Fires in underground hard rock mines

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Fires in mines
The environment

- Access by elevator or ramp.
- Complexity; 3-D aspect; ever changing layout.
- Limited access/road system in some cases.
- More or less fixed ventilation possibilities. But the ventilation flows will vary.
- Darkness.
Workshops; canteen; storage facilities; crusher stations; transportation drifts; shafts etc.

Ore transport by train or truck.
Difficult with barriers in some areas.
Large number of vehicles. Heavy vehicles.
Extremely long distances.
Risks in general

- Explosives.
- Falling rocks.
- Gases.
- Flooding.
- Open shafts.
- Flammable liquid and gases.
- Fires in heavy vehicles, conveyor belts etc.
- Smoke spread.
Fire behavior

- Extensive smoke spread in length + 3-D + mechanical ventilation.
- Smoke stratification only at the fire vicinity. Fire gases cools down rapidly. Poor visibility.
- Due to the general vastness and openness of the mine drift and most combustibles found at the lower part, flame radiation will dominate as the spread mechanism.
- Combustible materials generally found concentrated at certain positions, the likelihood of the fire spreading from the first item is generally small.
- Flashover not likely in an open mine drift.
- Spray fires – hydraulic equipment.
Vehicle fires

- Vehicles found in almost all parts of a mine.
- Large amounts of tyre, diesel, hydraulic oil, hydraulic hoses, cables etc.
- Rapid fire growth.
- Considerable smoke production.
- Long lasting fires.
- Most common type of fire.

- Most dangerous fire under ground.
Fire and rescue service

- Attack routes – evacuation routes.
- Lack of barriers – use ventilation.
- Should we ventilate while the evacuation is still going on?
- Smoke ventilation – where will the smoke end up?
- Miners in refuge chambers, will the air last?
Choice of extinguishing agent.
Falling rocks.
Backlayering.
Extremely long distances.

Fire and rescue units stationed under ground.
Challenges ahead

- Quantifying different types of fires – smoke ventilation.
- Modelling mine fires. Fire perspective!
- How much air should the refuge chamber contain?
- Design and construction of mining vehicles.
Fire experiments in an underground mine