Frequently asked questions about Heavent and Update History

The beta version has been released as the new version of Heavent. It works with HvMeasurement, an included data acquisition program.

Known bugs as of November 2014

Conditions of Use

1. Unless you have purchased a relevant site license, only the individual at the company named in the heavent.chk or heavent.pass file (the "Licensee") may use Heavent (which includes Heavent and the package of software included with Heavent) under the license listed.
2. The Licensee and his Company may not allow anyone else to use Heavent under his or her license, even if only one individual uses Heavent at a time.
3. The Licensee may install Heavent on as many computers as desired as long as no one else uses his heavent.chk or heavent.pass file to operate Heavent on those computers.
4. The Licensee may have Heavent installed on a network as long no one without a license uses Heavent as a result.

Installation Issues

5. **Run-time error '339'. Component 'MSCOMM32.OCX' or one of its dependencies are not correctly registered: a file is missing or invalid.**

   Solution: if necessary, go to Run on the Start Menu or Dos Prompt on the Accessories Menu. If a particular DLL or OCX is listed as not correctly registered, at the command prompt type: `regsvr32 whatever.ocx`

6. Note that the most up to date version of software is on my computer. The next most up to date version is on www.IndustrialVentilation.net

7. VISTA compatibility:
   Step 1. Right click on the shortcut for Heavent (on the Desktop or in the Start menu), and click Properties from the popup menu.
   Step 2. On the Properties dialog, click the Compatibility tab.
   Step 3. Click OK.

   Step 4. Right click on the Heavent icon on the desktop
   Select Properties
   Check the box that says, "Run this program as administrator."
   Select Compatibility
   Click the box - Run this program in compatibility mode for: Windows XP (Service Pack 2)

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Thanks to: Marc L Corbett, CIH
Ultra-Fine Occupational Consulting, LLC

Opening old files

Heavent tries to open files from older versions. Since it has seemed beneficial to change the file structure from time to time, it gets increasingly more problematic the older the file is.

You may get an error message when opening older files or files that have become corrupted. The chances are that Heavent has retrieves most of it by that point. Check the Schematic and the Input screen. If it looks okay, save to a new filename and re-input missing data. If not, re-input everything from scratch in a new file.

Why do Heavent values deviate from my spreadsheet?

1. It is always possible that a bug has appeared in Heavent. If you are convinced there is an error, please let me know and send me your .SEG file.
2. If the differences are sometimes modest, and occasionally more than modest but not huge, it is likely that you are seeing limitations of what can be done with reasonable effort with spreadsheets.

   Heavent does the following that are very difficult to do on a spreadsheet and nearly impossible with a calculator:
   a. Computes the effect of SP on density and the effects of density on SP iteratively hundreds of times.
   b. Does Q_{corr} to airflows *and SP* values to every duct upstream of the junction as well as at the "lower" duct at the junction fitting. This is repeated at every single junction, no matter how complex the system.
   c. Includes the effects of every downstream damper on every upstream duct.

3. If you Toggle it to do so, Heavent computes junction losses using the author's method, which is based on mathematical models fitted to a huge data set of experimentally determined values. The alternative is to do it using the methods of the ACGIH Industrial Ventilation manual, which are simply wrong, not to put too fine a point on it. The IVM method and values are based on Alden (1939), in which he proposed "temporary" values to use until better ones were developed. The IVM then apparently misunderstood Alden's suggestion and placed the "loss" upstream of the junction in the lateral instead of downstream in the submain.

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Dampers

4. How does the F_{damper} value relate to adjusting the damper? For example, if I ask the model to set dampers and ask for a system minimum air flow, I get a few "zero" F_{damper} settings (for those branches that do not need a damper) and F_{damper} values ranging from 6 to 70. I presume the branch with F_{damper} of 70 means that branch needs a damper to be "very closed" and the branch with F_{damper} of 6 needs a damper to be "somewhat closed". Is this the right way to interpret the results?

   Answer: Correct in all aspects. A $F_{damper} = 0$ means the duct needs no damper. Its resistance is already too high compared to others. In fact, you may want to consider reducing its resistance by replacing the whole branch with one that less resistance, perhaps by using a smaller duct diameter. If the branch has more elbows and runs longer than necessary, you may want to consider straightening its path. Mitered elbows can be replaced with rounded elbows.

   F_{damper} increases exponentially as the damper is inserted further. A very high F_{damper} means the damper must be pushed in much more than half. You can also increase branch resistance by using a smaller duct diameter.

5. In actually balancing the system, should you start with the branches with large F_{damper} values?

   Answer: Yes. Do this in order of decreasing F_{damper} values.

6. Would you adjust the damper to get the value of SP that Heavent computed for downstream of the damper?

   Answer: No. Adjusting the damper changes all pressures, but SP_{end} would change little.

7. Would you adjust the damper to get the target air flow/velocity then continue until all dampers are adjusted?

   Answer: There are many strategies that can be followed:

   SP_h/SP_{end} ratio method: In order of F_{damper} values, adjust the first damper until

   Observed SP_h/SP_{end} = SP_h/SP_{end} predicted by Heavent

   When it is done, do the branch with the next lower value of F_{damper}

   "Goal" method: Beginning with the branch with the highest F_{damper} value, adjust each damper until:

$$SPh_2 = SPh_{open} \ (Q_{target}/Q_{open})^2$$

$$\text{or, } VPcl_2 = VPcl_{open} \ (Q_{target}/Q_{open})^2$$

where: SPh_{open} = hood static pressure measured with all dampers open
Q_{open} = airflow measured with all dampers open
Q_{target} = airflow that you want in the branch duct
VP_{cl} = centerline velocity pressure measured under good conditions

Modified goal method: same as goal method but first adjust the fan speed first so that:

$$Q_{fan2} = \text{(Sum of } Q_{target} \text{ values for branches) x 1.2}$$

8. Heavent predicted that my fan pressure would increase from 2.04 to 6.95 inches w.g. if I balanced with dampers. Is there a way to avoid having high pressures when balancing with dampers?
   Answer: You can increase duct sizes for the branches with high resistance, which will be those with very low F_{damper} values. Just be careful that duct velocities don't fall below levels needed to keep dust moving if the contaminant is a dust.

9. Should I increase or decrease duct sizes when using dampers?

   Answer: You should consider increasing duct sizes for branches having the lowest values of F_{damper} , especially if other dampers have very high values, assuming that the velocity in the duct would still be above the level needed for particulates, if there are any particulates.

   You should consider decreasing branch duct sizes if the velocity will be too low after adjusting the damper. This is most likely when its F_{damper} value is very high and the system is controlling particulates.

Modeling Installed Systems

1. Can I model an installed system without measuring all of the pressures and flows?

   Answer: Yes, but the model accuracy will suffer. The more you omit, the worse the model will become. If you do not input the measured value of SP_{end} and VP_{avg}, Heavent predicts based solely on your inputted length, elbows, etc. and loss coefficients, just as it would for an uninstalled system.

HvMeasurement

1. Currently free for those with a valid license to use Heavent

2. Download from www.IndustrialVentilation.HvMeasurement.html
3. Works only with TSI PVM100 and TSI DP-Calc 8702 family
4. On most computers must use a USB to serial converter (some work well, some don't).

Density and Changes in Q Due to Density

1. Why does the density of the air decline all the way to the fan and why does the airflow seem to increase all the way to the fan?

   Answer: The density of the air changes with the pressure in the ducts. For a negative pressure the density is reduced. Since the magnitude of the negative pressure increases as you approach the fan, the density also decreases as you approach the fan. Likewise, since air expands with decreasing density, Heavent shows the airflow increasing as you approach the fan.

2. How do I handle a duct connection that begins with 75 ft of duct lined with refractory material given that the temperature starts at over 2,000 F and exits the lined section and enters the cast iron section at 500F?

   This is a severe problem for Heavent (and any other program). Heavent assumes no loss of heat from the ducts, allowing use of conservation of heat. If it did allow loss of heat, it would have to ask you to input how much the duct would lose in each section. In addition, it is highly unlikely that loss coefficients that worked at lower temperatures and densities would be at all accurate when applied to such high temperatures.

   Even with default values, this would greatly complicate user inputs and would probably leave Heavent guessing what was going to happen. Given the rarity of such severe temperature levels and heat losses, it is better to avoid the issue and to use work-arounds for cases like this.

   One option is to:
   1) estimate what the temperature is when it reaches a stable temperature in the duct.
   2) use your experience to estimate the pressure drop in the lined portion at high temperatures
   If you know the SP in the lined duct for a given airflow, you can estimate it for different airflows in the same lined duct from:

   $$SP_2 = SP_1 \times (Q_{scfm2}/Q_{scfm1})^2 \times density_1/density_2$$

   3) Input the computed value of SP_2 into the branch as SP_{other} and otherwise ignore

the lined section of duct in the model of the system.

Transferring License to use Heavent

1. My understanding is that the license can be transferred with payment of a fee. Is that correct?

   Answer: You can transfer a single license within a company for a fee (see website for costs) with the agreement of Steven Guffey, PhD, if the previous licensed user will not be using Heavent any more.

   Updates (see last item for most recent update)

Recent History of Updates

13-Sep-2001 to 1-Oct-2001: fixed problem with adding ducts downstream of fan; fixed presentation of Fhood value on air-cleaner screen

28-Nov-2001: fixed bug in air-cleaner screen that caused freeze-up under some conditions
Improved error handling and reporting.

11-Dec-2001: fixed bug in printing that crashed the program when the system schematic is very large in total length.

31-Dec-2001: fixed many annoying bugs inadvertently introduced in previous version. None affected computation accuracy; all were related to inputting or displaying data. Most involved inputting psychrometric values and default values.

3-Jan-2002: fixed bug in airflow-psychrometrics that caused crash.

20-Jan-2002: improved input of data in Quick Inputs and in Psychrometrics

4-Feb-2002: fixed bug causing loss of inputs if changed ID of air-cleaning device. Changed splash screen to require confirmation (by clicking 'Yes' when queried) that licensed user is using the program.

14-Feb-2002: added ability to Schematic view to add manual dampers and booster fans. Improved screen inputs for miscellaneous (now 'Junctions')

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30-May-2002: fixed errors in initial selection of diameters and erratic behavior of "fixing" ducts. Several cosmetic changes.

7-June-2002: fixed error in previous installation, which failed to include a specific file, sabotaging installation. Greatly improved fan system effects inputs.

15-July-2006: Bug: not saving information on slots in hoods. I am working on it. It should be fixed within the week and posted.

31-July-2006: Installation failed to register richtx.ocx. Re-wrote installation and posted new setup.exe.

4-October-2006: Elbows-roughness-length screen was crashing because of a reference to a newly nonexistant menu item. This was fixed. Also disabled the measured values input screen temporarily in anticipation of the release of a data acquisition module that makes this screen obsolete. I hope to release that new application by the end of October if all goes well. If you need to use the measured values feature before then, please let me know.

4-May-2014: Numerous small improvements

