2023 Ventsim™ User Conference

Operational Benefits of Ventilation Modelling in Mines

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Introduction

Ventilation software allow us to develop a digital twin of the mine ventilation system. Modelling tools can be effective in helping us manage ventilation systems, assessing changes and troubleshooting issues within the system.

This presentation provides an overview of some operational benefits to ventilation modelling.


DISCLAIMER: garbage in = garbage out
*if mines want ventilation models to be an effective too they need to invest time to keep it updated and calibrated.

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Visual Tool

Ventilation modelling is a good visual tool to communicate with your team the ventilation plan, limitations of the mine plan and explain changes that could improve the ventilation system.
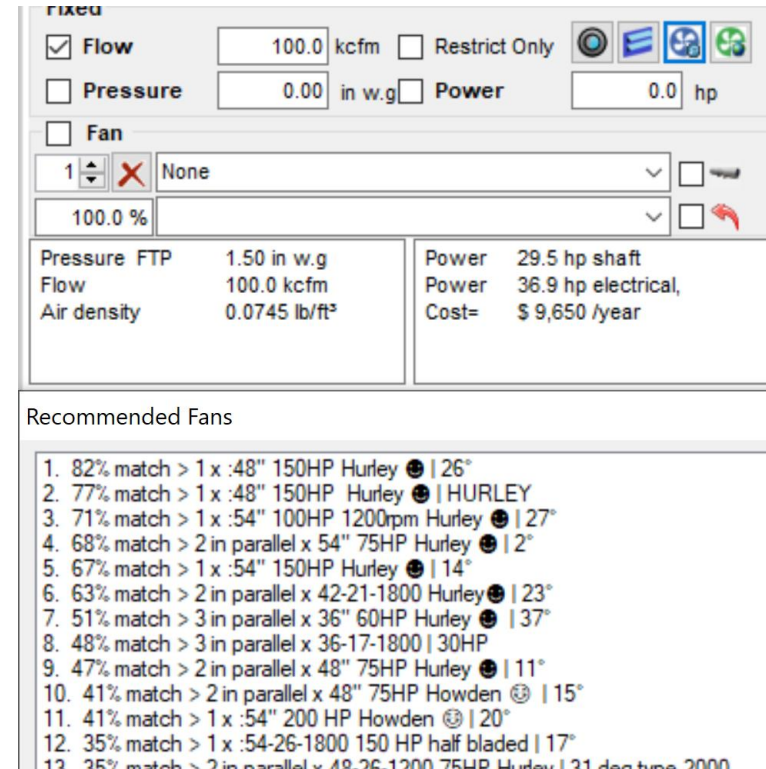
Staging the ventilation system can also help plan ventilation work and define changeover milestones.

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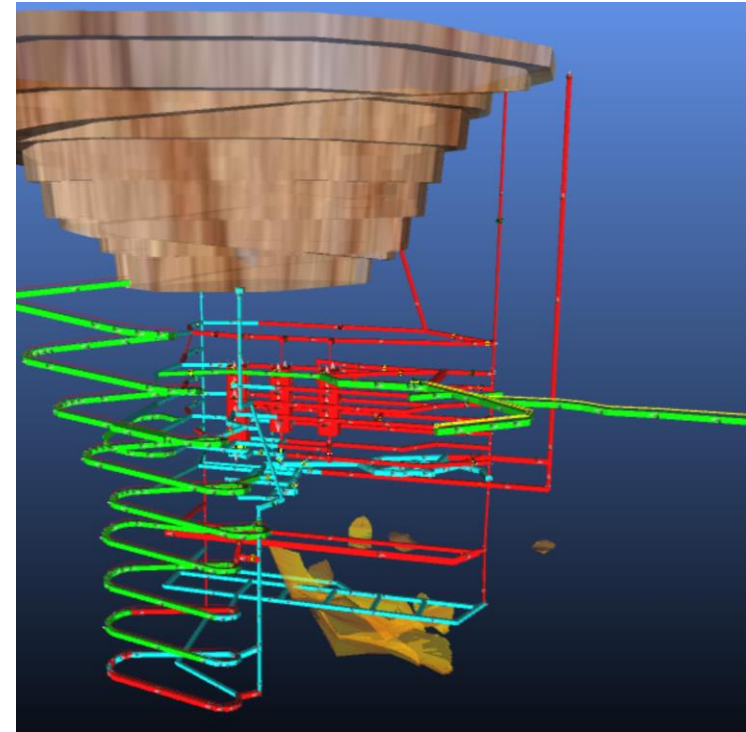
Selection of Fans from an Existing Database

Mines typically have a large selection of fans available on site. VentSIM offers a tool which allows selection of fans from the database, to match required operating flow and pressure.

This allows rapid selection of alternate fans, in the event of fan damage.

Recirculation

As mines expand and the ventilation system extends it is possible that the system will encounter some recirculation, and especially with large mines it might be harder to evaluate visually.

The recirculation tool in VentSIM allows for evaluation the recirculation in the system.

Ventilation controls can be planned to reduce/avoid recirculation and ensure good air quality underground.
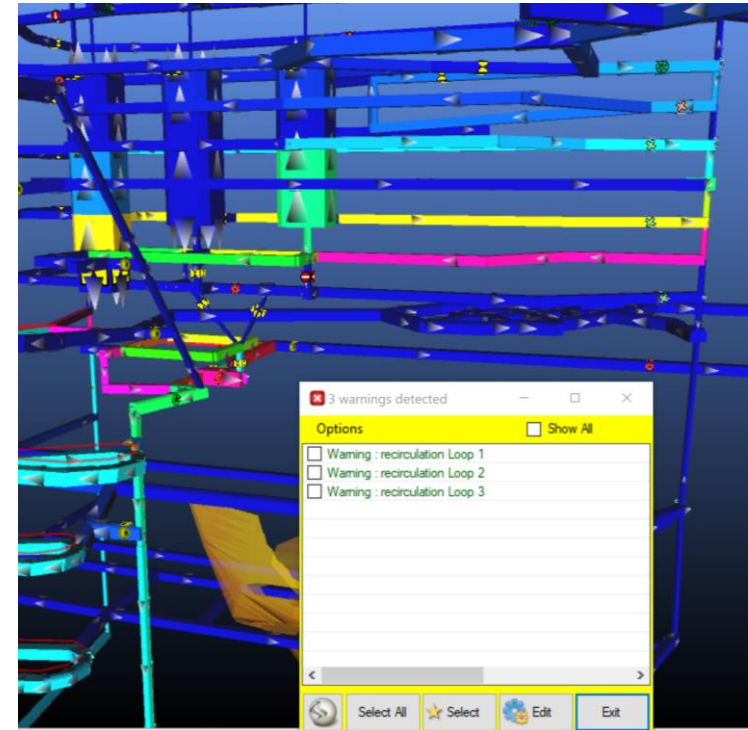
Blast Modelling

Time for blast clearance, limits the time available underground for mining activities. Blasting is typically undertaken during shaft changes to limit the affect on mining, but long blast clearance time can reduce effective mining time.

In the ventilation modelling blasting time and effected areas can be modelled. Various ventilation options can be compared to assess benefits.

Blast Gas Clearance Troubleshooting

At times, blast gases are longer than expected, this is usually due to ventilation connections that are not accounted for or known.

Presence or delay of blast gases, in certain areas of the mine can help pinpoint issues. Ventilation modelling users can compare the results to the ventilation model to determine the likely causes for the delayed blast clearance.

On site measurements can then be taken to validate the hypothesis.

Troubleshoot Blockage in Vent System

Performance of the ventilation system is reliant on the condition of the ventilation airways. Sloughage and rock fall can change the resistance of the airways and increase the operating pressure point of the fans and decrease the ventilation flow.

Access to ventilation raises and drifts can be restricted at some mines. Using the ventilation model and taking on site measurements can help troubleshoot which airways are the issue.

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Fire Simulation Modelling

An important stage in fire risk evaluation is identifying combustible sources (and the "fuel" quantity). With fire modelling precautionary measures can be taken to mitigate fire/smoke risk.

In the event of a fire, modelling can be a good tool to assess areas within the mine that could be damaged, help provide information to mine rescue and the fire inspector.

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Determining Seasonal Changes in Ventilation System

In hot/deep mines, the natural ventilation pressure can have a big effect on the operation of the ventilation system. The flow can change direction based on the ambient temperatures.

Having a thermodynamically calibrated model can help identify ambient conditions which will cause reversal in the ventilation flow. It is very important that mines are aware of conditions that could change flow direction, possibly effecting egress routes and exhausting directions.

Thank you for your attention!

Any Question?

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0
Harm

1,200+
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