# SAFE ESCAPE FROM LONGWALL DEVELOPMENT SECTION IN CASE OF BELT FIRE

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- **INTRODUCTION**

- **PURPOSES OF THIS PAPER**

- **CAPABILITY OF THE MINE-FIRE SIMULATOR**

- **DESCRIPTION OF THE STUDIED VENTILATION SYSTEM**

- **COMPUTER SIMULATIONS (real time visualization) :**
  - horizontal entries
  - inclined entries

- **CONCLUSIONS**

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## INTRODUCTION

- Despite remarkable improvement in mine-safety procedures, coal-mine fires remain among the most serious hazards in underground mining

- When a fire occurs outby a working area, the immediate safe evacuation of miners from the mine should always be the first action during the rescue operation

- Many times, the dedicated escapeways for the evacuation of the miners become contaminated by the byproduct of fire from adjacent entries

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## PURPOSE OF THIS PAPER

Present and discuss ways in which the mine fire simulator (MFS) named "VENTGRAPH" could be used as a *teaching and training* tool for mining ventilation and safety specialists.

According to studies, performed by the former US Bureau of Mines, the most important factors in saving lives during a mine fire is miners' training.

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## CAPABILITY OF THE MFS "VENTGRAPH"

- **Program combines three distinct modules:**
  - **conventional ventilation network simulator,**
  - **fire development simulator (heat and gases),**
  - **temperature changes due to a fire.**

- **Purpose of this simulator is to predict the behavior of the ventilation system in case of a fire.**

- **Program also enables the simulation of fire-controlling actions, such as setting regulators, building or breaching a stopping, and changing the fan characteristics.**

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## CAPABILITY OF THE MFS "VENTGRAPH" (cont.)

- **Color-graphic visualization (dynamic animation) of the spread of gases, temperature, flow and other parameters provides a convenient display of the calculated results.**

- **Using VENTGRAPH the authors analyze and visualize underground mine fire scenarios that controls fire contaminants and maintain safe escape route(s) from the longwall development panel.**

## Description of the Studied Ventilation Systems

- Ventilation arrangements for Longwall Development Panel (LDP):
  - single-split,
  - three-entry,
  - belt being used for intake

- Total length of the LDP 860 m

- Pillar centers 60 m by 30 m

- Medium air-tight stopping 250 $Ns^2/m^8$

## Description of the Studied Ventilation Systems (cont.)

- LDP with horizontal and inclined entries (10 %).

- Fire characteristics:
  - fire developed in belt entry 800 m outby the face,
  - coal of heating value 5,100 kcal/kg is on fire,
  - fire build-up to max. size of 60 $m^2$,
  - intensity of burning 30 g $m^2$/sec,
  - CO/CO2 ratio 10%. during oxygen-reach stage of fire.

## Single-split ventilation arrangement for longwall development panel
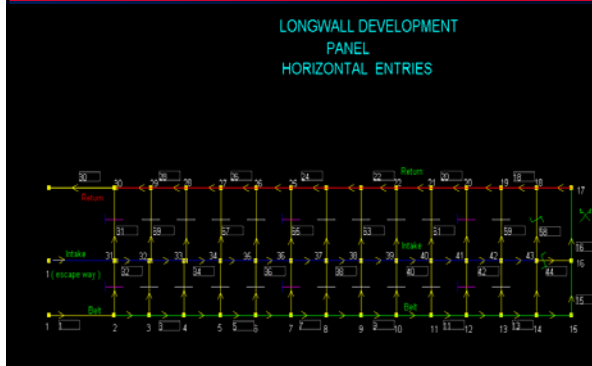


## COMPUTER SIMULATIONS
### (REAL TIME VISUALIZATION)

Ventilation Control Process to maintain the Escape-way free from contaminants and available for travel

## CONCLUSIONS

- An unlimited number of models for different mine fire scenarios can be created and analyzed using this simulator.

- The best result of using this simulator for *teaching/training* is that each picture created by the simulator is worth a thousand words.

## CONCLUSIONS  (cont.)

- Well-designed computer simulation exercises can be used both for teaching and training mining engineers, safety and ventilation personnel who are responsible for ventilation arrangements during fire fighting, mine rescue, and recovery.

I would like to say thanks to
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