FACT SHEET

Efficient Water Heating

Running an energy-efficient steam, hot water or process heating system can greatly improve your business' energy consumption, bringing benefits both for your bottom line and the environment.

Many large tourism operators use boilers to provide their property with hot water and, in some cases, space heating via a heat exchanger (such as a radiator) that transfers heat or steam. Smaller tourism operations will typically use storage water heaters which hold smaller amounts of water that are heated using electricity, natural gas, liquid petroleum gas (LPG) or renewable energy sources such as solar.

Operations with restricted space and access may use instantaneous systems that heat water for one to several taps where water heating is used. Both boilers and hot water systems can waste a lot of water and energy if not operated efficiently.

This factsheet includes:

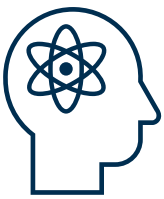
- Types of Systems
- Improving Boiler Efficiency
- Efficient Operation and Maintenance
- Alternatives to Electric Water Heaters

TYPES OF SYSTEMS

There are two types of hot water heating systems, storage systems and instantaneous hot water systems. Storage systems continually heat a stored amount of water; however, a large amount of energy is consumed in the process. Instantaneous hot water systems, also called on demand systems, heat water only when it is needed. These systems conserve energy but may result in more water being used while waiting for the water to be heated.

WHAT TO CONSIDER

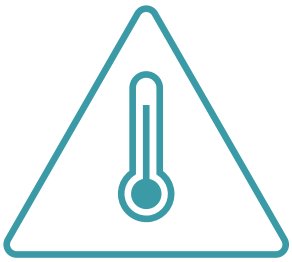
Before investigating opportunities to create efficiencies in the hot water systems, consider:



- The different requirements of the property and operations, such as hot water for kitchens, guest rooms, pools and spas
- The climate and groundwater temperature, as this will determine water heat
- Building codes and regulations

IMPROVING BOILER EFFICIENCY

Boilers use large quantities of water and energy and can be responsible for wasting heat, water and water treatment chemicals. The following highlights potential incidents and initiatives to improve efficiency and reduce wastage:



Blowdown - A blowdown is when a portion of water is expended from the boiler to prevent a build-up of contaminants in the water, which can cause biological growth, corrosion and scale. Blowdown means more fresh make-up water is consumed to replace the water lost from the boiler.
Initiatives to reduce blowdown include:

- Install automatic blowdown system - undertake blowdowns at set time intervals rather than manually.
- Reuse boiler blowdown water for other activities such as cleaning if the water quality is appropriate to the application.
- Install a blowdown heat recovery system to preheat make-up water.

  Identify alternative water sources to reduce the amount of mains water required to replace blowdown by identifying suitable alternatives such as rainwater, condensate, recycled water or bore water.

Poor Combustion Efficiency - Boilers can consume excessive amounts of energy if they do not convert their fuel into heat efficiently. This not only wastes energy and fuel but also increases combustion gas emissions and unburnt fuel deposits (soot) on the inside surface of the boiler tubes, which act as an insulator by reducing heat transfer efficiency and by allowing heat to escape.

Combustion and heat transfer efficiency can be improved by:

- Regularly monitoring flue temperatures and boiler flue gases. Many boilers lose 10-20% of their fuel energy input up the stack. An increase in temperature usually means soot and scale are having an insulating effect and reducing the boilers efficiency. As a 5°C rise in flue temperature indicates a 1% efficiency loss, find out the optimum temperature by reading the flue temperature immediately after the boiler has been serviced and cleaned.
- Undertaking regular checks for air leaks to reduce excess air in the system.

Distribution Losses - Some losses of steam or hot water will occur during the distribution of steam through leaks, lack of insulation and incorrectly sized pipes. These can be addressed in the following ways:

- Pipework - Heat losses in the distribution system can be reduced by removing redundant pipework. Ensure pipework is correctly angled for maximum drainage and not over-sized as larger surface areas lose heat, while undersized pipes result in greater pressure - increasing the probability of leaks. Reduce pipework by ensuring the pipes between the tank and points of end use are as short as possible to reduce heat loss.
- System leaks - Regularly check the system for leaks including the tank and pipework. Ensure all steam traps are regularly maintained to ensure they open and close effectively. Traps that remain closed become waterlogged which increases heat loss, while traps that do not close effectively lose water, heat and chemicals.
- Insulate - Insulating boilers and steam lines can greatly reduce heat loss by up to 90%.
- Condensate return - Install condensate return lines to capture condensation to be returned to the boiler to reduce water and energy consumption, and the amount of treatment to chemicals required.

EFFICIENT OPERATION AND MAINTAINENCE

Ensure that boilers are operated at their optimum working pressure and temperature as operating boilers at lower pressures will reduce their efficiency. If lower pressures are required, consider installing pressure reducing valves at the end point of use, instead of reducing the boiler operating pressure. If thermostats are set too high, they will cause the water to be heated unnecessarily. However, make sure that the thermostat is not too low that there is a risk of harmful bacteria growing in the tank.

Operate boilers as needed but try to start them as late as possible and shut them down as early as possible. If the boiler is operating at times of low demand, consider a smaller boiler or hot water storage system that could operate during these hours.

Retrofitting and relacing hot water systems - Assess the efficiency of your current system and determine whether retrofitting or replacing the system would be more economically efficient.

If demand for hot water or steam at your property is variable, consider installing an accumulator which is an additional vessel filled with heated water. When there is a sudden peak in demand the pressure is reduced causing some of the water to immediately become flash steam, thus protecting the boiler from instantaneous loads. Alternatively, consider replacing boilers with multiple de-centralised boilers for part load systems.

Other retrofit options include:

- Retrofitting gas pilot lights with automatic electronic ignition systems.
- Replacing the system with an alternative energy supply.

ALTERNATIVES TO ELECTRIC WATER HEATERS

Energy intensive electric water heaters typically generate more greenhouse gases than other water heaters.

Gas - Gas heaters produce about one third of the emissions that electric heaters produce. This may be a good alternative for properties with limited space and access to piped natural gas.

Heat Pumps - Heat pumps absorb heat from the outside air using a refrigerant liquid which is kept at a temperature lower than the outside air temperature. The heated refrigerant is then compressed into a hot vapour which can be used to heat water via a heat exchanger. A compressor is required to compress the refrigerant, and subsequently these types of systems make a noise like an air-conditioning unit. While they still consume electricity, it can be up to 40% less than conventional electric hot water heating. If your operation is located near another source of heat such as hot groundwater, bedrock, or waste heat from nearby processes or businesses, heat pumps can utilise this heat. These pumps can be located anywhere including sitting on top of existing hot water systems inside buildings.

Solar - The viability of solar systems depends largely on the climate and the site's level and type of hot water usage. Smaller operations may be able to meet all their hot water needs while operations using large amounts of hot water may find solar pre-heaters that feed water heated by the sun into a conventional heater more suitable.

Most systems have an electric or gas booster for periods of insufficient sunshine. Huge advances in the materials used to make solar heaters and technological advances using lenses, mirrors or dye coated glass to focus sunlight into a small beam to achieve higher efficiency, should make solar a more efficient and cost-effective alternative for water heating in the near future.

CASE STUDY

QUEENSTOWN HOLIDAY PARK & MOTELS CREEKSYDE

Queenstown Holiday Park & Motels Creeksyde was established in 1987 in Queenstown, New Zealand. Originally a site for camper vans, Creeksyde has grown into a popular holiday park offering a wide range of facilities and accommodation types.

Environmental management and supporting local organisations have always been key priorities and in 2004 Creeksyde became the first holiday park in the world to be EarthCheck Certified. With a dedicated team committed to sustainability, the park has achieved EarthCheck Master to become the first park in New Zealand to attain EarthCheck Master Certification!

Creeksyde has implemented a range of sustainable initiatives to reduce energy and water usage.

- ✓ Hot water supplies are preheated using captured heat from the property's laundry dryers and solar panels.
- ✓ Heat loss is reduced through insulation, double glazing and suitably lined curtains to mitigate pressure on the heating system.
- ✓ The Creeksyde team check for water leaks on a weekly basis to ensure there is no unnecessary water loss.