

## HyBlade EC condenser efficiency

EC fans used in condenser applications can range in sizes from 450mm to 910mm.

These are now available in sizes up to 630mm in new ebmpapst HyBlade composite technology as shown.



In condensers, a massive reduction in energy requirement can be achieved in two ways;

firstly by improvements of specific fan power and secondly by allowing floating head condensing pressure control as shown by Kroger (4).

An analysis of the performance of EC condensers is shown below, according to Giles (Propeller 21—ebm-papst). In this graph it can be seen how the noise, refrigeration performance, power and control features of the fan vary with each other.

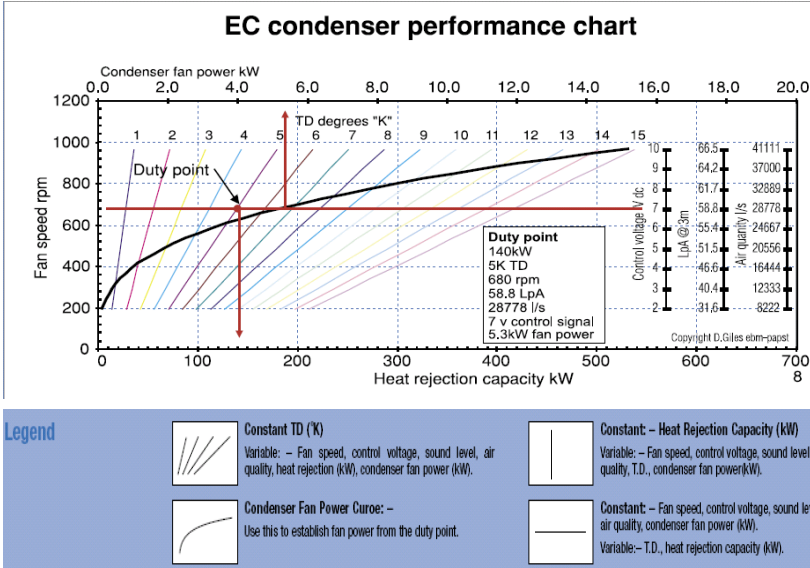
The fan speed is controlled by a simple 0-10V control from the refrigeration or air-conditioning controller and the fan feeds back its performance into the refrigeration controller via a tachometer or rs485 feedback loop.

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This clearly shows the reduction in power consumption and noise available with EC condenser fans.



If we look at the temperature charts for Melbourne shown below, the normal design temperature of an ambient of 30degC is only attained for 2% of the hours in a year. From the above chart of EC condenser performance, even if the fans we used at 80% speed on average throughout the year then 50% savings can be made. This is a massive overestimation of the performance requirement but let us translate that to power and carbon savings.

Temperature bin hours	Melbourne	
	Cum h/yr from 20 degrees	Hours per year per bin.
Ambient temperature 34	54	15
33	75	21
32	105	30
31	138	33
30	159	21
29	220	61
28	272	52
27	329	57
26	407	78

**1.8 %**

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The recent survey of the refrigeration and Air conditioning market by Anderson (5) has surveyed the power consumed by this market sector. Below is shown the analysis of power consumption and savings available in translating the condensers to EC condensers in cold rooms. A similar calculation can be shown for air-conditioning.

Cool Rooms - (Data from CC-Coolrooms)										
Description	Total Power abs [GWh/a]	COP	HRF	Heat Rejection [GW]	Condenser air Qty [G/s]	AC [W// s]	AC con- denser fan [GW]	EC [W// s]	EC con- denser fan [GW]	% of total power con- sumption
Deli Case/Other Retail	395,097,024	2.5	1.4	1,382,839,584	162,859,449	0.32	52,115,024	0.26	42,343,457	
Mini (up to 3m x 3m)	65,594,880	2.5	1.4	229,582,080	27,038,285	0.32	8,662,251	0.26	7,029,954	
Small (up to 6m x 4m x 3m)	86,338,560	2.5	1.4	302,184,960	35,588,854	0.32	11,388,433	0.26	9,253,102	
Medium (6m x 6m x 4m)	100,915,200	2.5	1.4	353,203,200	41,597,362	0.32	13,311,156	0.26	10,815,314	
Large (10m x10m x 4m)	152,494,080	2.5	1.4	533,729,280	62,868,236	0.32	20,114,635	0.26	16,343,141	
Warehouse (20m x 10m x 4m)	201,830,400	2.5	1.4	706,406,400	83,194,724	0.32	28,622,312	0.26	21,630,628	
Distribution Centre	607,173,120	2.5	1.4	2,125,105,920	250,277,461	0.32	80,088,787	0.26	65,072,140	
	<b>1,609,443,264</b>			<b>5,633,051,424</b>	<b>663,414,371</b>				<b>172,487,736</b>	<b>11%</b>
									<b>212,292,599</b>	<b>13%</b>

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Using the temperature bin data we can thus estimate the power and carbon savings achievable with EC condensers in Australia; these are shown below.

	EC condenser fans		
Savings	100% load	80% load	50% load
Coldroom [GWhr]	39,804,863	123,978,878	184,694,561
GHG [tonne CO2]	52,940,467	161,172,541	245,643,766
Air-conditioning [kW]	601,116	1,872,276	2,789,179
GHG [tonne CO2]	799	2,490	3,709
Total GHG [MtonneCO2]	52,941	161,175	245,647

Changing from AC to EC condenser fans is a simple process as proven by existing users. A speed control line is required but not to have a controller in modern refrigeration circuits is very rare and therefore the application of the EC technology is easy.

The total savings available with EC condensers is 185,000 TWhr power savings or Green House Gas savings of 245,000 Mtonne CO2. This is a major contributor to Green House Gas targeted savings.

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