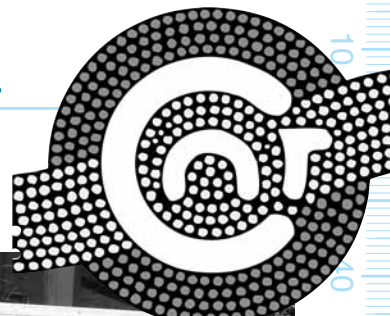


BUSH TECH BRIEF #11

Maintaining your air conditioner



Background

Evaporative air conditioners are being installed and used increasingly in housing in remote Indigenous communities. The air conditioners usually run on bore water. The quality of the groundwater is variable, but is usually high in total dissolved solids (TDS) and total hardness¹. The use of groundwater results in excessive scaling, increased maintenance and servicing and reduced life expectancy of air conditioners.

CAT has received many questions from Indigenous communities and program managers about ways to increase the life expectancy of air conditioners. Rainwater does not contain dissolved salts, so there would be a reduced scaling effect, lower maintenance and less replacements of parts.

CAT investigated the hazards and feasibility of using rainwater for air conditioners. This BUSH TECH explains some of the issues that are important when using and maintaining air conditioners and the potential for using rainwater to run air conditioners.

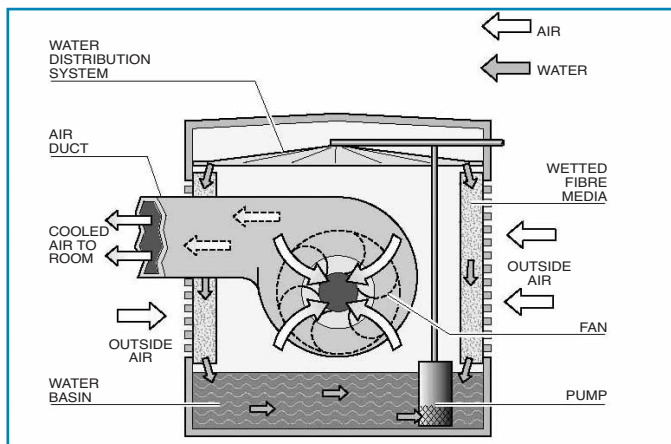
Why use evaporative air conditioners?

Evaporative air conditioning is one of the most energy-efficient methods of cooling a home. In dry climates, evaporative cooling can be used to inexpensively cool large homes. They are generally more suited to areas of low humidity, like central Australia.

Direct evaporative air conditioning adds moisture to the air. Therefore, during the high rainfall season in northern Australia (December-March), evaporative air conditioners are less suitable. The higher humidity results in uncomfortable and, for many individuals, unacceptable indoor humidity. Refrigerated air conditioners are more suited to this environment as they dehumidify the room air.

How evaporative air conditioners work

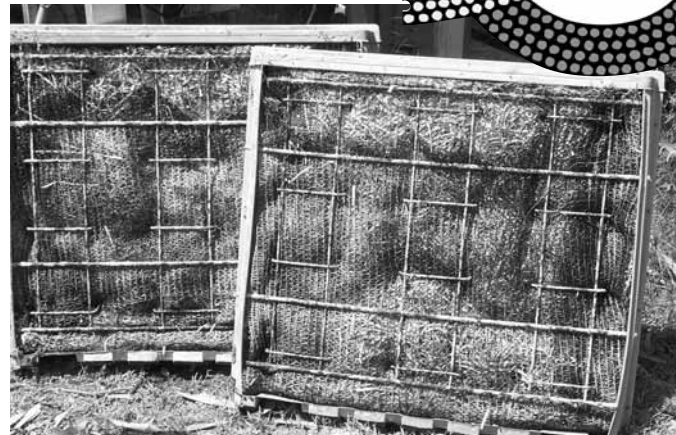
Evaporative air conditioners require water and electricity to operate. The typical evaporative air conditioner consists of eight major parts: housing (usually metal), a blower, recirculating water pump, water reservoir, float valves, pads, water distribution lines and an electric motor.² In areas with poorer water quality supply, evaporative air conditioners usually are fitted with bleed-off valves. This allows constant dumping of part of the water and allows the refill valve to replace it with fresh water.



(Public Health Division, Victoria, 2001 4)

Life expectancy of evaporative coolers

The typical life expectancy/warranty of an evaporative cooler is five years on parts and labour. However, evidence from remote communities shows that air conditioners sometimes function properly for only six months to one year. Scaling reduces the life expectancy of parts and the unit as a whole. The groundwater



AIR CONDITIONER PADS REMOVED READY FOR CLEANING.

supplies (bore water) used for the evaporative air conditioners usually contain high levels of Total Dissolved Solids (TDS) and high levels of Hardness (as Calcium Carbonate, CaCO₃), which causes scaling and corrosion. Roof mounted air conditioning units also corrode building roofs. Due to the high amount of scaling, increased servicing and cleaning is required.

Maintenance of evaporative air conditioners

Correct maintenance will make your air conditioner last longer and work more efficiently. It is important to follow any specific manufacturer's directions for maintaining the unit. Regular maintenance will prevent the build-up of sediment and minerals, fungus and algae on the pads and inside the unit, and ensure good air hygiene. Regular maintenance will prevent windblown dust and pollen from dirtying the water, which can form sludge and block the pads, pump and water distribution system. Fungi and bacteria may grow if water is allowed to stagnate in the basin.

A maintenance schedule

Inspect the air conditioner monthly and service as required. Clean and disinfect the cooler at least every six months 4;

Disinfecting the cooler:

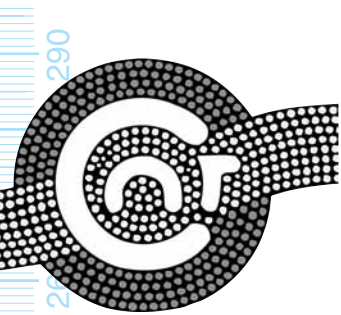
With the fan isolated and the pump circulating water around the unit, add 5 millimetres (1/5 inch) of household bleach (that has 4 % available chlorine), per 5 litres of circulating water. This will give you approximately 20 parts per million (ppm) of 'free chlorine' (chlorine available to kill bacteria).

- Allow the disinfected water to circulate for at least 30 minutes
- Dump the water and refill with fresh water
- Circulate for five minutes and again dump the water, to remove any chlorine residue
- Repeat previous step
- Refill with water and begin normal running
- Check that the equipment is running correctly.

Legionnaire's Disease

There is no evidence that evaporative coolers can cause Legionnaires' disease. The air supplied to the cooler may contain a variety of dust, dirt, bacteria, soluble gases and nutrients. Evaporative coolers 'wash the air', removing pollen and dust. Legionella's presence in water is not known to create a problem while in the water. Evaporative coolers do not provide suitable growth conditions for Legionella bacteria and they do not release an aerosol in which the bacteria could be transmitted.³

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BUSH TECH BRIEF #11

Maintaining your air conditioner

(continued)

Cleaning the cooler:

Before Summer

- Disconnect all power to the unit
- Remove external weatherproof covers
- Remove filter pads and clean them thoroughly with a hose. Replace if required. Refit when dry
- Clean all waterways, including the bleed-off system and sump
- If a fan belt is fitted, check for wear and correct tension. A one centimetre (2/5 inch) depression when pressed is about right. (Check manufacturer's specifications and adjust if necessary)
- Refit filter pads, close drain valve and open water inlet valve to allow the unit to fill with fresh water
- Disinfect the unit.

After Summer

- Disconnect all power to the unit
- Loosen all sediment and slime in the basin with a brush
- Drain all water from the tank and pipes
- Remove and clean filter pads
- Dry the internal components by running the fan only. If a drain valve is fitted leave open, clean all surfaces of scale etc and wash out
- Fit waterproof covers to external units.

Considering rainwater

CAT investigated the feasibility of using rainwater in two remote central Australian Indigenous communities. The research found that the air conditioners required far more water than the rainfall run-off collected. In the case study communities, one community with houses of a roof size of 150 m² could run their air conditioners for only one month. In another community, with the same size roof area and rainfall but lower water consumption, air conditioners could be run for three months.

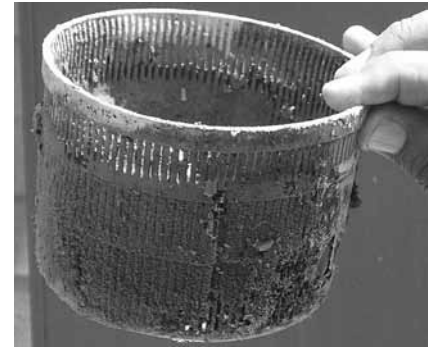
In these examples, if the communities decided to use rainwater for air conditioners, the operating time of the air conditioners would need to be carefully managed and priority given for only the really hot days.

Potential for rainwater Use

If you are interested in using rainwater for your air conditioner, answer these questions to work out whether it is possible:

- How much water is used to run the air conditioner per household on a daily basis?
- What is the average rainfall for your region?
- What is the total roof area of your house?
- How big is the storage (rainwater tank) required to store the collected rainfall?

Then, compare the rainwater collected/stored to water consumption to determine feasibility.



THE BUILD-UP OF CALCIUM (LEFT) BLOCKS WATER FLOW TO THE PADS. ONCE THE FILTER BASKET IS BLOCKED LIKE THE ONE ABOVE, NOT ENOUGH WATER WILL GET THROUGH TO THE PUMP. CLEAN BY SCRUBBING IT WITH A STIFF BRUSH AND WATER.

How to increase the life of your air conditioner

- Using a bleed-off valve on the water circulation system can reduce TDS and hardness levels. This decreases the mineral build-up on the pads and on the inside of the cooler but increases water use by 25 to 50%. The valve usually is located on the vertical water distribution pipe after the water pump or incorporated into the sump of the unit. This allows constant dumping of part of the water and allows the refill valve to replace it with fresh water.
- Regularly maintain the system
- Scale prevention devices have been used with some success in remote communities. However CAT research found no conclusive scientific evidence that these are effective. There are many products on the market; some are catalytic or magnetic technologies. These technologies attach to the water supply pipes and cost \$300 or more.
- Install ducting to only certain areas of the house and make full use of natural air flows.
- Use a rainwater and groundwater mix to reduce the amount of salts in the water supply. This will require planning for storage capacity of rainwater and monitoring of air conditioner usage for the system to be sustainable.

References

- 1 Fitzgerald J., Cuncliffe, D., Dodds S., Hostetler S., Rainbow, S. and Jacobson, G. 2000. Groundwater Quality and Environmental Health Implications, Anangu Pitjantjatara Lands, South Australia. Bureau of Rural Sciences, Canberra, Report
- 2 Brown, P.E. 2000. Operation and Maintenance of Evaporative Coolers. ASHRAE Journal, 27-31.
- 3 Puckorius, P., Thomas, P. and Augspurger, R. 1995. The design and operation of evaporative coolers help prevent the growth and transmission of Legionnaires' disease. ASHRAE Journal, 29-33.
- 4 Public Health Division, Victoria. 2001. Evaporative Coolers, An Operation and Maintenance Guide for Owners. Public Health Division, Victorian Government Department of Human Services, Melbourne, <http://www.dhs.vic.gov.au/phd/1010301/index.htm> .

Compiled by Robyn Grey-Gardner,
CAT/Cooperative Research Centre
for Water Quality and Treatment

(from the report Rainwater for Air Conditioning by Liam Wilson, Rio Tinto Fellow, 2002.)

Copies of the full report are available from CAT, (08) 8951 4311.