

The Case for using ClearShield® on Solar PV Panels

Introduction

The ClearShield System™ for “non-stick” glass surface protection:

- maintains the original light transmission on PV solar panels
- increases cumulative watt hours for more cost-effective energy production
- reduces maintenance costs and cuts CO₂ emissions

The studies and tests below show improvements in energy conversion if dirt is removed from and/or ClearShield applied to Solar PV panels.

ClearShield Studies and Tests

1. **SUPSI Switzerland 2010 + 2.64%.** An independent watt peak lab test commissioned by Ritec, before and after on 4 ClearShield-treated solar panels. The 4 panels had just been cleaned a few days earlier, and so were not at all dirty for the initial watt peak test. They were then renovated and protected with the ClearShield system after which a subsequent peak watt test was performed, and the best-performing panel improved its peak watt by 2.64 % as a result (with a variance of +/-0.5% . The worst performing panel showed no difference, and the other 2 were in between). N.B. a peak watt test is a lab test “snapshot” and not a real life study.
2. **Romag NE England 2011 +9.8%.** Romag is a UK solar panel manufacturer. They have had 2 strings of 14 solar panels on a roof on permanent test , one treated with ClearShield, the other not, since April 2011. The ClearShield-treated panel has shown a 9.8% improvement in the number of kilowatt hours generated compared to the untreated panel over this period. It should be stressed that none of these panels have been cleaned, and that the local environment is not particularly harsh in terms of the potential for pollution.
3. **Ritec Weathering Test Tottenham, N.London 2010 +25%.** Two solar panels were installed on our factory roof and over a period of 1 year in 2010 the ClearShield-treated panel was able to respond more effectively to changing light levels, with a significant cumulative improvement in performance of approx. 25%, when compared to the untreated panel.
4. **Ritec Light Transmission through glass Test with Low Iron glass and A/R coating 2011/2012 +6%.** In 2012 we commenced a second test to measure light transmission at our factory using Low Iron glass with an Anti-Reflective coating to maximise the figures. ClearShield can only be applied to certain A/R coatings, so a test patch is necessary before proceeding. A piece of glass part-treated with ClearShield was

further divided into “dirty” and “clean”, making 4 squares on the same pane. Over 9 months, the untreated dirty glass transmission was 84% compared to ClearShield glass 87% - a 3% difference. After a single wipe with a clean damp cloth, the ClearShield glass improved to 92% and the untreated glass to 86% - a 6% difference. The test is still running.

5. **Ritec Arrow Diagram GPD Finland 2011 +9%.** In 2011 Ritec presented a seminar at Glass Processing Days in Finland. This is based upon assumptions from glass industry light transmission figures, which report that dirt on glass blocks light transmission by anywhere between -5% and -20%. We settled on a figure of -9% for our illustration. So Standard Float glass, Low Iron glass and Low Iron glass with A/R coating transmit 87%, 91% and 95% respectively when clean and 78%, 82% and 86% respectively when dirty. ClearShield maintains original light transmission, so Standard Float glass with ClearShield has a better light transmission (87%) than dirty Low Iron glass with A/R coating.

Cleaning Studies and Tests

6. **Google Analysis 2009 USA +36%.** In 2007 Google switched on its new Solar Power installation, which at the time was the largest in the USA. In 2009 a study was published online that showed that cleaning the solar panels thoroughly doubled the output, and then cleaning 8 months later increased output by 36%.
7. **Solar Energy Conference Paper 2008 Valencia +15%.** The 23rd European Photovoltaic Solar Energy Conference and Exhibition 2008 published a comparative analysis of the dust losses in PV modules, and reported that losses in power due to accumulated dirt can reach 15% for periods without rain.
8. **2nd World Conference on PV Solar Energy Conversion 1998 Austria +10%.** This conference reported that the PV lab of HTA Burghof in Switzerland had observed a permanent pollution strip which caused a gradual reduction of energy yield of up to 10%, with the most significant factor being location near a main railway line, causing iron dust pollution. This power loss was reversible through regular cleaning.

Conclusions

Solar PV panels need to be regularly cleaned to improve and maintain acceptable levels of energy conversion. Renovating and protecting with the ClearShield System™ will give enhanced results beyond cleaning, and will reduce the amount of maintenance and cleaning required.