

Hazardous Location Enclosure Cooling Solutions

Combustible vapors, liquids, gases, or flammable dusts are often present in many industrial applications. These materials are safe in small amounts, but when they exist in abundance, they become a hazard. These hazards wreak havoc, causing damage to equipment and property, harming employees, and hurt profits.

With the implementation of the correct equipment, these costly hazards can be contained and controlled, making an explosion or large fire avoidable.

For electrical enclosures that are in these potentially hazardous locations, Vortec's line of Hazardous Location Vortex A/C units are an excellent addition to keep expensive equipment cool and safe while keeping stray sparks away from hazardous materials.

Let's Talk About Explosions

Technically speaking, an explosion is defined as a violent expansion in which energy is transmitted outwards as a shock wave. When this happens in real life, explosions are dangerous. Accidents occur most frequently where hazards are present: in chemical plants, refineries, paint shops, cleaning facilities, mills, flour silos, tanks, and loading facilities for flammable gases, liquids, and solids.

Factors that cause explosions:

1. Flammable Substance (Fuel)

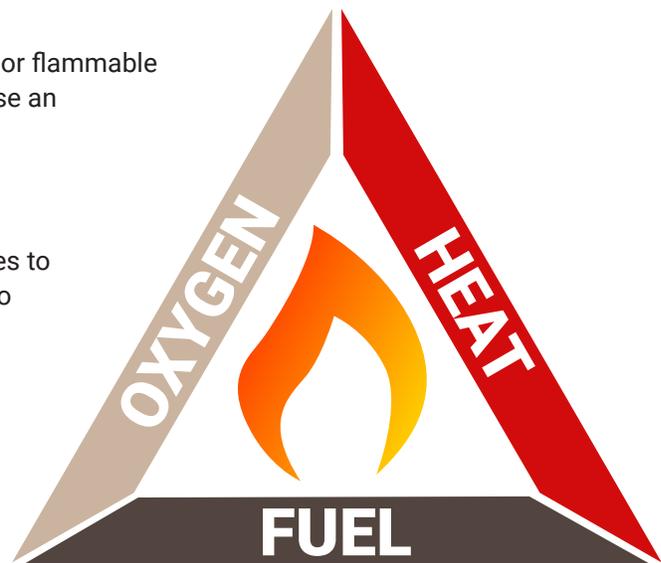
There must be enough flammable gas, liquid, vapor, or flammable solid to produce an ignitable mixture that could cause an explosion or fire. Without fuel, a fire cannot burn.

2. Oxidizer (Air)

An oxidizer is a type of chemical which a fuel requires to burn. There must be enough of an oxidizer present to cause an explosion.

3. Source of Ignition (Heat)

A spark or high heat must be present. A fire can't start without a source to light it or heat high enough to cause the material to light on its own.



Major causes of industrial fires and explosions:

Every year, industrial fire protection standards improve to ensure the best practices are followed on how to prevent accidents. Factors like combustible dust are a very well-known cause of fires. However, in most cases, fires and explosions spark from preventable reasons, such as:

1. **Static electricity**
2. **Hazardous, dirty, or impure chemicals**
3. **Combustion engines**
4. **Hot work**
5. **Mechanical sparks**
6. **Faulty electrical wiring**
7. **Faulty equipment and improper maintenance**
8. **Careless smoking of cigarettes**
9. **Failure to properly train employees**
10. **Failure to ensure employees are complying with regulations**

Controlling Explosions Caused by Electrical Equipment

Unfortunately, flammable substances are not always avoidable (ex. dust in flour silos). Therefore, it is of great importance that electrical equipment, such as enclosures and their cooling equipment, are properly fitted to the environment in which they will be installed.

When these environments are unavoidable, isolating any one of the elements that can cause an explosion (fuel, air, or heat) is critical. Removing one of the elements from the ignition triangle can provide explosion protection and preclude unwanted, uncontrolled, and often disastrous explosions. If one of the three elements of the ignition triangle is missing, ignition will not occur.

To protect against the likelihood of ignition and/or explosion by electrical equipment you should take the following steps:

Confine the Explosion

Often enclosures are used to contain an explosion. They are designed and tested for situations where the hazardous substance enters an enclosure and is ignited by an electrical spark or hot surface. It's important that the enclosure, as well as its purge and cooling systems are all rated to prevent explosions and contain hazards.

Limit the Energy

Many enclosure coolers use a solenoid valve and electric thermostat to control the cooling in an enclosure, but these devices should be avoided in Hazardous Locations due to their potential to create a spark. A compressed air operated enclosure cooler with a mechanical thermostat is an intrinsically safe option for cooling electric enclosures in hazardous locations. Another source of ignition could be hot components: by using an enclosure cooler, components are kept cool, and ignition is less likely.

Isolate the Hazard

Keeping the hazard out of the enclosure is critical to prevent explosions. By maintaining a slight pressurization on the cabinet, unwanted dusts and gases are less likely to breach the enclosure.

Vortec's Hazardous Location Enclosure Coolers

Vortec A/C Enclosure Coolers ensure reliable and safe operation in hazardous environments. As soon as the cooling system turns on, it begins to cool the enclosure. Once the unit's integrated mechanical thermostat senses acceptable enclosure temperatures, the cooling system stops and the integrated check valve seals off the cold air outlet. This allows the purge system to create a positive pressure in the enclosure. The purge system will maintain the necessary pressure to block gases, vapors, dusts, fibers and contaminants from entering the enclosure. When it's time to cool the unit again, the Vortec A/C will turn on, maintaining the positive pressure. The mechanical thermostat makes the unit intrinsically safe.

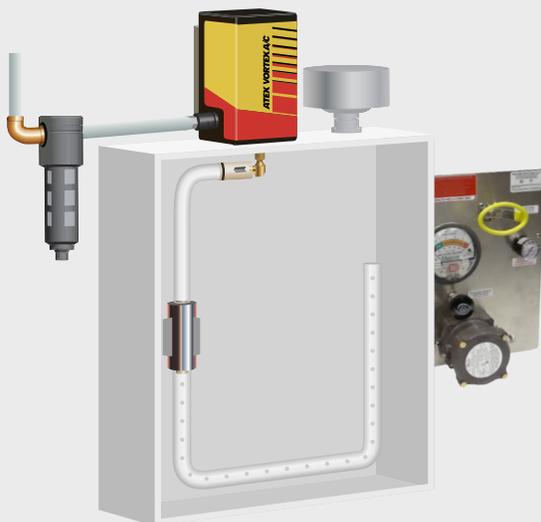
The HazLoc Vortex A/C is specifically designed for simple installation and flexible mounting, and provide the protection needed in hazardous environments, for most types of Hazardous Locations:

- **Vortec's Hazloc Vortex A/C** is certified to cool enclosures in Class I Div. 2 Groups A, B, C, and D, Class II Div. 2 Groups F&G, and Class III locations. It is safe for temperature class T4.
- **Vortec's ATEX Vortex A/C** is certified to cool enclosures in ATEX Zones 2 & 22 and T4 temperature class areas. (Ex II 3 GD T4).
- **Vortec's ProtEX Vortex A/C** is certified to cool enclosures in ATEX Zones 1 & 21, as well as UL Classified for Class I, Division 1, Groups A, B, C and D, Class II, Division 1, Groups F and G, Class III. These units are rated for T3 temperature class areas.

Vortec's HazLoc, ATEX, and ProtEX Vortex A/C models require the use of an approved purge and pressurized system to maintain the hazardous location ratings.

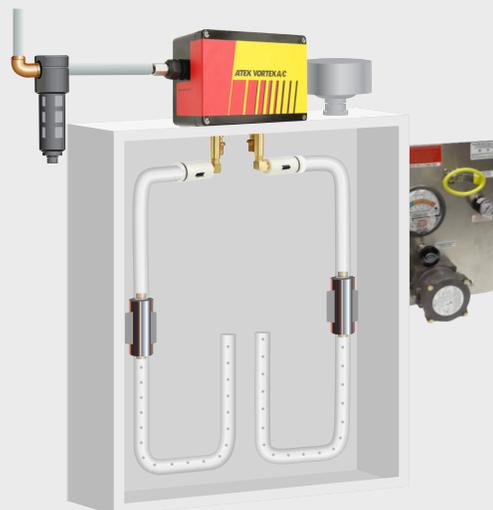
What Makes Vortec's Hazloc and ATEX Vortex A/C's Unrivalled?

The Hazardous Location Vortex A/Cs are designed to cool industrial control cabinets located in hazardous locations. They use dried, filtered, compressed air to generate cold air inside the cabinets. With no moving parts, Vortex A/C units eliminate the need for extensive maintenance and make the units extremely reliable.



SHOWN TOP MOUNTED ON CUSTOMER'S ENCLOSURE WITH PURGE SYSTEM AND SPARK ARRESTOR VENT

ATEX VORTEX A/C
900-2500 BTUH



SHOWN TOP MOUNTED ON CUSTOMER'S ENCLOSURE WITH PURGE SYSTEM AND SPARK ARRESTOR VENT

ATEX VORTEX A/C
5000 BTUH

These units feature:

- Sleek, modern design
- Noise reduction of 78%, when compared to other vortex enclosure coolers
- Requires no refrigerants
- Energy use reduction through its integral mechanical thermostat
- Quick and easy installation, complete in about 5 minutes
- Flexible installation: top, side, or front (door) mount
- Incorporated check valve to prevent loss of enclosure pressure when cooling is not required

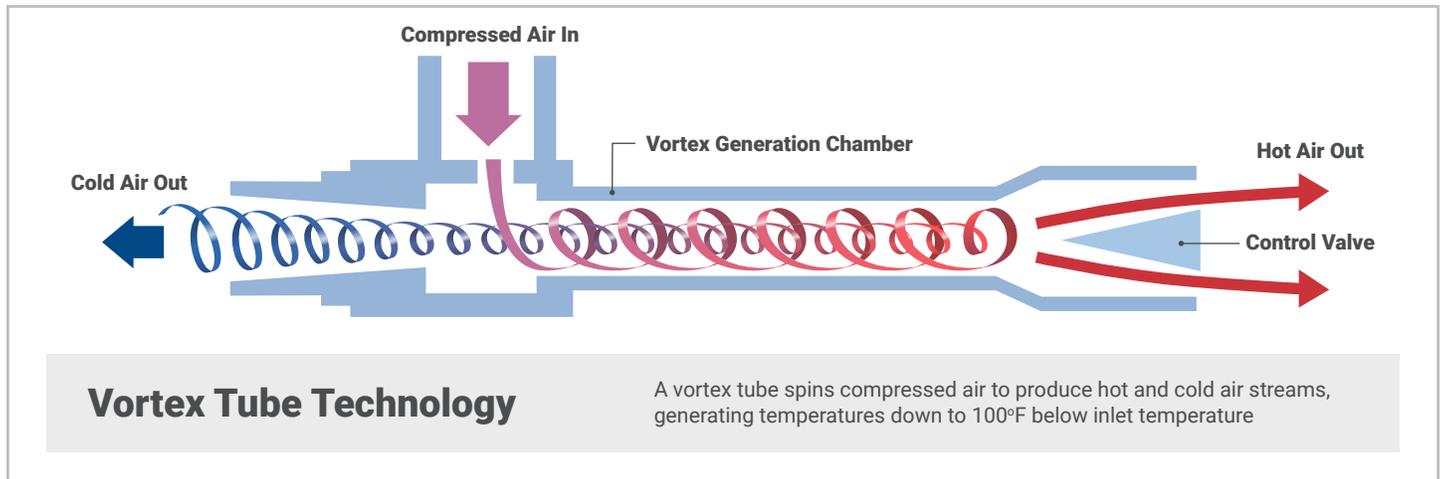
Hazardous location units come in three different hazardous location ratings with different cooling capacities to fit any application's specific needs. Vortec 70 scfm models feature Vortec's unique patented two-stage cooling system designed to conserve compressed air. During regular usage, the coolers utilize only the first cooling stage. However, when there is increased demand for cooling, whether due to high heat load in the enclosure, high ambient manufacturing facility temperatures, or hot weather conditions, the second cooling stage is activated. This allows us to save you energy, while providing the right cooling capacity to an enclosure.

Product Name	Rating	Thermostat	Cooling Capacity (BTUH)	Air Consumption (SCFM)	Sound Level	Model Number
ProtEx	ATEX Zones 1 & 21 Class I Div 1, Class II Div 1, Class III Groups A, B, C, D, F, G Temp Class T3	Mechanical	900	15	60 dBA	8115
			1500	25	66 dBA	8125
			2500	35	72 dBA	8135
			5000	70	75 dBA	8170
HazLoc	Class I Div 2, Class II Div 2, Class III Groups A, B, C, D, F, G Temp Class T4	Mechanical	900	15	60 dBA	7515
			1500	25	66 dBA	7525
			2500	35	72 dBA	7535
			5000	70	75 dBA	7570
ATEX	Zones 2 & 22 Temp Class T4	Mechanical	900	15	60 dBA	7415
			1500	25	66 dBA	7425
			2500	35	72 dBA	7435
			5000	70	75 dBA	7470

How Do Vortec Enclosure Coolers Work?

All of the hazardous location Vortex A/C's operate by using the patented vortex tube technology, which has been optimized for use in hazardous locations. A cylindrical generator uses compressed air to spin the compressed air, also known as a vortex, which separates air into hot and cold air streams.

The compressed air rotates at speeds up to 1,000,000,000 revolutions per minute, as it is forced down the inner walls of the hot end of the vortex tube. At the end of the hot tube, a small amount of air exits through a valve as hot air exhaust.



The remaining air is forced back through the center of the incoming air stream at a slower speed. This super-cooled air flows through the center part of the generator and exits through the cold air port which then cools the enclosure.

Certifications

The National Electrical Code (NEC) is a regionally adoptable standard for the safe installation of electrical wiring and equipment in the United States. The National Electrical Manufacturers Association defines the standards that are used in North American electrical enclosures and Underwriters Laboratories ensures that these standards are being followed.

ATEX is the name commonly given to the two European Union directives for controlling explosive atmospheres.

ATEX and NEMA are very similar certifications, both ensuring that equipment and protective systems are fit for their intended purpose. They also guarantee that adequate information is supplied with electrical equipment to certify that it can be used safely.

Special equipment must be used in these locations to prevent hazardous materials from becoming explosive or ignited. Buyers must understand the ratings that safety organizations have defined as safe equipment in these locations.

Using the correct electrical cabinet components will help to ensure the safety of employees, the prevention of property damage, and the loss of profits associated with explosions and fires in industrial locations.

Both the UL and ATEX have made a set of standards for equipment that separates different environments into classes hazardous conditions and risks. Zones and Group Zones are specific to ATEX ratings, while Divisions are specific to UL in North America.

Hazardous Material	UL Class / Division	ATEX Zone System	UL Groups	Group Zones
Gases or Vapors (acetylene, hydrogen, ethylene, propane)	Class I, Division 1 Class I, Division 2	Zone 0, Zone 1, Zone 2	A, B, C, D	II C, II B, II A
Combustible Dusts (electrically conductive dusts, carbonaceous dusts, agricultural dusts)	Class II, Division 1 Class II, Division 2	Zone 20, Zone 21 Zone 22	E, F, G	No Equivalent
Fibers or Flyings (cotton lint, flax, rayon)	Class III, Division 1 Class III, Division 2	No Equivalent	No Equivalent	No Equivalent

Conclusion

Vortec Hazardous Location enclosure coolers provide an intrinsically safe alternative to conventional enclosure cooling methods, such as air conditioners, fans or conventional vortex coolers. By keeping the enclosure slightly pressurized, Vortec Hazardous Location enclosure coolers keep hazardous components out of the cabinet; the use of a mechanical thermostat limits the energy, preventing sparks caused by electric thermostats; and the efficient and effective cooling minimizes hot surfaces that could cause ignition.

With models available for most location ratings, the Vortex A/C enclosure cooler family is an efficient and effective tool for maintaining the electronics in most industrial facilities.

About Vortec

As the first company to develop technology for converting the vortex tube phenomenon into effective industrial cooling applications, ITW Vortec prides itself on providing the best innovative compressed air solutions in the industry.

Since 1961 Vortec has continued to refine and expand vortex tube applications, as well as develop air amplification products. Purchased by Illinois Tool Works in 1990, Vortec is housed in the under the ITW Air Management business unit and works alongside Paxton Products to design quality engineered air systems.

The Vortec team is passionate about providing expertly designed compressed air solutions that improve efficiency and increase productivity. With our combined 200+ years of industry experience, we are committed to providing quality and timely service, advice, and products. Our products allow our customers to increase equipment efficiency, entrain air for conveying and blow off, along with delivering spot and enclosure cooling. We stand behind our products and offer the industry's best warranty.



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