



Case Study: Forest Hill Chase Shopping Centre, Vic

Energy Savings

15,080 kWh
Per Year

1 year

\$13,800.00
Savings

CO₂ Offset

139
tonnes



Forest Hill Chase

Location:	Forest Hill, Victoria
Building:	Shopping Centre
Focus:	Variable Primary Flow Optimization
Date PP Installed:	December 2013
Project Cost:	\$22,500.00
Payback Period:	18 Months
Energy Savings:	115,080 kWh Annual
Savings:	\$13,800.00 per annum (estimate)
CO2-e Offset:	139 Tonnes per annum

Summary:

PlantPRO is the latest “smart” technology available that provides the latest in optimised control, trending, diagnostics, and reporting for Central Air Conditioning Plant. The results provide significant energy savings, significantly greater control flexibility and the tools to operate and maintain the plant in the best possible optimised condition.

Details:

Forest Hill Chase Shopping Centre is a major Retail Centre located in the eastern suburbs of Melbourne. The Centre has a strong focus on energy efficiency and is constantly looking for new and innovative products to optimise their energy usage.

PlantPRO was installed at this site to both optimise the operation of the central plant and to provide advanced measurement and reporting capabilities to the facility. Control strategies included active lift optimisation through a combination of chilled water and condenser water reset and further enhanced with variable speed primary pumping control. In addition to this, optimised chiller sequencing was employed to ensure the best fit chiller was always sequenced for the given building load.

Primary chilled water pumping energy was separated out to compare before and after data since the implementation of Variable Primary Flow through PlantPRO’s Plant optimisation engine.

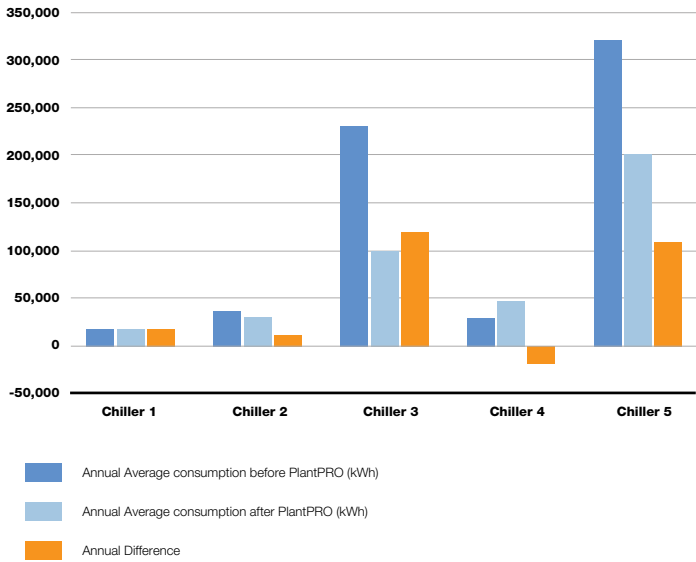
Outcomes:

Each chilled water pump reacted differently to the introduction Variable Primary Flow through PlantPRO controls optimisation engine. A marginal improvement in energy consumption was seen on the two high load chilled water pumps (Chillers 1 and 2) with average savings of approximately 6kW-hr.

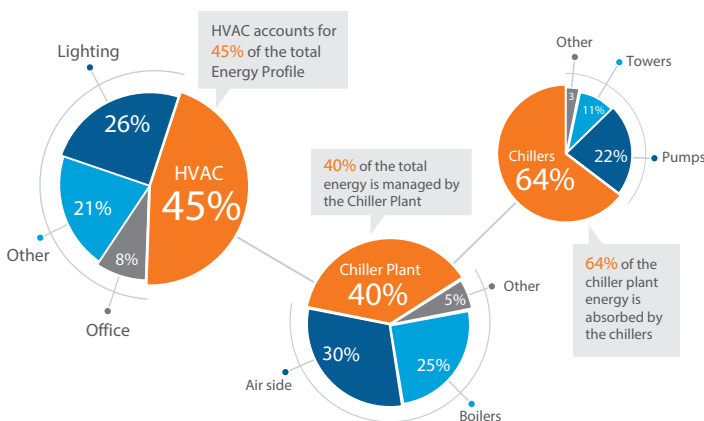
Chilled water pump 4 showed a significant reduction in power consumption with an average reduction of 22kW-hr. This was due to the pump selection being quite generous and as such allowing a high turn down.

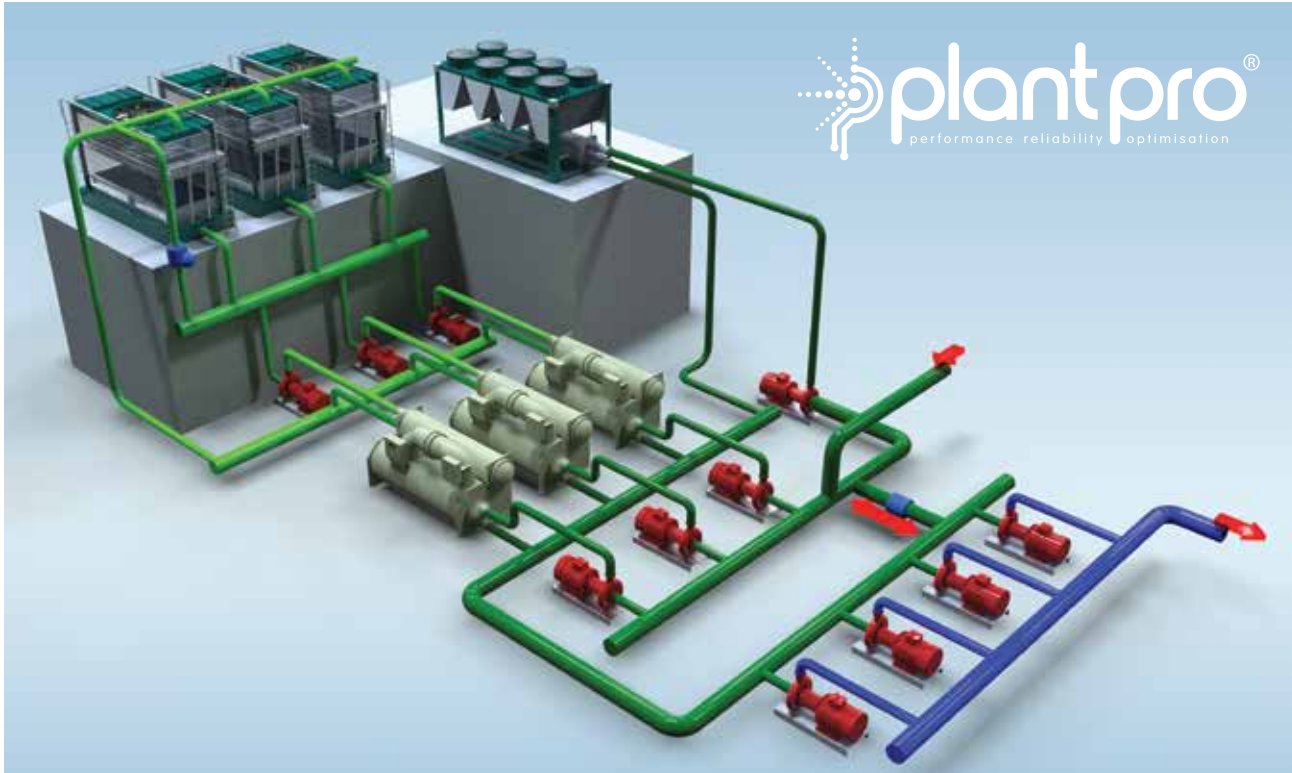
Chilled water pump 5 actually consumed more power after the introduction of VPF. This was due to flows being too low prior to plant being optimised by PlantPRO.

Normalised against expected run hours for each chilled water pump, an annual reduction of 115,080 kWh will be achieved. This equates to a savings of \$13,800.00 pa.



Typical Building Energy Consumption





Introducing PlantPRO

PlantPRO is the latest “smart” technology available to provide the latest in optimised control, trending, diagnostics, and reporting. The result will provide significant energy savings, significantly greater control flexibility and will provide the opportunity to operate and maintain the plant in the best possible optimised condition.

As the cooling load varies, PlantPRO enables and disables Chillers so that the current cooling capacity is matched to the current cooling load. This action is commonly called Chiller sequencing. The two fundamental elements of any sequencing control strategy are the sequence order, the order in which chillers are enabled and disabled, and the sequencing logic, the rules by which Chillers are enabled and disabled to match the cooling capacity to the load.

The Chiller sequence order can be set manually or PlantPRO can set the order automatically. With the manual sequence order option, the operator will manually enter the sequence order required. With the automatic sequence order, PlantPRO chooses the next “on” chiller based on efficiency ranking or Chiller run time depending on how the configuration has been set.

PlantPRO sequences the required number and order of operating Chillers within a plant room and then simultaneously determines the required number of operational cooling tower and condenser water pump combinations. PlantPRO stages on the cooling towers by managing the shut off valves and starting the next condenser water pump so as to optimise the lift conditions within each Chiller.

The condenser water pump and cooling tower sequence order can be set manually or PlantPRO can set the order automatically. With the manual sequence order option, the operator will manually enter the sequence order required. With the automatic sequence order, PlantPRO chooses the next “on” pump and tower based on accumulated run time.

PlantPRO benchmarks each individual Chiller against IPLV/NPLV and ProCOP while simultaneously calculating instantaneous COP of each individual Chiller. PlantPRO also provides overall plant performance for all operating Chillers, pumps and towers.



Optimisation of each Chiller is based on maintaining minimum lift for any given operating conditions while taking into account the field load requirements.

Individual Chillers undergo continuous diagnostic checks to identify issues that cause deterioration in performance. Instantaneous gas cycle conditions as well as heat transfer performance are considered in the diagnostic process.

Diagnostic alerts are generated whenever conditions are outside of normal conditions. These diagnostics are determined by logical testing of the data and where more than one abnormal condition is detected, the diagnostics are displayed as a percentage of run time order.

PlantPRO Chiller monitoring tool includes:

- Comprehensive charting and data analysis tools for all inputs for analysis of the complete system performance.
- Efficiency indicators to compare and benchmark chiller efficiency to that of design.
- Diagnostics of system issues.
- Manually generated chiller logs
- Automatic and manually generated monthly reports detailing standard statistics including power and water consumption, hours run, monthly diagnostics summary etc, plus a range of specific performance measures for benchmarking purposes with other sites and chillers.

Plant monitoring tool includes:

- Plant trending and data analysis for analyzing overall system performance.
- Summary pages covering the status of all associate pumps and fans.
- Automatic and manually generated monthly reports.
- Tool to analyze and rank the relative performance of all operational chillers.
- Active Chiller Performance control module that will automatically select the most efficient combination of available chillers at their respective most efficient load points.
- Active CHW supply temp relief control module that will manage CHW supply

Cooling Tower monitoring tool includes:

- Tools to analyze water consumption including cycles of concentration.
- Tools to benchmark and diagnose major leaks and other water consumption issues.
- Automatic and manually generated monthly report covering volume of cost of water supplied and disposed.
- Active Cooling Tower Optimization control module to optimize the overall system performance taking in account the type and number of chillers running as well as ambient conditions.
- The tower will nominally be setup to run independently from the chillers and will control themselves to deliver water at the temperature that will deliver the best COP irrespective of how many chillers are running. We can also set them up to control on wet bulb temperature as well if you choose. (If you have specific control ideas that you would like to incorporate, we can certainly include them during the programming phase. We will also be able to make changes remotely as well if required.)