HVAC

BONITRON

Cleanrooms
Data Centers
Hospitals
+More!

HVAC Solutions

- *HVAC demands vary among applications*
- *Many require constant power to prevent costly downtime.*
- *Trust a company with 20+ years of critical backup power experience*

Products

Uninterruptible Power for Drives
Dynamic Braking
Line Regeneration

Data Center Cooling

Heat continues to be the enemy of data center servers. Servers generate high levels Wof heat, but **must remain within a certain temperature range to operate.**

This requires an efficient cooling system that consists of multiple motor-driven components, including pumps and chillers that require constant power. **If a chiller loses power it can take up to 15 minutes to restart, leaving the data center without cooling.**

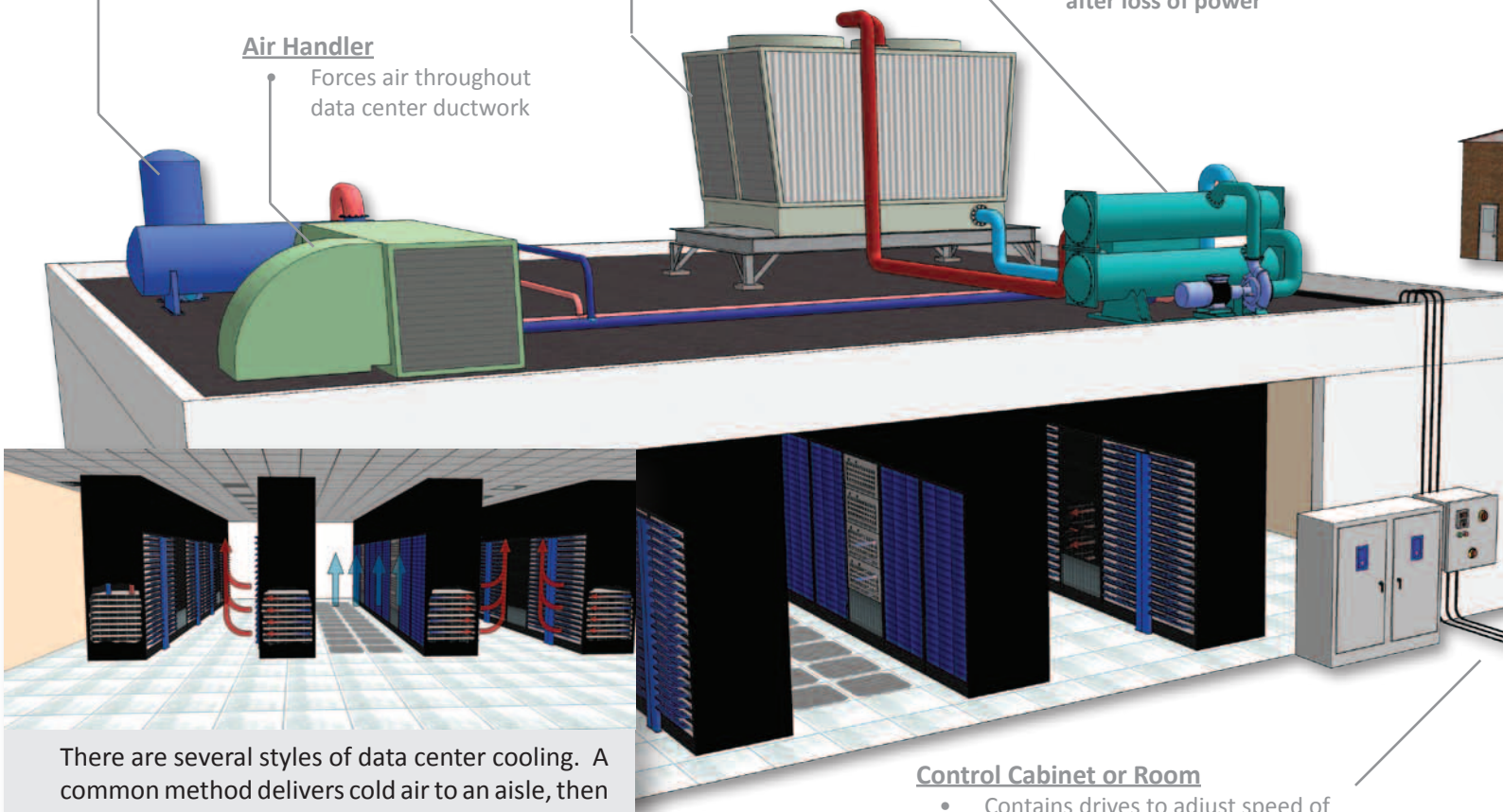
Variable speed drives are used to make the cooling system more efficient by offering variable flow rates on motors instead of simply off and on. This saves power, reduces maintenance costs, and allows extensive remote monitoring.

Chiller
- Cools water used in HVAC systems
- Requires uninterrupted power
- HVAC blows only warm air without chiller
- **Take a long time to restart after loss of power**

Cooling Tower
Dissipates heat from chiller

Heat Exchanger
Heat is extracted from system

Air Handler
Forces air throughout data center ductwork



There are several styles of data center cooling. A common method delivers cold air to an aisle, then is drawn through the servers and hot air exits into the hot row, and is drawn from the room.

Control Cabinet or Room
- Contains drives to adjust speed of motors controlling HVAC equipment
- Contains Bonitron Uninterruptible Power for Drives

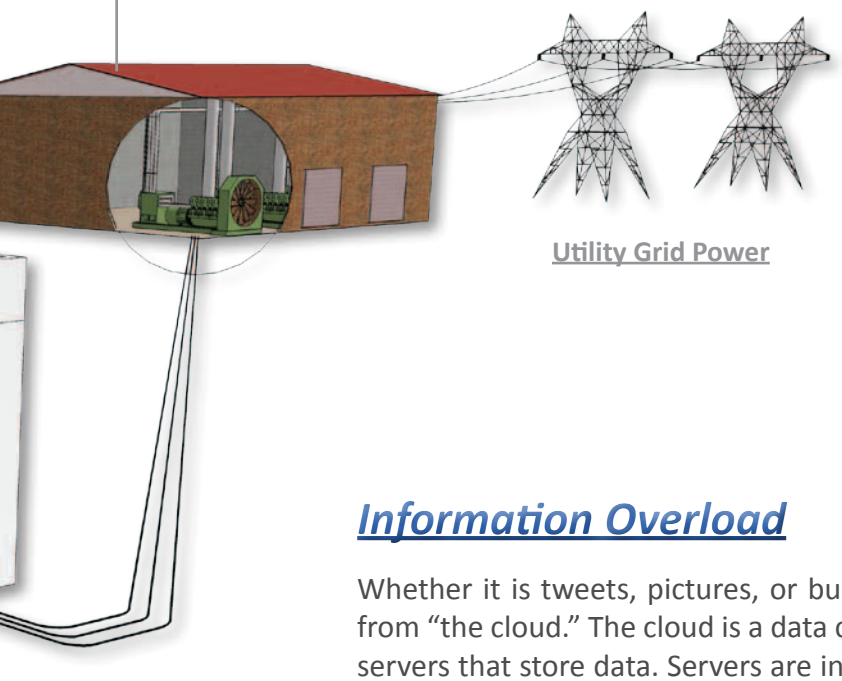
Power Disturbance

A minor fluctuation in power can quickly cause chaos in a data center. [While the servers may have backup power, the cooling system may not]. Without cooling, data centers must shut down within seconds to prevent overheating and damage. This leaves critical data unavailable.

An Emerson study suggest that the average downtime lasts around 90 minutes and costs over $500,000!

Generators

- Provide backup power during an outage
- 10-second startup time requires another power source to keep cooling systems running
- Slower startup time puts less stress on the generators and increases system reliability



Utility Grid Power

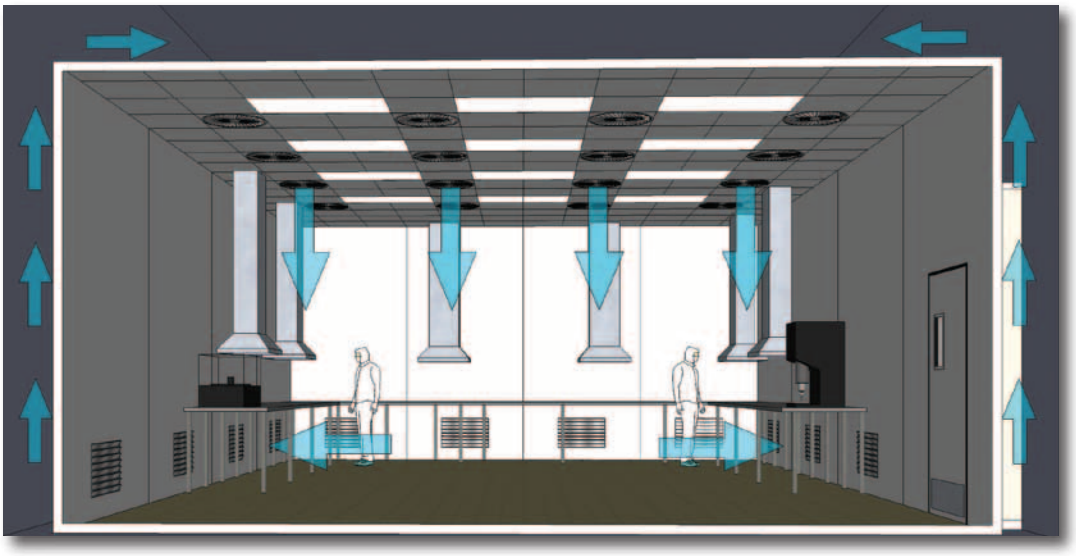
Roughly 1.8 trillion gigabytes of data was created in 2011 and according to researchers, data volumes are doubling every two years!

Information Overload

Whether it is tweets, pictures, or business documents, consumers are demanding more from "the cloud." The cloud is a data center like the one pictured, which houses numerous servers that store data. Servers are in high demand and continue to evolve to allow **more data storage in a smaller space**. Unfortunately, **servers of this magnitude emit high levels of heat** and **require powerful and reliable cooling systems.**

Cleanroom Air Handling

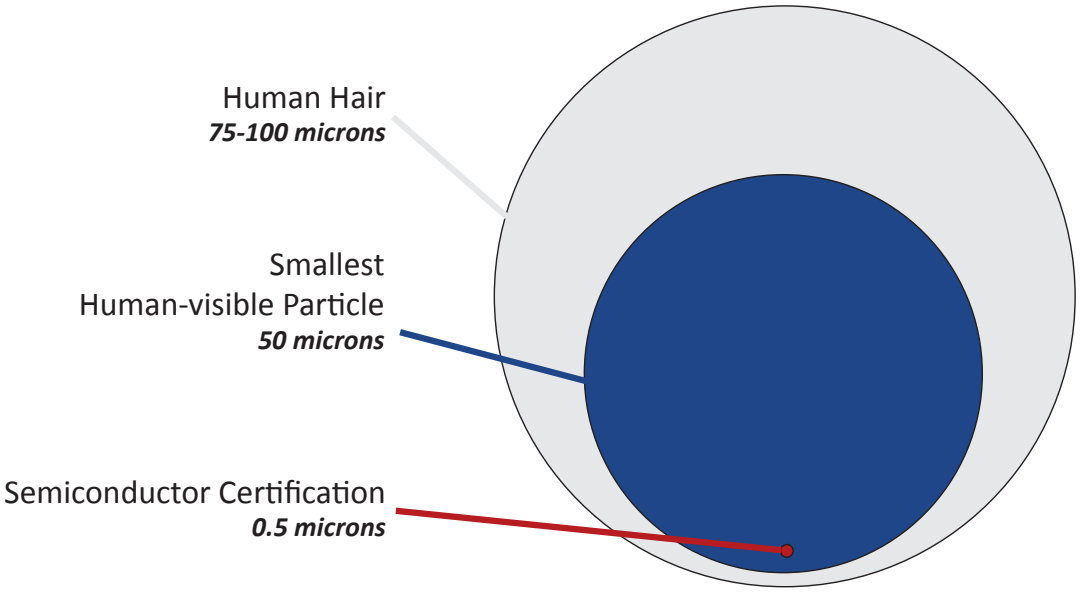
Certain hi-tech industries must maintain a production environment free of dust. In these facilities a dust particle in the wrong place can result in product and profit loss. Standards regulate the size and number of particles allowed within a cleanroom of a certain class, which is determined by the needs of the application.



Airflow

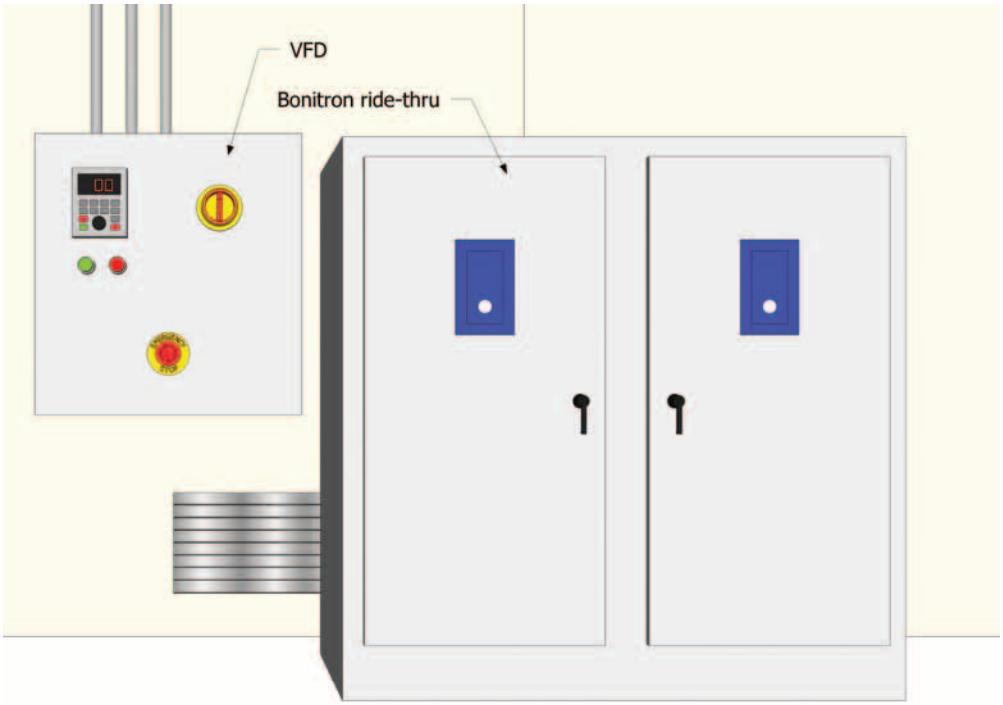
To ensure the air is clean, air within a cleanroom is changed 20 - 600 per hour through the use of proper ductwork and HVAC control.

HVAC fans must work continuously to maintain a constant airflow. A disruption in the airflow caused by a voltage sag could result in a contamination of the cleanroom environment.

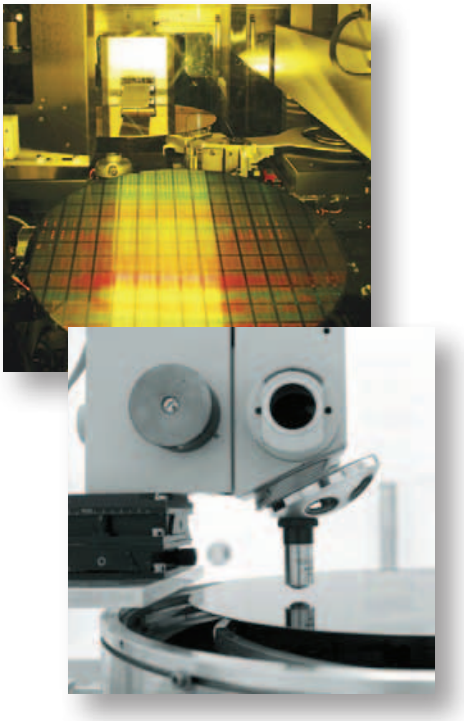


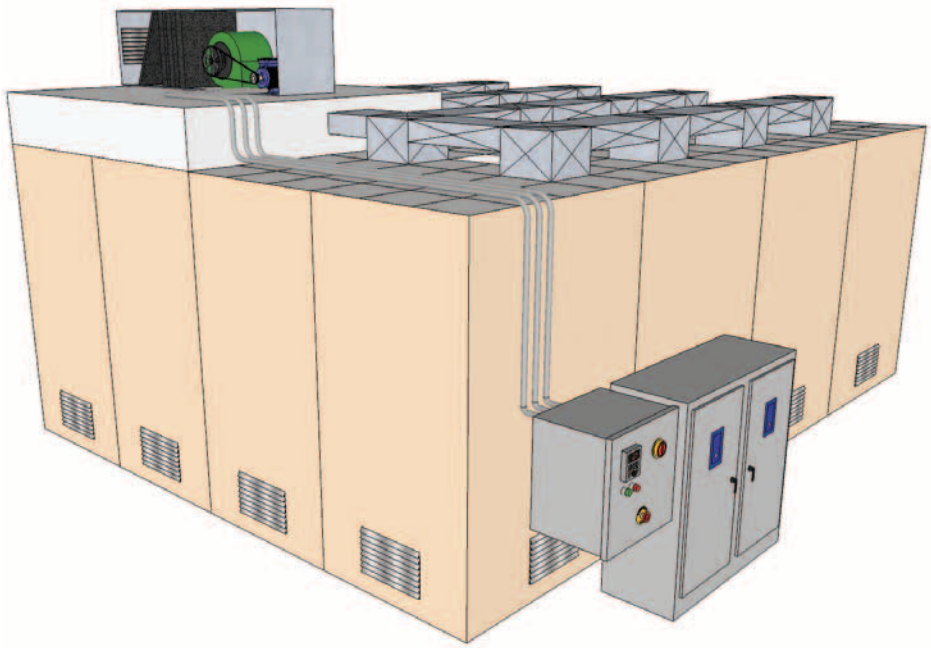
Particle Size

While our desks may be covered in visible dust, cleanrooms are designed to prevent particles much smaller than what is even detectable by the human eye from entering the cleanroom area.



- A Variable Frequency Drive controls the motor speed.
- The Bonitron UPD unit maintains a constant voltage to the VFD during a voltage sag.
- For longer outages, the UPD unit will need to use batteries or capacitors for uninterrupted operation until the generator is brought online.





Continuous Power

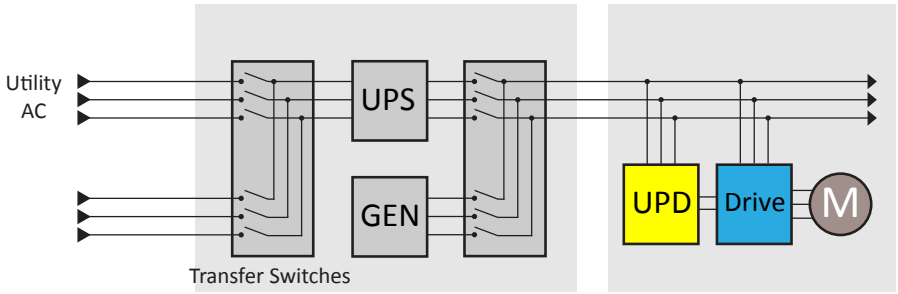
Continuous power is critical for cleanroom applications in order to ensure proper air exchange rates are occuring.

Bonitron Uninteruptible Power for Drives provides continuous power to motors and drive systems in case of a voltage sag so that they do not see any disturbance and maintain a constant speed.

Undervoltage Solutions

Uninterruptible Power for Drives

Electricity travels miles to reach the drives and motors that control your process. While outdoor power lines and substations are vulnerable to power outages caused by cars, weather, and even animals, the lines inside your plant are susceptible to power quality events as well.

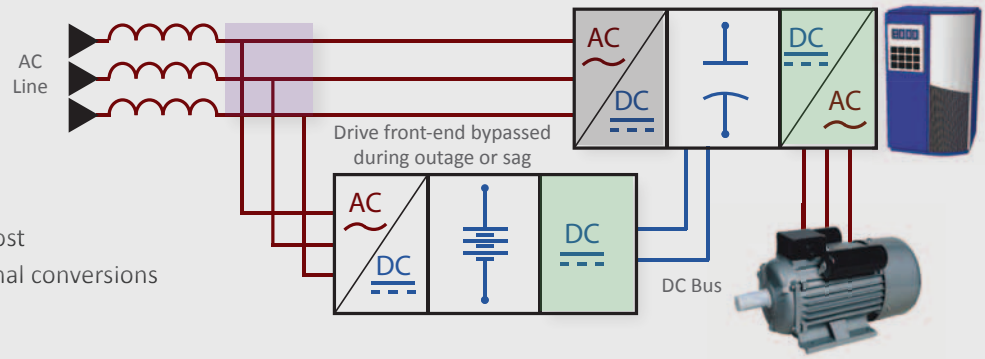


Unlike typical plant wide solutions, Bonitron designed its UPD solutions to connect directly to the DC terminals of one or multiple drives. If drive voltage sags, the Bonitron UPD immediately provides power so motor speed is not affected and the process never sees a disturbance. When properly sized, Bonitron UPD systems provide drives with full-load power until the AC line is restored or generators are online.

Bonitron UPD Systems use battery or capacitor DC energy to power the DC bus of the drive via DC bus connection terminals on the drive. This eliminates an unnecessary and energy-wasting DC to AC conversion.

Bonitron UPD Advantages

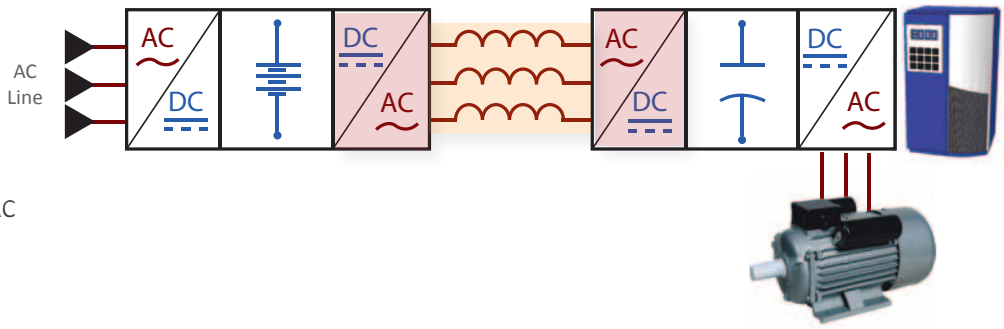
- Parallel Connection
  - High reliability
  - Seamless power source transfer
- Increased efficiency
  - Ultra-low standby power
  - Sized to drive system for reduced cost
  - Power supplied to DC bus for minimal conversions



Competitors' double conversion UPS systems convert DC voltage that is stored in batteries or capacitors back to AC voltage in order to power the drive, which in turn converts it back to DC. Variable frequency drives are not recommended for use with UPS Systems, as the drive input reactance interacts negatively with UPS inverters.

In-line UPS Disadvantages

- Series Connection
  - Decreased reliability
- Decreased efficiency
  - Unnecessary conversions
  - Converts energy storage back to AC



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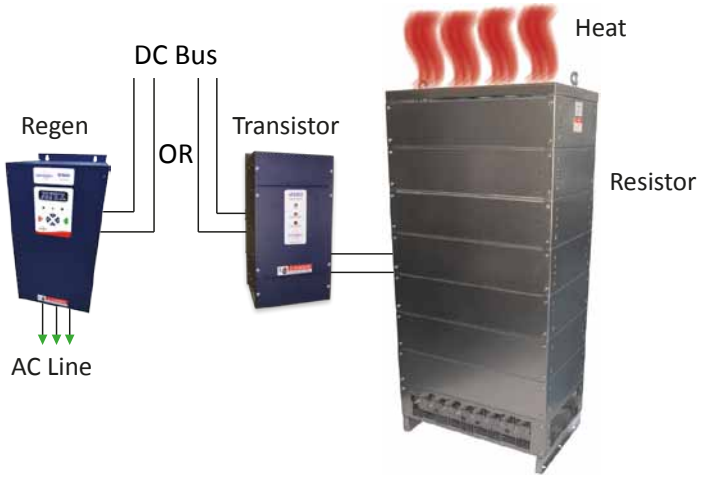
Bonitron UPD Highlights

- Seamless transfer from: Utility power - Bonitron - Generator (if necessary)
- Parallel connection for high reliability and remarkable life expectancy
- Delivers DC power for increased efficiency
- Ultra-low standby power
- Easily installs at drive location
- Scalable to your power and outage specifications
- Sag correction solutions available with no energy storage required
- Monitor power quality events with a digital user interface with data logging
- *SEMI-F47, IEC 61000-4-11, IEC 61000-4-34, Samsung Power Vaccine

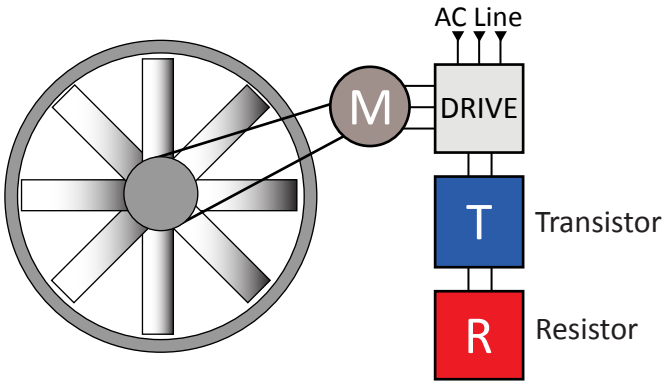
*Contact Bonitron to discuss power standards per model

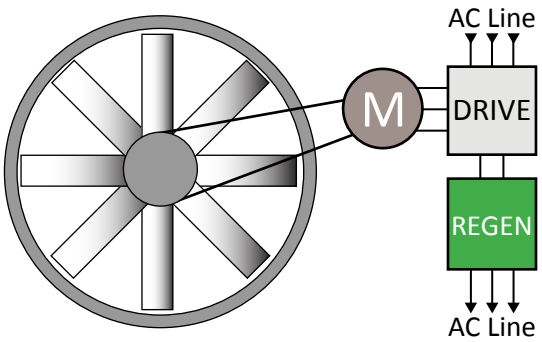
Overvoltage Solutions

In some applications, fans exceed 15 feet in diameter. With a fan this large, it is important to have a reliable way to stop it. This can be done with either a dynamic brake or a regenerative brake. VFDs use the fan motor as generator which slows down the fan. The generated energy has to go somewhere or it will damage the drive. The **dynamic brake** takes the energy out as heat through a transistor and resistor combination. The **regenerative brake**, or regen, puts the electric energy back onto the AC line.

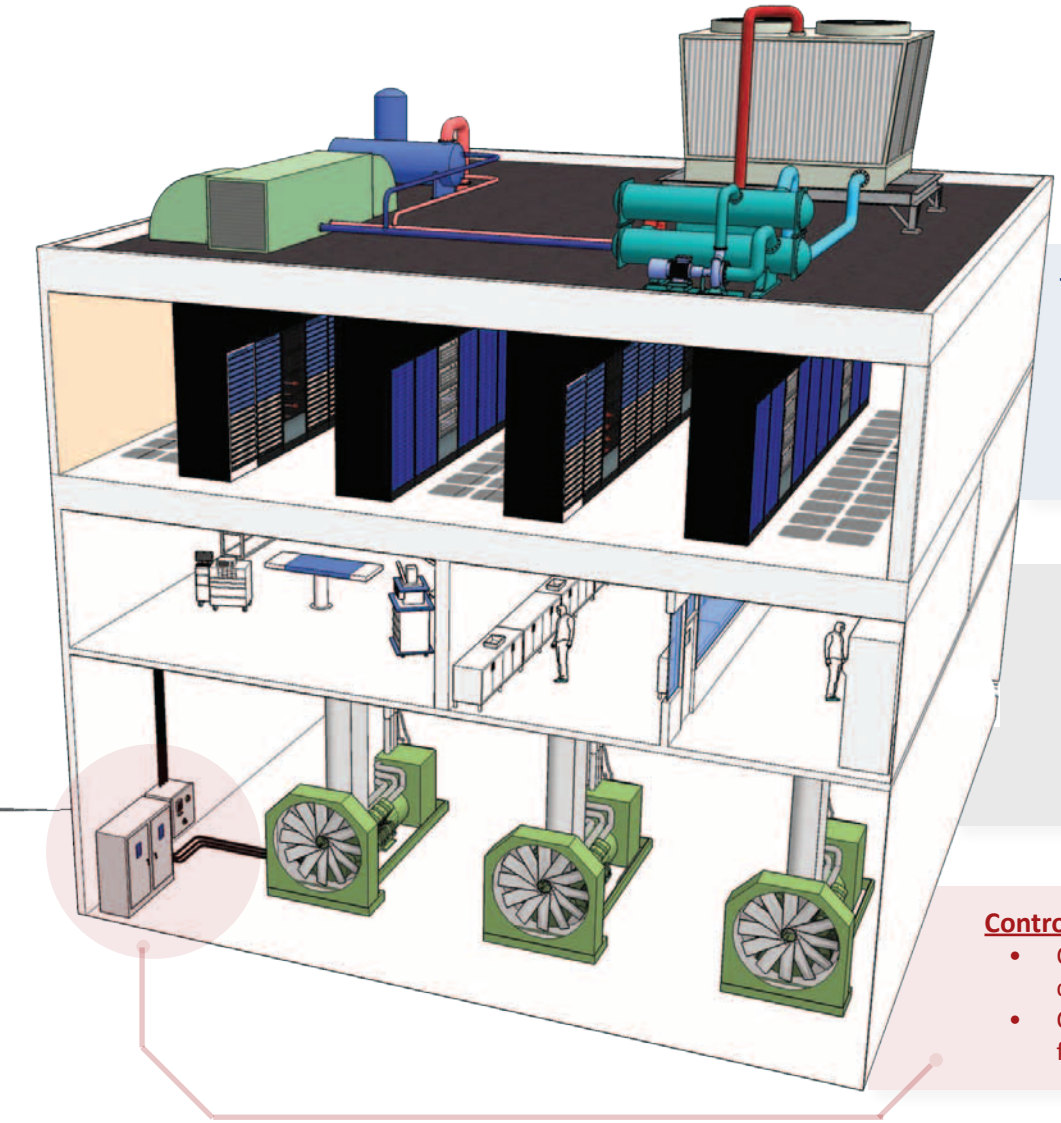


Depending on how often the fan is stopped, the dynamic brake can be the more affordable alternative. Some drives already have the transistor built into them and only require a resistor to dissipate the energy. The heat generated by the resistors can increase cost if the resistors are indoors and need to be cooled with AC. Resistors also need time to cool down after a braking cycle. If the braking will be frequent or constant, a regen would be the better choice.





The regen has many advantages over the dynamic brake. The lack of heat generation is good for multiple reasons. First, because the unit does not generate high levels of heat, it does not need to be cooled. Second, the unit can run continuously without the need of a cool down period. Third, the lack of heat generation allows its use in environments where there might be flammable material such as feathers, dust, or wood. The regen also boosts energy efficiency as it puts energy back onto the utility line.



Data Center

- During an outage, heat from servers can still cause damage, making HVAC uptime critical
- Records must be accessible
- Servers can be restarted quickly, but chiller takes time to restart

Cleanroom

- Temperature and humidity tightly controlled
- Pressure differentials prevent contamination
- Constant airflow patterns remove contaminants

Control Room

- Contains drives to adjust speed of motors controlling HVAC equipment
- Contains Bonitron Uninterruptible Power for Drives

Common Cleanroom Applications

Powder Coating Enclosures

Paint System Enclosures

Storage Rooms

Packaging Rooms

Laboratories

Semiconductor Manufacturing

Compounding Labs

Pharmaceutical Packaging

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