plantpro®

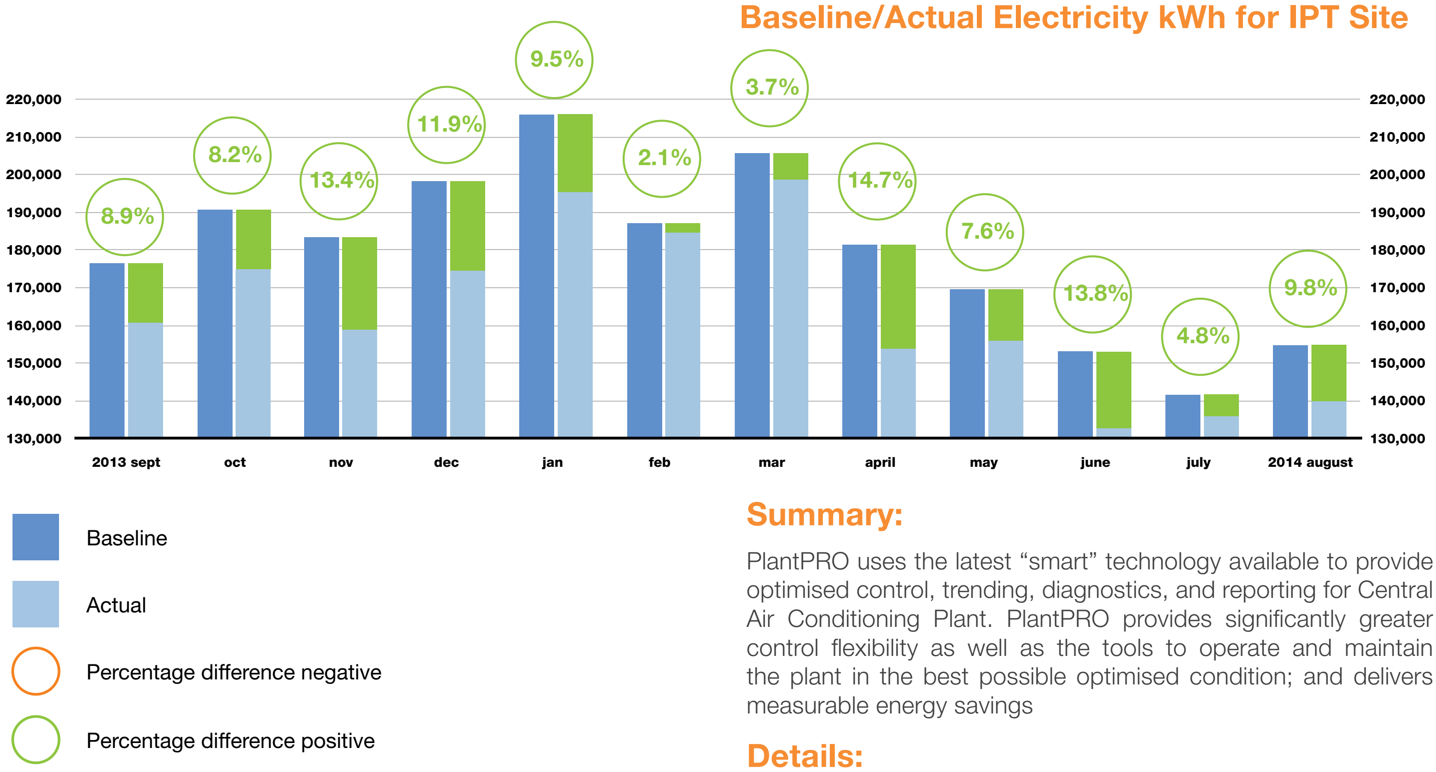
performance reliability optimisation

Case Study: Innovation Place, Sydney NSW

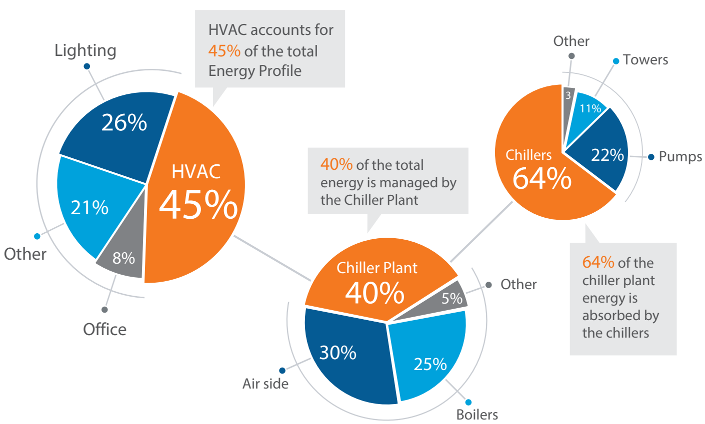
Innovation Place

Location:	North Sydney NSW
Building:	23 Storey A-grade office
Rating:	5 star energy rating
Date PP Installed:	13th June 2013
Energy Savings:	10.9% (over baseline readings)
Project Cost:	$59,000.00
Payback Period:	1.4 Years
Savings:	$42,603.00 per annum (estimate)
CO2-e Offset:	250 Tonnes per annum

Baseline/Actual Electricity kWh for IPT Site



Typical Building Energy Consumption



Summary:

PlantPRO uses the latest “smart” technology available to provide optimised control, trending, diagnostics, and reporting for Central Air Conditioning Plant. PlantPRO provides significantly greater control flexibility as well as the tools to operate and maintain the plant in the best possible optimised condition; and delivers measurable energy savings

Details:

Innovation Place is a 23-storey A-grade commercial office building located in North Sydney. It has been designed to a 5star base building Australian Building Greenhouse Rating and as such has a strong focus on energy efficiency and sustainability.

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 building. Control strategies included active lift optimisation through a combination of chilled water and condenser water reset, which was 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.

Outcomes:

Plant energy consumption compared to normalised baseline data has improved significantly since PlantPro was fully tuned in September 2013, with an improvement of 10.9% over baseline readings.

Innovation Place, Sydney NSW

Innovation Place PlantPRO Case Study in more detail:

Innovation Place is a 23-storey A-grade commercial office building located in North Sydney. The building has been designed to a 5–star Australian Building Greenhouse Rating and as such has a strong focus on energy efficiency and sustainability.

The mechanical services plant utilises three Trane constant speed screw chillers with a total plant capacity of 2700kW. A unique pipework layout has been employed on this site that allows the plant to deliver 13°C chilled water to a chilled beams water circuit while at the same time deliver 6°C to a secondary chilled water circuit.

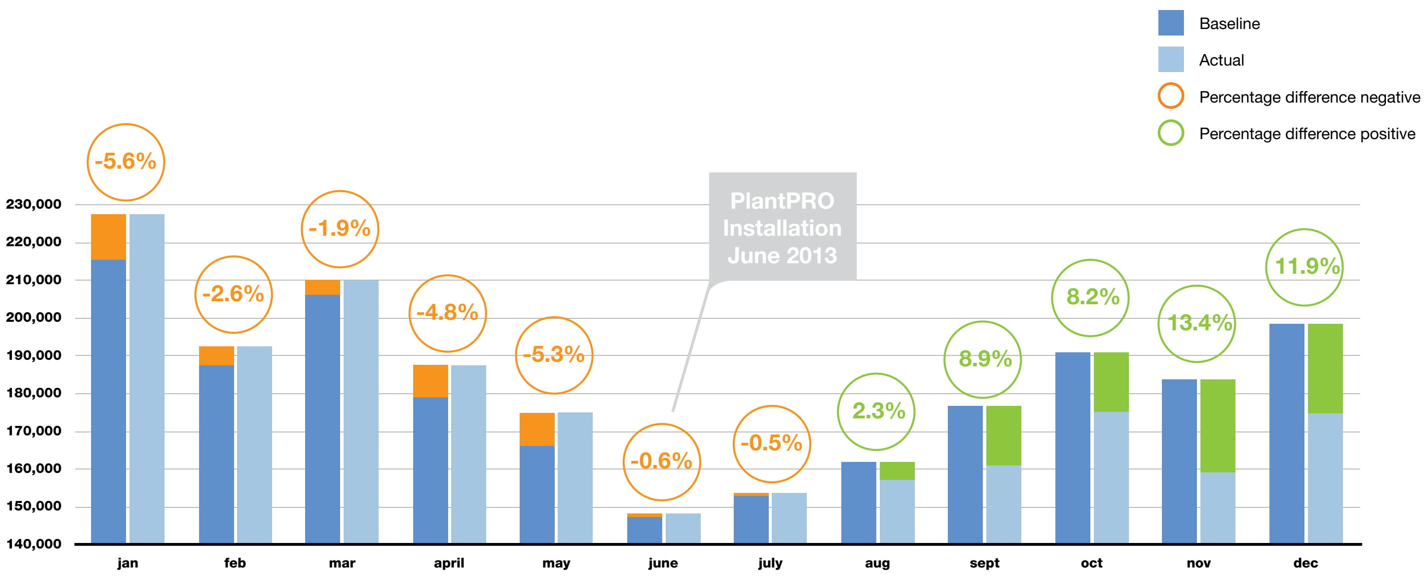
PlantPRO was installed on this site to both optimise the operation of the central plant and to provide advanced measurement and reporting capabilities to the building. Control strategies included active lift optimisation through a combination of chilled water and condenser water reset which was further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

PlantPRO took over control of the plant at Innovation Place at the beginning of June 2013. A tuning process was then instigated to optimise the operation of the plant. Using two years of historical plant consumption data, baseline energy usage was captured and analysed using Metrix4 Utility Accounting Software.

Raw energy consumption is often not a true indicator of how efficiently a building plant is performing. To analyse building plant energy consumption and compare it against previous years, it is important to not only look at kWh consumption but also normalise the data against weather variables over the recorded period. The Metrix4 Utility Accounting System does this and presents the end user with a true picture of the actual energy savings.

Early indications of plant energy consumption compared to normalised baseline data have shown a significant improvement since the installation of PlantPRO. After the initial tuning period, energy consumption stabilised with an average improvement of 11% over baseline readings.

Baseline/Actual Electricity kWh for IPT Site



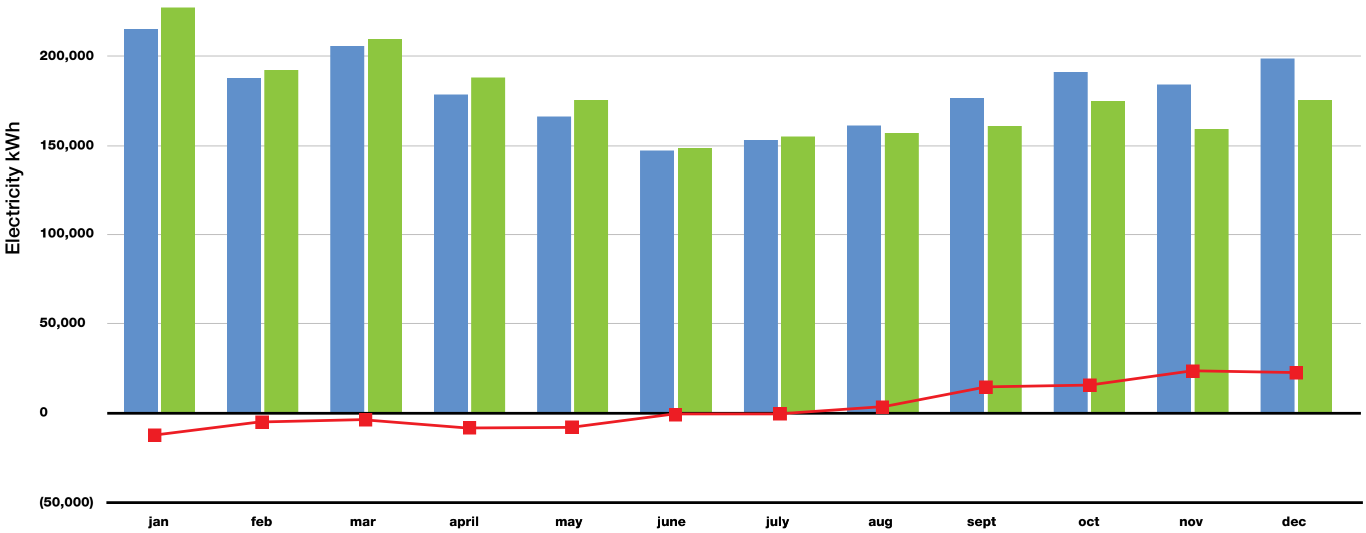
Year Ending 12/31/13

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Baseline	215,474	187,601	206,262	178,987	166,232	147,290	152,946	160,857	176,802	190,951	183,721	198,515
Actual	227,486	192,518	210,092	187,512	174,985	148,213	153,683	157,193	161,039	175,210	159,163	174,815
Baseline - Actual	(12,013)	(4,917)	(3,830	(8,525)	(8,753)	(923)	(737)	3,664	15,763	15,741	24,558	23,700
Percent Difference	-5.6%	-2.6%	-1.9%	-4.8%	-5.3%	-0.6%	-0.5%	2.3%	8.9%	8.2%	13.4%	11.9%

Progressive improvement since the installation of PlantPRO

Monthly Energy Savings:	Approximately 20,000 kWh
Estimated Annual Energy Savings:	In excess of 240,000 kW
Estimated Annual Cost Savings:	Approximately $42,600.00
Simple Payback:	1.4 years.

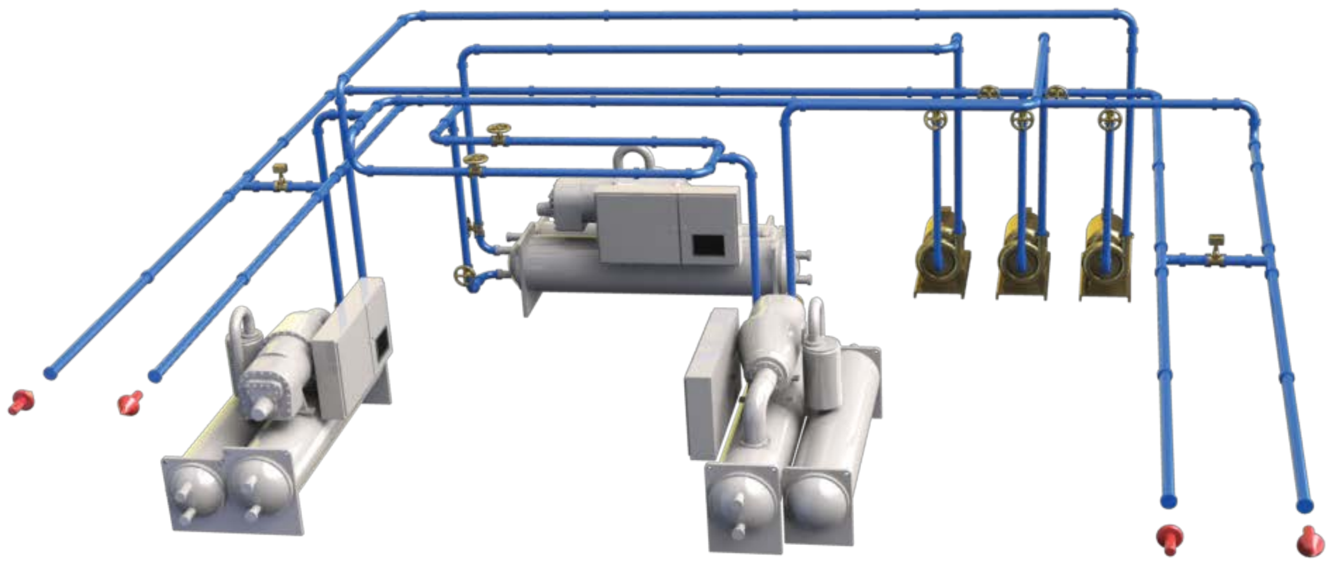
Indirect savings attributed to the installation of PlantPRO

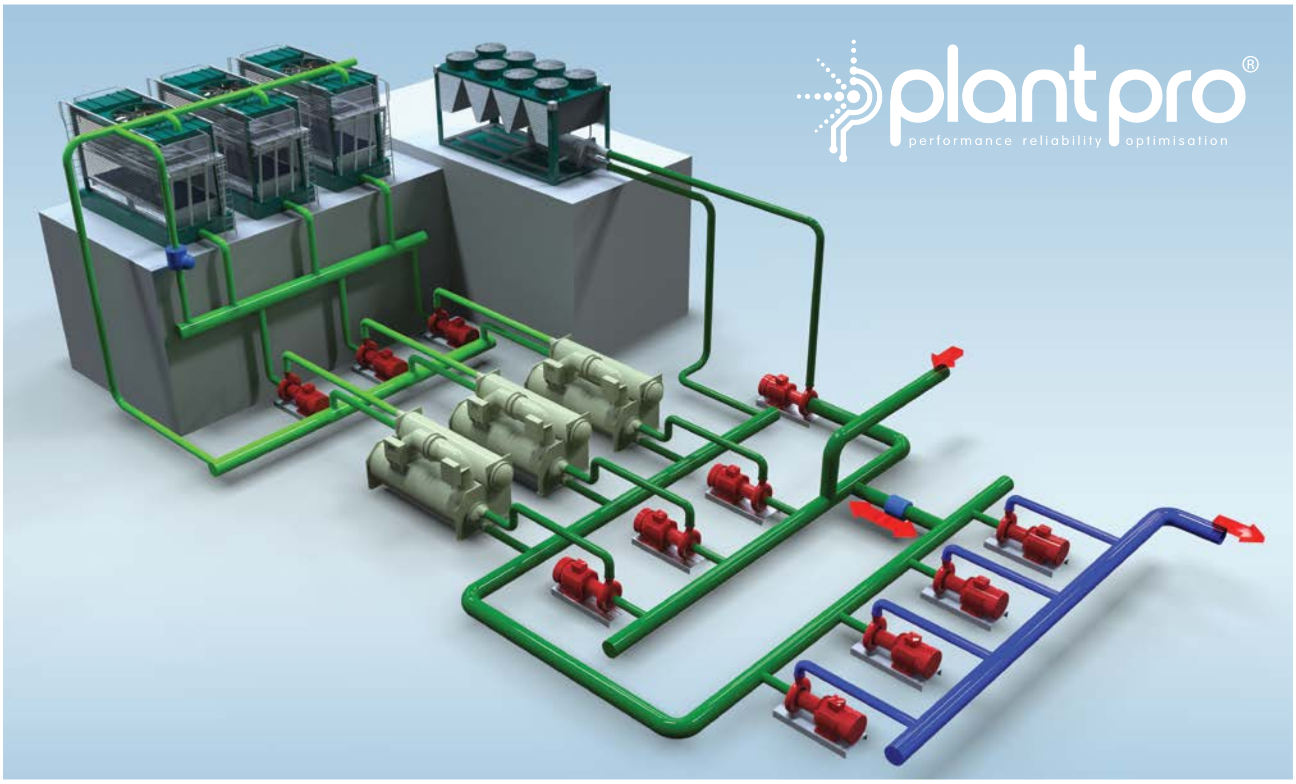


In addition to bottom line energy savings, plant stability has been significantly improved since the installation of PlantPRO. This stability improvement has in turn provided more consistent building conditions and helped ensure the condition space stays within contractually agreed temperature ranges.

Through PlantPRO's real-time diagnostics and automated fault reporting systems, early warnings through emailed alerts have ensured that small plant issues are addressed proactively before they become major issues.

General operational issues highlighted by PlantPRO are now being addressed by both the Building Operations team and the BMS contractor which should further improve overall running costs of the plant.





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.)