SOLAR EDGE SEALANT WITH OPTIMIZED SEALING AND APPLICATION PROPERTIES

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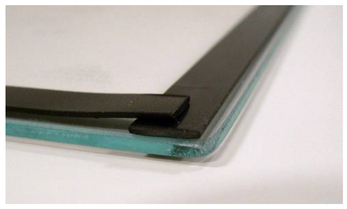
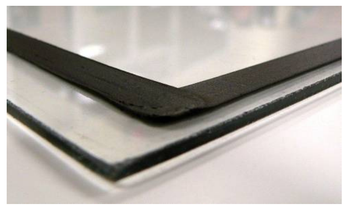
RELIABILITY BY CONSISTENT APPLICATION



TAPE APPLIED



BULK APPLIED

Availability of a unique pumpable solution improves the consistency of application and reduces the effects of workmanship and process variations. Following are the key benefits of using a pumpable bulk solution for PV modules:

- *Reduced number of seams/knit lines*
- *No need for overlaps at the corners*
- *Flexibility to adjust dimensions based on internal architecture*
- *Reduced process changeovers (versus using tape rolls) reduces process variability*
- *Dimensional controls by end user*
- *Waste reduction*
- *Reduction in process steps*
- *No concern with atmospheric/moisture exposure of tapes for desiccant and reactivity*

ABSTRACT

Photovoltaic (PV) modules are sensitive to moisture as it negatively impacts both their safety and long term performance. Edge sealants play a pivotal role in preventing such moisture ingress. PV modules demand edge sealants that have optimized sealing properties in order to maximize these performance considerations. Studies were conducted to develop a solar edge sealant with better moisture vapor transmission rates (MVTR), thermal stability, mechanical properties; and that reacts chemically with glass to form a permanent seal. Apart from surface and bulk properties, highly consistent application is also critical. The delivered form of the edge sealant is key to developing manufacturing procedures that reduce process variability and lower the probability of invoking warranty claims. The results of the various studies to characterize edge seal performance are presented in this poster.

This poster does not contain any proprietary or confidential information

Acknowledgements:
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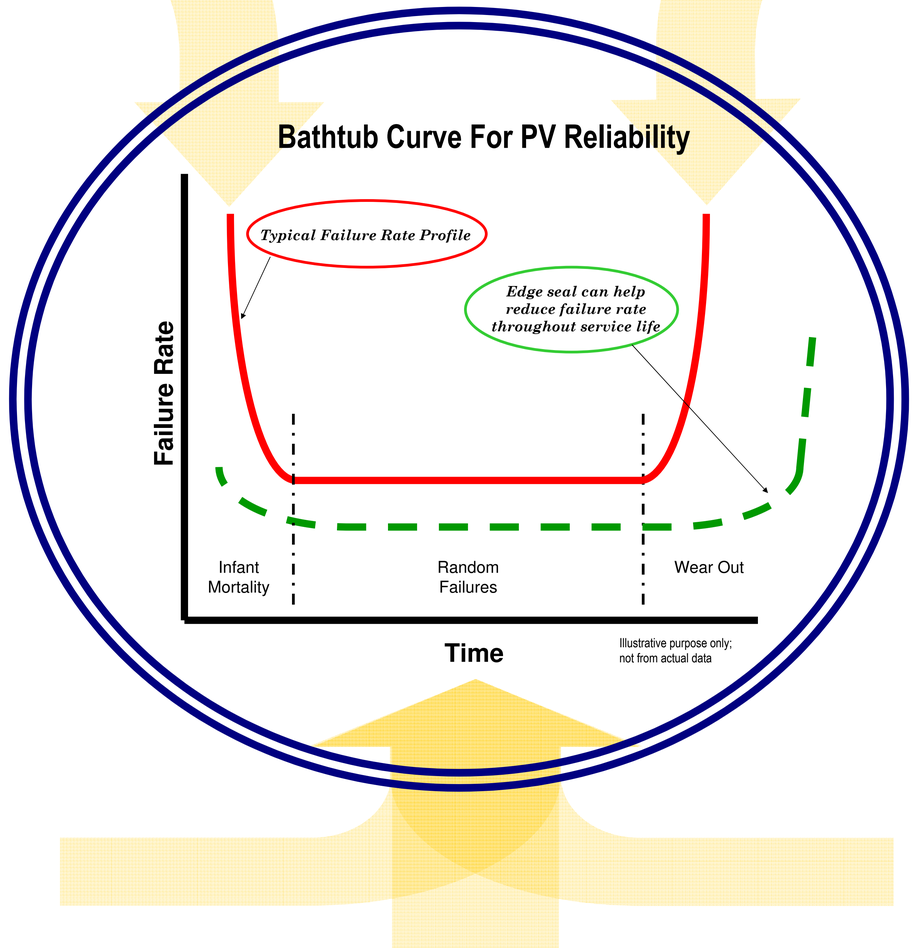
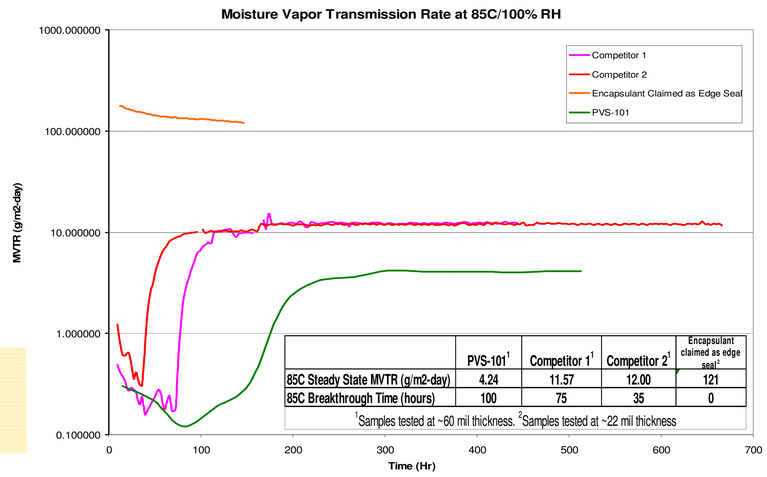
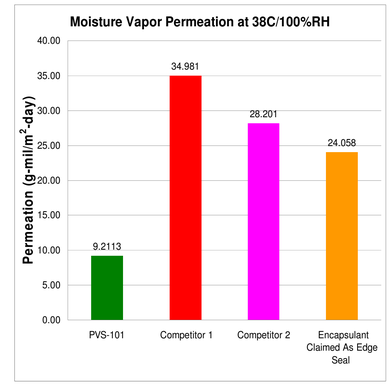


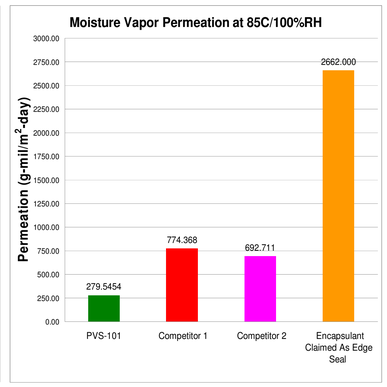
MOISTURE INGRESS



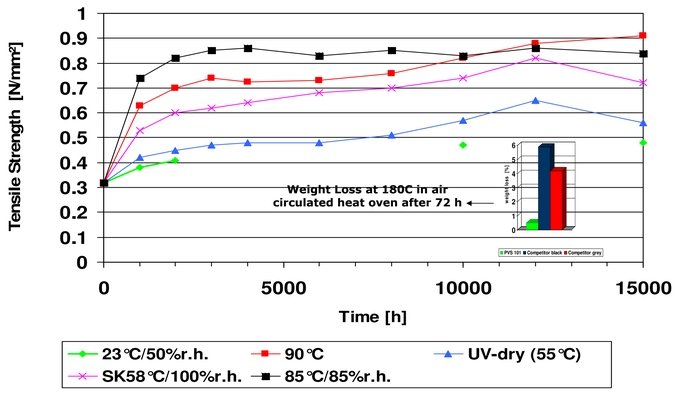
	PVS-101[1]	Competitor 1[1]	Competitor 2[1]	Encapsulant claimed as edge seal[2]
85C Steady State MVTR (g/m2-day)	4.24	11.57	12.00	121
85C Breakthrough Time (hours)	100	75	35	0

[1]Samples tested at ~60 mil thickness. [2]Samples tested at ~22 mil thickness



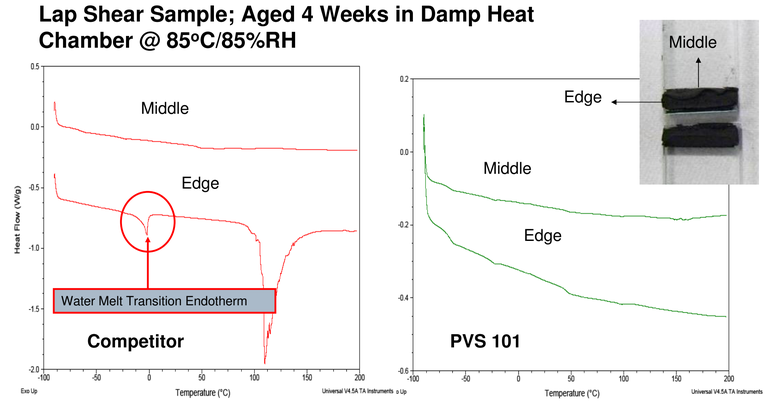


THERMAL STABILITY



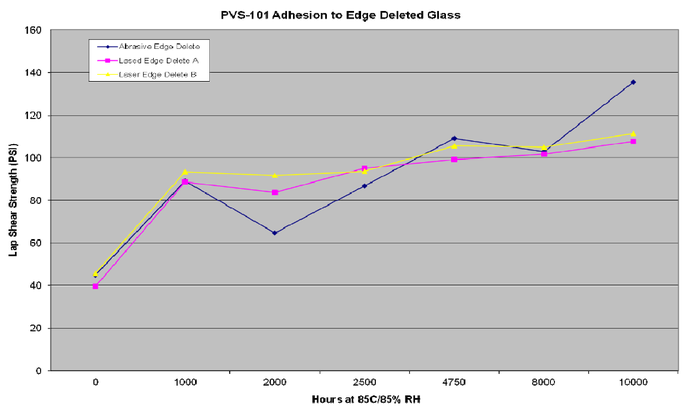
Thru 15000hr (~625 days) PVS-101 cohesive strength has not decreased under the above environmental conditions and exhibits better thermal stability than the competitive material.

MOISTURE VAPOR PERMEABILITY



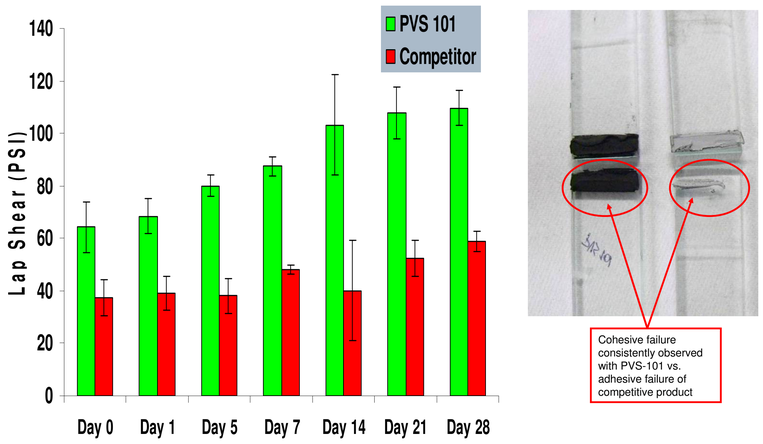
The Endothermic Transition highlighted in the competitor material above is consistent with the melt transition of water and is present after damp heat exposure toward the outside edge of the competitive lap shear sample. This is not found at the edge of PVS-101 nor at the center of either sample.

ADHESION : LONG TERM PERFORMANCE



Significant increase in PVS-101 cohesive strength with prolonged exposure and equivalent performance on abrasive or laser edge delete glass

ADHESION : SHEAR STRENGTH TO GLASS

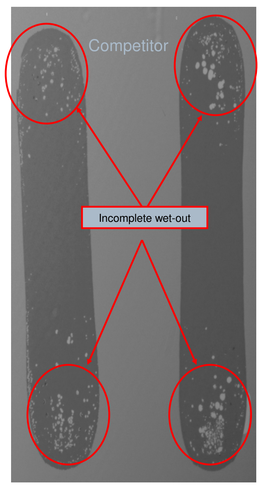


1.7mm thick samples conditioned at 240 ºF for 30 min and compressed to 1.22 mm. Lap shear tests performed at a speed of 4 inch/min

ADHESION : WETOUT TO GLASS

@150C 800 mBar 10 min

@150C 900 mBar 10 min



- **Acoustic Microscopy technique used to determine wet-out characteristics to glass.**
- **PVS-101 has complete wet-out to the glass vs. the competitive product where discrete/circular voids are observed.**