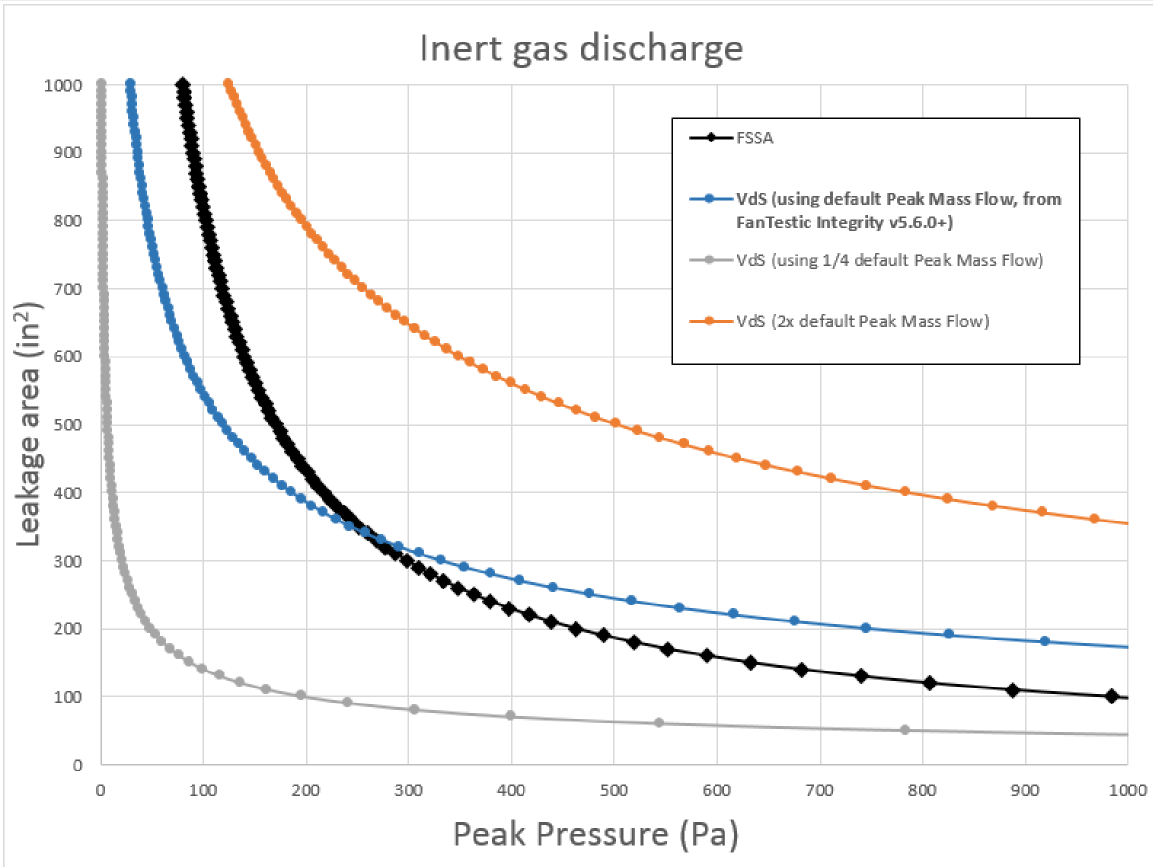
Explanation of Peak Pressure and Venting Equations



There is a discrepancy between equations that predict the vent area required to keep peak pressure in an enclosure below a specified peak pressure limit during a clean agent discharge. VdS equations (for all agents) and FIA equations (for inert agents) are based on formulae that require knowledge of the peak mass flow rate that will occur during a discharge. FSSA equations are experimentally derived and require only that a value for leakage area and the agent in use be known by the software users.

VdS (and FIA inert) peak pressure equations vary according to a power of 2 function of the leakage available during discharge and the peak mass flow rate which in theory may have been a good idea. But the extensive testing that went into developing the peak pressure equations for FSSA showed that peak pressure actually varies according to a power of the leakage that depends on the agent in use and is closer to 1. These experimentally derived values for power are included in the software, and so the user is not required to estimate or determine the peak mass flow rate.

Because of the discrepancy in the peak pressure equations which are used to calculate the required leakage area and determine what size pressure relief vents will be needed, the software provides a default peak mass flow rate that will give a result that is close to experimental results at expected peak pressures if the user chooses or is required to use VdS equations. The default was chosen so that at a peak pressure of 250 Pa the required vent area will be about the same regardless of what peak pressure formulae are used.

If users choose to change the default then it is up to them but at least the defaults lead them in the correct direction. The worry is that if users of VdS make the peak mass flow rate smaller than the default, they could end up specifying a vent for a given enclosure pressure limit that is too small, which would result in over-pressurization of the enclosure during discharge and possible damage. If they make the peak mass flow rate larger than the default, they could end up specifying a vent that is too large, resulting in a wasted resources.

The VdS equations when used with halocarbon agents pose further problems. The VdS equations do not provide a way to predict negative peak pressures, and do not take into account relative humidity in the enclosure during discharge. Experimental testing indicates that negative peak pressures during discharge may in fact be greater than the positive. The FSSA equations provide equations for predicting the peak pressures that will result in both positive and negative directions as well as taking into account humidity.

Because VdS equations do not specify a particular value for the negative peak pressure, designers may choose to install single direction pressure relief vents (PRVs) which will not relieve the negative peak pressure pulse, and could lead to enclosure damage during the halocarbon discharge.

Retrotec believes the FSSA equations are more realistic than VdS equations and our new FanTestic Integrity version has numerous warnings to educate the users and help them ensure the PRV's being specified will be adequate to the job.