Elite Software HEAVENT

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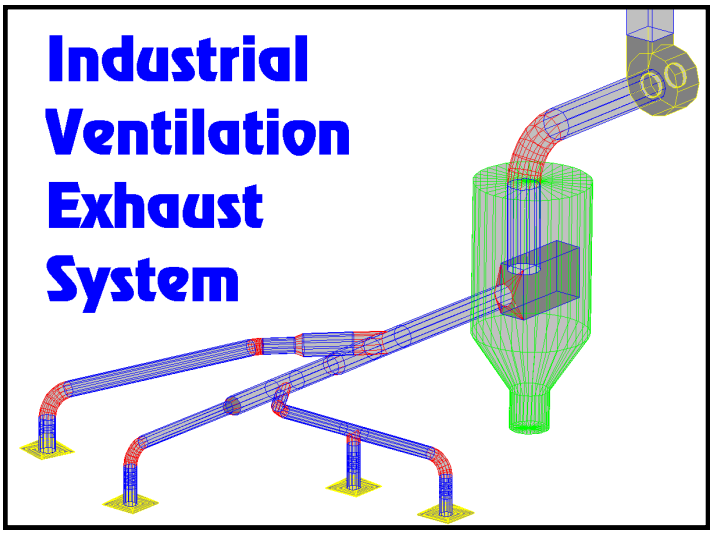

HEAVENT OVERVIEW

The Elite Software HEAVENT program analyzes industrial ventilation and exhaust duct systems. HEAVENT aids in new system design, commissioning and trouble shooting, and in redesign and balancing of existing systems. With HEAVENT, optimal duct sizes can be determined that maintain both the minimum desired velocity and balanced static pressures at all duct junctions. HEAVENT can work with round, rectangular, and flat oval ducts of any duct material desired. HEAVENT has provision for virtually all types of components found in ventilation and exhaust systems including: ductwork, hoods, fans, collectors, blast gates, system effect factors, and all types of fittings. Hoods can be selectively designed with any slot dimensions and taper desired and with and without a filter. A hood can also be a “naked” duct flanged or unflanged or simply an open elbow fitting. Suggested air flows are given for common hood designs. Collectors can be specified as fabric filter, mechanical, electrostatic, wet, or as a combined fan and collector. All types of air cleaning devices are handled including bag and envelop filters, baffle, skimming and settling chambers, single and multiple cyclones, afterburners, spray tower and fiber cell gas absorbers, and deep and shallow bed gas adsorbers. HEAVENT can also calculate the effect of temperature changes and moisture addition/removal that dryers, wet collectors, and other such items might have on the air. Essentially, HEAVENT can be instructed to work with standard sea level air or to adjust air quantities and properties as dictated by the psychrometric air conditions. In achieving balanced static pressures at junctions, HEAVENT allows the designer to quickly experiment with the effects of changing a duct size, fitting type, branch entry angle, hood data, or even a blast gate. HEAVENT calculates extremely fast and performs extensive error checking of the duct system.

DEMONSTRATION VERSION

If you would like to evaluate HEAVENT in further detail, you can ***download free of charge*** a functional demo of HEAVENT from Elite’s web site, **www.elitesoft.com** The demo version is a full version of the program but with the limitation of not allowing the project data to be saved.

HEAVENT FEATURES

- Analyzes Industrial Ventilation & Exhaust Duct Systems
- Able to Design Large Systems (up to 320 branches)
- ***Sizes Round, Rectangular, and Flat Oval Ductwork***
- Calculates Flows, Velocities, Pressures & Temperatures
- Manual or Automatic Duct Diameter Selections
- Handles All Types of Fittings and Branch Entry Losses
- ***Achieves Balanced Static Pressures at all Duct Junctions***
- Helps Size Hoods and Slot Dimensions
- Shows Schematic Layout of the System as well as Summary Tables of Specified and Computed Data
- ***Accounts for Non-Standard Air Conditions***
- Works with English or Metric Units
- Calculates immediately as you input or change values
- Provides Comprehensive and Concise Reports
- Instantaneous Input Error Checking

CALCULATION METHOD

HEAVENT uses the design methods and data explained in the ACGIH Industrial Ventilation Manual. All output reports can be easily verified by hand.

PROGRAM INPUT

HEAVENT uses a graphic data entry system that provides a schematic sketch of the duct system as you enter data. Heavent requires no arbitrary subsystem "naming" conventions ("parent-child-daughter") as you define a duct system, yet you can design very large systems with up to 320 branches. There are no commands to memorize and required inputs are kept to a minimum through extensive user-settable defaults and intelligent guesses about your next selection. Loss coefficients and table values are displayed when needed. All input data is checked at the time of entry so that no improper data can be entered. Five major types of data are requested: General Project Information, Ducts, Hoods, Collectors, and Fans. The general project data includes the date, project location, client, designer, and project name, the elevation, room conditions, duct material data, and fitting database. Duct section data must be given beginning and ending node numbers, shape (round, rectangular, or flat oval), dimensions, and lengths. A duct section can include any combination of duct runs and fittings. Hoods, collectors, and fans are entered as occurring at a particular node number. Hoods require a design cfm, duct entry loss factor, minimum duct velocity, slot data, and additional loss data. Collectors require the collector type (fabric, mechanical, electrostatic, wet, or fan/ collector), design pressure drop, design flow rate, duct reentry loss factor, and minimum outlet velocity. Fans require entry of the inlet diameter, outlet area, fan speed, blast to outlet area ratio, outlet elbow direction, and fan performance data concerning static pressure and cfm values. Both the total and static pressures of the fan are calculated. HEAVENT also handles the effects of poor inlet and outlet conditions on the fan performance.

SYSTEM REQUIREMENTS

HEAVENT is a Windows program and will run on any computer with Windows ‘95 or higher, including Windows 7 and 8.

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PROGRAM OUTPUT

The HEAVENT Program provides eight tables of data for concerning connections, air flow conditions, fitting data, entry angles and VP coefficients, slot/plenum data, static and velocity pressures, and damper performance data. Additional reports give specifics on hoods, fan inlet and outlet conditions, and details concerning all air cleaning devices and collectors. Reports may be viewed on screen and printed as desired.

	Hood	Reco...	Hood								Source	
ID	Type	Vel	AboveTa...	Flan...	Heighl	Width	Depth	Lx	Ly	Height	Width	Depth
20	---	---	---	---	---	---	---	---	---	---	---	---
30	---	---	---	---	---	---	---	---	---	---	---	---
40	---	---	---	---	---	---	---	---	---	---	---	---

Conditions at the fan inlet and outlet

	Inlet	Outlet	Units
Qact	4417	4417	cfm
Qstd	4322	4322	cfm
DenFact	0.99	1.0	
Tdb	70.0	70.0	F
w	0.01	0.01	
SP	1.87	0	in. wg
VP	0.39	0.38	in. wg
Dia	18.0	18.0	in.
Fsystem	0	0	

Actual Fan Pressures and Fan Table Pressures

	Actual	Table	Units
Qact	4,417	4,417	cfm
FanSP	1.485	1.499	in. wg
FanTP	1.87	1.887	in. wg

Air-Cleaning Device(s)

ID	Qinlet	Tinlet	Texit	Winlet	Wexit	SPfixed	SPknown	Qknown	DFknown	Exponent	SPdevice	Fhood
630	4414	70.0	70.0	0.008	0.008	0	0	3628	1.0	0	0	0.25

Table 1 of 8: Connections; Duct Cross-Section; Density

ID	DuctType	Label	UPb1	UPcoll	UPb2	DownId	Shape	Dia.	Width	Ga	H2O	Tdb	DenF
10	Branch		0	0	0	140	Round	7.0	0	20	0.008	70	0.992
20	Branch		0	0	0	140	Round	7.0	0	20	0.008	70	0.992
30	Branch		0	0	0	240	Round	7.0	0	20	0.008	70	0.992
40	Branch		0	0	0	340	Round	7.0	0	20	0.008	70	0.992
140	Submain		0	10	20	240	Round	10.0	0	20	0.008	70	0.992
240	Submain		0	140	30	340	Round	14.0	0	20	0.008	70	0.992
340	Submain		0	240	40	630	Round	16.0	0	20	0.008	70	0.992
630	Collector		0	340	0	639	Round	18.0	0	20	0.008	70	0.992
639	Fan Inlet		0	630	0	640	Round	18.0	0	20	0.008	70	0.991
640	Fan		0	639	0	641	Round	18.0	0	0	0.008	70	0.991
641	FanExhaust		0	640	0	1000	Round	18.0	0	20	0.008	70	0.995

Table 2 of 8: Airflow Level; Velocity, Length & Roughness

ID	DuctType	Label	Qinputbas	Qinput	Qdrv	QactInt	QactFinal	Vt	Vel	Length	Roughnes
10	Branch		dry air at l	999.0	999.0	1,180	1,229	3000	4,599	0	0.0004
20	Branch		dry air at l	999.0	999.0	1,020	1,062	3000	3,974	0	0.0004
30	Branch		dry air at l	999.0	999.0	1,059	1,103	3000	4,126	0	0.0004
40	Branch		dry air at l	999.0	999.0	1,020	1,020	3000	3,816	0	0.0004
140	Submain				2,155	2,201	2,292	3000	4,202	0	0.0004
240	Submain				3,191	3,395	3,395	3000	3,175	0	0.0004
340	Submain				4,322	4,414	4,414	3000	3,161	0	0.0004
630	Collector				4,322	4,415	4,415	3000	2,498	0	0
639	Fan Inlet				4,322	4,417	4,417	2400	2,500	0	0.0004
640	Fan				4,322	4,420	4,420	2400	2,501	0	0.0004
641	FanExhaust				4,322	4,400	4,400	2400	2,490	0	0.0004

Table 3 of 8: Elbow Data

ID	DuctType	Label	NEL15	NEL30	NEL45	NEL60	NEL75	NEL90	Nel	Eq90
10	Branch		0	0	0	0	0	0	0	0
20	Branch		0	0	0	0	0	0	0	0
30	Branch		0	0	0	0	0	0	0	0
40	Branch		0	0	0	0	0	0	0	0
140	Submain		0	0	0	0	0	0	0	0
240	Submain		0	0	0	0	0	0	0	0
340	Submain		0	0	0	0	0	0	0	0
630	Collector		0	0	0	0	0	0	0	0
639	Fan Inlet		0	0	0	0	0	0	0	0
640	Fan		0	0	0	0	0	0	0	0
641	FanExhaust		0	0	0	0	0	0	0	0

Sample Reports

Table 4 of 8: Entry Angle; VP Coefficients

ID	DuctType	Label	J-angle	Fhood	Fel	Fentry	FcorrEntr	Fmisc	Sum CF
10	Branch		0	0.25	0.19	-.26	0	0	0.989
20	Branch		45	0.25	0.19	0.068	0	0	1.318
30	Branch		45	0.25	0.19	0.142	0	0	1.392
40	Branch		45	0.25	0.19	0.152	0	0	1.402
140	Submain		0	0	0.19	-.23	0	0	-.23
240	Submain		0	0	0.19	-.18	0	0	-.18
340	Submain		0	0	0.19	0	0	0	0
630	Collector		0	0.25	0	0	0	0	0
639	Fan Inlet		0	0.25	0.19	0	0	0	1.25
640	Fan		0	0.25	0.19	0	0	0	0
641	FanExhaust		0	0	0.19	0	0	0	0

Table 5 of 8: Slot/plenum Data

ID	DuctType	Label	Nslot	Lslot	Hslot	VTslot	Fslot	Vslot
10	Branch		----	----	----	----	----	----
20	Branch		----	----	----	----	----	----
30	Branch		----	----	----	----	----	----
40	Branch		----	----	----	----	----	----
140	Submain		----	----	----	----	----	----
240	Submain		----	----	----	----	----	----
340	Submain		----	----	----	----	----	----
630	Collector		----	----	----	----	----	----
639	Fan Inlet		----	----	----	----	----	----
640	Fan		----	----	----	----	----	----
641	FanExhaust		----	----	----	----	----	----

Table 6 of 8: Static Pressures; Velocity Pressure

ID	DuctType	Label	SPslot	SPo	SPrun	VP	SPH	SPbr	SPJ	SPmain
10	Branch		----	0	1.293	1.308	1.711	1.551	1.286	0
20	Branch		----	0	1.287	0.977	1.278	1.163	1.286	0
30	Branch		----	0	1.465	1.053	1.378	1.251	1.462	0
40	Branch		----	0	1.263	0.901	1.179	1.073	1.263	0
140	Submain		----	0	0.254	1.092	0	0	1.462	1.657
240	Submain		----	0	0.114	0.623	0	0	1.263	1.345
340	Submain		----	0	0	0.618	0	0	1.389	1.358
630	Collector		----	0	0	0.618	0	0	1.389	1.389
639	Fan Inlet		----	0	0.483	0.386	0	0	1.872	1.853
640	Fan		----	0	0	0.386	0	0	1.872	1.872
641	FanExhaust		----	0	0	0.385	0	0	0	0

Table 7 of 8: Damper and Troubleshooting Coefficients, Measured Values

ID	DuctType	Label	Fdamp	Fcorr	SPrat	Xrun	Xend	meas V	meas SPI	meas SP	meas Xru	meas Xer
10	Branch		0	0	1.103	0.186	0.186	0	0	0	999.0	999.0
20	Branch		0	0	1.1	0.19	0.19	0	0	0	999.0	999.0
30	Branch		0	0	1.101	0.188	0.188	0	0	0	999.0	999.0
40	Branch		0	0	1.098	0.192	0.192	0	0	0	999.0	999.0
140	Submain		0	0	0	0.32	0.518	0	0	0	-1.229	999.0
240	Submain		0	0	0	0.441	1.158	0	0	0	-1.793	999.0
340	Submain		0	0	0	0.236	1.198	0	0	0	-1.983	999.0
630	Collector		0	0	0	0.681	2.6	0	0	0	-2.223	999.0
639	Fan Inlet		0	0	0	1.202	3.799	0	0	0	-3.653	999.0
640	Fan		0	0	0	0.051	3.845	0	0	0	-4.879	999.0
641	FanExhaust		0	0	0	0	0	0	0	0	0	999.0

Table 8 of 8: Description/Comments

ID	DuctType	Label	Fcorr
10	Branch		0
20	Branch		0
30	Branch		0
40	Branch		0
140	Submain		0
240	Submain		0
340	Submain		0
630	Collector		0
639	Fan Inlet		0
640	Fan		0
641	FanExhaust		0