Energy Efficiency Standards

R&D Promotes Energy Efficiency

All Airedale products are developed with the clear objective of reducing total lifecycle costs. As one kilowatt of power saved every hour 24/7, represents a saving of £876 a year to you the customer, equivalent to saving over 4 tonnes of CO^2 per year; it is knowledge like this that drives innovation and delivers maximum value to our customers. To enable customers to benchmark the efficiency of our products, we promote three key industry standards, namely the Energy Efficiency Ratio (EER), Eurovent EER classification and European Seasonal Energy Efficiency Ratio (ESEER). For example see the table below relating to our TurboChill product.

Table 1 - TurboChill Technical Specifications Selected Capacities

Model Number	Nominal Cooling [kW]	EER[1]	Eurovent EER Classification [1(a)]	ESEER[2]
Single Circuit				
TTC12B212X95R	500	3.25	A	5.49
TTC12B212X70R	550	3.23	A	5.46
Dual Circuit				
TTC22B212X70R	450	3.25	A	4.95
TTC23C216X70R	650	3.14	A	5.15

1 Energy Efficiency Ratio (EER)

The EER is the ratio of the cooling capacity to the power input of the unit. EER is a measure of how efficiently a cooling system will operate at application-specific conditions when the outdoor temperature is at a particular level. The higher the EER, the more efficient is the air conditioner.

1(a) Eurovent EER Classification

Eurovent, the European Committee of Air Handling and Refrigeration Equipment Manufacturers, has set its own formulae to calculate EERs, making it easier to compare the performance of chillers manufactured by Eurovent accredited companies. Eurovent EER values are only valid at specified ambient and water conditions. In the case of air cooled packaged chillers, the unit EER must be given at 7/12ºC water conditions, 3ºC ambient. Eurovent has also established its own classification for full load EER. This classification follows an A to G approach, with A as the most efficient and G the most inefficient.

Table 2 - Eurovent EER Classification A-G

EER Classification	Air Cooled	Water Cooled	Remote Condenser
A	>= 3.1	>= 5.05	>= 3.55
B	2.9 - >3.1	4.65 - >5.05	3.4 - >3.55
C	2.7 - >2.9	4.25 - >4.65	3.25 - >3.4
D	2.5 - >2.7	3.85 - >4.25	3.1 - >3.25
E	2.3 - >2.5	3.45 - >3.85	2.95 - >3.1
F	2.1 - >2.3	3.05 - >3.45	2.8 - >2.95
G	<2.1	<3.05	<2.8

(Source: Eurovent)

Advantages: The EER enables comparable products to be benchmarked against one another for efficiency.

Disadvantages: Currently EER figures only cover the performance of the unit at one specific condition, at which the chiller may operate for less than 1% of its lifetime. Some chillers will perform better at low load and/or ambient conditions, but this is not reflected in the traditional EER value.

2 European Seasonal Energy Efficiency Ratio (ESEER)

The ESEER is a weighted formula taking into account the variation of EER with the load requirement and change in ambient temperature.

The ESEER calculates a unit's yearly energy efficiency based, in the case of an air cooled packaged chiller at nominal conditions of 7/12ºC water, 35ºC ambient, on a small range of ambient temperatures.

The higher the ESEER, the more efficient is the cooling system. The calculation equation is:

ESEER = A*EER100% + B*EER75% + C*EER50% + D*EER25%

Using the following weighting coefficients:

A = 0.03, B = 0.33, C = 0.41, D = 0.23

ESEER = 0.0=A + 0.==B + 0.41C + 0.2=D

Advantages: Compared with EER, this method gives a more realistic overall system efficiency on a seasonal basis, at part load conditions.

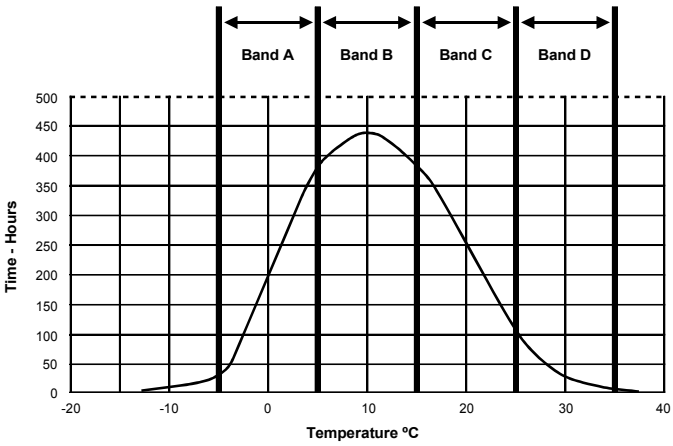
Disadvantages: The ESEER does not incorporate free-cooling to any degree. The minimum ambient temperature of 20ºC is unrealistic for most of Europe. Water temperatures of 7/12ºC are fine for comfort cooling, but for IT/process applications, there is a wide variation. For example a machine designed to work at 18/12ºC water would be much less efficient at 7/12ºC.

= Free-cooling Seasonal Energy Efficiency Ratio (FSEER)

Whilst the ESEER provides a good representation of a typical chiller's yearly energy efficiency, no advantage is given to free-cooling chillers. Typically the ESEER of a conventional chiller will be greater or the same as an equivalent free-cooling chiller.

FSEER is an Airedale value used to represent the annual energy efficiency ratio of a free-cooling chiller. This method is applicable to Northern European cities and incorporates the following temperature bands.

Graph 1 - Temperature Band Classification



FSEER Calculation

The number of hours within each temperature band (Graph 1) is used in the calculation.

FSEER = A*EER100% + B*EER75% + C*EER50% + D*EER25%

Table = - FSEER Calculation Data

Temperature	0ºC	10ºC	20ºC	30ºC
Temperature Range ºC	≤5	>5, ≤15	>15, ≤25	>25
Total Hours	1963.7	4141.7	2210.5	423.8
Percentage of Total Hours	0.23	0.47	0.25	0
Capacity Requirement %	0.25	0.5	0.75	1

Advantages: True representation of the energy efficiency of a free-cooling chiller.

Disadvantages: Currently only limited use by the industry.

Alternative Energy Efficiency Standards

Apart from the standards applied by Airedale, we do recognise that there are alternative standards available, such as:

1) Integrated Part Load Value, known as IPLV, is similar to ESEER, but applies different weighting factors, giving an apparent higher efficiency value than ESEER - an advantage to those manufacturers using IPLV. It has similar disadvantages to ESEER.

2) Seasonal Energy Efficiency Ratio (SEER): Developed in the USA, the SEER uses similar calculation methods to ESEER, but with weighting factors that are more suitable for the USA.

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