

WinVent

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A Software for the Calculation of Explosion Protection Devices for Dust, Gas and Hybrid Mixtures



In publishing the Guideline VDI 3673 Part 1, November 2002 the issue VDI 3673, 1995 is being recalled. Consequently WinVent 2.5 and 3.0 must also be recalled and replaced with the new WinVent 3.1.

Based on the new release of the guideline VDI-3673 Part 1, November 2002, the book of W. Bartknecht "Explosionsschutz, 1993", the draft of the EN standard "Dust Explosion Venting Systems" and NFPA 68, "Edition 2002". The software calculates all the required information for explosion venting of vessels, silos and rectangular enclosures.

Complete calculations are given by the maximum recoil force, the duration of the recoil as well as the transferred impulse, flame and pressure development in the vicinity of vented equipment.

Versatile in choice of dust dispersion, type of venting device and influence of the vent pipe.

Easy to use while WinVent runs under Windows 95 / 98 / NT / 2000 / ME / XP. The comprehensive and illustrated help gives additional information and practical hints.

1. Application of WinVent 3.1

The application especially with the new changes of WinVent will be briefly explained. It compares the calculation gained from the old version 2.5 with the new version 3.1.

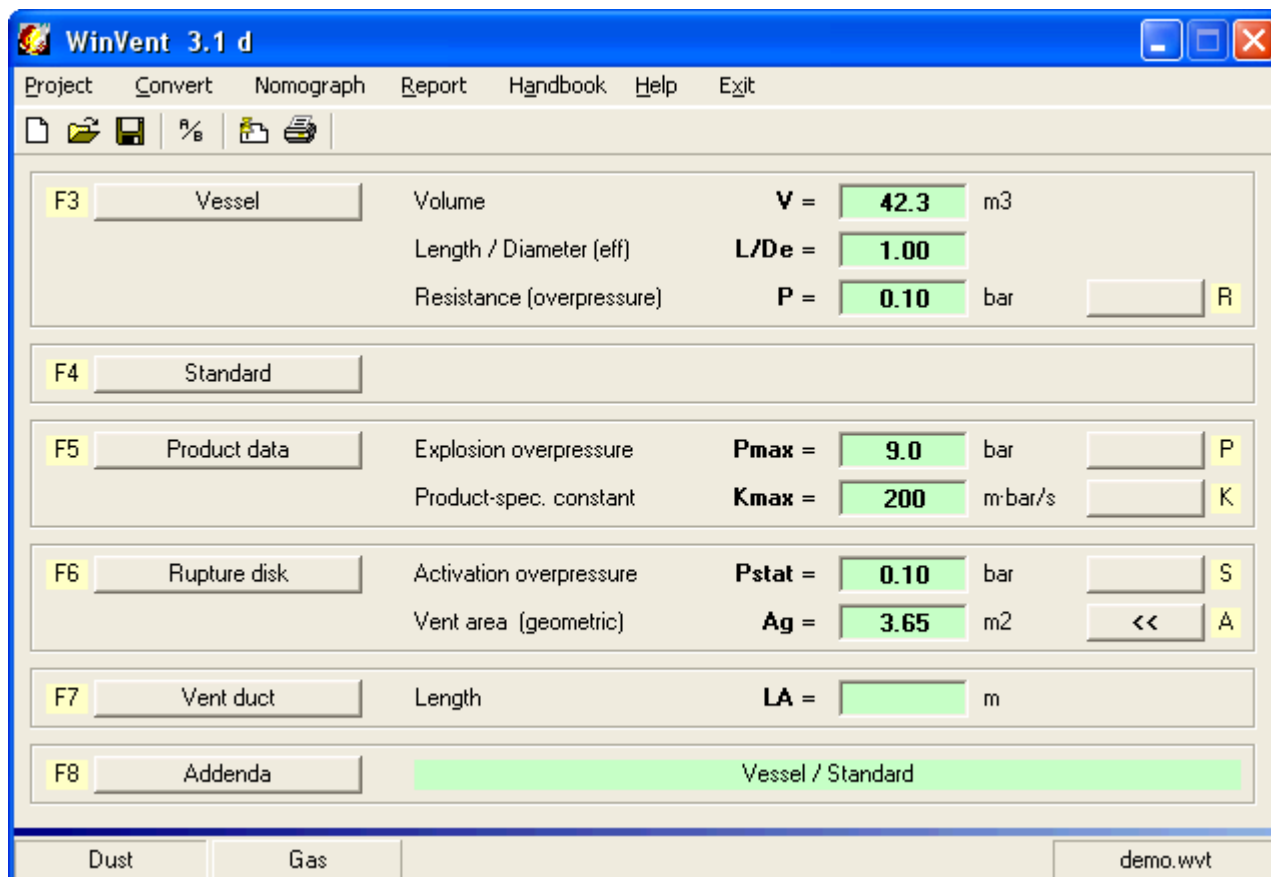


Figure 1. WinVent 3.1 main picture

2. Calculation of the vent area

WinVent 2.5

The requirement of vent area increases with increasing H/D ratio. This effect only becomes relevant for $H/D \geq 2$. Therefore there are cubic vessels in which the ratio of height to diameter $H/D < 2$; and elongated vessels (lying on their side or upright) in which the ratio of the height to the diameter $H/D \geq 2$. Example:

- a) $H/D = 1.0$: $A = 3.1 \text{ m}^2$
- b) $H/D = 1.5$: $A = 3.1 \text{ m}^2$
- c) $H/D = 2.0$: $A = 5.0 \text{ m}^2$

WinVent 3.1

The requirement of vent area increases with increasing H/D ratio. This effect has already been taken into account when the ratio $H/D > 1$, e.g. $H/D = 1.1$. Therefore for the vent area calculation no differentiation between compact and elongated vessel is made. Example:

- a) $H/D = 1.0$: $A = 3.1 \text{ m}^2$
- b) $H/D = 1.5$: $A = 4.2 \text{ m}^2$
- c) $H/D = 2.0$: $A = 5.0 \text{ m}^2$

3. Calculation of the volume of the vessel

WinVent 2.5

With this version only the volume of cylindrical or rectangular shape can be calculated. The calculation of composite volumes / equipment such as the volume of a spray dryer or a filter is not possible.

WinVent 3.1

With the new version, volume calculation for the most technical equipment is no problem any more. For example a detailed filter (bag house) volume calculation is easily done with the dimensions in meters (Fig. 2), but calculating in inches or feet dimensions is also possible by changing the "input dimensions".

The screenshot shows the WinVent 3.1 software interface for calculating the volume of a cylindrical bag house. The interface is divided into several sections:

- Navigation:** Rectangular, Cylindrical, Cyclone, Enclosure, Handbook.
- Equipment Selection:** Cylindrical Bag House, Vent on Cylinder.
- 3D Model:** A 3D model of a cylindrical bag house with a hopper at the bottom. Dimensions are labeled: body diameter (4.00), clean air (1.00), bag length (4.00), bag diameter (0.150), no. of bags (50), vent to top (1.50), vent height (1.20), body height (4.00), hopper (1.80), and bottom diameter (0.300). The unit is [m].
- Results Table:**

Clean Air Plenum	12.57	m ³
Bag Total	3.53	m ³
Dirty Air Plenum	37.70	m ³
Hopper	8.15	m ³
Total Volume	58.41	m³
Dirty Volume	V = 42.31	m ³
Linear length	L = 3.10	m
Diameter (eff)	De = 3.74	m ²
- Resistance and Pressure:**

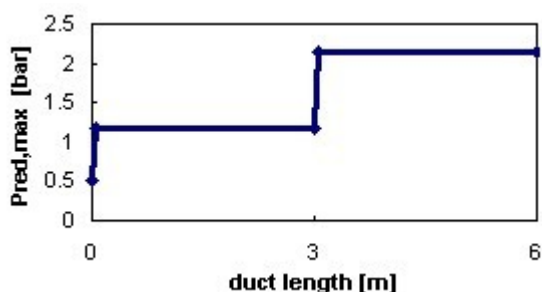
Resistance	P = 0.10	bar
* Pressure (abs)	Pb = 1.00	bar
- Check parameter:** * Check parameter
- Input dimensions:** meters

Figure 2. Example of the detailed volume calculation of a cylindrical bag house (filter) with the WinVent 3.1

4. Calculation of the influence of vent duct

WinVent 2.5

The calculation of the influence of vent duct length on the maximum explosion overpressure $P_{red,max}$ is a step function (Fig. 3, left). There are only two possibilities, one for pipe length greater than 0 m to 3 m and the other greater than 3 m to 6 m. A vent duct length over 6 m is not allowed to be installed.



WinVent 3.1

The calculation of the influence of vent duct length on $P_{red,max}$ is not anymore a step function (Fig. 3, right). For any duct length L , the $P_{red,max}$ increase can be calculated. The effect of vent duct upon pressure increase is most pronounced when the flame propagation in the duct reaches the velocity of sound. This will occur at a duct length L_S . Vent ducts with a length of $L > L_S$ have no additional effect on the pressure increase. This is in Figure 3 the case for $L = L_S = 5.9$ m.

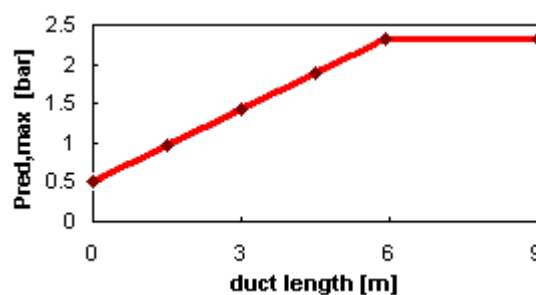


Figure 3. Comparison of the effect of vent duct with different length upon pressure ($P_{red,max}$) increase

5. Additional Changes

Flame propagation:

The maximum outside range requirement of a flame LF originated from a vessel increases with increased volume of the vented vessel:

WinVent 2.5

$$LF = 8 \cdot V^{1/3} \text{ in m}$$

This amount for e.g. a 100 m³ spray dryer in:

$$LF = 37 \text{ m}$$

WinVent 3.1

$$LF = 10 \cdot V^{1/3} \text{ in m}$$

This amount for e.g. a 100 m³ spray dryer in:

$$LF = 46 \text{ m}$$

Vent calculation for gases mixtures:

The calculation of the vent area in m² of gas-air-mixtures can be done for the following H/D ratios:

WinVent 2.5

H/D ratios of 2 or less

WinVent 3.1

H/D ratios of 5 or less

Order form:

Order no. SP3501 **WinVent - Software 3.1** on CD-ROM

Price: EUR 300.- Delivery: ex stock

Based on the attractive price of WinVent upgrades are not planned.

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