RP1014

IMPACT OF ENERGY EFFICIENCY POOL PUMPS ON PEAK DEMAND, ENERGY COSTS AND CARBON REDUCTION

Research Question

What can be done to improve the energy efficiency of a pool filtration system?

How much energy can be saved?

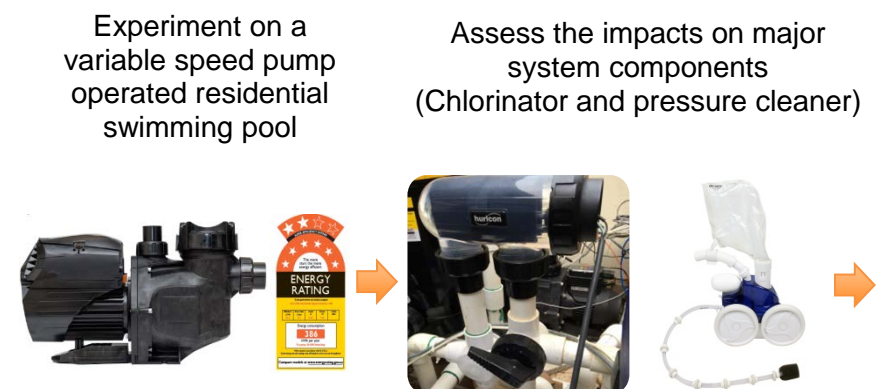*What are the associated impacts on key system components, such as salt water chlorinator and pool cleaners?*

Can we run the pool filtration system with a PV?

Highlights and impacts

★ Filtering the pool at around 60 L/min with a robotic pool cleaner in use, saves pump energy by 70%.

★ Typical salt water chlorinator and pressure cleaner do not work properly at flow rates less than 60 L/min and 78 L/min.

★ PV powered energy efficient pool filtration system (with robotic cleaners) can payback the initial cost in 5.4 years.

★ If all Australian pools were retrofitted to the proposed energy efficient design, 1000 GWh electricity and 1 Mt CO_2-e could be reduced annually.

Methodology

The experiment was performed on an existing swimming pool filtration system in Sydney. The methods are presented as follows:

Experiment on a variable speed pump operated residential swimming pool

Assess the impacts on major system components (Chlorinator and pressure cleaner)

Retrofits (Robot cleaner)

Data acquisition and pool water testing

Results

Key experimental results under various scenarios

| Operating scenarios	A	B	C	D	E	F (BAU)	G
Pump speed (rpm)	900	950	1150	1450	2075	2850	750
Cleaner type	Pressure cleaner						Robot
Running time (hr/day)	14	10	8	6	4	4	10
Total flow (L/min)	58	62	78	102	155	220	64
Chlorinator working?	No	Yes					
Water chemistry	Poor	Good					
Proportion of flow via pool return	0%	0%	0%	24%	50%	65%	100%
Water clarity	Poor			Ok		Good	Perfect
Manual clean?	Yes						No

Improvement of pool conditions with robotic cleaner retrofitted (LHS: pressure cleaner; RHS: robot cleaner)

Daily energy usage (kWh/day) of the whole filtration system under various scenarios
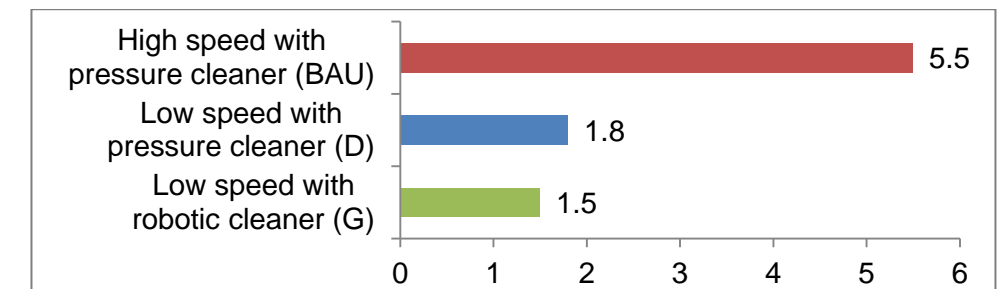
PV system output and pool loads at summer solstice (LHS: cloudy day; RHS: clear day)
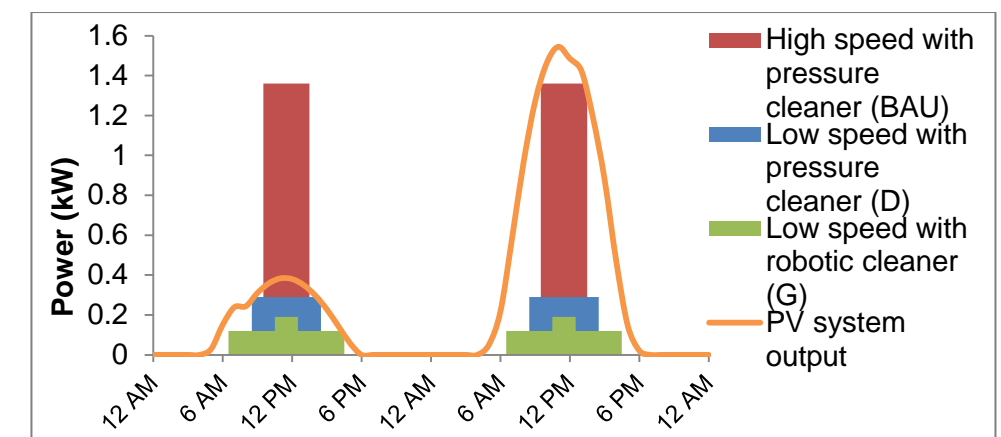
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