

ABB's technology enables Hobart Aquatic Centre to save an estimated \$36,000 in reduced energy costs



With a more energy efficient solution that includes ABB motors, drives, and Smart Sensors, for a digitally connected advanced analytics and scalable system.



The Doone Kennedy Hobart Aquatic Centre in Tasmania, Australia, has been a popular community facility for 23 years and is owned and operated by the Hobart City Council. It's a \$50 million AUD sporting facility that houses a warm water pool, leisure pool, and an Olympic sized swimming pool that not only provides a place for recreational swimming, but also somewhere for children to learn how to swim.

Commissioned in 1998, the Council recognised that due to ageing infrastructure, the energy required to heat such large volumes of water to maintain a comfortable swimming temperature year-round, was becoming unmanageable with rising costs seen not only in heating bills, but also impacting the environment.

Consequently, they've undertaken an upgrade of the Centre as part of a series of major projects to create a more sustainable

city for better communities. New features include the capture of heat contained in treated sewerage effluent and the installation of over 1500 solar panels.

Restructure, rollout, reheat

In looking at the motors and drives being used to manage the entire pool filtration and water circulation system, HVAC central plant, and grey water systems, Jason Clark - Program Leader Facility Operations at Doone Kennedy Hobart Aquatic Centre, says "we were looking to future-proof our equipment in this particular design. We knew that a full replacement was imminent given how much we were spending on motor repairs. Our assets were aging and on the brink of being deemed end of life."

"By undergoing an asset replacement with highly energy efficient solutions, modelling shows that the money saved from maintenance activities such as refurbishments and rewinds, combined

with operational cost savings, will set us up for a return on investment in less than 3 years' time."

He continues, "it's an industry standard approach that if a motor fails, you get it rewound. And we were looking at motors that preceded 1998 that have already been rewound and refurbished a couple of times each. There should be more acknowledgement that this has become an outdated practice thanks to the data we now have to show that repeat repairs actually increases operational costs and total cost of ownership. Not to mention, the amount of carbon emissions this dated equipment emits into the environment simply by the nature of their traditional design."

ABB Value Service Provider A1 Electric Motors worked with Enginuity Power Solutions, an electrical power system consultant based in Tasmania, to identify energy efficient equipment that was scalable and capable of operational analysis in a new system for the Hobart Aquatic Centre in response to these needs.

A sustainable solution to easily integrate and reduce operational costs

Tom Green, Managing Director at Enginuity Power Solutions supported Hobart City Council in the design which includes 19 ABB ACH580 variable speed drives (VSDs), 19 ABB synchronous reluctance (SynRM) motors, 2 gateways and 25 ABB Ability™ Smart Sensors – the key element in advanced analytics and maintenance planning for motors, pumps and mounted bearings and gearing, for a truly wirelessly connected digital platform.

Tom says, "I recommended the ABB ACH580 drives because of their ability to reduce harmonic distortion levels on the system simply because of the inherent features

of this newer drive technology. These drives, coupled with the SynRM motors, will also reduce the current electrical draw demand by approximately 18% - and that's even better than anticipated."¹

Additionally, the existing building management system at the Centre required a BACnet protocol (BAC) for building and automation control, which comes standard through these drives.

The ACH580 drives have been coupled with ABB's IE5 SynRM motors because of their ability to increase energy efficiency and reduce energy losses by up to 40%. These motors are also helping to lower operational costs and maximise performance when packaged together with ABB drives.

One advantage of these motors is their cooler running temperature that extends the life of stator windings, bearing lubricants and the bearings themselves. It also reduces the need for cooling of workspaces. A SynRM motor is always installed with a VSD to form an optimised package that offers flexibility and precision to replace standard induction motors in any application.

Tom says, "these SynRM motors have reduced maximum demand requirements to run. It's giving the Centre more options and more capabilities to upgrade operations because they're not only lowering energy costs but also freeing up space on existing infrastructure to accommodate future expansion.

In industries we support, we're recognising that a lot of places are already at maximum capacity where there's no more space and no room to expand any further. This will be a massive problem in Australia as population density increases and coal and

gas fired plants shut down with the infiltration of renewable energy. That's why rather than increasing central infrastructure like poles, wires, and generators, using a systematic approach like this which fixes issues at the source with connected loads will help to overcome these challenges. It's preventing the need to spend thousands of dollars later."

Digitalisation enables advanced analytics and smart data

The ABB Ability™ Smart Sensors that will be installed on the motors, pumps, and mounted bearings of the Centre's new system will convert the equipment into smart, wirelessly connected devices. By measuring key parameters from the surface of the equipment data can be used to gain meaningful information on its condition and performance. This enables users to identify inefficiencies within their system and to reduce risks related to operation and maintenance.

Jason says, "the right kind of monitoring and control of pumps, and of the motors and drives that power them, can go a long way toward improving their performance and helping us make sure they keep running. Using ABB's Smart Sensors is probably the easiest kind of digital technology we could implement, with the quickest payoffs."

The Centre will be able to monitor their new equipment for statuses including temperature, vibration, power surges and other conditions that can be indicative of potential (or immediate) problems.



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Inside the Doone Kennedy Hobart Aquatic Centre.



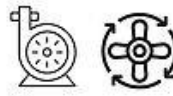
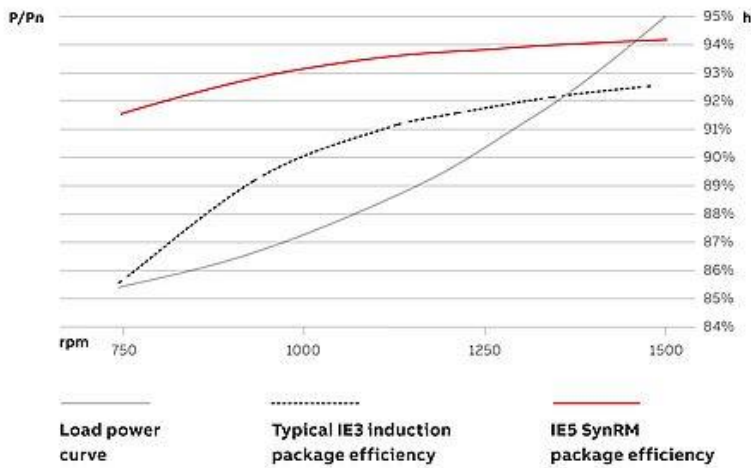
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ABB's IE5 SynRM motor and drive package – helping customers to save energy, spend less, and produce more.



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Inside the Doone Kennedy Hobart Aquatic Centre plant room, beside an ABB SynRM motor with Smart Sensor, and the older ACH550 drives being replaced with the new ACH580 drives (L-R): Michael Kean - Program Officer Facility Operations at Doone Kennedy Hobart Aquatic Centre, Tom Green – Managing Director at Enginuity Power Solutions, and Jason Clark - Program Leader Facility Operations at Doone Kennedy Hobart Aquatic Centre.



110 kW,
1500 rpm drive system
in pump/fan duty



Example: For a 110 kW
1500 rpm drive system in
pump/fan duty, with an IE3
induction motor the package
efficiency is 92.5%, while for
an IE5 SynRM motor the
package efficiency is 94.2%.

At partial loads, an IE5 SynRM motor and VSD package offers significant energy efficiency advantages over an IE3 induction motor.



Industrial case studies with SynRM motor and VSD packages show dramatic reductions in energy consumption.



Studying the pump system used for grey water circulation at the Centre, a comparative data analysis of the previous motors and drives versus what's already been installed of the new ABB SynRM motor and drive packages purchased by the Centre was conducted.

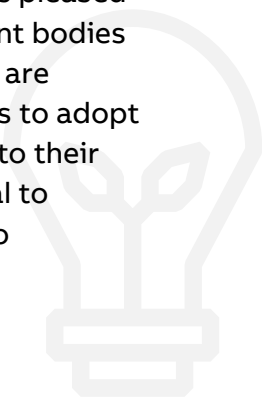
Initial results have already shown a 15% reduction in maximum demand for energy consumption alone. This reduction in current draw and maximum demand (kVA) during peak periods will reduce the Centre's electricity network charges by an estimated \$17,000 AUD per year.

In looking at energy consumption, because of installing this newly modernised system Hobart City Council will additionally experience an estimated yearly savings of \$36,000 AUD and a reduction of 77 tonnes of carbon emissions, based on saving 259 megawatt hours (MWh) of electricity usage annually – compare this to the average Australian household which consumes about 7 MWh per year.²

Further positive results on the horizon

Enginuity Power Solutions will be performing a post-commissioning assessment in February 2022 for a complete before and after analysis following the installation of the entire ABB system purchased by the Hobart City Council for the Centre. He anticipates that with this modelling data that includes energy analysers to map energy usage, the Centre will experience a significant drop in carbon production and further reduced running costs. They'll also have a newly increased ability to shed load to remove strain from equipment like main switches and transformers and reduce maximum energy demand for outside utilities and existing infrastructure overall.

Rory Paltridge, Division Manager for ABB motors in Australia says, "infrastructure is responsible for around 70% of greenhouse gas emissions in Australia. ABB is pleased to be supporting local government bodies such as Hobart City Council, who are undertaking significant initiatives to adopt more energy efficient systems into their overall infrastructure. This is vital to succeeding in the race to net zero emissions."



¹Energy savings were calculated by Enginuity Power Solutions using ABB's [EnergySave Calculator](#) for drives and [Motor savings calculator](#).

² CSIRO Typical House Energy Use data. This is for electricity only and in those parts of Australia that also have significant gas use (mainly Victoria) this should be additionally considered when looking to cover all energy use. More high level energy consumption data is available on the federal governments energy website: [Energy consumption | energy.gov.au](https://energy.gov.au/consumption)

Additional Resources

[Watch video](#) on ABB's SynRM motor and drive packages – The Perfect Match

[Learn more](#) about the capabilities of ABB Ability™ Smart Sensors

[Learn more](#) about ABB Value Provider A1 Electric Motors in Victoria

[Learn more](#) about Enginuity Power Solutions in Tasmania

Summary of estimated savings

Application	Qty	Running costs/year	Investment	Savings/year**	Energy saved/year	Payback time	CO2 reduction/year	Net present value****
FP1-1 Filter Pump	1	9 885 AUD	8 404 AUD	2 283 AUD	16 MWh	3 Years 9 Months	5 t	14 825 AUD
FP1-2 Filter Pump	1	9 885 AUD	8 404 AUD	2 283 AUD	16 MWh	3 Years 9 Months	5 t	14 825 AUD
FP1-3 Filter Pump	1	9 885 AUD	8 404 AUD	2 283 AUD	16 MWh	3 Years 9 Months	5 t	14 825 AUD
FP1-4 Filter Pump	1	9 885 AUD	8 404 AUD	2 283 AUD	16 MWh	3 Years 9 Months	5 t	14 825 AUD
18-1 Grundfos Pump	1	6 109 AUD	7 254 AUD	1 535 AUD	11 MWh	4 Years 8 Months	3 t	8 504 AUD
18-2 Grundfos Pump	1	6 030 AUD	7 254 AUD	1 456 AUD	10 MWh	4 Years 8 Months	3 t	7 711 AUD
P6-1 Circ pump	1	4 338 AUD	5 504 AUD	1 066 AUD	8 MWh	4 Years 9 Months	2 t	5 558 AUD
P6-2 Circ Pump	1	4 338 AUD	5 504 AUD	1 066 AUD	8 MWh	4 Years 9 Months	2 t	5 558 AUD
P6-3 Circ pump	1	4 338 AUD	5 504 AUD	1 066 AUD	8 MWh	4 Years 9 Months	2 t	5 558 AUD
FP2-1 Filter Pump	1	9 761 AUD	8 404 AUD	2 159 AUD	15 MWh	3 Years 11 Months	5 t	13 590 AUD
FP2-2 Filter Pump	1	9 761 AUD	8 404 AUD	2 159 AUD	15 MWh	3 Years 11 Months	5 t	13 590 AUD
FP2-3 Filter Pumps	1	9 761 AUD	8 404 AUD	2 159 AUD	15 MWh	3 Years 11 Months	5 t	13 590 AUD
P7-3 Chilled water pump Grundfos	1	4 337 AUD	6 004 AUD	1 149 AUD	8 MWh	4 Years 11 Months	2 t	5 891 AUD
P7-2 Chilled Pump	1	4 337 AUD	6 004 AUD	1 149 AUD	8 MWh	4 Years 11 Months	2 t	5 891 AUD
P7-1 Chilled Water Pump	1	4 457 AUD	6 204 AUD	1 181 AUD	8 MWh	4 Years 11 Months	3 t	6 011 AUD
Grey water	1	6 643 AUD	7 704 AUD	1 469 AUD	10 MWh	4 Years 11 Months	3 t	7 393 AUD
AHU Fan 1	1	18 940 AUD	14 704 AUD	4 695 AUD	34 MWh	3 Years 2 Months	10 t	32 650 AUD
AHU Fan 2	1	18 940 AUD	22 628 AUD	4 695 AUD	34 MWh	4 Years 6 Months	10 t	32 650 AUD
Total		151 620 AUD	153 102 AUD	36 134 AUD	259 MWh	4 Years 2 Months	77 t	223 445 AUD

Data analysis of the ROI calculations conducted by Enginuity Power Solutions in a report submitted to Hobart City Council prior to the commencement of the ABB project commissioning. It outlines the predicted savings which were to be realised because of the infrastructure upgrade.

Existing Motor/Pump/Drive:

8/10/2019 6:08:58 PM 702msec	Vrms ph-n	241.71 V	243.7 V	244.09 V	0.1 V	
8/10/2019 6:08:58 PM 702msec	Vrms ph-ph	419.46 V	422.85 V	421.19 V		
8/10/2019 6:08:58 PM 702msec	Arms	18.7 A	17.4 A	21 A	1.1 A	
8/10/2019 6:08:58 PM 702msec	THD V	2.79 %	2.43 %	2.5 %	26.91 %	
8/10/2019 6:08:58 PM 702msec	THD A	58.94 %	64.2 %	40.63 %	3.18 %	
8/10/2019 6:08:58 PM 702msec	Power Factor	0.83	0.86	0.93		0.87
8/10/2019 6:08:58 PM 702msec	Active Power	3.72 kW	3.61 kW	4.74 kW		11.88 kW
8/10/2019 6:08:58 PM 702msec	Active Energy	201.85 kWh	217.99 kWh	274.10 kWh		693.93 kWh
8/10/2019 6:08:58 PM 702msec	Reactive Power	1.36 kvar	140 var	0.67 kvar		1.95 kvar
8/10/2019 6:08:58 PM 702msec	Apparent Power	4.51 kVA	4.24 kVA	5.13 kVA		13.77 kVA

New Motor/Pump/Drive:

26/05/2021 10:12:09 PM 895msec	Vrms ph-n	241.91 V	243.49 V	244.21 V	0.19 V	
26/05/2021 10:12:09 PM 895msec	Vrms ph-ph	419.54 V	422.78 V	421.34 V		
26/05/2021 10:12:09 PM 895msec	Arms	15.7 A	16.5 A	16.6 A	0 A	
26/05/2021 10:12:09 PM 895msec	THD V	2.13 %	1.94 %	1.95 %	124.54 %	
26/05/2021 10:12:09 PM 895msec	THD A	8.27 %	6.49 %	7.29 %	35.94 %	
26/05/2021 10:12:09 PM 895msec	Power Factor	0.99	0.99	0.99		0.99
26/05/2021 10:12:09 PM 895msec	Active Power	3.75 kW	4 kW	4 kW		11.85 kW
26/05/2021 10:12:09 PM 895msec	Active Energy					
26/05/2021 10:12:09 PM 895msec	Reactive Power	150 var	100 var	300 var		0.6 kvar
26/05/2021 10:12:09 PM 895msec	Apparent Power	3.8 kVA	4 kVA	4.05 kVA		12 kVA
26/05/2021 10:12:09 PM 895msec	Apparent Energy					
26/05/2021 10:12:09 PM 895msec	Reactive Energy					

Comparative data following the first motor and drive replacement on the grey water pumping system at the Doone Kennedy Hobart Aquatic Centre, highlighting the significant reduction in current draw and maximum demand (kVA), plus reduction in harmonic distortion which results in cost savings and an optimised operating system.



Birdseye view of Doone Kennedy Hobart Aquatic Centre.

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