Open Loop Laboratory Water Use

"Open-loop" water use in laboratories is expensive and wasteful. It is one of the largest types of water use on campus, accounting for hundreds of thousands of dollars of water costs annually. It has often been used for cooling, vacuum, and makeup water for animal research facilities.

Open Loop Cooling

The largest open-loop use is for cooling, where cold water from the building supply is passed through equipment or laboratory chillers and dumped to the drain. This setup is often used because it is relatively inexpensive to install and requires little maintenance. **However, a single installation can use many thousands of dollars worth of water every year, while dumping valuable heat into the drain**.

Installation of open-loop cooling is now prohibited in UBC's Technical Guidelines. However, cooling of laboratory equipment using other methods can often involve technical or financial hurdles, particularly when changing an existing open-loop installation. For example, building HVAC systems may not always have sufficient cooling capacity, or building cooling systems may not be near equipment.

What can researchers do?

For new installations: when planning for research equipment purchases, include the necessary equipment to minimize or eliminate open-loop cooling such as efficient closed-loop chiller units or control systems, in your funding plans and grant applications.

For a new or renovated building or lab: identify all equipment that will require cooling as early as possible in the planning and design process, ideally including:

- Equipment type and location
- Peak cooling loads (kW)
- Required cooling water temperature (if water cooled)
- Scheduling of equipment operation.

Though accommodating all cooling needs by building systems is not always possible, identifying cooling needs to the building project team in advance will allow them to be taken into account during design of building HVAC systems.

For existing labs and equipment with open-loop cooling: convert open-loop cooling to alternative closed loop systems, and/or increase the efficiency of the open-loop cooling systems.

What are the alternatives or improvements to open-loop cooling?

Alternatives and improvements to open-loop cooling include the following options.

1. Connect lab equipment to available building chiller systems, where available and where the chiller systems have sufficient capacity.
2. Connect lab equipment to high efficiency, stand-alone chillers (heat pumps) that can reject heat outside of the building, to the building space (provided the building systems can accommodate

this heat), or to open-loop cooling with a much lower flow rate. Efficient chillers, for example a Haskris R100, can potentially reduce open-loop cooling flow rates by 60% or more when replacing an old, inefficient chiller. If the lab equipment has a standby mode, ensure that the chiller also runs in standby mode.

3. As an alternative to no.2, "dry" chillers that provide cooling by running the water through a water to air heat exchanger are also a potential option, depending on the required temperature of the cooling water to the equipment, room temperatures, and the ability of the building to accommodate the rejected heat. Dry chillers are considerably less expensive than heat pump-based chillers.
4. Use timers or control systems to schedule equipment operation only to times when needed, to reduce open-loop cooling demand and water consumption. This also reduces electricity consumption (see additional information below).
5. In some cases, it may be possible to use non-potable water sources such as harvested rainwater for open-loop cooling, or conversely to use water draining from open-loop cooling for other non-potable uses.

The best solution depends on the individual situation, so alternatives must be considered on a case by case basis.

Open-Loop Vacuum Uses

Use of open-loop faucet water to draw vacuum for distillation units and filtration processes can also consume large amounts of water. Alternative options include:

- For vacuum needs, install a laboratory vacuum system, or use small electric vacuum pumps.
- As with all lab equipment that uses electricity including vacuum pumps and cooling systems, operating outside of peak electricity demand times (10-4 pm, especially in hot/cold weather) reduces peak electricity demand.