Case Study: Autoclave Water and Energy Recovery
Facility: Somerset Hospital, Greenpoint, Cape Town

GGHH Agenda Goals
Water, Energy

Hospital Goals
- Reduce water consumption.
- Reduce energy consumption.
- Reduce expenditure on water and energy.

Progress Achieved
- Reduction in water consumption – 5000 liters per day
- Domestic hot water generated from waste heat – 6000 liters per day
- Estimated cost saving of ~USD 15,750 per year. Pay back in less than 2 years

The Issue
Autoclaves use potable water to produce steam, and more significantly, to condense the steam in the pressure chamber to draw a high vacuum. During the process this potable water typically runs to waste. This waste water is not only clean but is hot. An autoclave typically uses about 200 liters of water per cycle and this water is discharged at about 40^{0}C and runs to waste.

Sustainable Strategy Implemented
Previous strategies focused on the saving water but overlooked the significance of the energy content of the hot water that ran to waste. In view of the water crisis in Cape Town, resulting from several years of low rainfall, it is understandable that water saving received priority.

The current initiative stems from years of experience in reducing energy consumption by using heat pumps. The condenser water from autoclaves is easily recovered by a heat pump. The saving in electrical energy reduces the greenhouse gas emitted by the predominantly coal fired power stations in South Africa. It also reduces the load on South Africa's aging power stations.

Implementation process
The implementation process involved measurement and analysis of the electrical energy consumed by the autoclaves and then designing a system that would simultaneously cool the waste water for 100% re-cycling and use the energy to heat domestic water to 60^{0}C. The design achieved this by:

- Capturing the clean warm waste water in a "Jo-Jo" tank.
- Cooling the water in the "Jo-Jo" tank using a water to water heat pump.
- Pumping the cooled water back to the autoclaves.
- Using the rejected heat to produce domestic hot water at 60^{0}C

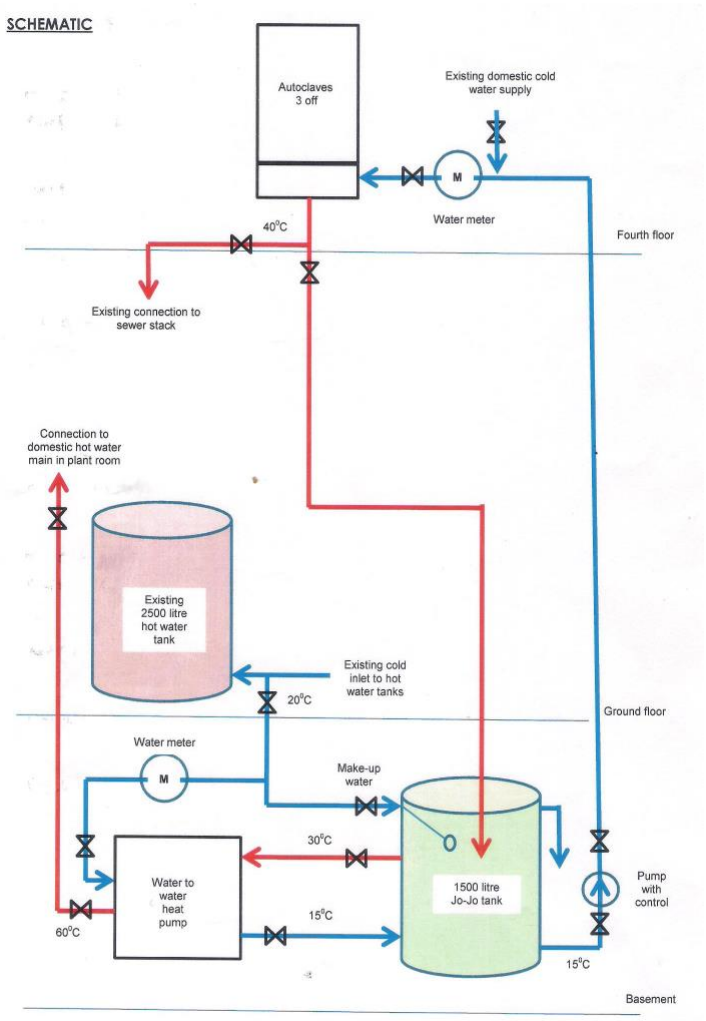
Tracking Progress

On completion of the installation the system was subjected to a full performance test involving metering and recording of water flows and electricity consumption. From the water and energy measurements the Coefficient of Performance (COP) of the domestic water heating and of the overall system was calculated.

The installation has water meters and temperature indication installed so that the maintenance personnel can monitor the performance.

Results

- The saving in water varied from 4500 liters per day to 6000 liters per day. An average saving of 5000 liters per day is anticipated.
- The domestic hot water generation varied from 6000 to 7000 liters per day. An average generation of 6000 liters per day is anticipated.
- The COP of the 60^{0}C hot water generation was calculated to be 3.3 and the overall COP was 5.6 (over a 24-hour test period).
- The cost saving in respect of water is expected to be ~USD 3,425 per year and electricity ~12,330 per year.
- The pay-back on investment will be less than 2 years.



Next Steps

The roll-out to other hospitals is already in progress.

Demographic information

Somerset Hospital is a 340 bed Regional Hospital providing general specialist services. It is a referral hospital for an estimated 500,000 people who are reliant on public health services.

Andy Cunninghame Pr Eng
Departmental GGHH Energy Champion
Western Cape Government Health
Address: Old Boiler House, Karl Bremer Hospital, Bellville
Tel: 021 830 3777
Cell: 083 301 9015
E-mail: Andrew.Cunninghame@westerncape.gov.za