



# Ventsim Visual™ Newsletter

**VENTSIM SOFTWARE**  
Chasm Consulting

Volume II Issue I  
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## Ventsim Visual™ Version 2.0 Software Released

### New Updates to Ventsim Visual!

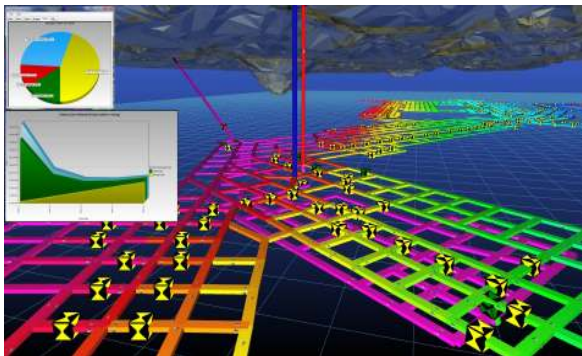
Version 2.0 of Ventsim Visual has been released with many new features (some of which were previewed in Version 1.8)

If your maintenance is up to date, the new version can be downloaded or updated from <http://www.ventsim.com/>

- **Vent duct builder** tools with leakage path construction—allows users to quickly select a series of airways, and build vent duct which automatically includes regular leakage paths in the construction to better simulate real duct performance underground.
- **Customizable airway shapes profiles** for any airway. Shapes can now be entered as profile strings into Ventsim, in the form of an X-Y dimensionless coordinate in the Preset Form. The shapes can be applied to any airway, and will automatically be rendered in 3D with auto calculated areas and perimeters for resistance calculation.
- **Preset airway types**—specific types of airways can be created with pre-determined size, shape profiles and friction factors. This can then be applied to any airway without the need to manually set all the parameters.
- **Excluded airways**—airways can now be excluded from simulation by selecting the option in the Edit Box. Excluded airways (for example future development) are not simulated, and any airways connecting to them are assumed fully sealed. Excluded airway can also be made transparent or hidden.
- **Multi positional data.** Data can be shown from 4 different locations

along each airway, as well as an average. The option is located in lower left of screen.

- **New Heat Simulation Options** in the Settings including improved moisture calculation and user specifiable airway subdivisions for improved simulation accuracy.
- **Additional Dynamic Contamination** options including fixed time release (for example stench gas) and a variety of other gas release options available in the EDIT box.
- **Multi-Element Gas Simulation** options for simulating up to 15 different common gases simultaneously through a model.
- **Direct Import of Autocad, Datamine and Surpac string files** (without the need for DXF)
- **New File Management Features**, including settings and fan sharing between files, and file comparison tools.
- **Movable ICONS.** Fans, resistances, heat source etc, can now be moved to other airways by dragging the icon with the MOVE button.



New Graphing Report Options available in the Summary Report

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### About Ventsim Software.

**Ventsim Visual™ is a mine ventilation simulation package that comes in two versions.**

#### Standard

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

#### Advanced

- All the Standard features
- Thermodynamic heat and moisture modeling
  - 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 software is available under a purchase license or limited time rental.**

## Ventsim Visual Training Courses 2011

Sweden, Jarpas, March 2 - 3

Chile, Santiago March 23 - 24

USA, Denver, April 13 - 14

Australia, Sydney, May 19 - 20

Australia, Brisbane, May 16—17

Australia, Perth, May 26—27

Ventsim Visual training courses are a great way to quickly build up competency in all aspects of ventilation design and simulation using Ventsim Visual. Over two days, you will learn about ventilation model design, fan selection, ventilation cost optimisation, gases, contaminants and DPM, refrigeration and heat in mines.

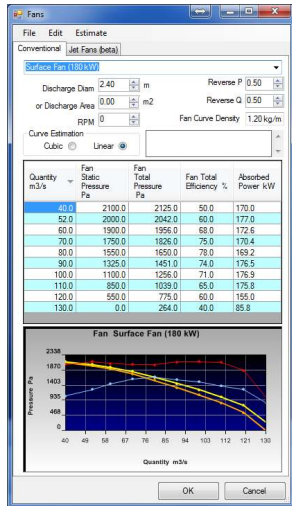




# Fan Simulation in Ventsim Visual

Ventsim Visual has a range of powerful facilities to simulate and estimate fan performance in a ventilation model.

Ventsim uses a database of fan curves and settings to estimate the performance of fans in any application underground. To ensure fans are accurately simulated, at a minimum, pressure and quantity fan curve information must be entered into the fan table (available from the TOOLS > FANS menu item). To get the most out of fan simulation however, consider entering the additional optional information for more accurate results.



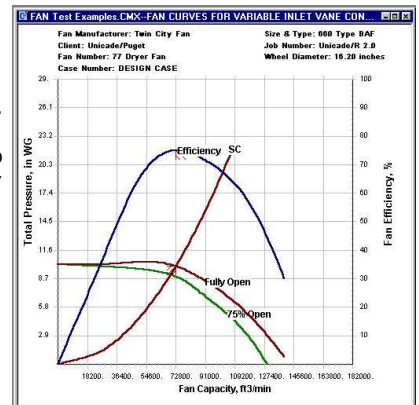
**Fan diameter or discharge area.** Ventsim uses discharge size to calculate the velocity of air discharging from a fan. When using *total pressure* simulation, if the fan is located underground, then Ventsim assumes both fan static and velocity pressure (total pressure) is used to drive the airflow ventilation through the mine. If the fan is exhausting to the surface, Ventsim assumes the fan velocity pressure discharge is wasted to the surface atmosphere and is not used for underground ventilation.

**Fan Curve Density** is an important parameter which Ventsim uses to modify fan performance at different air densities. The density in the Fan Database must be entered according to the manufactures fan curve specification NOT at the air density of the mine to be simulated. When the fan is placed in the mine ventilation simulation, Ventsim will automatically modify the fan curve to suit the simulated density.

**Include efficiency or power curves** in the fan database tables. Ventsim uses this information to accurately calculate power consumption and cost of ventilation. The information is also used to calculate heat from fans during heat simulations. Only efficiency

or power data needs to be entered (not both) as Ventsim automatically calculated the other data. If the information is not available, Ventsim uses a default efficiency (set in the Settings), which may not be as accurate.

**Only Fan Static or Total pressure** need be entered (not both). It is recommended to use **Fan Total Pressure** where possible. Fan Total Pressure allows Ventsim to use the discharge velocity pressure to help estimate fan performance underground. If this is ignored and only static pressure used, fans may underperform in the simulation.

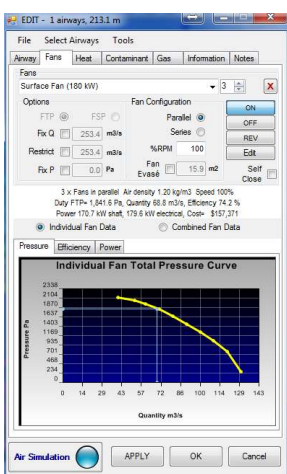


## APPLYING FANS IN VENTSIM VISUAL

When placing a fan in a ventilation model, use the EDIT command to specify the fan configuration. Note that options are also available to adjust the fan speed (a facility available on many new variable speed fans) for increasing or decreasing performance. Pressing SIMULATE will update the simulation and show fan performance and duty points.

**When assessing fan performance, ensure that** the operating point of the fan does not exceed the maximum (stall) pressure. Fan performance and airflow in real terms will dramatically decrease, and fan life may be decreased. Try to design ventilation simulations well below this stall point to allow for some contingency in real life fan pressures.

Also ensure fans are not operated below the minimum (low or negated) specified fan curve pressure. While fans in real terms will still operate, power efficiency is likely to be poor, and some fan designs produce excessive vibration or blade stress. Choose a fan more suitable for this pressure duty if possible.



## Fixed Flow Hints

**Fixed flows are often used to simulate fans**, if the fan duty has not yet been determined or the fan type is not known or available.

Fixed flows produce an estimated fan static and total pressure during simulation, as well as power consumption, all of which is useful in specifying the requirements for an actual fan.

In most cases, for final working simulations, it is recommended that fixed flows be replaced with actual fan curves, otherwise future simulations derived from this model will be distorted by the fixed flow—which will continue to deliver identical flows regardless of pressure required.

Ventsim Version 1.8+ has a recommendation feature (the '?' button) which recommends the most suitable fan to replace a fixed flow.



## Maintenance and Upgrades for Ventsim Visual Software

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

Ventsim Visual maintenance, can be purchased at any time and includes support and all upgrades (available in 12 months extensions). It is an economical way to ensure you have the latest versions, improvements and support for your software.

Alternatively, for single upgrades of expired licenses to the latest version without ongoing support requirements, contact us at [admin@ventsim.com](mailto:admin@ventsim.com) for a no obligation quote





## Tutorial — Optimising Ventsim Visual Display Speed

Ventsim Visual uses the latest 3D technology to deliver unparalleled speed and animation to ventilation models. Making sure you have suitable graphics hardware in your computer can make using Ventsim Visual a much more enjoyable experience.

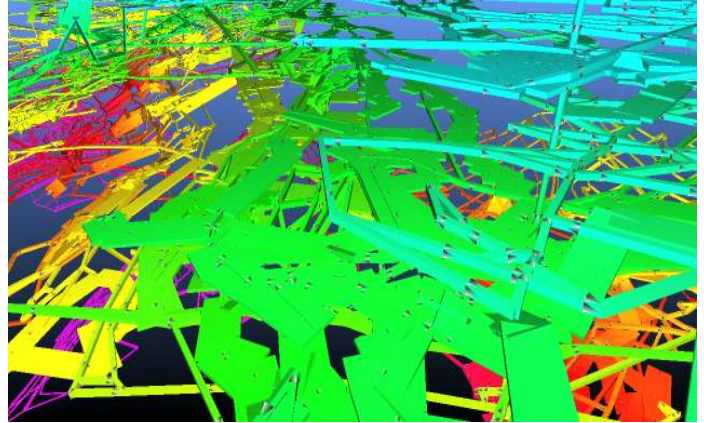
Older computers with limited graphics cards or extremely large models can slow down display of graphics. Some hints to improve speed are as follows.

### In the Tools > Settings > Graphics

- Turn on 'Hide Text While Rotating'
- Turn off 'Antialiasing'
- Turn on 'Back Face Culling'
- Use Fast Text Rendering if you don't need international characters.

### Other hints include ;

- Turn off Text Display if not required ("T" key)
- Turn off airflow animation if not required
- Turn off node display ("N" key)
- Use Wireframe Display ('W' key) if solid graphics are not required.



### To improve display quality (sometimes at the expense of speed)

- Turn on 'Antialiasing' if your graphics card supports it.
- If 'stripey' or uneven patterns appear when you zoom out, turn on 'Back Face Culling'
- Try using a different coloured backgrounds for better contrast.



### What Graphics Hardware do you have ?

Much of Ventsim Speed comes down to the quality of computer hardware being used. You can check your hardware from the Help > System Info menu.

Modern Graphics systems can be broadly grouped into two categories.

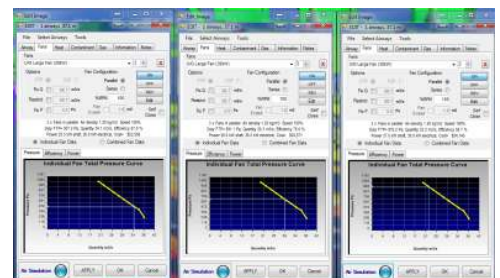
**Dedicated (Discrete) graphics** cards produced by NVIDIA or ATI deliver by far the best performance. Even low cost versions of these graphics system (as little as \$50) can make Ventsim Visual graphics many times faster. High end Nvidia Quadro cards specified for workstation desktop and laptop computers work fine, however are not really required and will deliver little improvement over most lower cost graphics solutions.

**Intel Integrated** graphics are embedded on the motherboard and deliver much slower performance. Older models such as the 45 series which are common on computers several years old (sometime specified as 4500 series) will generally deliver poor performance. Newer chipsets from Intel (such as Core I3, I5, I7 series processors) will deliver improved performance. The latest iteration of Intel Core Processors (labeled 'Sandy Bridge') deliver much improved performance again, equaling a low end NVidia or ATI solution.

If you are purchasing a new computer, it is recommended that a dedicated graphics card from **Nvidia or ATI** be specified, or one of the **new generation Core I3, I5 or I7 processor** computers. These computers graphics system will run the graphics in Ventsim from 500%—1000% faster than older INTEL graphics, making the program working environment much more pleasant. These days there is very little cost premium to purchase a computer with faster graphics.

## Ventsim Visual Quick Hints

- Use Shortcut Keys—nearly every command in Ventsim has a shortcut key (shown on most menu items), which can greatly improve time changing mouse tool selection modes and simulation.
- Drag and drop files - most files types (Ventsim, DXF, Datamine, Surpac etc) can be dragged and dropped from Windows Explorer into the Ventsim screen to load.
- Use Form Imaging—most forms in Ventsim (Edit Form, Main Screen, Financial Sheet etc) have an option to create a copied image of results. This is usually available from the form menu. Imaged forms can be used to compare before and after results of a simulation 'side by side'. Created images can be saved or copied to the Windows clipboard (for pasting into another application) by Right Clicking on the form image.
- Airways with warnings or errors, can directly be selected from the warning box after simulation. Multiple airways can be selected and edited simultaneously.
- Airways can be directly edited in View mode by Double Clicking the airway.
- Ventsim Visual can be made to work with Mac™ Computers providing Windows is installed as an option in Bootcamp™, or third party emulation program such as 'Parallels™' is used.





## The Sins of Ventilation Recirculation

**Recirculation can be defined as any portion of mine air-flow that travels through the same area more than once.**

For the purposes of this discussion, it is NOT the reuse of air in other parts of the mine, although this can also have undesirable consequences.

While some mines allow a limited amount of controlled recirculation, for most mines it is an undesirable and sometimes dangerous result of poor ventilation design, which is often exacerbated by poor maintenance of ventilation controls. In fact, in many countries, the use of recirculated air is strictly forbidden by mining legislation.

Recirculated air has a number of undesirable and possibly dangerous consequences.

1. Buildup of heat and humidity. As air recirculates, it repeatedly picks up increasing heat from machines, rock strata and ventilation fans. Moisture and humidity is increased by ground water and mining activities.
2. Build of fumes and dust. Mining activities need fresh air to clear out noxious gases and dust. Recirculated air prevents this and allows fumes and dust to accumulate.
3. Recirculated blasting fumes and dust may often prevent re-entry into blasted areas for extended periods of time, delaying production and other activities.
4. Gas buildup, particular in coal mines can create a dangerous environment, prone to explosion or poisoning of personnel.

Chasm Consulting has been fortunate to have had the opportunity to review many mine ventilation systems around the world. Unfortunately, in a remarkably high portion of mines, recirculation is very prevalent. In many cases, mine personnel are not even aware of it.



In response to the poor ventilation conditions caused by recirculation, a common response is to install more fans or larger fans, which can often make conditions even worse.

### Mine Design Issues

The vast majority of recirculation in mines is caused by two aspects of mine ventilation design.

**1. Underground booster fans.** Booster fans are normally designed to 'push' air through a mine, usually to assist surface mounted fans to circulate air into further reaches of the mine. This configuration creates a high pressure zone through the region in front of the fans. ANY connection back to the mine behind the fans (drives, declines, shafts, mined out voids and stopes) provide an opportunity for air to leak back into the mine and recirculate. Even closed doors and other ventilation control may allow for unacceptable recirculation, particularly if high pressures are present.

**Solution :** Use booster fans only when necessary and limit or eliminate pathways for boosted air to re-enter the mine. If possible, place booster fans near intake or exhaust shafts to limit re-entry points. Ensure any doors or controls to prevent recirculation are of high quality and regularly maintained.

**2. Underground development fans;** are another source of recirculated air regularly encountered in mines. In many cases, the auxiliary fan consumes more air than it receives, resulting in

used air being redrawn back through to feed the fan intake.

**Solution :** Any free standing (or hanging) auxiliary fan MUST have more air feeding past the inlet than it consumes. As a rule of thumb, try to ensure at least 0.25m/s or more of excess air moves past the fan when running to prevent air being drawn back from the working face. Test installed fans using smoke tubes or similar to ensure air is not drawn back through the fan.

Finally, avoid using multiple in line auxiliary fans to extend duct length, unless the duct is solid, low leakage duct and cannot draw air through gaps under negative pressure. Do not use open flexible duct feeding into downstream fans and duct, as recirculation will be significant and inevitable.

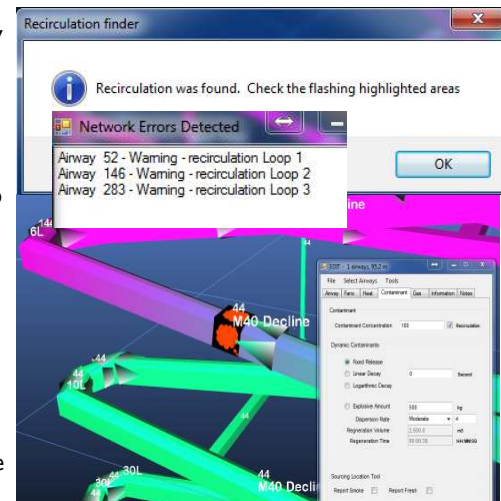
### Using Ventsim Visual Recirculation Features

Ventsim Visual Advanced has an automatic recirculation detector (the green toolbar button). This will highlight any area of a mine which has recirculation levels above a limit defined in the settings (which can be changed in the Tools > Settings > Air Simulation section).



**To determine the exact portion of recirculation,** place a contamination source (smoke) in any portion of the recirculated part of the mine. Set the concentration strength to '100' if not already set, and perform a 'steady state' contaminant simulation. If recirculation is present, some contaminant will return to the same point.

For example, if a contaminant value of '44' is seen to return to the point of original contamination, then this indicates 44% combined recirculation of the original source. 'Acceptable' recirculation limits need to be determined by the mine.



**Chasm Consulting**  
(incorporating Ventsim Software)  
Ventilation Simulation Software, Training and Consulting  
for the mining industry.



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Phone: 61 7 47285730

Fax: 61 7 4775 3323

[www.ventsim.com](http://www.ventsim.com)

[www.chasm.com.au](http://www.chasm.com.au)

E-mail: [admin@chasm.com.au](mailto:admin@chasm.com.au)

Email: [admin@ventsim.com](mailto:admin@ventsim.com)

