



## Energy savings up to 51% from upgrading condensers

### Abstract

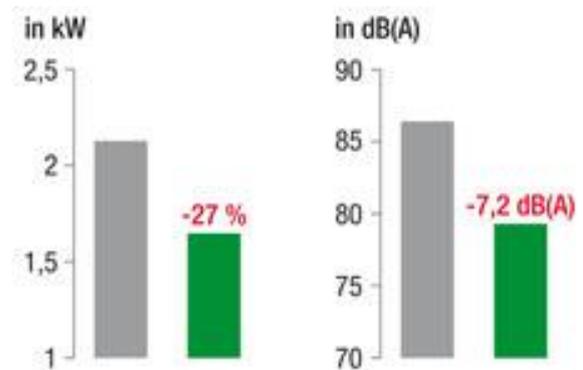
This trial demonstrates how the addition of ebm-papst's new AxiTop diffuser to existing EC HyBlade axial fans can give significant energy savings from 15% to 51% on condenser packs running on part load and even improvements of 26% at full load. The conclusion observes that upgrading existing systems with AxiTop can not only improve the efficiency of the fans but also improve the efficiency of the complete system.

### What is AxiTop?



The AxiTop diffuser has been developed to fit the ebm-papst range of HyBlade axial fans as supplied to all the major refrigeration plant manufacturers. It is also ideal for retrofit providing a simple solution to upgrade existing fans installed across the estate. An upgrade that reduces the noise, decreases the power consumption and increases the fan performance.

The scale of possible energy savings - or efficiency enhancement and noise reduction that can be achieved with an optimal diffuser. By simply replacing a standard fan with guard grille for one with support arm, guard grille and AxiTop diffuser, savings of up to 27% can be achieved in terms of power consumption, while operating noise is reduced by up to 7.2 dB(A).



Operated at the same operating point, energy savings of up to 27% and 7.2 dB(A) less noise development are possible, depending on the application. (measured on size 800 mm)



## Condenser trial



An AxiTop trial was conducted by Space Engineering Services and Coolers and Condensers on behalf of a major UK supermarket with the aim to evaluate what energy saving benefit was available by retrofitting existing EC condenser fans with the new AxiTop diffuser.

Sub metering and temperature logging was applied to 4 Condensers, two identical LT packs and two identical HT packs, and recorded for 4 weeks.

The AxiTop product was fitted to two condensers, LT2 (3 fans) and HT2 (5 fans). The other two packs were used as a base line for comparison.

Sub metering and temperature logging continued for a further 4 weeks.

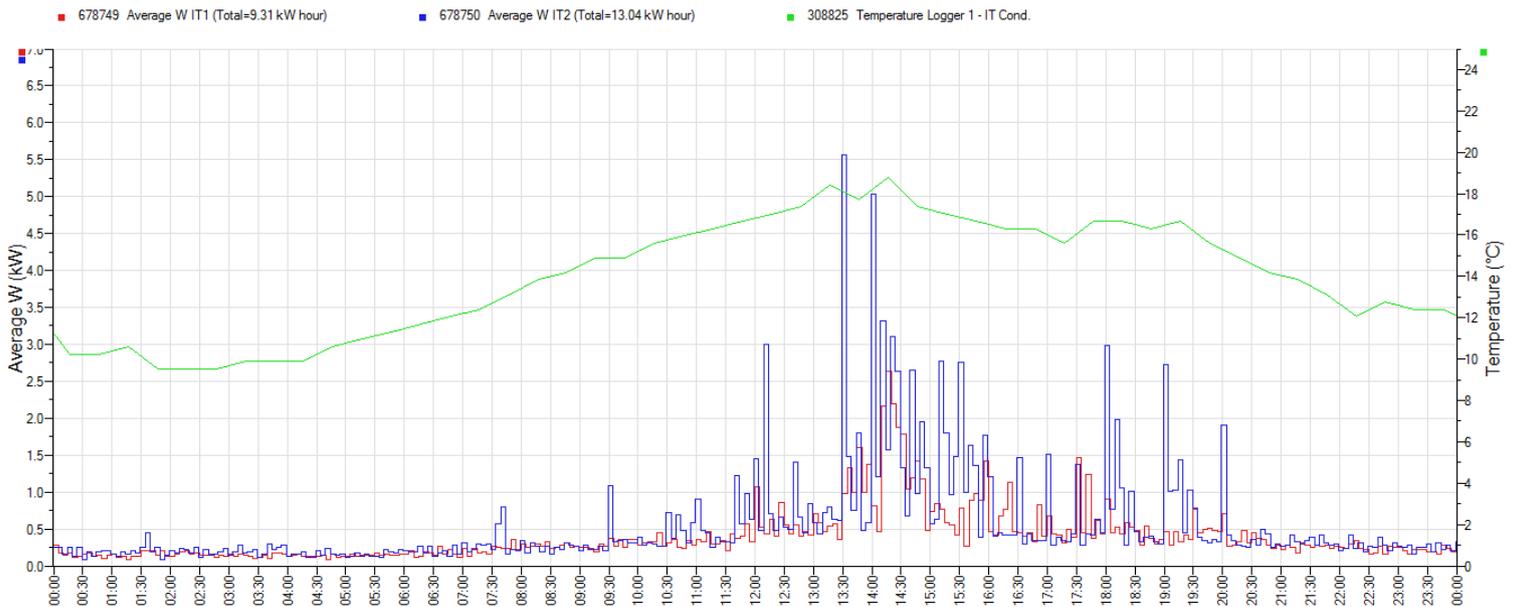


## HT pack data results

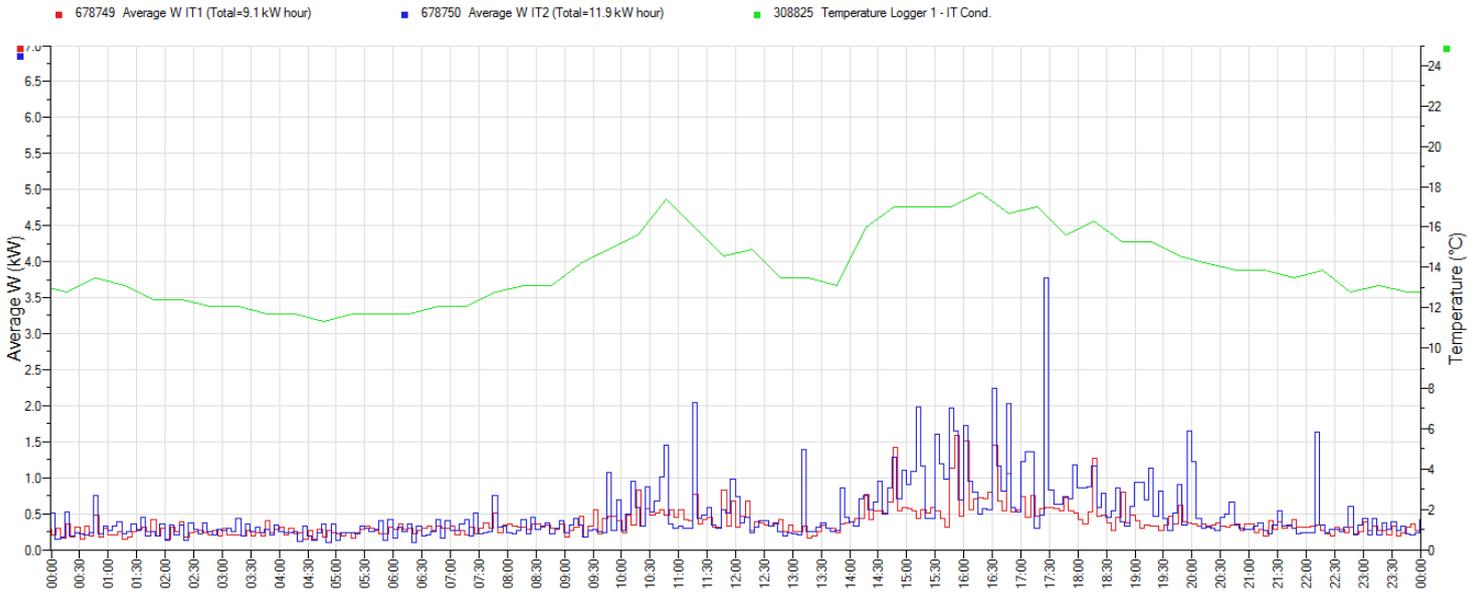
Graphs 1 and 2 show the before and after data for the HT packs. The data is recorded on the same trading day (Saturday) with almost identical average ambient temperature conditions.

The Red trace is the base line unit HT1 which shows a total power consumption of 9.31kWh before and 9.1kWh after which is almost identical readings taking into account measuring tolerances on different days.

The Blue trace is from the converted unit HT2 which shows a reduction in total power consumption from 13.04kWh to 11.09kWh which is a 15% reduction due to AxiTop being fitted.



\*\*Graph 1: Before Data – Ave Daily Temp 13.7°C



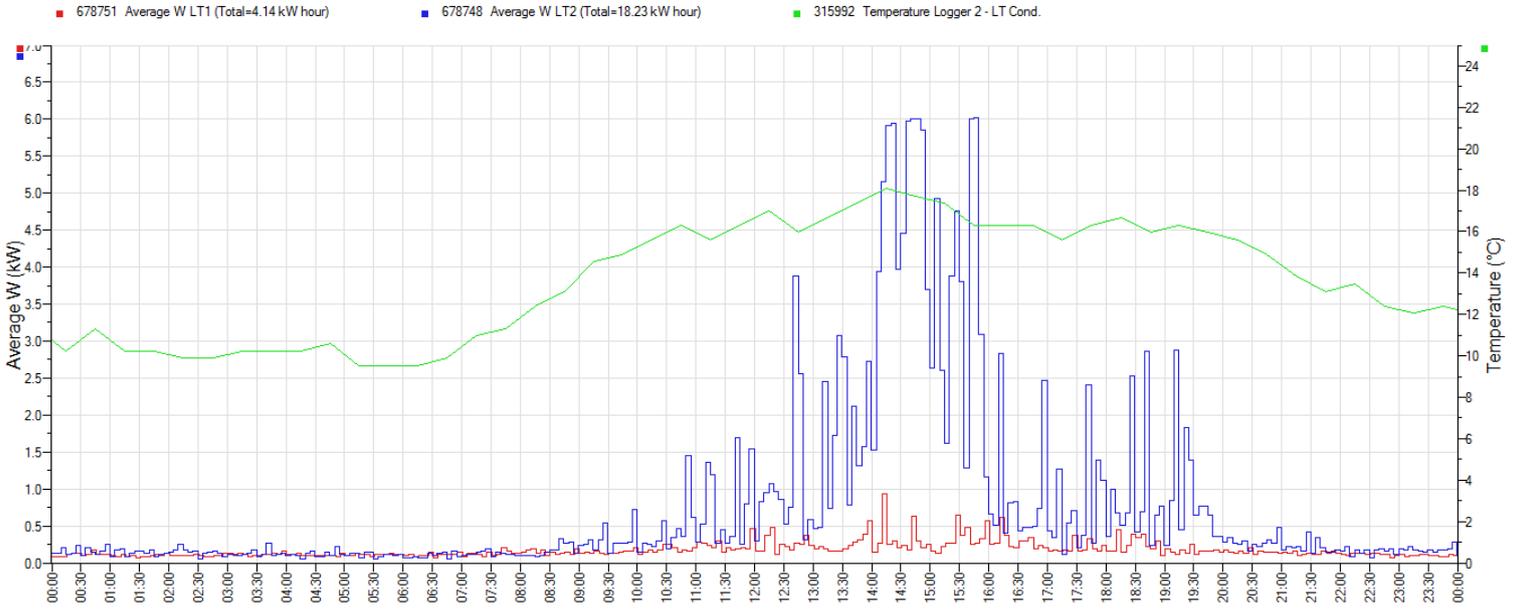
\*\*Graph 2: After Data – Ave Daily Temp 13.8°C

## LT pack data results

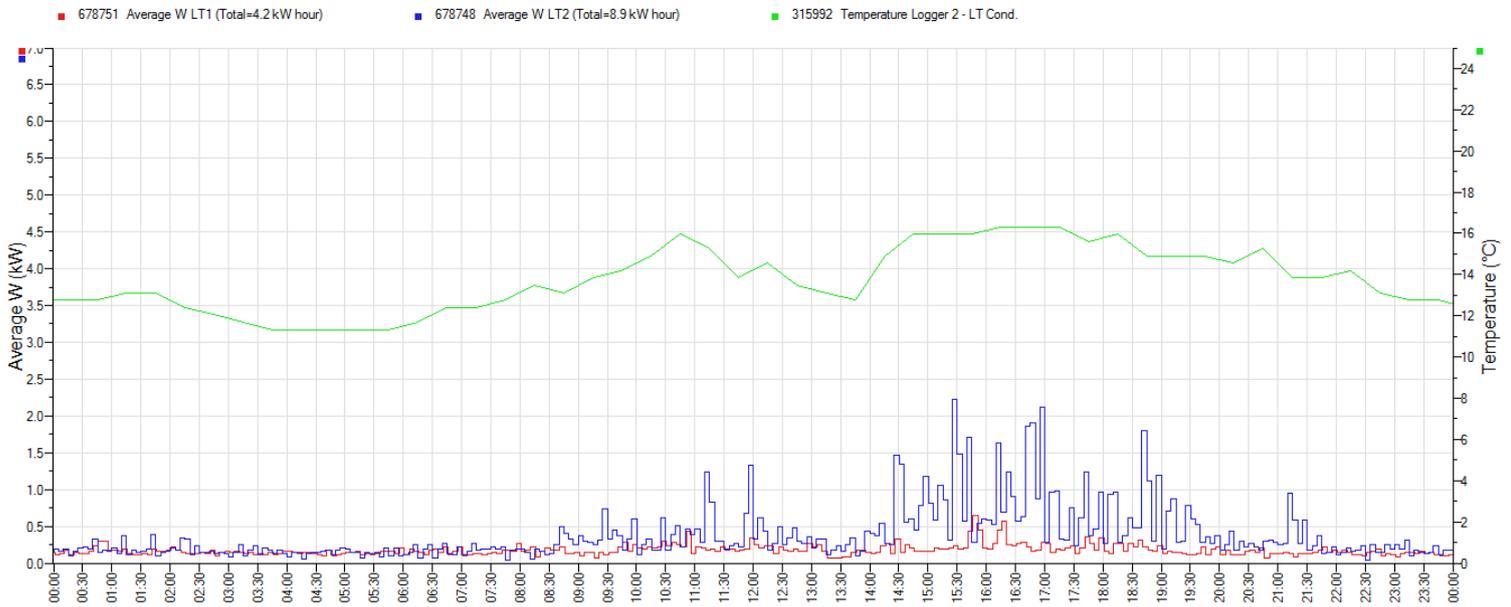
Graph 3 and 4 show the before and after data for the LT packs. The data is recorded on the same trading day (Saturday) with almost identical average ambient temperature conditions.

The Red trace is the base line unit LT1 which shows a total power consumption of 4.14kWh before and 4.2kWh after which is almost identical readings taking into account measuring tolerances on different days.

The Blue trace is from the converted unit LT2 which shows a reduction in total power consumption from 18.23kWh to 8.9kWh which is a 51% reduction due to AxiTop being fitted.



\*\*Graph 3: Before Data – Ave Daily Temp 13.7°C



\*\*Graph 4: After Data – Ave Daily Temp 13.8°C

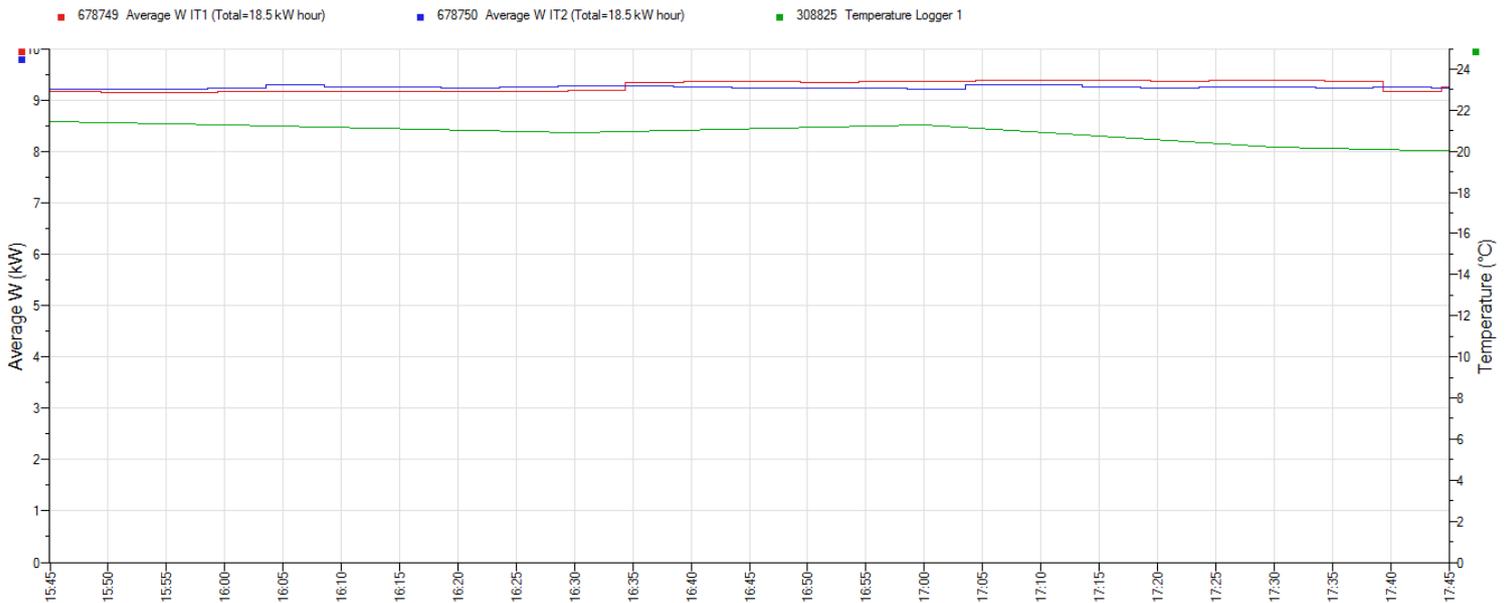


## HT pack data results on the hottest day

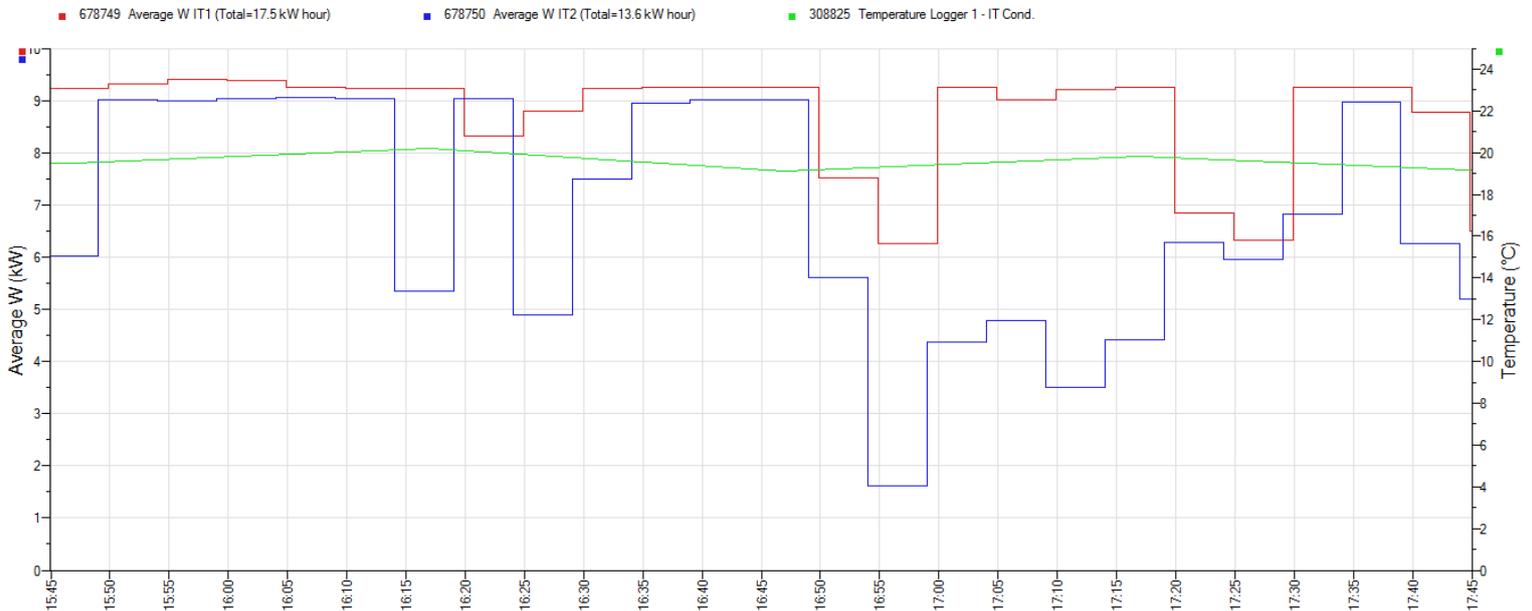
Graph 5 and 6 show data from a 2 hour window on the hottest day before the retrofit compared to a similar day after conversion. The data is recorded on the same time period, on the same trading day (Monday) with near average ambient temperature conditions.

The Red trace is the base line unit HT1 which shows a total power consumption of 18.5kWh before and 17.5kWh after which is a drop of 1kWh (0.5%).

The Blue trace is from the converted unit HT2 which shows a reduction in total power consumption from 18.5kWh to 13.6kWh which is a 4.9kWh or 26% reduction in this 2 hour period due to AxiTop being fitted.



\*\*Graph 5: Before Data – Ave Temp 20.7°C



\*\*Graph 6: After Data – Ave Temp 19.5°C

## Discussion

Based on identical trading days with the same ambient conditions it was shown that the base line packs HT1 and LT1 have performed almost identically.

The AxiTop packs HT2 and LT2 however showed significant savings of 15% and 51% respectively.

It is clear that the LT2 pack improved significantly more than expected and this is believed to be due to the siting of LT2 which is partially surrounded.

Other than improving the efficiency of the EC axial fans by converting dynamic pressure into useful static pressure, the AxiTop improves the throw of the fan and can prevent air recirculating within the unit when siting conditions are not ideal. Diagram 1 shows a simulation of how the diffuser straightens and improves the throw of the Axial fan.

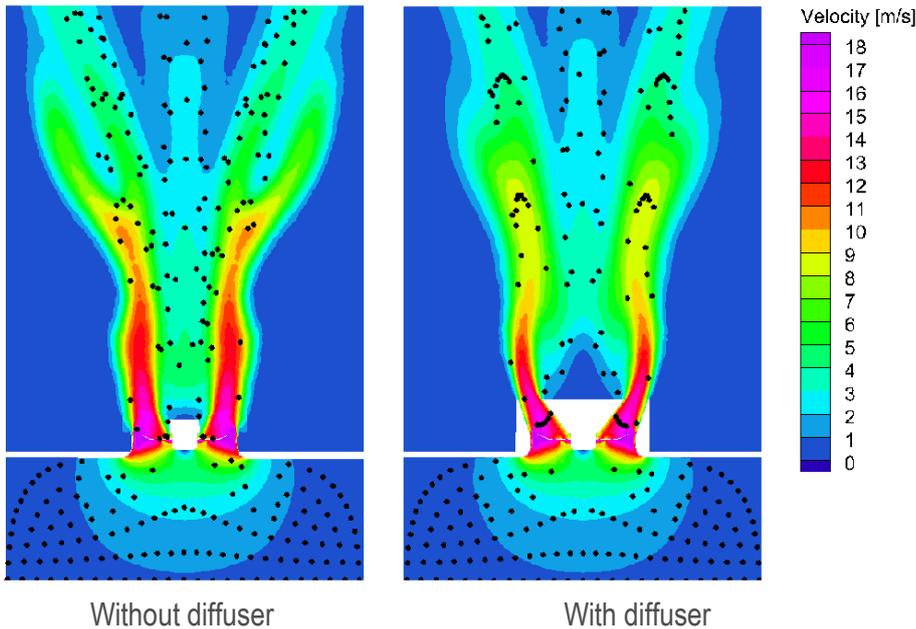


Diagram 1

During high ambient conditions Graph 5 shows identical power consumption for both HT condensers with all fans running at their maximum. Following conversion of HT2 there is a marked reduction due to AxiTop of 26% even with the fans running at maximum speed.

When the trace drops as shown in Graph 6, this shows the discharge pressure set point from the pack is being achieved and so allows the fans to ramp down. HT2 is achieving this more often than HT1 and for a greater length of time so energy is being saved not only from the fan energy reduction but also from the compressors as well.

## Current and Potential Future Applications

The AxiTop Diffuser is used on sites with condensers, coolers and chillers. Future applications could involve the upgrade of sites where noise levels are an issue. The product also offers the possibility to boost the air performance of fans on equipment that has been incorrectly sized for an application. The added benefit of the AxiTop is the reduction of energy usage as demonstrated through the above trial.