



Apricus Evacuated Tube vs Flat Plate

Comparing Apricus Evacuated Tube and High Performance Flat Plate Collectors

ABSORBER vs APERTURE vs GROSS AREA

Often graphs comparing flat plate collectors with evacuated tube collectors are based on gross area, which shows the evacuated tube collector with a y-intercept of only 40-45%, and the flat plate around 75-80%. This can be very deceptive making it look like the flat plate is almost twice as efficient. This is not the case.

By using absorber area, the graph can be radically changed to show evacuated tubes as much higher than flat plates. The graph below shows this clearly, with both gross and absorber efficiency lines for the Apricus evacuated solar collector and a leading flat plate. Aperture which is the exposed glass surface area is often a better or "fairer" surface area value to use, and is gradually becoming the standard for performance values. Apricus offer a range of collector sizes to suit all needs, from 1-2 person units to large industrial projects.

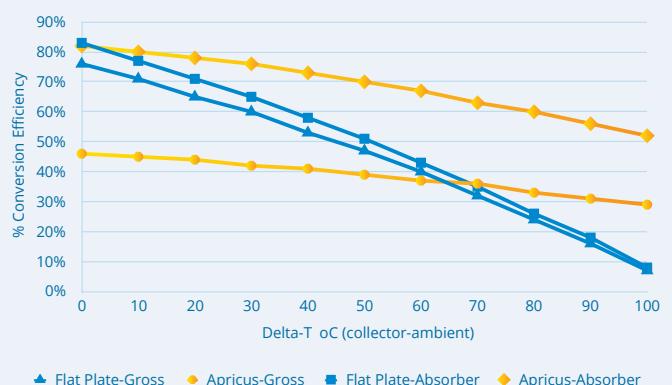
By manipulating which surface area is used, it is possible to show a flat plate being almost twice as efficient as evacuated tube, or considerably lower. It is therefore important that the whole picture is understood so a realistic comparison can be made.

Looking at either the gross or absorber area graph it can be seen there is a significant difference in the shape of the lines. Due to the higher heat loss of the flat plate the curve drops off as the temperature differential increases.

At temperatures of around 100°C the efficiency of a flat plate is virtually negligible while an Apricus evacuated tube collector can still be converting 50+% of available sunlight into heat energy (based on absorber area). For this reason evacuated tube collectors are required for any applications requiring higher temperatures.

The superior insulation properties of the evacuated tubes are also the reason that the performance in cold regions is far better.

Collector Efficiency Curves (800W/m2)

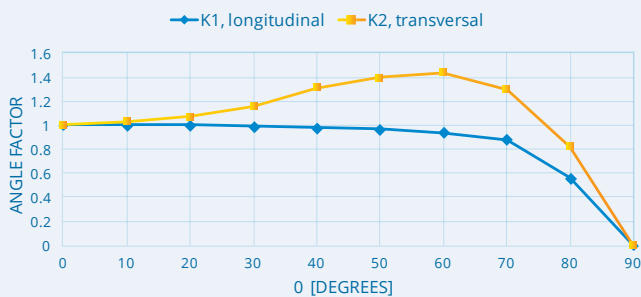


PASSIVE TRACKING (IAM)

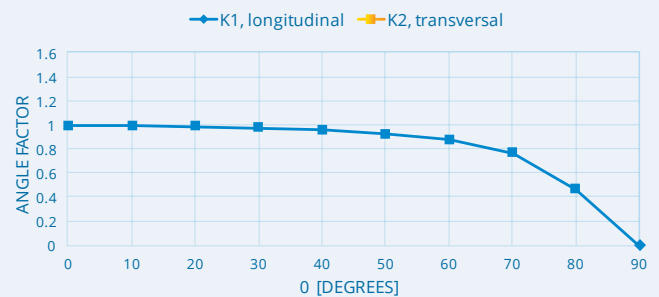
Another key difference between flat plates and evacuated tubes is the passive tracking. This is called IAM which stands for Incidence Angle Modifier, so basically how the heat output changes at different angles, with the sun directly overhead and perpendicular to the panel used as the baseline.

There are two forms of IAM, transversal and longitudinal. Transversal is what we are really interested in and looks at how the collector behaves throughout the day as the sun passes across the sky. Longitudinal looks at the sun's path through the sky throughout the year. All collectors have a similar curve for this aspect, unless of course the install angle is adjusted to track the seasonal sun position. The following graphs show a flat plate collector and the Apricus collector.

Apricus EtC (Incident Angle Modifier)



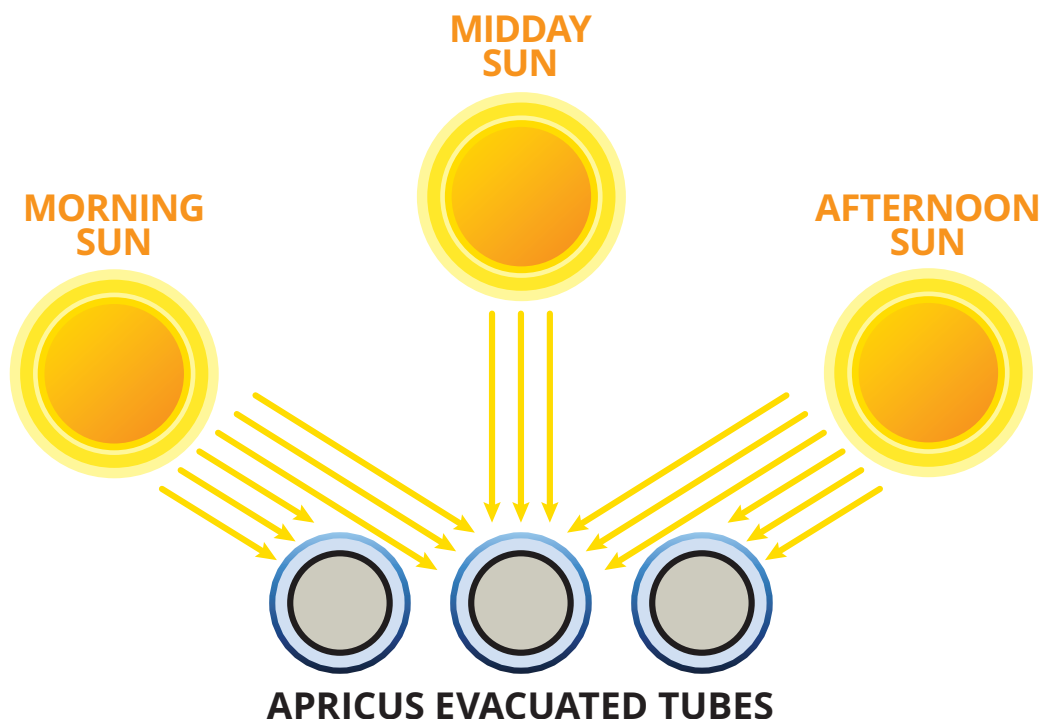
Flat Plate (Incident Angle Modifier)



Notice the great difference in the transversal curves (ORANGE). For flat plates both transversal and longitudinal are the same, which is pretty close to a cosine curve. Please note that NOT ALL evacuated tubes have this positive IAM curve.

Apricus collectors have a round absorber which passively tracks the sun and thus provides more stable heat output from mid morning to mid afternoon.

Software based output modelling comparing the Apricus collector with a "flat plate" IAM curve and the real passive tracking IAM curve resulted in an average daily output difference of 25%. This highlights the importance of passive tracking, and also explains that while some collectors may have better efficiency curves, once the IAM output is considered the collector output is comparably greater.



THIRD PARTY DATA COMPARISON

When comparing the daily heat output of the two collectors an adjustment should be made to ensure the difference in actual panel size is considered.

The total daily output values should be divided by the aperture area to give an energy per m² value. Most test reports now provide performance variables based on aperture as standard.

The table below shows data from SRCC reports adjusted into MJ/m² area.

| Third Party Data Comparison | | | | |
|-----------------------------|----------|-------|---------------|--------|
| | CATEGORY | CLEAR | MILDLY CLOUDY | CLOUDY |
| Apricus | C (20°C) | 15.21 | 11.03 | 6.97 |
| | D (50°C) | 12.80 | 8.75 | 4.69 |
| Flat Plate* | C (20°C) | 13.94 | 9.68 | 5.23 |
| | D (50°C) | 8.71 | 4.84 | 1.16 |
| % difference | C (20°C) | 9% | 14% | 33% |
| | D (50°C) | 47% | 81% | 304% |

*Based on Apricus and Leading Flat plate thermal performance test report data.

Domestic hot water production will result in the collector operating in both the C and D categories, so it may be valid to take an average of the two categories to get an average value.

Clear = 28%
Mildly Cloudy = 47%
Cloudy = 169%

It can be seen that there is a significant difference in heat output/m² aperture area particularly at the high temps (Category D).



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SUMMARY: KEY POINTS

- Evacuated tubes work in all seasons and are more efficient at higher temperature differentials, such as during colder weather or when trying to achieve high target temperatures.
- Apricus systems are designed for ease of installation and assembly. No need for a crane or cherrypicker as may be required for flat plates.
- Higher variability of applications (Spas/hot-tubs, Heating support, Solar cooling).
- Better overall contribution in Autumn, Winter & Spring.
- Easy to maintain – In the event of a damaged tube(s) simply remove and replace.
- Evacuated tubes can be positioned more favourably towards the sun than flat plates. They can be up to 45° either side of north pointing and still achieve good solar collection.
- Apricus collectors passively track the sun (IAM – Transversal Incidence Angle Modifier) allowing direct solar exposure from early morning to late afternoon.
- Apricus collectors have a much more favourable performance curve. The y-intercept alone is not a key indicator of actual performance. The shape of the curve and IAM must also be considered.
- Flat plate collectors have their place in the market, but when you want higher temperatures or performance in cooler weather, evacuated tubes have a huge advantage over flat plate collectors.

Contact us today

For more details contact Apricus on 1300 277 428 **1300 277 428**.

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