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Recirculating Chiller Maintenance

Recirculating chillers are cooling systems that provide precise temperature control as well as cooling below ambient temperature.

KEY PREVENTATIVE MEASURES AND MAINTENANCE TO KEEP YOUR CHILLER RUNNING

To ensure a chiller is functioning as efficiently as possible and to minimize the risk of downtime, it's important to properly operate and maintain it. Just like in a car, there are fluids that need to be checked and filters that need to be replaced. Every chiller installation is unique, and the conditions in your installation determine how often you should inspect and perform maintenance. The preventative maintenance period for chillers depends on several factors including:

- Number of hours of operation per day and type of pump used
- Environmental conditions and location of the chiller
- Coolant used in the system
- The type of maintenance that should be performed includes, but is not limited to:
- Cleaning condenser fins
- Coolant top off and flushing
- Filter and strainer cleaning or replacement
- Pump lubrication

In addition to monthly, quarterly, or yearly maintenance, there is also a quick and easy weekly inspection that can be performed. All service and maintenance on a chiller should be performed by a qualified technician – ideally someone who has been trained on chillers, the equipment that is being cooled, and health and safety concerns. Also, before beginning any maintenance, the chiller should always be powered off and unplugged.

FACTORS IMPACTING THE PREVENTATIVE MAINTENANCE SCHEDULE

Some applications require the chiller to be running 24-hours per day, 7 days per week. Other applications require only periodic use of the chiller. The maintenance schedule should consider the amount of time the chiller is in operation. Instead of measuring in miles like you would with a car, you'll want to measure in terms of hours of use. Number of hours of operation per day and type of pump.

Environmental conditions also play a large role in the amount of maintenance a chiller will need. Chillers should only be used indoors at a maximum relative humidity of 80%. High humidity can result in condensation that could damage electrical components in the chiller or on the equipment it's cooling. Chillers should also only be operated at ambient temperatures between 50°F (10°C) and 95°F (35°C). Extreme temperatures can negatively impact thermal performance, cause strain on electrical components, and/or result in freezing and bursting of the evaporator. Chillers should also only be used in areas that are relatively clean and dust free. The dustier and dirtier the air, the more maintenance your chiller is likely to need. Using an air filter is recommended if ambient air is dusty. However, it's important to note that an air filter will add slightly to pressure drop, and therefore will cause a slight decrease in thermal performance.

The other factor that significantly impacts maintenance is the type of coolant you are using. If you are using water as your chiller coolant, it is critical that you use filtered, clean water. Water with high mineral content can lead to corrosion and fouling of your coolant passages, resulting in system clogs or leaks. Boyd recommends using a corrosion inhibitor as well as an algae inhibitor to prevent growth in the reservoir. (See Figure 1.)

For example, a solution containing 30% inhibited ethylene glycol (EGW) can inhibit corrosion as well as algae growth. (See our article "Selecting a Heat Transfer Fluid for Liquid Cooling" for more information.)

WEEKLY INSPECTION

A weekly chiller inspection should take less than 5 minutes.This inspection should check for coolant leaks, coolant level and discoloration in the reservoir, dust or debris accumulation on condenser coil fins, proper air flow, and air and coolant filter condition if applicable.

Figure 1: Chillers Reservoir with Algae Growth Along Top (the discolored areas)

LEAKAGE

Leaks are rare if the chiller is properly maintained. However, if you notice coolant on the floor near the chiller or dripping from the chiller enclosure, turn off the chiller and disconnect the power. When leaks occur, they are usually due to use of the wrong type of fittings, connections, or hoses. Any leaks should be fixed before the chiller is used again.

Figure 2: Chillers Coolant Level Site Tube

COOLANT LEVEL

Any significant drop in the coolant level in the reservoir since the previous weekly check should also be investigated. If there is no visible system leak, then the loss may be due to equipment leakage elsewhere, such as within the application itself. Coolant should be added if the coolant level site tube on the front of the chiller approaches the half-full mark. (See Figure 2.)

CONDENSER COIL FINS

For maximum thermal performance, the condenser coil fins should be free of dust and debris (See Figure 3.) Therefore, checking the condenser coil fins weekly is especially important if the system is in a dusty environment and is not fitted with an air filter. To check the condenser, remove the front grill by sliding it upward, pulling the bottom out, and pulling it straight down. Use a fin comb, soft paint brush, or shop vacuum to remove any debris and keep the fins clean. You may also use compressed air (60-90 psi) to blow off dust from the condenser coil fins. This will maintain the proper airflow and allow for better cooling of the refrigerant. Caution should be taken though when cleaning the fins, since they are sharp and can also bend relatively easily.

Figure 3: Chillers Condenser Fin Coils and Chiller Condenser Fin Coils Filled with Dust

AIR FLOW

In addition to keeping the condenser coil fins clean, proper ventilation should be maintained around the air-cooled chiller. Inadequate ventilation will cause a decrease in cooling capacity and, in a worst-case scenario, a compressor failure. The area around the chiller must be kept clear and unobstructed in order for the chiller to work properly. The two sides and back of the chiller should have a minimum clearance of 18″ (46 cm), and the top clearance should be at least 6″ (15 cm) to allow for proper air circulation. It is also important to ensure that the hot air exiting the chiller does not recirculate into the inlet openings. The front of the chiller must have an ample supply of ambient temperature air. During a weekly inspection, clearance should be checked. Chillers are usually on casters and therefore can be moved, either intentionally or unintentionally, if the brakes aren't on.

NOISE LEVEL

Chillers are normally very quiet units. Therefore, any abnormal sound or substantial increase in noise level since the last inspection may indicate an impending pump, fan, compressor, or coolant blockage problem. It's important to investigate the cause of the noise and perform necessary service to prevent system downtime. Pumps and fans can be replaced relatively easily, as can hoses or other components. However, it's best to purchase these before your system is down due to lead time needed for shipping replacement parts.

Figure 4: Chillers Water Filter

WATER FILTER

A water filter is an option available on most chillers. (See Figure 4.) With a new system, the water filter can quickly accumulate foreign matter introduced during system setup. This can lead to a decrease in system performance in a short period of time. If you have a water filter installed, inspect the filter cartridge one day after you set up a new system to ensure the filter is clean and the system runs at maximum capacity. After this initial filter inspection, it is recommended that the water filter be checked monthly.

MONTHLY OR QUARTERLY MAINTENANCE

If the chiller is run 24 hours per day, it is recommended that the following maintenance be performed on a monthly basis or more frequently if needed. Otherwise, it should be performed quarterly or as needed.

- Remove the top and side covers of the chiller. If the chiller is equipped with an air filter on the condenser, replace the air filter (Figure 5).
- If the chiller does not have an air filter, vacuum or use compressed air (60-90 psi) to blow out the condenser coil. Vacuum dust from the inside of the chiller.
- Clean the pump strainer (if equipped) and replace it only if necessary.
- Replace the water filter (if equipped)
- Inspect the coolant for any foreign matter by opening the cap and looking in. If any foreign matter is found, perform the steps outlined in annual maintenance.


Figure 5: Chiller Air Filter

The coolant should be flushed and replaced regularly based on the amount of particulate matter that has been found in the system during planned maintenance inspections and on the ambient conditions. If the pump strainer and coolant is found to have little or no contamination after the first inspection, replacing the coolant and cleaning the strainer on an annual basis is recommended. When the strainer is cleaned or replaced, the electrical power must be disconnected, and the system drained of all coolants. To clean the system:

- Drain the coolant.
- Replace the coolant with clean, high quality water.
- Run the chiller for 10 minutes and then drain the coolant again.
- Replace all filters.
- Refill the chiller with coolant and run for 3-5 minutes to purge air from the lines.
- Top-off the coolant level and wipe up any spills.
- Replace the covers.

It's important when reconnecting the chiller to your application that you keep any thread sealant outside of the liquid cooling loop. If thread sealant gets into the system, especially the pump, it can cause a clog and/or an equipment burnout.

PERIODIC MAINTENANCE LOW LEVEL SWITCH

A low-level switch protects the pump in the event of accidental fluid loss and is an optional feature on some chillers (Figure 6). Since this switch is "passive" during normal operation, it is advisable to check it every 6 months. This can be done by opening the tank cover and pushing down on the switch to see if the low level alarm is activated.

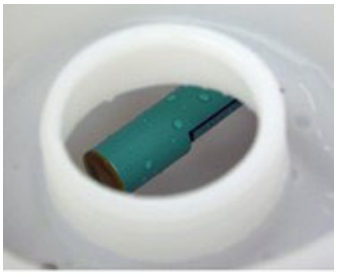

Figure 6: Chiller Low Level Switch

PUMP MOTOR LUBRICATION

A positive displacement (PD) pump typically lasts 7,000-10,000 hours or about 1 year of continuous use or 3-4 years if only used during normal business hours. (See Figure 7.) To maximize the pump life, you should ensure the PD pump is well lubricated at all times. You don't want to allow the pump to run dry, even briefly, as serious damage will result. PD pump motors may use sleeve type bearings with large lubricant reservoirs. If your motor does not have a port for oiling, the motor is a sealed bearing motor and does not require lubrication. Oiling instructions are posted on each motor. In the absence of instructions, however, it is recommended that approximately 30 to 35 drops of SAE 20 non-detergent oil be added to each bearing on the following schedule (SAE 20 = 142 CS viscosity):

Duty Cycling	Oiling Frequency
Continuous	Once every year
Intermittent	Once every two years
Occasional	Once every five years

Figure 7: Positive Displacement (PD) pump motor used in a chiller, with pump motor lubrication port under yellow cap

PUMP STRAINER

If your chiller has a positive displacement pump, it's also important to periodically inspect and clean the pump strainer. If the strainer becomes fouled, flow rate will decrease, and the pump may wear prematurely. (See Figure

8.) Most chiller operators find that the strainer should be cleaned every 3-6months. The strainer does not need to be replaced unless itis damaged.

Figure 8: Chiller pump strainers – dirty and clean, respectively

CONTROL BOX FUSE REPLACEMENT

Lastly, if you blow a fuse on the controller board, the fuse can be replaced by a qualified technician. To replace the fuse, remove the top and side panel on the unit. Then, open the inline fuse holder, remove the blown fuse, and replace the cover.

Whether you are considering buying a standard chiller or custom chillers, it's important to be aware of the operation and maintenance requirements. If you already own a chiller(s), it's important to ensure that it is being properly operated and maintained. This will ensure it is operating as efficiently as possible, as well as minimize the risk of equipment downtime. As with a car, you'll also want to be sure you have access to a good mechanic. If you need spare parts, help troubleshooting, or service on your equipment, contact us to ensure your system will last as long as possible.

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