

Specifiers: Solar Thermal - Basic Facts

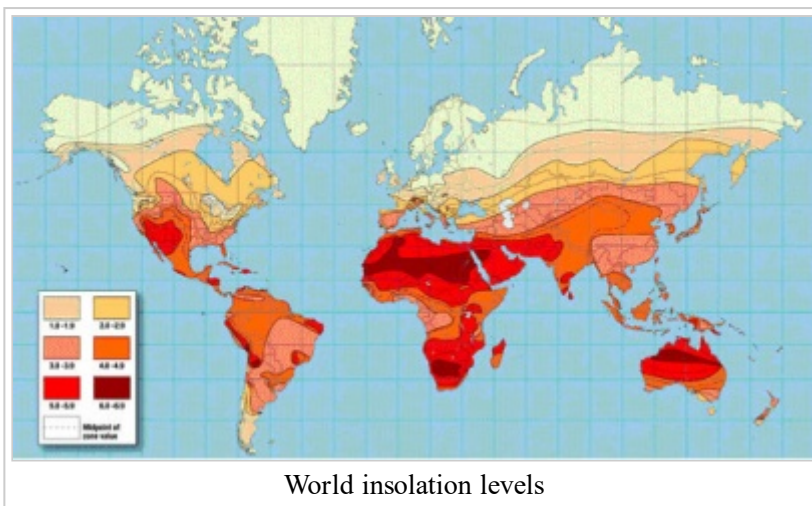
From RVR

Intensity of Solar Radiation

The intensity of solar radiation in space immediately outside the earth's atmosphere is a constant 1353 W/m^2 . This is known as the solar constant.

A substantial part is reflected and/or absorbed by the atmosphere and clouds. On clear days, much of the radiation reaching the ground will be direct whereas on cloudy days, it will be diffuse. Diffuse radiation is radiation which has been reflected by clouds and other objects. As much as 40% of the total solar radiation available in summer is diffuse radiation.

Latitude has a big effect on the amount of solar energy available. The map below shows how the amount of energy available varies with location.



The maximum intensity reaching the earth's surface at summer noon in Ireland and the UK is about 800 W/m^2 .

Useful figures for the designer

It is useful for the design engineer to have some quick approximations. Our technicians, at RVR Energy Technology, find the following figures useful.

Quick Figures for Solar Thermal systems in UK and Ireland

Maximum summer insolation	800 W/m^2
Maximum system output	600 W/m^2
Average solar radiation on collector surface	$2.4 - 3.4 \text{ kWh/m}^2\text{day}$

Solar system heat yield

350 - 450 kWh/m²y

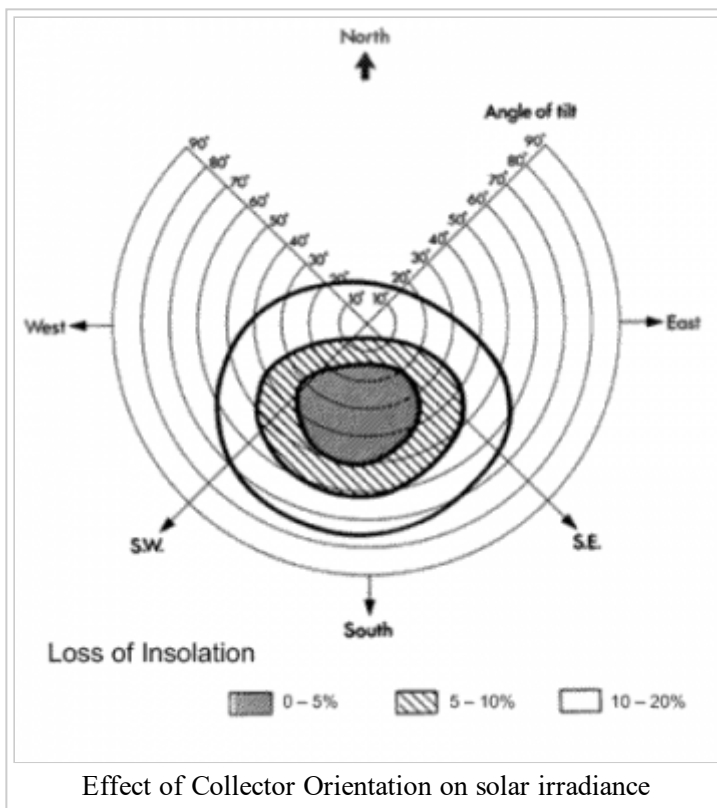
Collector Orientation and Tilt Angle

The tilt angle of the collector is a trade off between summer and winter performance. The optimum tilt angle is larger in the winter than in the summer because of the low elevation of the sun. For applications optimised for summer performance, the tilt angle should not exceed the angle of latitude - 10°. This is equivalent to a tilt angle of between 40° and 45° for the UK and Ireland.



On the other hand, if one (**unusually!**) wants to optimise winter performance, the collector should be inclined at angles greater than the angle of latitude by up to 20°. Typical tilt angles in this case would be 65° to 75°.

The optimum collector orientation is due south but any orientation between east and west is viable. The diagram below shows the effect of solar collector orientation and tilt angle on the irradiation level.



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