Accumulation of Fibre Breaks under Time-Dependent Loads of CFRP Pressure Vessels

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- Focus on cyclic and creep loading
- Model accounting for fibre breaks will be used
- Able to use the model for the full-scale cylinder
- Calibrate the model with the real pressure vessel

Abstract:

The understanding of damage mechanics on carbon fibre composite is critical in order to determine the reliability of pressure vessels. It has been found that the failure process starts with randomly distributed fibre breaks and as the loading continues, it will coalesce together into a cluster of fibre breaks. Sooner or later those clusters will cause a total failure. On the other hand, there are some interesting findings of new pressure vessels that have an altered reliability compare with the aged vessels. It is believed that the viscoelastic properties of the matrix is the reason behind this phenomenon. However, it is still being under investigation.

For the moment, there is no existing method to quantify the time-dependent effect on carbon fibre pressure vessels or composite pressure vessels (CPV) in general. Whether the existing model can be used or using another measurement method to gain more data is still in question. Therefore, it is required to find a suitable method to explain such phenomenon and even develop furthermore to give a strength criterion for certain types of pressure vessels. Finally, a hint for the scatter of such criterion would also become an added value to this research. In the end, it might be used for evaluating different composite materials, such as: glass, aramid, hybrid, etc.