Application of A Basquin Model On Fatigue Tests of a Fragile Materials

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Abstract : Cyclic tests of repeated fatigue loads were carried out in three-point bending on a fragile materials. The tests were conducted to burden with R = 0 (ratio of minimum stress to maximum stress), a charging frequency set to a minimum of 75 cycles / min, 1,25Hz and a sinusoidal signal. The specimens used were cut on medium thickness molded plaques 4 mm, dimensions of 80 mm length and 15 mm width according to the recommendations of the standard EN ISO 14125. These specimens were subjected to various loading levels versus the maximum charge of static failure in three-point bending, either: 90%, 80%, 85%, 70%, 60%, 55%, 45%, 40% for each load level, a minimum of three test specimens was tested. The curve traced Wohler is distinguished by a wide dispersion in the lifetimes between the specimens subjected to the same level of loading and tested under the same conditions of cycling and was modeled by a straight line. This dispersion is a consequence of the heterogeneity of the studied fragile materiel. Indeed, the characteristics of specimens such as reinforcement's rate, distribution, density and shape defects and static strength are not comparable from one specimen to another. This phenomenon of dispersion that the life of forecasts studied fragile materials can be estimated with a high probability by the curve of Wöhler. However, the route of the latter giving the middle part a good and acceptable performance can still be used as a comparison corresponding to variations in compositions, test frequency, cycling parameters …. etc . The deterioration of the fragile material takes place in the early fatigue loading cycles and gradually increases on the surface and within the volume to the final fracture. The state of fatigue damage is characterized mainly by a combination of density and orientation of microcracks. The stages of evolution of the damage in the case of cyclic loading are the same as those encountered in static loading but chronology and different magnitudes.

Keywords : fatigue, damage, frequency, static, Wöhler curve