

**PRECISION TEMPERATURE AND HUMIDITY
CONTROL FOR GROW ROOMS**



HVAC Systems

PRECISION COOLING & DEHUMIDIFICATION



“CULTIVATOR” SERIES PACKAGED UNIT



Hybrid Technology

INTRODUCTION

The “*Cultivator*” Series package unit is the industry’s **MOST ENERGY EFFICIENT** and **HIGHEST** capacity dehumidifier on the market! The *Cultivator*™ packaged unit has been specifically designed for the indoor grow room industry and has been designed to accommodate the unique needs of indoor grow facilities. The unit is perfect for the large lighting and dehumidification loads.

The *Cultivator* is a direct result of working with master growers to accommodate their special requests to incorporate key features into a single packaged unit design. The *Cultivator* allows for maximum flexibility with the ability to easily change the units set points to best fit the environmental needs and growing methods.

Major Design Features:

- ⇒ **Packaged Unit Design**
- ⇒ **Precision Temperature and Humidity Control**
- ⇒ **Energy Efficient with Utility Savings w/ Economizer Options**
- ⇒ **Superior Indoor Air Quality (IAQ) Filters , Ionization & Outside Air Ventilation**
- ⇒ **Cooling & Dehumidification**
- ⇒ **Multiple Cooling Circuits (Risk Management)**
- ⇒ **Code Compliant CO2 Purge Control & Exhaust Systems**
- ⇒ **Ease of Design, Installation with Equipment Quality and Longevity**

Highlights

Hybrid Cooling and Dehumidification: Hybrid technology combines both Chilled Water and DX (Direct Expansion) technologies to provide the most efficient cooling & dehumidification unit for the grow industry. By utilizing the best features of chilled water with the best features of Direct Expansion (DX) systems, we are able to improve, not only the efficiency, but reduce the size of the packaged unit as compared to all other manufacturers. **These features and benefits are unsurpassed.**

Vari-speed Technology: Variable speed compressors allow the unit to cool & dehumidify during both at full load and part load conditions (lights “On” and “Off”) without short cycling the compressors. High efficiency Vari-speed EC fans and Vari-speed condenser fans are the most efficient system in the industry. Oversized DX coils provide high dehumidification and Hot Gas Re-Heat coils provide **FREE** reheat .

Ionization and UV Lights: Ionizers and UV lights are standard options to mitigate odors and kill air borne pathogens. Power exhaust fans combined with outside air damper control, provides room pressurization control and code compliance for CO₂ purge control.

Filtration: The unit accommodates (3) stages of filtration: Pre & Secondary Mixed Air and Final stage HEPA filters providing the cleanest air possible. Because the unit offers HEPA (hospital grade) final filters, we can utilize outside air to both cool & dehumidify **Saving Thousands of Dollars** in energy per year! Filtration combined with Ionization and UV lights options provide the **BEST** Indoor Air Quality (IAQ) available!

Economizer & CO₂ Purge Control: There is nothing more efficient than **FREE** dehumidification and cooling. The vari-speed exhaust fan, maintains proper building pressure to prevent room infiltration. The exhaust fan also serve as the CO₂ purge control fan. Both supply an exhaust fans can be put on a emergency power circuit if required. The dampers modulate to insure the most efficient system performance.



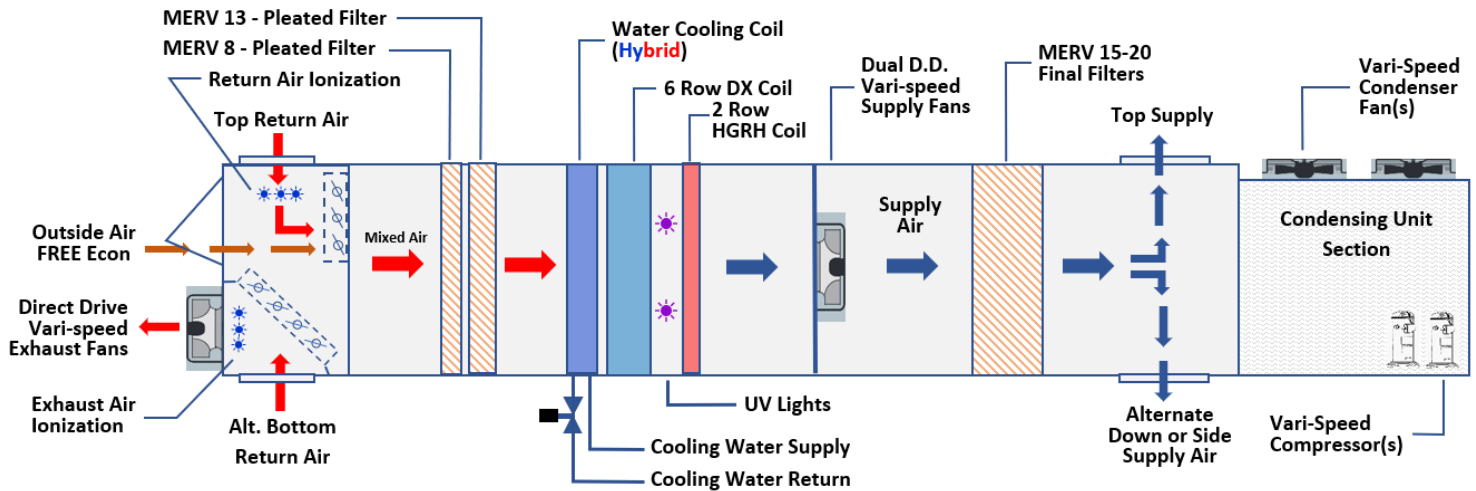
“Cultivator” Packaged & Split Unit
Air Cooled, Water Cooled, Heat Pump & WSHP & Split Condensing Unit Options

REQUIRES 50% LESS ENERGY
than
STANDARD DX EQUIPMENT!

The highest efficiency unit in the industry !

Cultivator & Hybrid Series Packaged Unit Layout

CGEE *Cultivator* & *Hybrid* Cultivator Series
(Packaged Unit Options & Section Layout)



FEATURES

- Commercial/Industrial Construction Standards
- Single Piece Dehumidification Unit Design
- Single Point Power Connection
- Hi-Capacity DX Coil (Latent Load Dehumidification)
- Hi-Capacity Hot Gas Re-Heat Coils (Full Modulating)
- Chilled Water Coils (Sensible Load) (Hybrid)
- Advanced Filtration 2", 4", 6" and 12" Pleated Filters
- Integral HEPA Final Filtration Section
- Ionization (IAQ & Odor Control)
- UV Lights (Mold Mitigation)
- Economizer Control: **FREE** Cooling & **FREE** Dehumidification
- Building (Room) Pressurization Control
- CO2 Emergency Purge Control (Code Compliance)
- Hi-Efficiency Direct Drive Vari-Speed ECM Fan motors
- Hi-Efficiency Direct Drive Vari-Speed Compressors
- Hi-Efficiency Supply and Exhaust Fans
- Hi-Efficiency Electronic Expansion Valves
- CO2 Dispersion Chamber
- Dual Supply and Exhaust Fans Options
- Hinged Access Doors with Locks
- Refrigeration Service Valves
- Electronic Expansion Valves
- Hi & Lo Pressure Transducers
- Stainless Steel Drain Pans
- Extruded Aluminum Airfoil Damper Blades
- Epoxy Powder Coat Paint
- Microprocessor Controller
- Variable Frequency Drives
- Touch Screen Interface Device
- BACnet Building Automation Controls
- Remote Monitoring and Factory Support
- Utility Rebates
- Easy Maintenance
- Warranty: 5-yr compressor, 3-yr controller, 1-yr parts

Learn more on how the Cultivator Series can work for you !



ASHRAE 90.1 COMPLIANT



INTRODUCTION

CGEE control systems have been designed to allow maximum flexibility to the owner, grower and the facility maintenance.

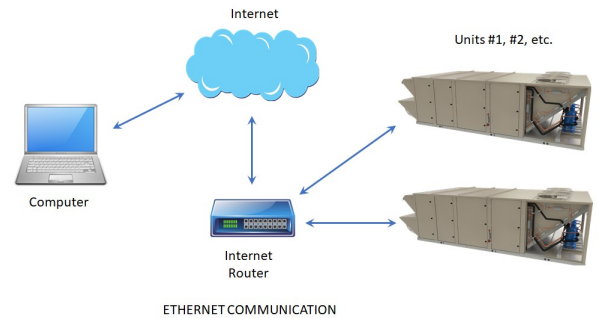
All major equipment is provided with **BACnet over IP** communication protocol. Also available is **BACnet MSTP** that allows for a BAS (Building Automation System) to communicate to each of the HVAC pieces of equipment to retrieve data such as systems setpoints, current temperatures and humidity levels, alerts and alarms, outdoor conditions, data logging and time of day schedules. BACnet was designed to be an open protocol between the controller, the peripherals like sensors and computer front end. CGEE BACnet controls have been designed to be and is **“Open Protocol”**. CGEE controls are Open Protocol and designed with Open Access to all equipment. It is not the intention of CGEE to prohibit the owner from hiring their own controls contractor to perform installation, service and/or to provide new code to have the controls system best the facilities need.



BACnet over IP

BACnet over Internet Protocol allows remote communication to each piece of equipment. Internet Protocol allows, through a computer, the factory and trained personnel to access the controls, set points, current sensors reading and alarms remotely from a computer. There is password protection to access the data for security purposes.

The user friendly screens and comprehensive tables provide data and set-points allowing a technician to help trouble shoot the unit. This internet connection also allows the factory to download changes in the software as needed and allows the factory to make application changes to the software as might be required by owner use. This can be done remotely. This remote access also allows the factory to participate in remote troubleshooting and diagnostics.



“BACnet over IP” Communication

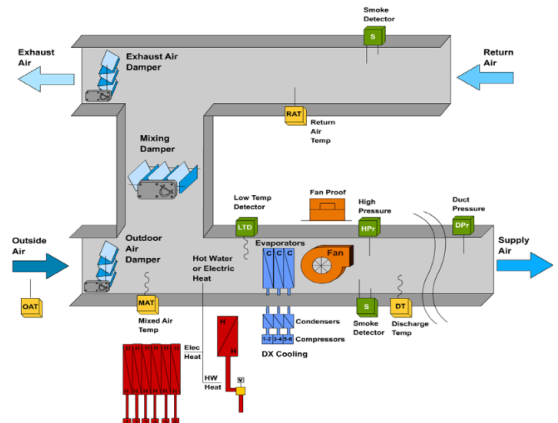
BACnet MSTP

BACnet MSTP is the BACnet connection that allows for a BAS computer front end to communicate to the HVAC equipment. This is a controller that is in addition to the BACnet IP (standard on most CGEE units).

There are several advantage and features of the BACnet MSTP controller and front end that the BACnet over IP does not offer.

- Custom Graphics
- Alerts & Alarms
- Remote Access
- Scheduling, Data Logging and Trending
- Integration of HVAC to building automation system
- Integration of lighting, landscape irrigation and other building functions.

For more information please contact the factory.



Sample: AHU Graphics

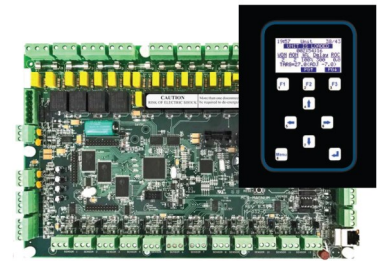
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The unit comes standard with the powerful **MAGNUM Microprocessor Controller** but as well offers several user options .

MAGNUM MICROPROCESSOR

The MAGNUM controller incorporates a powerful microprocessor controller with a local keypad and display for user interface. The expansion boards allow for up to 112 inputs and 108 outputs and communicates at 38,400 baud.

The RS-485 port allows for communication through BACnet IP and with the Building Management System (BAS). Standard on the unit controller is BACnet over IP, Modbus and Modbus IP. BACnet MSTP and LonWorks interface gateways are also available options through an added gateway card.



MAGNUM w/ Keypad Interface

REMOTE COLOR TOUCH SCREENS

Remote touch screen displays are available in two sizes: 10.1” and 15.0”. These may be mounted remote of the unit for remote viewing and monitoring unit status, setpoints , conditions and sensor inputs. Mounted outside a grow room or in a facility management room, the high resolutions (1280x1080) LCD display with LED backlighting allows ease of system monitoring and setpoint control.

For ease of installation, the display easily connects via ethernet cable to the RS485 port on the MAGNUM controller. If multiple ports are required, a RS485 extender module is available. Operating temperatures for the display are (-4°F to +149°F). An outdoor weather-proof version is available if required.



10.1” & 15.0” Remote Displays

FLASH MEMORY

The MAGNUM offers a 2GB industrial rated compact flash card option that mounts directly on to the main microprocessor controller. This option allows download and history storage. This is a great tool for troubleshooting and can save up to a years worth of data. This special flash card has extreme operating temperatures of (-40°F to +349°F).



2 GB Flash Card Option

ETHERNET HUB

The Ethernet hub allows for multiple RS485 connections to interface to the MAGNUM control board. With the use of the Hub, you may connect a Wi-Fi router, a Remote Touch Screen and offer BACnet IP access. Installation is simply and allows for multiple accessories and user friendly tools.



Ethernet Hub

Wi-Fi WIRELESS COMMUNICATION

If there is not a ethernet connection available to the unit, a wireless Wi-Fi Modem can be installed in the unit and access from your computer can be done through this Wi-Fi modem. A cross over cable is still required between the modem and the MAGNUM controller. Rabbit ear antennas are available as well as a booster antenna for extended range communication.



Wireless Modem

(continued)

Communications are a very integral part of facility management, monitoring and servicing. CGEE systems offer a variety of ways to communicate to the installed equipment.

BMS COMMUNICATION

The MAGNUM controller offers multiple way to communicate to the control and utilize the MCS Connect software that allows for easy setup and changing of temperature setpoints, control setpoints, fan speeds, damper position all the other operating criteria.

DIRECT LAPTOP CONNECT

You may directly connect from a computer to the MAGNUM control board via a ethernet cross over cable to the RSD485 port. Simply launch MCS Connect and discover your controller. The menus are easy to traverse through and all you points are available.

BACnet over IP CONNECT

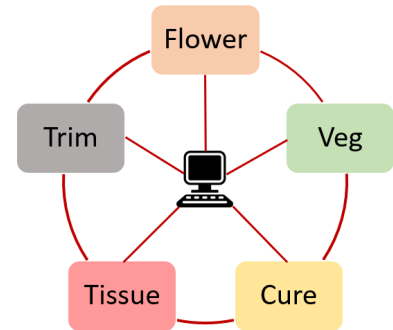
You may connect to the controller via a computer through the internet. If you are connected to a network, you must discover the network and then discover the controller. An ethernet switch is installed in the system to allow the a computer to communicate through the internet as seen in the connection diagram.

TOUCH SCREEN

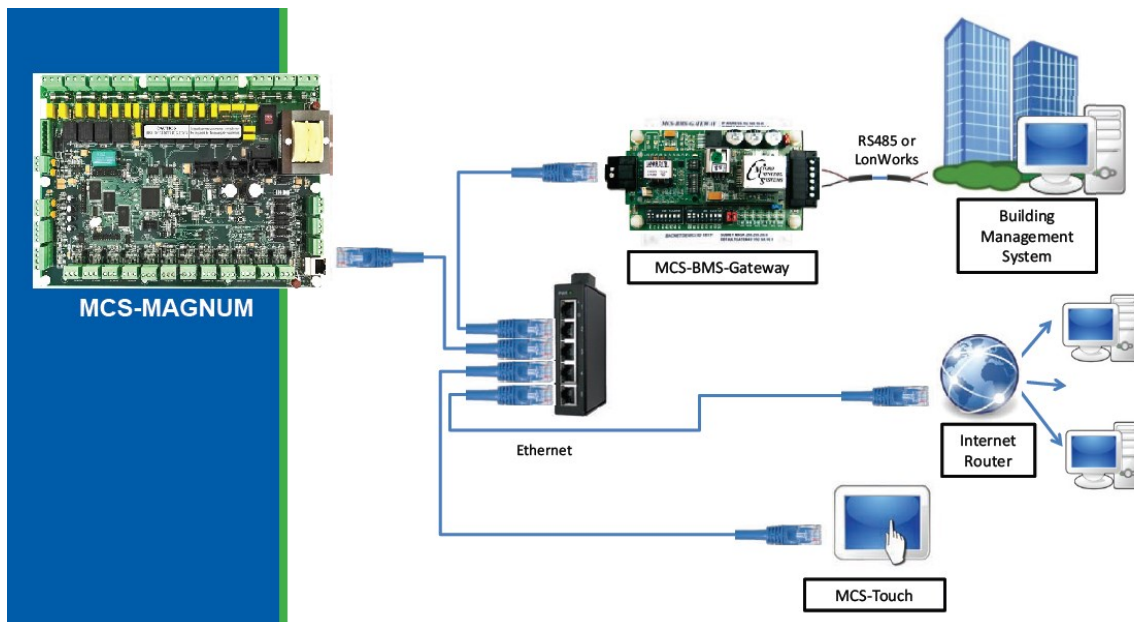
The Touch Screen will use a ethernet cross over cable or utilize the ethernet switch to communicate.

BAS/BMS CONNECT

A BAS (Building Automation System) may access the controller via the BAS front end and the BMS Gateway. This gateway access card can be ordered BACnet MSTP or Lon Works compatible. Modbus and Modbus IP are built-in as standard communication protocol.



Central Communications



INTRODUCTION

CGEE offers a variety of chiller options to best fit the facility design needs from 10 tons to a 4,000 ton air and water cooled options. Most manufacturers only provide standard chillers and accessories, CGEE offers a variety of custom changes to best fit the commercial indoor garden's needs. Innovation is unmatched in the industry and CGEE chillers are able to operate at low and sub-freezing water conditions to offer the most effective dehumidification.

From smaller to larger chillers, a variety of compressor options are available: Single & Variable Speed Scroll, Single & Variable Speed Screw, Single & Variable Speed Centrifugal and Variable Speed Magnetic Bearing Compressors.

In all options of compressor, the designer has the choice of initial cost effective standard efficiency chiller or a more investment driven, high efficiency chiller.



MAG Bearing Chiller

CHILLERS 10 TO 4,000 TONS		
TYPE	COMPRESSOR(S) / CIRCUITS	TONNAGE
Air Cooled Scroll (10-170 Tons)	(2) Compressor → Single Circuit	10-30 Tons
	(4) Compressors → Dual Circuit	40-95 Ton
	(6) Compressors → Dual Circuit	105-170 Tons
Air Cooled Screw (130-470 Tons)	(1) Compressor → Variable Speed	115-300 Tons
	(2) Compressor → Variable Speed	225-470 Tons
Water Cooled Screw (70-747 Tons)	(1) Compressor → Single Speed	70-332 Tons
	(2) Compressor → Single Speed	142-582 Tons
	(3) Compressor → Single Speed	600-634 Tons
	(1) Compressor → Variable Speed	133-376 Tons
	(2) Compressor → Variable Speed	270-747 Tons
Water Cooled Centrifugal (300-4,000 Tons)	(1) Compressor → Single Stage	300-,2000 Tons
	(1) Compressor → Dual Stage	500-1,600 Tons
	(2) Compressors → Dual Stage	2,000-4,000
Water Cooled Mag Bearing Centrifugal (90—680 Tons)	(1) Compressor → Variable Speed	90-190 Tons
	(2) Compressors → Variable Speed	210-370 Tons
	(3) Compressors → Variable Speed	390-570 Tons
	(4) Compressors → Variable Speed	600-680 Tons



ASHRAE 90.1 COMPLIANT



CHILLERS AND COMPRESSOR TYPES



R410A

Air Cooled Scroll
10-170 Ton



R134a

Water Cooled Vertical Screw
70-747 Ton



R134a

Air Cooled Screw
(133-470 Ton)



R134a

Water Cooled Vertical Screw
70-747 Ton (Multi-Compressor)



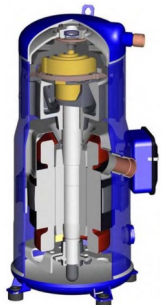
R134a

Water Cooled Centrifugal
300-4,000 Ton



R134a

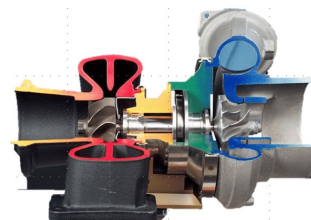
Water Cooled Mag Bearing Centrifugal
90-680 Ton



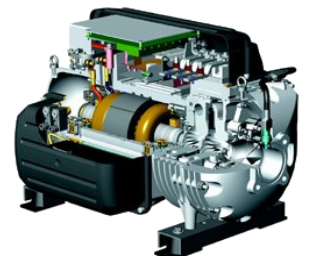
SCROLL



VETICAL SCREW



CENTRIFUGAL



MAG BEARING
CENTRIFUGAL

INTRODUCTION

CGEE has a full line of indoor and outdoor air handlers ranging from 1,000—56,000 CFM. The modular design of a 2” double wall panel construction will allow you to design the air handler’s length and width to accommodate space and any accessory required in your facility.

All units are constructed of heavy gauge aluminum profiles with thermal breaks at all joints. IAQ stainless steel drains pans, hinged access doors and direct drive fans are just some of the features in the modular design air handler.

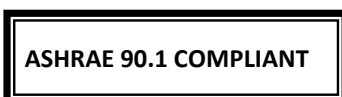
High capacity DX coils can provide heavy dehumidification with several reheat options including: electric SCR, hot water and HGRH when used with a DX remote condensing unit.



Modular Air Handler

AIR HANDLERS FROM 2,000 TO 55,000 CFM		
SIZE	CFM Range	NOM. TONS @ 400 FPM
12	1,667	4 tons
22	2,667	6 tons
32	3,896	9 tons
40	4,813	12 tons
48	5,729	14 tons
64	7,563	19 tons
80	9,625	24 tons
100	12,375	31 tons
120	14,438	36 tons
150	17,000	42 tons
180	22,000	55 tons
210	25,458	63 tons
240	28,708	71 tons
270	31,958	80 tons
320	40,000	100 tons
420	45,000	112 tons
520	56,250	140 tons

“HIGH QUALITY, FLEXIBLE DESIGN & CUSTOM FEATURES”



FEATURES & OPTIONS

CGEE air handlers have many standard features as well as many accessories and options. All coils and selections are AHRI certified and all fans are AMCA certified. This series of air handlers offers long life materials and construction methods and offer the flexibility to meet most any facility needs. For any features that are not listed below please contact the factory.

FEATURES and DESCRIPTION	STANDARD	OPTION
1" & 2" Double Wall Construction with injected polyurethane foam panels		
Hinged Access Doors with cam locks (Full height)	✓	
Epoxy Powder Coat Paint (ASTMB –117, 500 Hour Salt Spray)	✓	
Galvanized Steel Metal (UL-090U Approved)	✓	
Thermal Breaks	✓	
Door Latches	✓	
Direct Drive Fans	✓	
High Efficiency Inverter Duty 1,800 RPM motors	✓	
EC motors	✓	
Backward incline fans	✓	
VFD motor control		✓
Forward curved fans		✓
DX Coil (Cu/AL) Tubes/Fins		✓
Chilled Water Coil (Cu/AL) Tubes/Fins		✓
Hot Water Coils (Cu/AL) Tubes/Fins - Reheat or Preheat		✓
Steam Coils (Cu/AL) Tubes/Fins - Drainable /Cleanable		✓
Energy Recovery Wheel or Plate		✓
Return or Exhaust Fans		✓
Economizers (Extruded Aluminum with SS blade Seals)		✓
Outside dampers (Extruded Aluminum with SS blade Seals)		✓
Filter Gauges & Filter Switches		✓
Single Point Power Connection		✓
BACnet or Lon Works		✓
Electric Heaters—Staged or SCR control		✓
Filters 2", 4", 6", 12" & Bag Filters (Pre & Final Filter Options)		✓
Full Electrical Panels with transformers. Controls and switches		✓

ASHRAE 90.1 COMPLIANT



INTRODUCTION

What are CHP Systems/CCHP Systems?

Combined Heat & Power Systems (CHP systems) and Combined Cooling, Heat & Power systems (CCHP Systems). These are on-site electricity power generation systems that utilize the waste heat that would otherwise be wasted. These systems can provide useful thermal energy in the form of hot water, chilled water or steam which can be used for space heating, cooling, domestic hot water and industrial processes. These systems allow facilities to create their own microgrids that can function autonomously when power from the electric grid is lost.

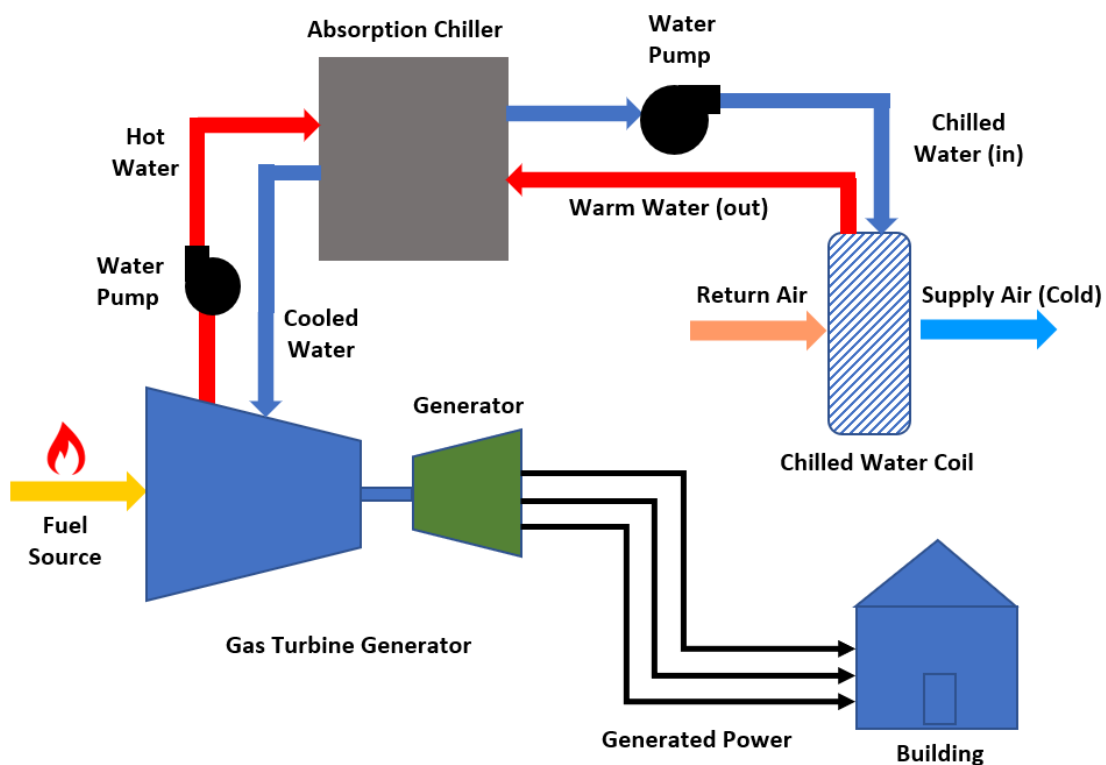
These systems can lower demand charges, reduce utility power requirements on buildings that cannot get enough electrical power and generate **FREE** cooling to the HVAC building system. Gas driven turbines are the most common generators and the cost of total generation / Kw (Kilowatt) will vary from city to city. Gas prices, electrical power rates, lighting schedules, grid power reliability, utility rebates and available capital will all factor into the decision whether CHP or CCHP is right for your grow facility.

Proper research into the available utilities, electrical power costs, natural resources and cost of installation are integral to making a good decision on whether to integrate CHP or CCHP into your facility.

**Cogeneration: Combined Heat and Power (CHP)
Chilled Water Combined Heat and Power (CCHP)**

Efficiencies: CHP up to 90%, CCHP 90% +

CCHP System Design Flow Diagram





PRECISION TEMPERATURE & HUMIDITY CONTROL

Hybrid Technology

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