LIFE CYCLE OF GRP

This is a snip from a much bigger report that tests GRP (FRP) products and make we sell and the life cycle time frames (can't share the bigger report as it has some tech of how our products are made compared to others and there's some IP in it). The key shows that lab tests accelerated at temperatures from 34 C to 28C have a life range from 35.7 years to 73.1 years.

4.2.5 Service Life Expectation

We will be able to calculate the service life (days), from the linear equation of aging, as follows:

The calculated service life at different temperature

Temp.	t (°C)	34	32	30	28
	T (K)	307	305	303	301
100/T (K^{-1})		3.2573	3.2787	3.3003	3.3223
t (Days)		13030	16497	20933	26679
t/365 (Years)		35.7	45.2	57.4	73.1

4.3 Others

4.3.1 The above calculation of aging life was based on the assumption that chemical reaction was related to aging in FRP materials. Their reaction rate was only affected by temperature. This seems rather likely to be true in that from the 11 mechanism of aging standpoints, the linear equation of aging life showed **R→1**, which had very good linearity.

4.3.2 In this study, we took the critical flexural strength as 216.7MPa that in fact was still rather high and hence we had very good safety factor.

4.3.3 Water temperature closely affects service life. If in future use, the service temperature would be different from what we have tested, additional works need to be done to assure its service life.

5. Conclusion

5.1 Like every other FRP products, it is reasonable to predict its aging behaviour by accelerated aging tests in hot water, based on its aging characteristic.

5.2 For aged FRP subject to hot water, the true water absorption rate of test specimens showed a "L" shape up-rise curve, and the ratio of flexural strength of the wet over dry samples showed a similar reduction curve. The flexural strength of the wet samples seems to be the major property of concern. Therefore, it is appropriate to use it to characterize the aging properties of FRP materials.

5.3 We took the critical timeτ as half the time required for the flexural strength of wet samples to reduce in half. Various τ taken from different temperature were put into the linear equation to predict aging life.
Logτ = A' +E/RT through least square method.
Logτ= 4.788 x (1/T) - 11.481
Thus, The Correlation Factor **R→1** showing very good linearity.

5.4 We found that the FRP specimen can last over 50 year under water at 30°C. It is for sure that pultruded fiberglass structural profiles, with proper chemical ingredients and processing, could indeed have very long service life in a hot and humid environment.

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