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A REPORT ON THE EFFECT OF MOISTURE EXPOSURE ON MECHANICAL PROPERTIES OF PULTRUDED COMPOSITES

TO WHOM IT MAY CONCERN:

In a recent study performed at BRP comparing the effectiveness of sealers on machined edges of pultruded parts, a set of non-sealed coupons were also immersed in water at 110°F over a period of 1 year and tested for tensile and flexural property degradation at 7 intervals. At every interval a set of 6 samples per test, machined as per respective test method prior to immersion, were taken out of water bath, patted dry and tested as soon as possible. The conclusions of the test data are as given:

Conclusions

1. **The loss or gain of strength due to sealing the machined edges of coupon is statistically insignificant, proving that sealing the cut or drilled edges doesn't have any positive effect on performance of pultruded parts.**
2. Comparing the control sample (unsealed at ambient on day 0) with the sample immersed in water at 110°F for a period of 1 year, there is about 19% reduction in tensile strength and 23% reduction in flexural strength.
3. It was observed that the rate of reduction of strength is higher in first 90 days of testing and appeared to flatten from 90 to 364 days
4. No significant change in both tensile and flexural moduli were observed
5. **It has to be noted that the tested values after 1 year exposure to hot water are still greater than that of BRP published minimum required properties.**

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TEST DATA

The test data regarding sealed (using pigmented Hetrolac®) and non-sealed samples as follows:

Properties of Non-Sealed Control Sample on Day 0				
	Tensile Stress, psi	Tensile Modulus x 10^6 psi	Flexural Stress, psi	Flexural Modulus x 10^6 psi
Average	55117	3.852	66000	2.653
Std. Dev.	1665	0.1344	3178	0.1532

Tensile Stress % as per ASTM D 638									
	Days	7	14	28	63	91	181	273	364
Sealed Samples	Average	48600	49133	46617	44923	44827	45967	46633	45483
	Std. Dev.	272	1573	2592	1982	2054	900	880	2166
Non-Sealed Samples	Average	49650	47450	46450	47101	43799	44950	44350	45183
	Std. Dev.	1086	1993	1936	1855	1277	1427	2577	2726

Tensile Modulus, x10^6 psi as per ASTM D 638									
	Days	7	14	28	63	91	181	273	364
Sealed Samples	Average	3.805	3.835	3.708	3.805	3.663	3.672	3.932	3.938
	Std. Dev.	0.225	0.192	0.105	0.164	0.168	0.120	0.366	0.160
Non-Sealed Samples	Average	3.858	3.787	3.92	3.863	3.757	3.778	3.72	3.735
	Std. Dev.	0.137	0.194	0.102	0.126	0.159	0.116	0.488	0.142

Flexural Stress, psi as per ASTM D 790									
	Days	7	14	28	63	91	181	273	364
Sealed Samples	Average	57717	59950	56933	52567	52933	52733	52933	50500
	Std. Dev.	2626	1559	2763	3407	3755	1294	4110	2122
Non-Sealed Samples	Average	57683	55783	57033	55100	53550	53833	54867	51000
	Std. Dev.	3058	2231	3016	1470	3378	2334	2171	3470

Flexural Modulus, x10^6 psi as per ASTM D 790									
	Days	7	14	28	63	91	181	273	364
Sealed Samples	Average	2.668	2.698	2.72	2.537	2.615	2.547	2.64	2.565
	Std. Dev.	0.105	0.138	0.135	0.117	0.105	0.121	0.115	0.104
Non-Sealed Samples	Average	2.617	2.558	2.585	2.615	2.65	2.642	2.637	2.638
	Std. Dev.	0.103	0.114	0.068	0.096	0.118	0.096	0.104	0.044

If you have any further questions regarding this matter, please feel free to contact the company.