



Ventsim Newsletter

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Chasm Consulting

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Ventsim Visual™ Version 2.4 Released

A major update of Ventsim Visual has been released with many new features and a host of improvements designed to improve ease of use and efficiency. The new version adds a number of new tools for ventilation simulation. If your [maintenance is up to date](#), the new version can be updated from the Help > Check For Updates menu in Ventsim Visual, or downloaded from <http://www.ventsim.com/>

List of New Features in Version 2.4

New feature : [Recirculation %](#) [Advanced Only]:

The recirculation function now calculates the exact amount of recirculation in every airway and displays it as a colour range. An option is also available to show **downstream air which has recirculated** at some stage.

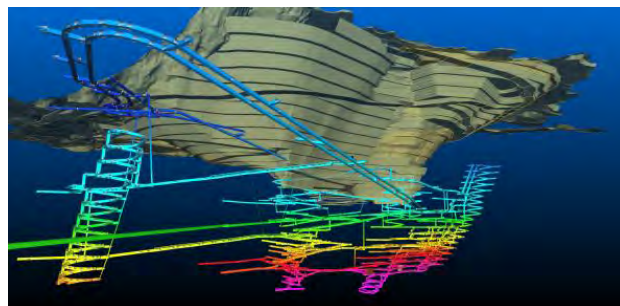
New feature : Reference merging and duplicate removal. Reference layers can be merged into a single name, and duplicate graphic elements can be removed to save memory and file size.

New feature : Gradients on airways. Gradients to airways can be applied while drawing the airway (in the Draw > Sub Option toolbar). In addition, airway gradients can be specified in the EDIT form.

New feature : Extended Colour legend : allows additional colours to be specified to show data outside the range of normal colours or range limits.

New feature : Copy Icons : allows using the COPY toolbar button to copy identical icons (fans, resistances, heat presets) on to other airways.

Versions of Ventsim Visual



Standard Version

- Full 3D modelling
- Real-time animation of airflow and fans
- Dynamic colouring of airways and data
- Airflow simulation and fan modelling
- Pressure modelling of fan and regulators
- Contaminant spread, sourcing and emergency simulation
- Financial functions to analyse airflow and fan costs.
- Variable speed fans which can be reversed or turned off.

Advanced Version

- All the Standard features
- Thermodynamic heat and moisture modelling
 - Strata heat and moisture
 - Refrigeration
 - Diesel heat and emissions
 - Electrical heat sources
 - Oxidization
- Compressible airflows and different mine air densities and fan operating environments.
- Multi gas contamination simulation
- Advanced financial analysis.
- Recirculation predictor
- Diesel particulate simulation

Ventsim Visual can be purchased or rented from Chasm Consulting or one of their authorised distributors.

Contact us at admin@ventsim.com for further info.

Simply drag and drop the icons on to other airways while the COPY button is selected.

New feature: [Drag N Drop pictures](#). This feature replaces the ICON name picture mapping feature in previous versions. To replace the standard Ventsim Icon pictures with you own custom pictures (for example a picture of a real fan), simply drag a picture file from a Windows folder on to any icon in your Ventsim model. All icons with the same type of attribute will change to the new picture. The pictures are saved with the file for use on other computers.

Enhancement : adjustable snap tolerance in the Settings > Program, to allow finer control of drawing and moving airways.

Enhancement : PQ (pressure quantity) survey results can be entered directly on to the EDIT form, and the associated airway resistance will be automatically set.

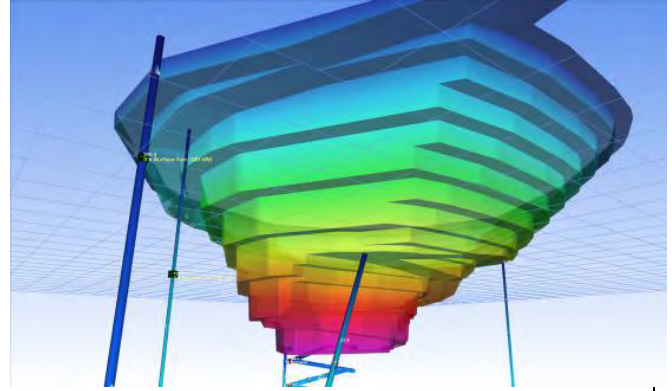
Enhancement : Multi-colouring for reference graphics

Enhancement : Individual financial factors and options available for raisebored (round) airways as well as 'blasted' or winzed vertical airways. Airway size optimisation now done to 0.1 m² accuracy instead of 1.0m²

Enhancement : pressure tolerance now increased to 75 kPa for compressible simulation. Simulations using high pressure pumps for (example) gas flow reticulation of methane gas mixes through small diameter pipe should now be possible. The tolerance can be changed further in the settings.

Improvements : Many dozens of minor bugs fixes and enhancements to make building and simulating ventilation models easier and more reliable.

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CONNECT [Optional Add-ons]: New optional tools to connect to external data.

[Ventlog™ Connector](#) is a free tool to allow Ventsim Visual to connect to a Ventlog™ file and display underground measured survey results against simulated results. This may assist with model calibration and checks, show possible areas of deficiency, and help demonstrate compliance with legal survey requirements. Note that Ventlog™ is a standalone software package available for purchase separately from Chasm Consulting.

[LiveView™](#) : An optional Ventsim Visual plugin available from Chasm Consulting with a series of tools to allow Ventsim Visual to connect to real time databases or file systems and display actual live ventilation data (airflow, gases, temperatures, fans etc) within the Ventsim model. Options also exist to simulate the live data and display downstream results.

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Gas Simulation

Ventsim Version 2.0 introduced 'Gas Simulation' as a separate type of contaminant simulation.

Gas Simulation differs from general contaminant simulation in that up to 15 different types of gases and contaminants can be simultaneously spread through the mine.

In addition, injection or increased concentration of one type of gas (for example increasing 'Methane CH₄') will automatically volumetrically balance and reduce concentrations of other types of gases. This provides a much more sophisticated way to analyse the mixtures and downstream spread of different types of gases.

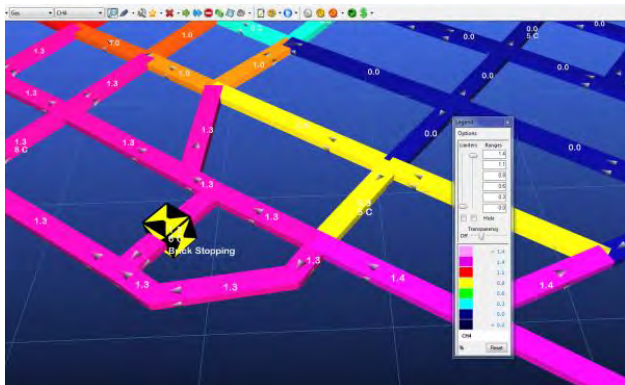
In addition, this option now incorporates mixture density calculations that are used to modify simulation results (due to potential density effect on natural ventilation), as well as the effects of density changes on friction and pressure loss through a model.

This even allows simulation of gas mixtures through small pipe drainage systems (such a methane gas drainage system in coal mines), which operate under extreme pressures and low densities.

[Click here for a tutorial on Gas Simulation](#)



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Ventsim Visual Maintenance and Upgrades

Ventsim Visual is being continually developed and improved, with new features being added every month. As part of the license agreement, full licenses have no expiry date, but new upgrades will only work for current maintenance holders.

The majority of maintenance fees go towards building better software, with new versions including numerous improvements, new features, additional licensed components, and implementation of user suggestions.

Ventsim Visual maintenance can only be applied from the expiry of the previous maintenance date, but can be purchased at any time to upgrade your license to the current version. It is an economical way to ensure you have the latest versions, improvements and support for your software.

Unfortunately, if you have expired maintenance, then maintenance fees may increase in price to reflect the new versions and improvements implemented during the expired period, as well as the ongoing 12 months of future upgrades and support should you require it.

Alternatively, for single version upgrades of expired maintenance to the latest version without ongoing upgrades and support requirements, contact admin@ventsim.com for a no obligation quote.



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Tutorial : Setting Custom Icons in Ventsim

** Note: custom icons may not work on older computers with Intel based graphics adapters, due to the limited graphics capabilities built into these cards. Any graphics hardware from NVidia, ATI, or newer Intel motherboard graphics will work fine.*

Custom Icons are a great way to more clearly show ventilation infrastructure icons or equipment within your ventilation model.

Older versions of Ventsim had the ability to store pictures files on a local hard drive directory (using the FILE > ICONS menu option), and automatically map the picture to any icons in Ventsim with the same name as the picture. Unfortunately, this had some limitations: the picture had to be exactly the same name as the icon name, and the Ventsim file did not store the picture such that when the network file was loaded on another computer, the icon pictures were no longer present.

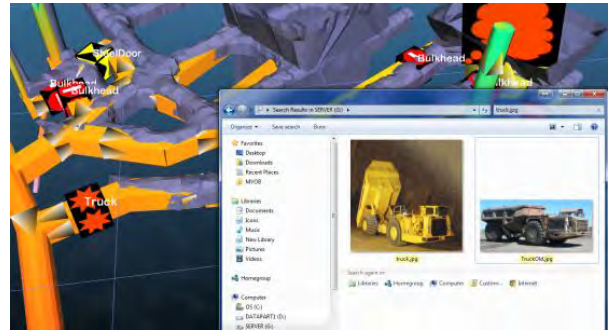
The new version of Ventsim Visual 2.4 makes the process much easier. Standard fans, resistances and heat preset items can be changed to any picture by simply dragging a picture file on to the icon. To do this, follow these simple steps.

1. Find a picture file on your hard drive in Windows Explorer.
2. Drag and drop the picture file on to your Ventsim icon.
3. All icons in Ventsim with the same fan or preset name will also be changed to the new picture
4. The pictures are saved with the file, and can be sent to other computers without the need to copy the pictures with the file.

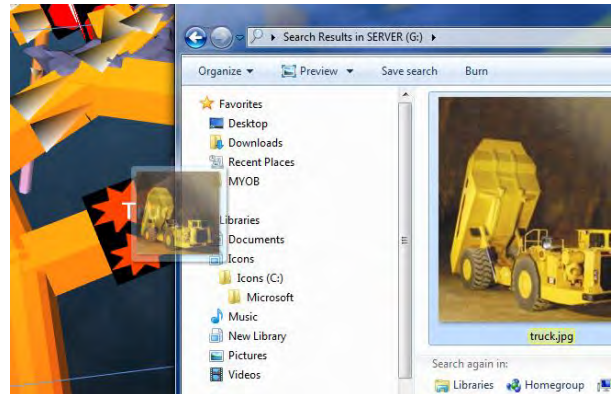
Using this option, pictures of actual ventilation fans, door, wall, regulators, and machines can be placed in your model. In addition, other non-ventilation items such as refuge bays, escape ways, workshops or even pictures of people can be placed in the models, by using a 'dummy' icon, such as a preset resistance name set to zero ('0') so it will not change the ventilation simulation.



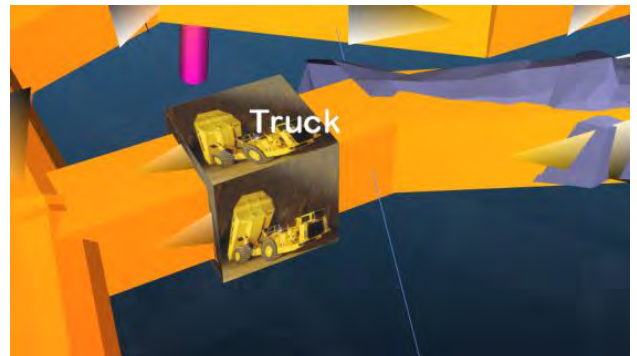
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STEP 1 – Find a picture in Windows



STEP 2 – Drag the image file into Ventsim



STEP 3 - Drop the image on to an icon



Tutorial : Introducing Ventlog™ Software

Chasm Consulting introduces a new software package to help manage recording underground measure ventilation information. Ventlog™ is available for separate purchase and does not require Ventsim software or licenses, and works under its own license.

Ventlog™ stores an unlimited amount of underground Ventilation survey data in a database format.

Underground ventilation surveys are an essential part of managing your ventilation system, and are required by law in many countries to ensure compliance with local rules and regulations.

Many mines use simple spreadsheets to record data, however this method introduce difficulties in managing data across multiple time frames and locations, and is normally difficult to analyse and compare trends and changes. In addition, using this data for making mine plans, or helping validate simulated results is time consuming and prone to duplication.

Ventlog software allows recording of dozens of different types of ventilation data, such as airflows, velocities, gases, temperatures and pressures, in a systematic database format. The data can be filtered, sorted, analysed and graphed for any location or date range.

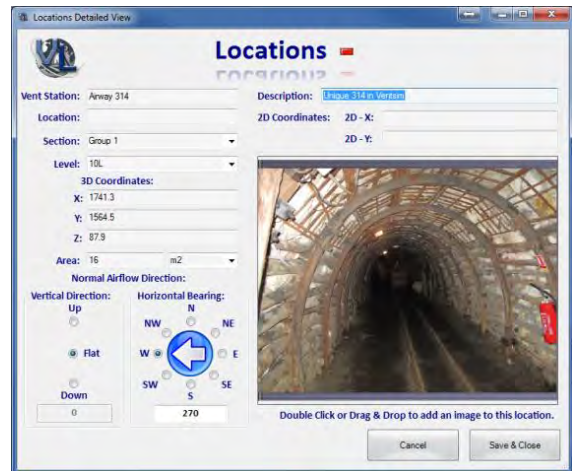
In addition, Ventlog automatically exports results to a mine plan DXF format for easy display and inclusion in actual mine plans. Ventsim Visual software also provides a free interface into the Ventlog database, so that actual surveyed results can be displayed with simulated results for any location and date.

To use Ventlog™ software;

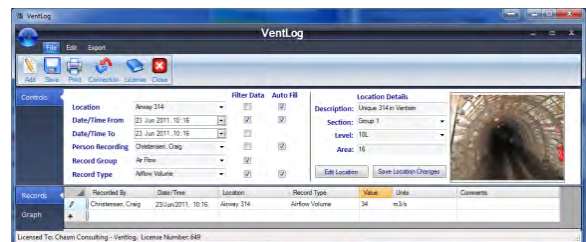
- the Ventlog™ Wizard can be used to create a new database to store your data. The wizard will guide the user through items such as database location, underground stations and authorized users. Underground stations can be established with pre-determined areas, locations coordinates, names, standard airflow directions and even pictures.
- Once locations are established, survey data can be entered against each location directly into the record sheet. The filter options can restrict the data shown to only a certain location, date range or ventilation data type.
- Each survey record required a location, ventilation data type, date and time and person recording, however the auto fill options can automatically fill the datasheet with most values, so that only the value (for example airflow) needs to be entered. All other information will automatically fill from the filter options.
- Once data has been entered, the database can be viewed and analysed to show recorded data for any location or type. The page can be switch to 'Graph' mode to allow graphing of up to six types of ventilation data



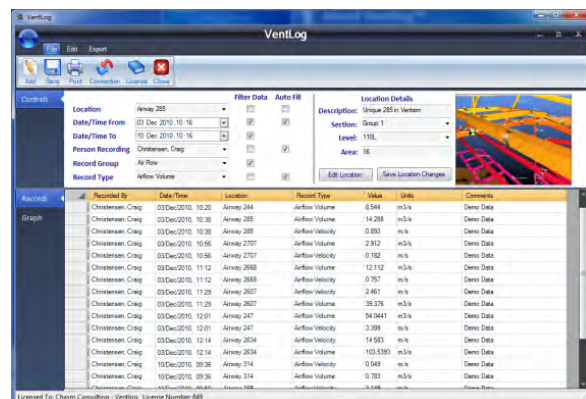
Step 1 – Create Database



Step 2 – Establish Locations



Step 3 – Enter Data

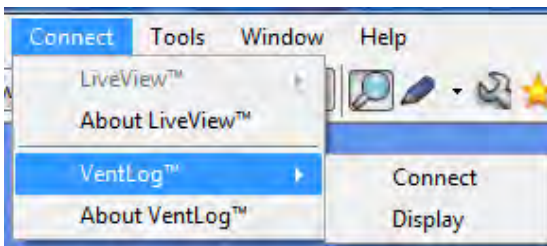


Step 4 – Analyse or Export Data

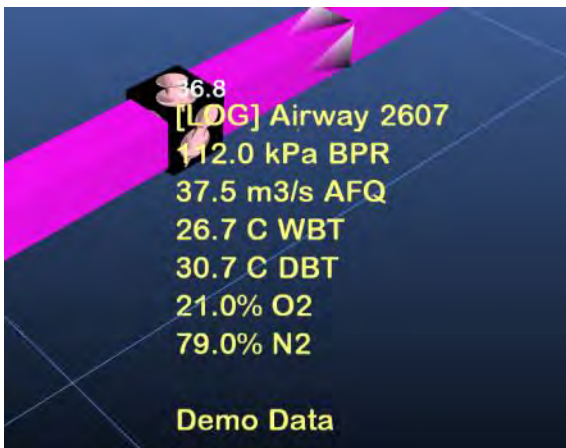


on up to two axes over a period of time.

- Data can be export to a DXF for importing into mine survey plans to create ventilation plans. Simply import the DXF file created into your mine survey software tool or CAD package, and the data is overlaid with your mine plan floor outlines. The position of the data and direction of the airflow arrow can be adjusted in the Ventlog™ locations section if they need to be fine-tuned.
- Finally, Ventsim Visual software 2.4+ has a free connection utility that connects to the Ventlog™ database, and displays all surveys results within your 3D ventilation models. This is a great tool to help compare measured survey data result against simulated results, or to show historical ventilation changes.



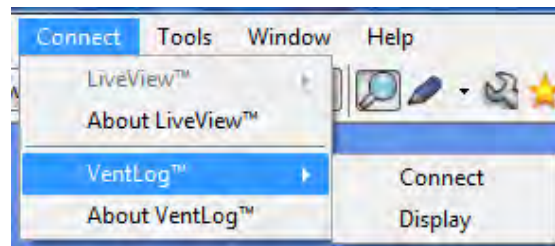
Ventsim Connector Utility



Ventlog™ Display in Ventsim Visual



Step 4 (cont) – Analyse or Export Data



Ventsim Connector Utility

Tutorial : Advanced Mine Air Recirculation



Recirculation can be defined as any portion of mine airflow that travels through the same location more than once.

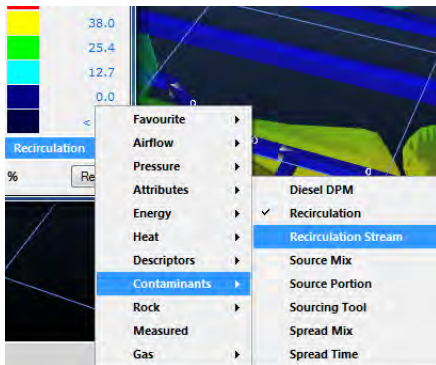
Users of Ventsim Visual Advanced can use new recirculation simulation routines, to test and calculate recirculation through every single airway in the mine simulation model. This function provides essential information on portions of the mine that may have controlled or uncontrolled recirculation, and allows users to gauge the potential impact and consequences of such recirculation.

In addition, while it does not necessarily indicate how much of the air has already recirculated in other portions of the mine, there is a secondary option called 'Recirculation Stream' which shows the maximum amount of recirculated air present in all downstream headings.

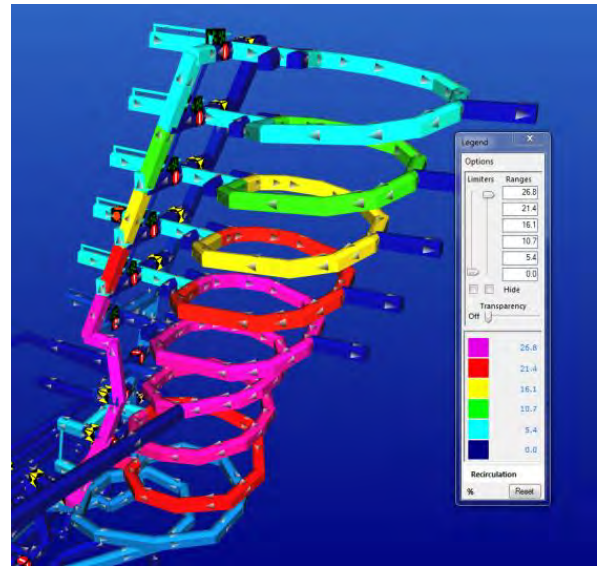
To activate the recirculation function, as before simply press the recirculation button to instantly show the results. For large models with significant recirculation, a warning may show indicating the process may take a little time to calculate.



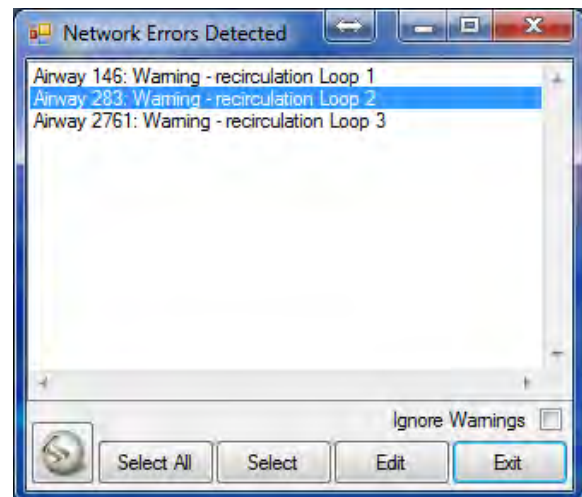
The colours will automatically change to display recirculation percentage. The alternative data display for downstream recirculation ("Recirculation Stream") can be selected from the colour or data 'Contaminant Menu' group.



In some cases, minor recirculation of air (for example, air leaking under the seal of a closed door) may be unavoidable, particular where high pressures are present. If this contributes to a relatively low total recirculation percentage, this can generally be ignored, although the permissible amount may need to be risk assessed for hazards such as heat, fumes and gas buildup. In addition, there is an option in the Tools > Settings > Airflow Simulation menu to restrict reporting of lower recirculation flows.



Recirculation showing exact % in each area. This design shows unacceptable recirculation levels in a ramp design.



Chasm Consulting suggests a permissible figure of no more than 5% recirculation due to leakage, however this figure is highly dependent on the situation and type of mine. A coal mine for example, with potential buildup of methane may find this unacceptable, whereas an 'over'-ventilated metalliferous mine may feel comfortable exceeding this level.

It should be noted that regulations in some countries do not permit any recirculation. While regulatory authorities are normally sympathetic to minor recirculation from leakage, each mine should check its own regulatory requirements before 'designing' recirculation (whether controlled or uncontrolled) in to their mine model.



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Tutorial : Gas Simulation (Advanced Version)



The new Gas Simulation feature in Ventsim provides a powerful tool for simulating the spread of different gas mixtures through a mine.

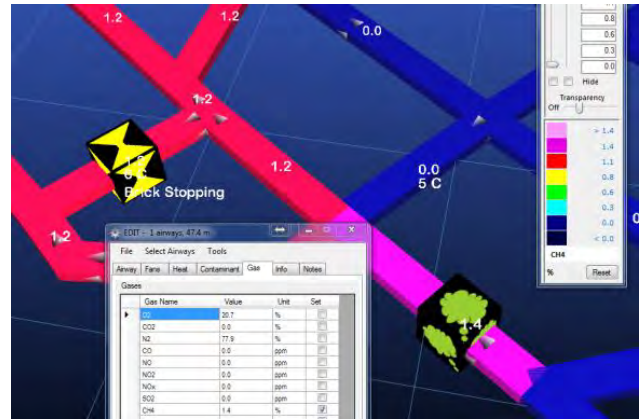
Gas simulation works in a similar way to normal contaminant spread simulation. Sources of gas are established and spread through the mine, mixing at junctions with concentrations and mixtures changes depending on diluting air and other sources of gas.

The contaminant routines in Ventsim work on a simplified linear average flow, and ignore complexities such as boundaries drag issues, higher center drive velocity profiles, and potential gas densities layering issues. Such complexities introduce a number of fluid dynamic complexities which are highly dependent on geometry and airway profiles, and are outside the scope of large mine ventilation simulation analysis. In most cases, this approximation will be adequate for most mine simulation needs.

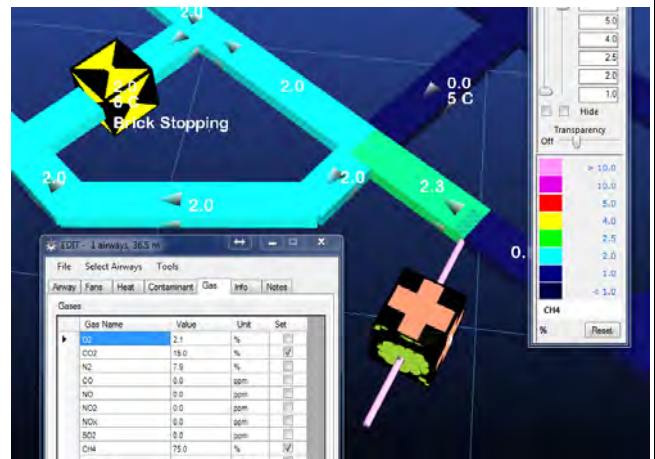
Gas concentrations in an airway are set in the EDIT box. A number of different gases can be simultaneously set, providing concentration does not exceed 100%. The remaining standard atmospheric gas concentrations (for example nitrogen) are adjusted to maintain a 100% volumetric balance. Multiple sources of gas can be entered into different areas of the mine.

There are two methods of introducing and simulating gas to a mine model in Ventsim.

1. Method 1 : Set the entire airflow to a mixed concentration. All airflow travelling past this point will be set to the specified concentration. This value could be derived from measured data underground, or through theoretical analysis. All simulated airflows downstream from this point will be derived from this source. Unlike general contaminant simulation, gas passing a set source will not accumulate from upstream or recirculation sources (use Method 2 if this is required)
2. Method 2 : Inject a pure concentration of gas into an airway, and allow it to mix with the airflow in the main airway. This method relies on injecting a small concentration of airflow (gas) from a fixed flow source, and normally should be set to a 'surface' connection, so that the gas is injected from an external source. The gas level in this injection airway is increase to the pure gas levels (eg 75% methane, 15% CO₂ etc). Downstream from the injection point, the mixture will show the diluted levels of gas. To gain a more reasonable colour scale, the legend scale may have to be renumbered to show only the concentration of interest.



Method 1 - Total gas concentration in an airway



Method 2 – Injection of small flows of pure gas concentration in an airway

Ventsim can optionally use the different densities of gases, and incorporate these into the natural ventilation and pressure loss calculation within the simulation. To utilize this feature, ensure that Natural Ventilation is enabled, and the Gas Density option in the Air Simulation Settings is turned on.

An area of a mine high in methane for example, may exert a significant upwards natural ventilation pressure due to the low density of the gas, and Ventsim simulation will reflect this if the option is turned on.

Gas distributions through pipes can be done in a similar way. Pipes in Ventsim can be constructed with the Ventsim ducting function, and high pressure pumps can be installed using Fixed Pressure options in Ventsim. A tutorial on using this method will be included in a future newsletter.



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Tutorial : Dynamic Contaminants (Advanced Version)

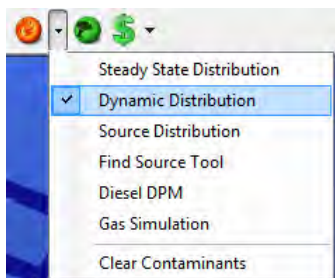


Dynamic Contaminants offer a way to simulate the second by second spread of a contaminant through a mine. This simulation differs from the normal 'steady state' contaminant and gas simulations in that ventilation models can show contamination progress and concentration at any time. Importantly, it can be dynamically changed during simulation (for example doors opened or close, fans turned off, on or reversed.)

This means that (for example) emergency procedures can be performed in the simulation at any time into the dynamic simulation to see the effect of the changes to the existing spread of the contaminants.

Contaminants are considered 'unspecified' in Ventsim, and can be set to any volumetric concentration. For example contaminants could be called 'Carbon Monoxide' and the original starting concentration set to 2000 ppm to represent explosive gases or perhaps a fire.

To set a dynamic contaminant, simply use the SMOKE button to place a contaminant and then use the EDIT function to change the concentration, type and length of time the contaminant is emitted for. This simplest dynamic form is a 'FIXED RELEASE' option which emits a continuous stream of contaminants at a specified concentration for a specified amount of time. Other more complex options exist to reduce concentration over time, or to simulate explosive quantities. To simulate a dynamic contaminant, simply choose the Contaminant > Dynamic option and the contaminant will immediately start spreading through the mine from the source(s).



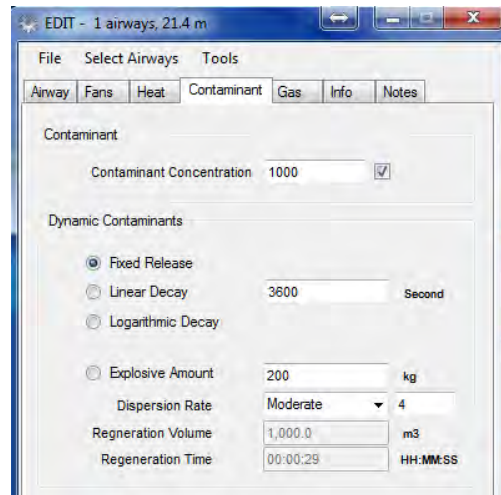
Step 2 : Start the Dynamic Contaminant routine

The model can be rotated at any time during simulation, and colours of contaminant levels adjusted through the color menu if required.

If a change is to be made to the circuit, the simulation can be paused at any time, and the following steps taken

- The model is adjusted (for example a door closed, or a fan stopped or reversed).
- An airflow (and heat if required) simulation is performed to simulated the changed airflows.

The Dynamic Contaminant simulation is then resumed to show the new pathway spread of gas from the current areas



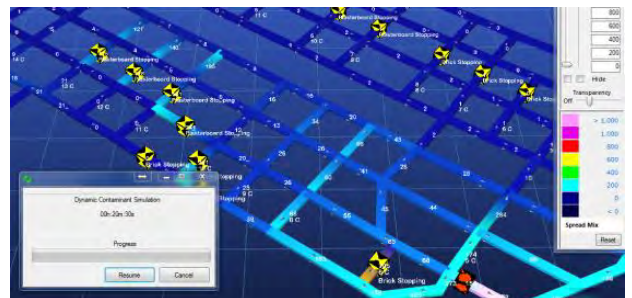
Step 1: Set the contaminant levels and release time.



Example: A dynamic contaminant of '1000ppm' is released and the simulation paused after 10 minutes

This option can be performed multiple times during simulation, and an idea of the effect of the changes can be quickly gained.

For example, if the airflow is reversed, the previous spread of contaminant may show to be 'pushed' back as the fresh air clears the previously contaminated areas.



Example: The main fans are 'reversed' and much of the contaminated air is reversed from the mine after 20 minutes, with only 'remnant' contaminations remaining in slow moving airways.



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