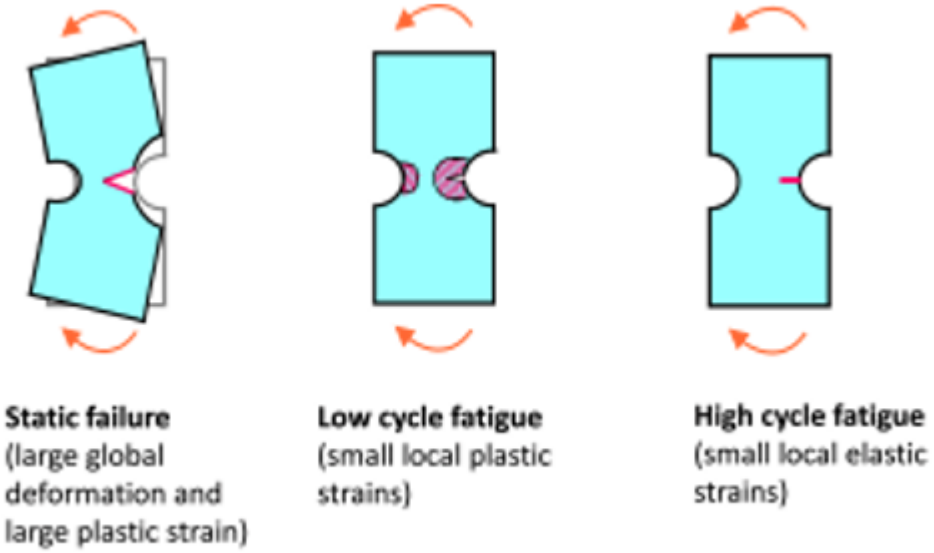
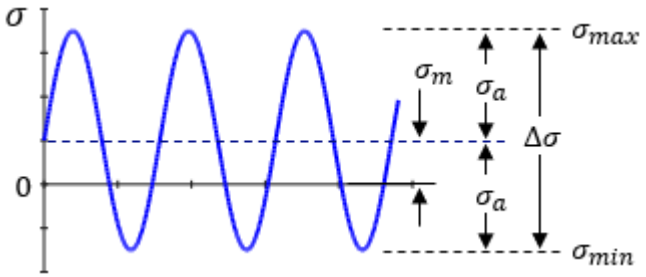
Predicting Fatigue using Linear – Finite Element Analysis



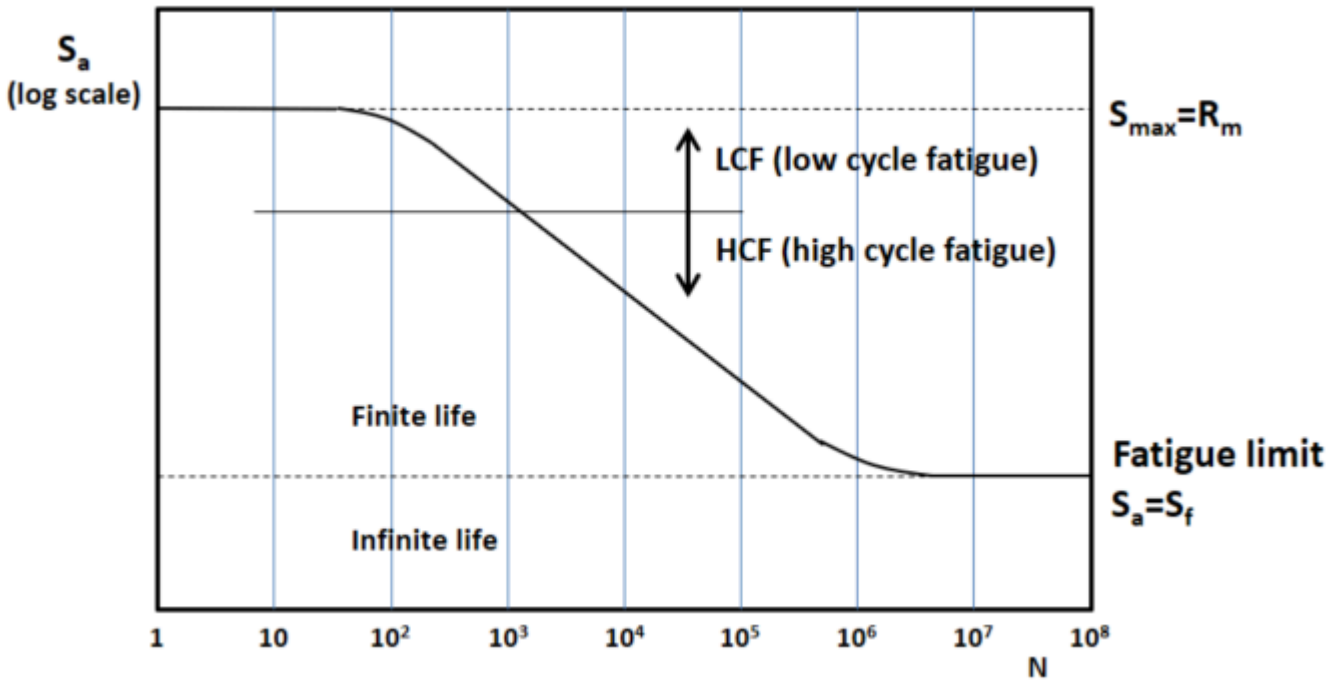
Components and parts of components under repetitive loads and varying load that did not cause plastic strain in a single cycle may undergo failure due to loss of strength and tiredness on the application. This is called Fatigue.

The effect of fatigue may be minor or catastrophic based on the application of that part. Fatigue cracks may arise from microscopic imperfection in the material's crystalline structure. Due to the positive and negative cyclic motion, from the microscopic level cracks starts to emerge. These failures occur without any warning even at the very small magnitude of stress.

Fatigue analysis is carried out in linear finite element analysis to predict the local regions of high-stress magnitude under operating and design conditions. To determine this, maximum and minimum cyclic loads is used.



S-N curve and Fatigue Life



Fatigue properties of the materials are described in the S-N curve of that material (Wohler curve). It charts the cyclic stress amplitude and the number of cycles to failure. The main values on consideration on endurance stress and elastic stress region.
From the linear stress fatigue analysis, the maximum stress magnitude is acquired and are compared to the stress values on the S-N curve and the respective number of cycles are calculated.

- If the stress value is less than the endurance limit of the material, then the life cycle is **infinite**
- If the stress value is above the endurance limit and less than the maximum elastic limit of the material, then the life cycle is **finite – High cycle (more than 104 cycles)**
- If the stress value is above the maximum elastic limit of the material, then the life cycle is **finite – Low cycle**

Conclusion :
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