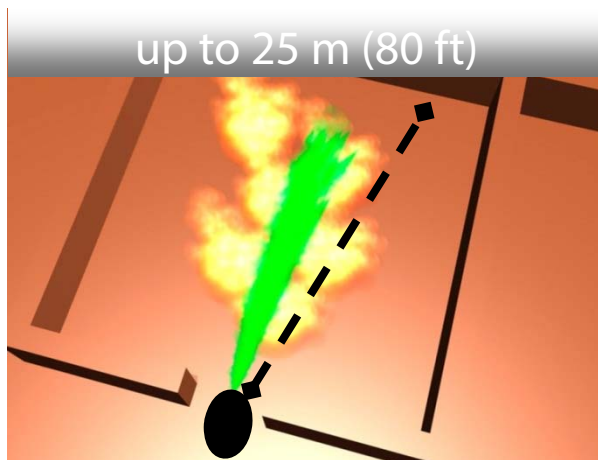


The animation shows the decompression process at the discharge nozzle.

Interior Structural Fire Fighting Process with One Seven®



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Due to the high velocity, the One Seven® foam penetrates deeply into the burning room, reaches the fuel and the surrounding structure like walls and ceiling.

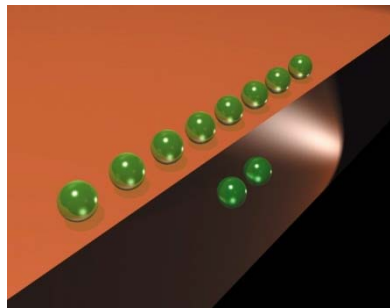


Typical throwing distance of a One Seven® handline.

Interior Structural Fire Fighting Process with One Seven®



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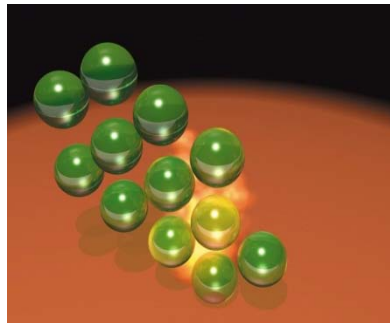


The foam bubbles stick to vertical and horizontal surfaces (like walls, ceilings and furniture) and cool this items within seconds from e.g. 500 degrees Celsius to about 100 degrees Celsius.

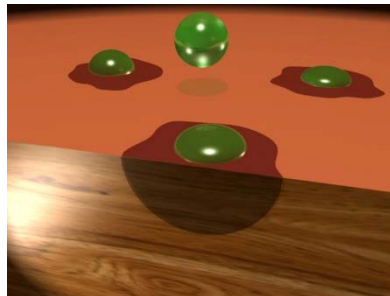
The picture shows the result of the adhesive foam properties in a practical demonstration.



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Due to the adhesion on the surfaces the large surface of the foam is exposed to the heat of the fire and the structure. Vaporization happens over a period of over 30 sec.



The water-foam solution which is released out of the foam when bubbles break penetrates into the Class A fuel due to its strong wetting power.

One Seven[®] MINING 6000



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- System developed for use in mines with a ruggedized design for tough job
- Explosion proof system (ATEX I)
- Water and gas to be supplied by installations in the mine
- Operational pressure from 2 bar (29 psi) up to 10 bar (145 psi) either pressed air or nitrogen
- Flows up to 6,000 l (1,585 gal US) of foam per minute
- Usable for prevention as well as fire fighting
- NEW: There is also a MINING 12,000 device available!



One Seven[®] MINING 6000



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- Dimensions (LxWxH): 2,550 x 990 x 1,420 mm
- Weight (dry): 1,550 kg
- Weight (operational): 1,750 kg
- Water consumption: max. 300 l/min @ min. 2 bar (29 psi)
and max. 10 bar (145 psi)
- Gas consumption: max. 6,000 l/min @ min 2 bar (29 psi)
(Nitrogen or Air) and max. 10 bar (145 psi)
- Foam concentrate: One Seven[®] Foam Class A (0.3%)
- Foam concentrate tank: 150 l (build-in)
- Foam quality: free adjustable for fire fighting (wet) to
preventive foam (dry)
- Life-time of dry foam: about 5 h

One Seven[®] MINING applications



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- The fire and explosion risk in mines remains, because of
 - risk of self-ignition of the materials (e.g. coal, waste)
 - explosive gases and dusts (e.g. methane gas, coal dust)
- One Seven[®] can be used **preventively** to cover dangerous areas in the goaf, preventing fire damp and dust explosions
- One Seven[®] can be used for **actual fire suppression** as well on machinery as on the coal itself
- Examples for both, preventive and active firefighting will be given in the subsequent sheets...

Reference for preventive application: The Czech OKD mines



In order to reduce the oxy-reactivity of the coal the goaf is covered with a rather „dry“ foam.



Areas of freshly broken coal are covered by use of handlines.

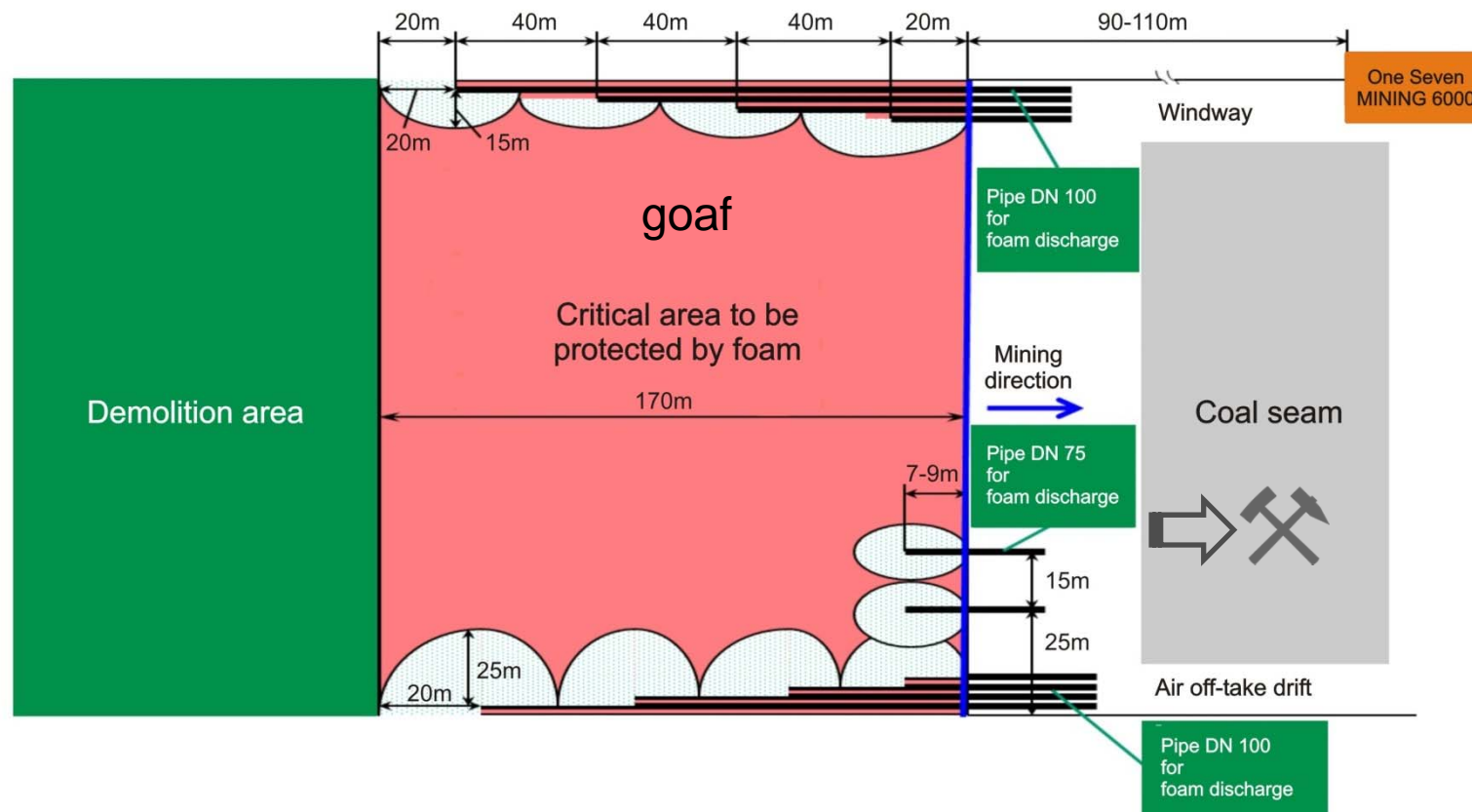
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One Seven[®] MINING: Preventive application in a longwall panel



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- One Seven[®] preventive application for a longwall panel



One Seven[®] MINING: Preventive application



- Application with Dry-Foam



One Seven[®] MINING: Preventive application, summary



The preventive effects of the One Seven[®] AM foam are:

- Displacement effect

By inundating the total space of a gate or the goaf with One Seven[®] AM foam any explosive gases will be displaced

- Inhibitory effect

Treating the coal with foam: Reduction of oxygen reactivity of the coal (Tendency of spontaneous combustion)

- Isolating effect

Avoiding oxygen exposure

- Spark suppression

No sparks can be created in case of cave-in's

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CAPEX and OPEX calculation for preventive application

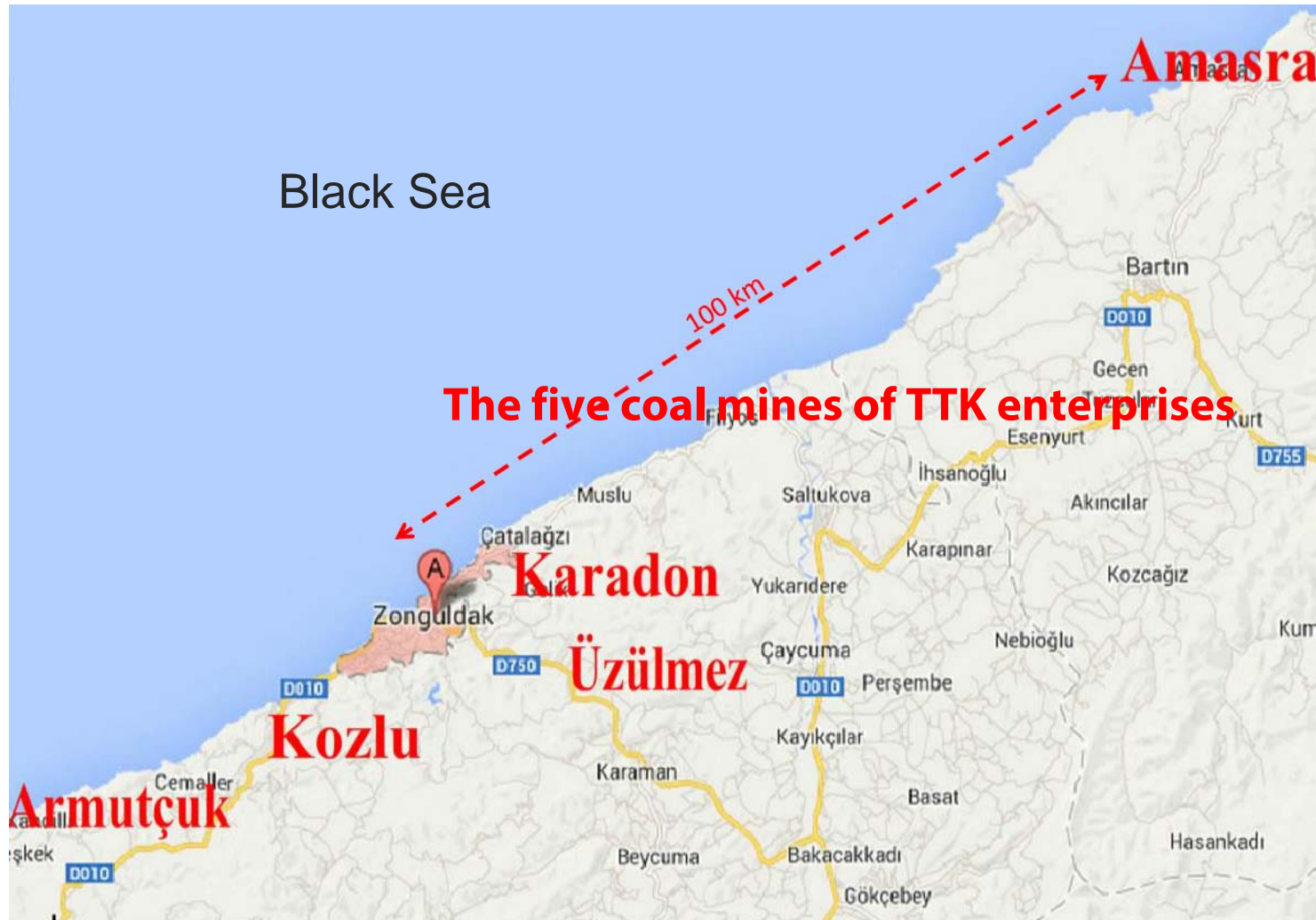


1. Generally: single investment (CAPEX) for the machine unit (MINING 6000: €120,000, MINING 12000: €145,000) and low operational costs during use e.g. cleaning or exchange of filters
2. Calculation of foam-concentrate costs:
 - a) Assumptions: Face length 300 m, seam height 3 m, longwall performance 8 m/d
A maximum amount of 7200m³/d foam has to be discharged to inundate the goaf
 - b) For example use of a One Seven MINING 6000 machine:
 - makes 6000l foam per minute
 - takes 20h to produce and discharge 7200 m³ foam
 - Causes a foam-concentrate consumption of 0,9 l/min (0.3 % of the water demand)
 - 20h consumption is 1080l foam-concentrate
 - c) **Daily costs:** ~ 3,- €/l x 1080 l/d = **3240 €/day** for foam-concentrate
3. Additionally: Costs for water (360 m³/d) and pressed air or nitrogen

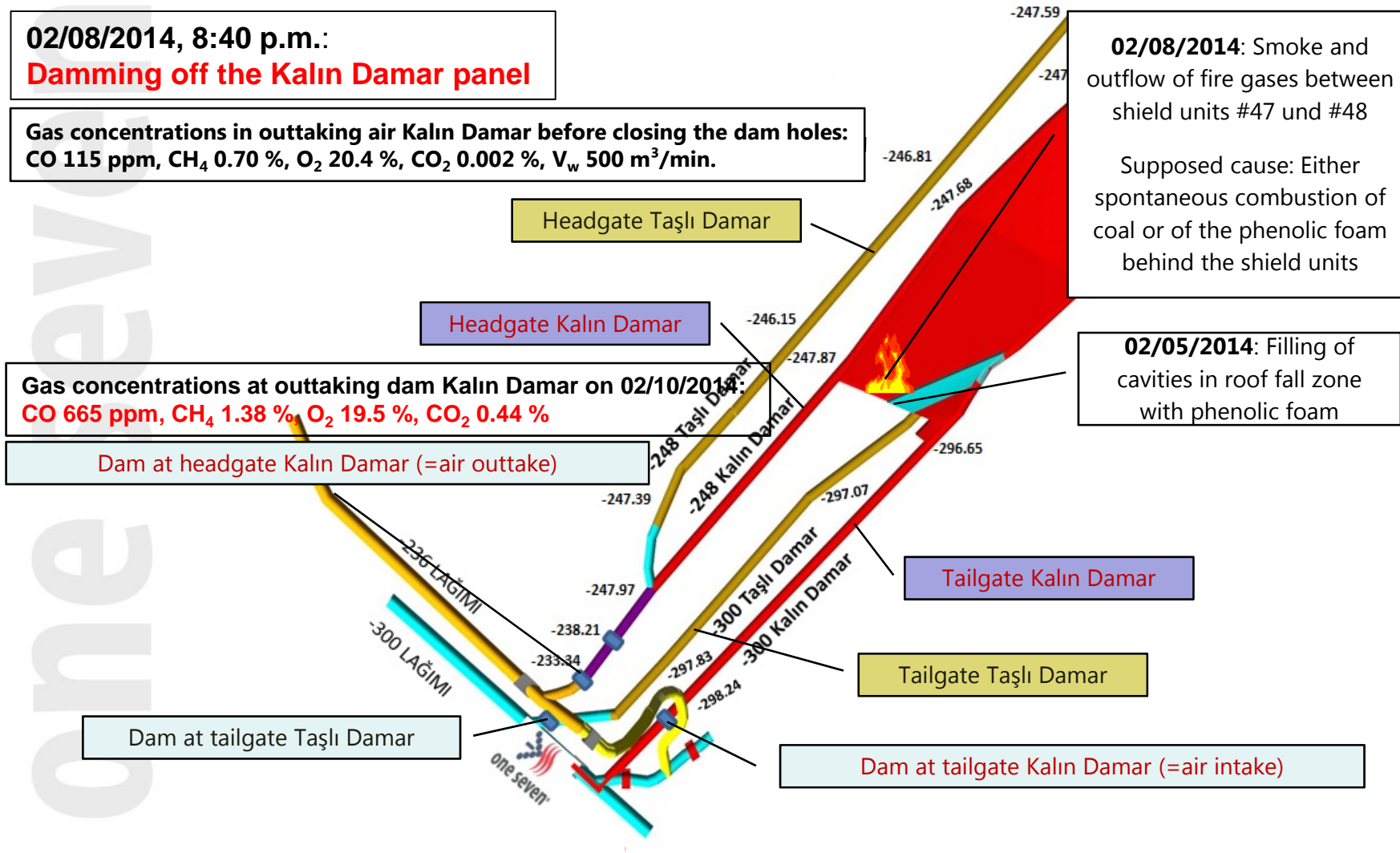
1st reference for active firefighting: TTK's Amasra coal mine - Turkey



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Amasra: History of the fire



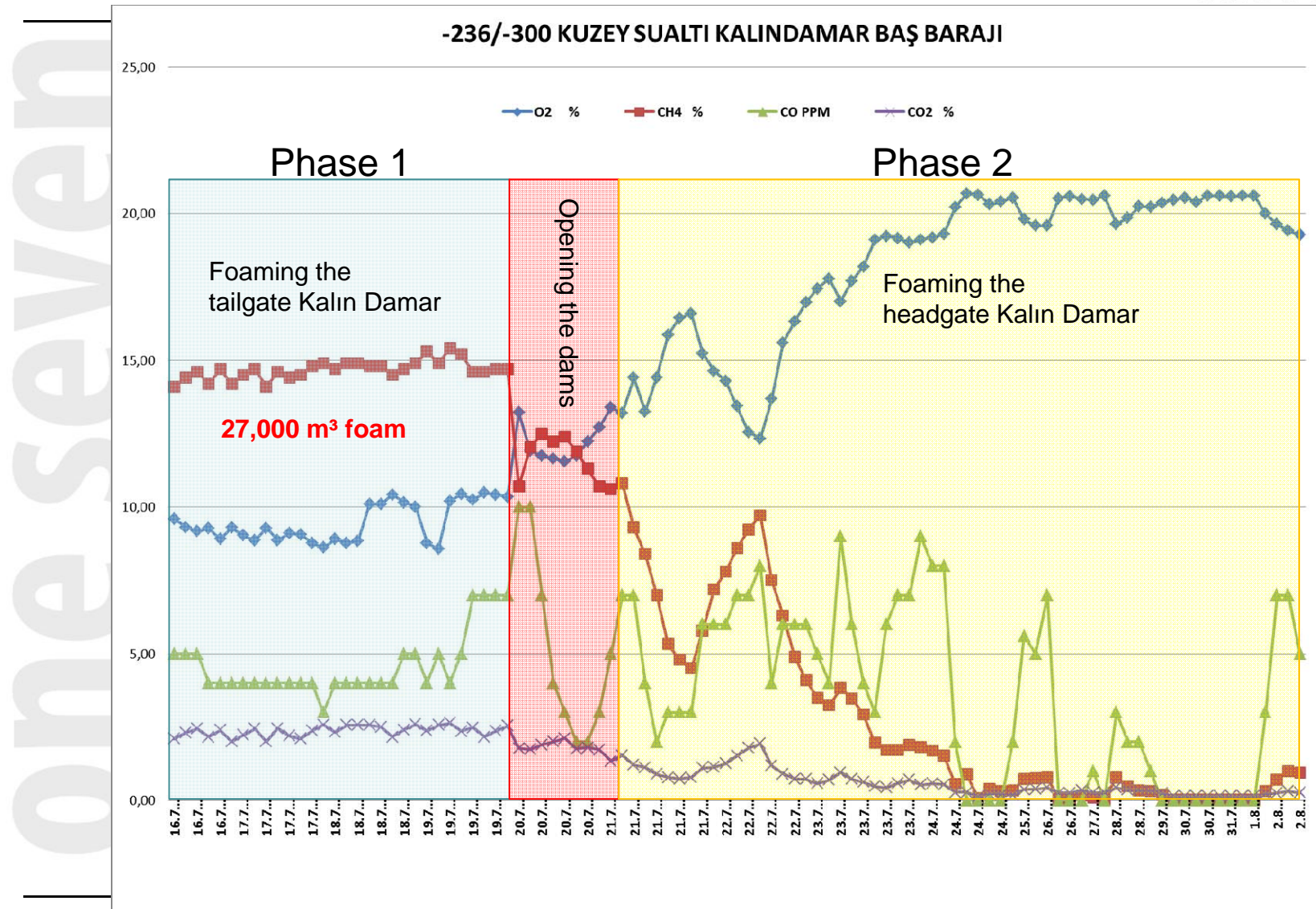
Firefighting in Amasra: Operating in three Phases



Because the matter is that the longwall face working is in steep formation, the fire-fighting operations have been carried out in **3 phases**:

1. From **07/16 until 07/20** the tail gate gallery was backfilled with foam, which was also the intake airway at the same time, to completely cut off the fire area of the air supply.
2. After the machine's removal to the head gate dam the fire area was completely inundated with foam over the head gate gallery from **07/20 until 08/02**, so that
3. **from 08/03** the mine rescue brigade was able to penetrate under auxiliary ventilation and continuous carrying of foam into the fire area.

Gas development during **Phases 1 and 2** at outtaking dam Kalin Damar



Amasra firefighting: Impression after opening the dams



Result of Phase 2: The head gate Kalin Damar is inundated with foam, ventilation engineer and assistant

Amasra firefighting: Conclusion



In a **20 days** continuous **engagement** (07/16 – 08/03) a covered mine fire, whose development 5.5 months lagged, could be extinguished by using a One Seven MINING 6000 machine and the Class A foam concentrate One Seven AM.

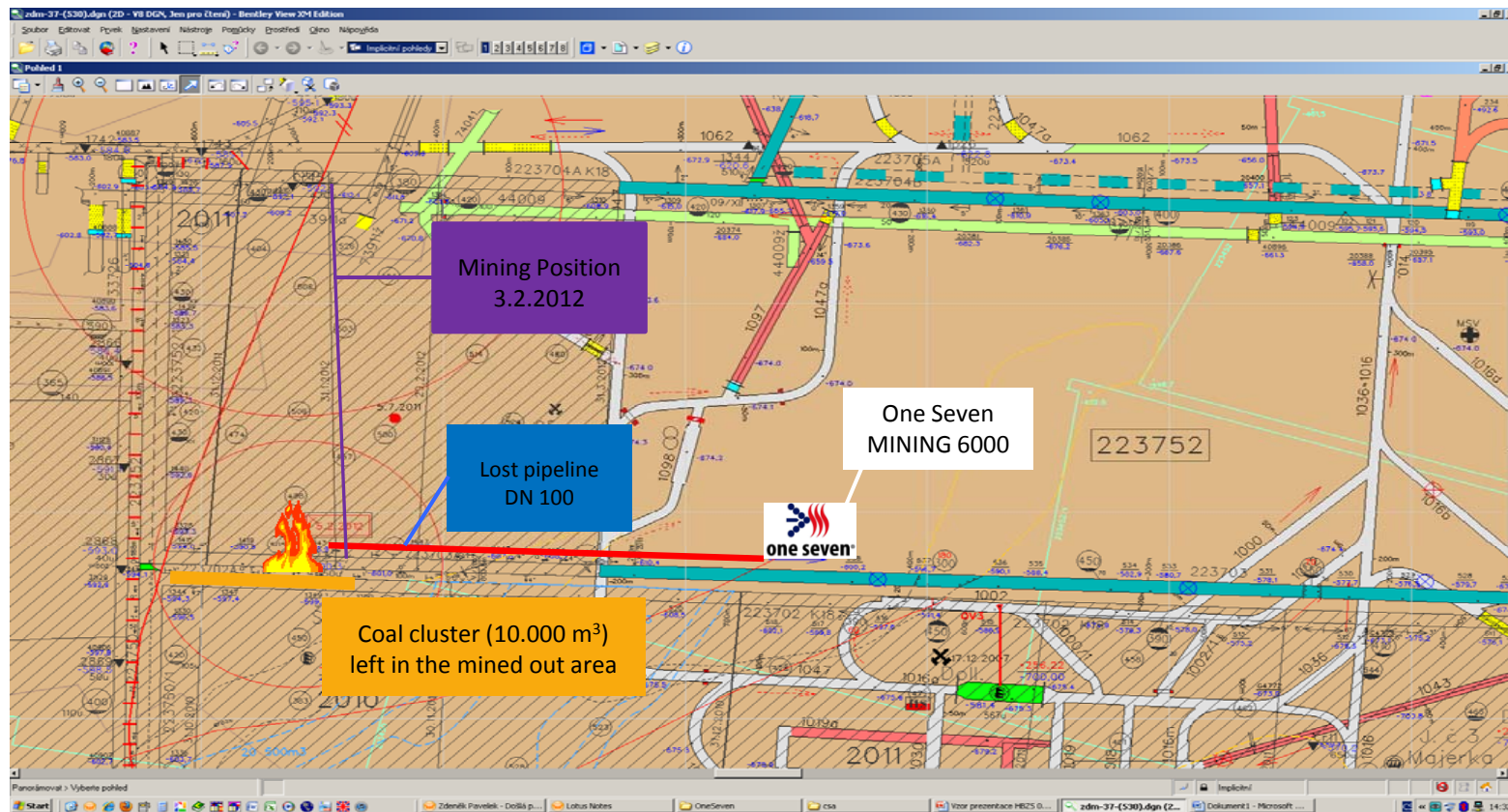
A total amount of about **91,000 m³ wet and dry foam** was brought into the dammed fire area. The **water consumption was 4,200 m³**; the consumption of **foam concentrate was 6,320 liters**. This caused **costs for foam concentrate** of about **€ 19,000** at the end.

The longwall equipment was found largely undamaged, which is suggestive of a limiting of the fire in the goaf. The equipment was recovered and prepared for continuing the excavation of the Kalin Damar seam.

2nd reference: Karviná mine, Czech Rep., panel 22 3752 from 02/05 until 02/15/2012



- Consumption of One Seven® Class AM foam was 16,855 Liters (= 10 days continuous operation). **Foam costs** of about **45,000 EUR**.



One Seven[®] MINING: Active firefighting, summary



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Extinguishing effects for mining application

- Cooling effect

Temperature reduction by vaporization

- Oxygen depletion effect

Repression of O₂ by foam

- Isolating effect

reduction of air flow by sealing off the goaf and abandoned

roads with foam

One Seven[®] vs Nitrogen Inerting



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The disadvantages of Nitrogen Inerting in the mining industry are:

- No fast fire attack possible
 - Complicate preparation, needs time to take effect
- Very expensive
 - Because of preparation, post processing and nitrogen consumption
- Success can not be assured
 - Backfire is possible after renewed contact with oxygen
- Dangerous for the staff. No breathable atmosphere!
- In case of failure: Complete production loss for long time or giving up coal reserves

One Seven[®] vs Nitrogen Inerting



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The advantages of the One Seven[®] MINING system are:

- Fast attack in case of fire is possible
- One Seven[®] is a highly efficient fire extinguishing medium
- One Seven[®] uses minimal volumes of water
- One Seven[®] uses minimal volumes of foam concentrate
- One Seven[®] increases firefighters' safety
- One Seven[®] allows simple manual handling
- One Seven[®] foam is harmless for the staff
- Also seams prone for self combustion can be worked out safely
- Prevention from long run-off times affected by self combustion



Thank you for your attention!

September 2015

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...effective fire fighting systems!