

Assessment of the fatigue life of a city bus

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The laboratory of service strength and fatigue life testing of the Regional Technological Institute has been cooperating with bus and trolleybus manufacturers SOR and SOALRIS for a long time. In order to assess the service life of city buses and trolleybuses, there is very often an insufficient amount of information from service loads available. One of the options for proceeding in such a case is to use so-called design load spectra. The paper aims to use a case study to calculation of the service life of a specific welded node using the service spectrum, which was evaluated for an empty and full car based on strain gauge measurements in urban traffic. Last but not least, the evaluation of thin-walled welded structures will also be discussed, especially with regard to the applied stress, as it is often problematic to place the strain gauge in such a way as to determine the commonly used nominal or hot-spot structural stress.

L profile

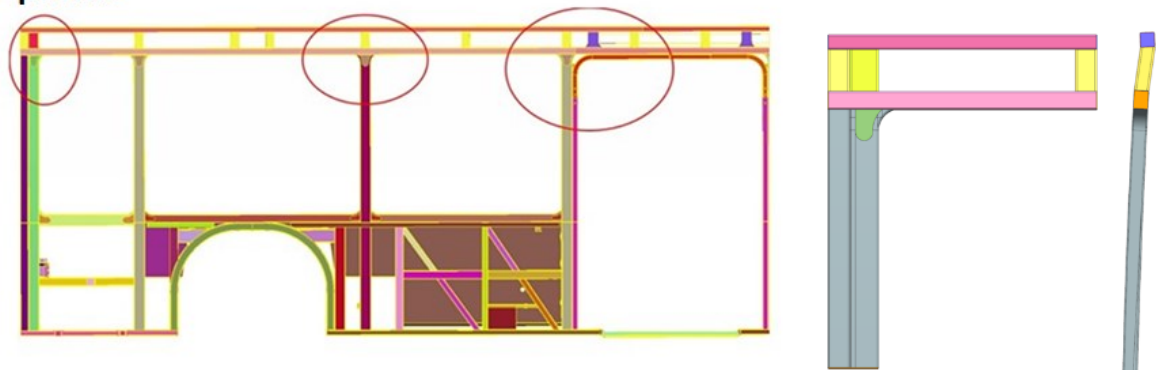


Fig. 1. CAD model of bus bodywork (left), CAD detail for testing (right)

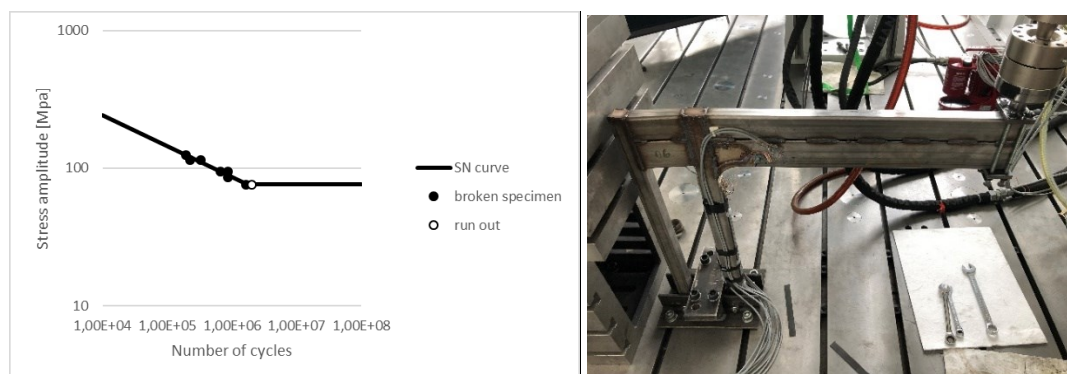


Fig. 2. S-N curve of bodywork detail (left), labor test (right)

The methodology will be demonstrated on the welded L profile, which is located in the rear part of the body. This welded detail has been tested in the laboratory, the test results are modified but realistic, the test was controlled by force and the failure criterion was the formation of a microcrack. The deformation was measured using strain gauges. Its values were used to transform force into stress.

The stress was measured on the real track, with the strain gauges placed in the same place during the ride and as during the test in the laboratory. Variable amplitude loading from real service representing approximately 13 km long track is shown below.

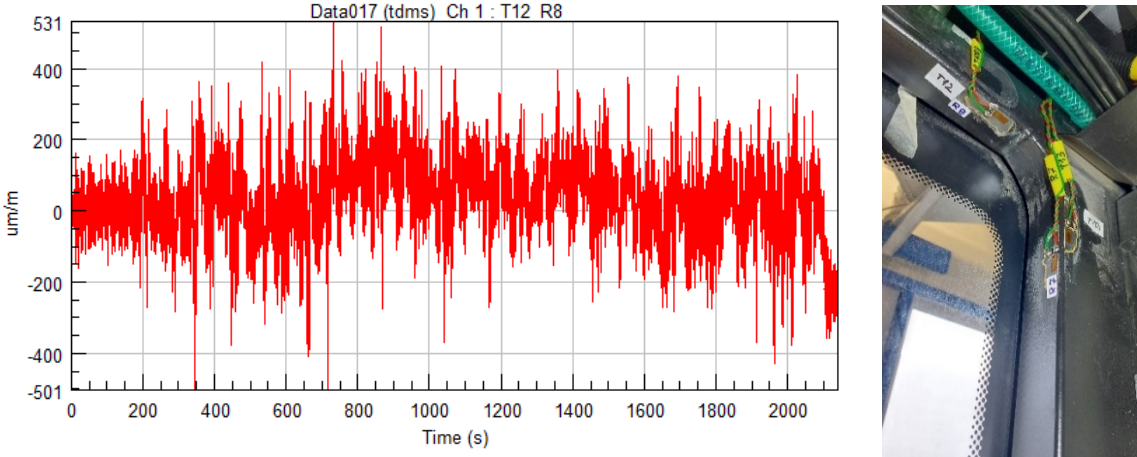


Fig. 3. The strain gauge signal, strain gauge on the bus

Software nCode and the fatigue damage accumulation hypothesis was used to calculate the service life. The methodology used for the calculation was described by authors mode deeply previously in [1].

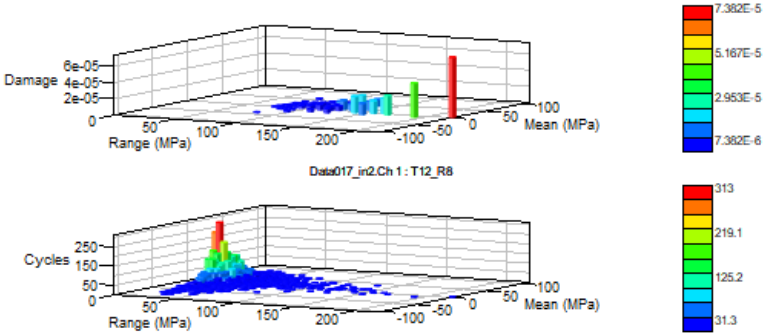


Fig. 4. nCode program results

Acknowledgement

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References

[1] Kepka, M. Consideration of random loading processes and scatter of fatigue properties for assessing the service life of welded bus bodyworks, International Journal of Fatigue (151) (2021) 106324.