Bengal Engineering And Science University, Shibpur

Department of Mechanical Engineering

Report on.....

b) ? How do the fatigue failures and static tensile failure differ ?

Solution :- There is a great difference between fatigue failures and static tensile failure.

In static tensile failure, considerable plastic flow precedes fractures, and the surfaces at the ruptured section show a silky, fibrous structure due to the great stretching of crystals.

On the other hand, in fatigue failure, the crack begins at some point in the material owing to a local defect or to a stress concentration produced by an abrupt change in cross-section. Once formed, the cracks spreads owing to the stress concentration at its ends. This spreading progresses under the action of the alternating stress until the cross-section becomes so reduced in area that the remaining portion fractures under the load.

ii) List some factors that influence the fatigue behaviour of the metal.

The factors, which influence the fatigue beha behaviour of the material are as follows:

a) non-homogeneity
b) inclusion
c) surface blemishes
d) surface damages (during use)
e) Corrosion.

Date.....

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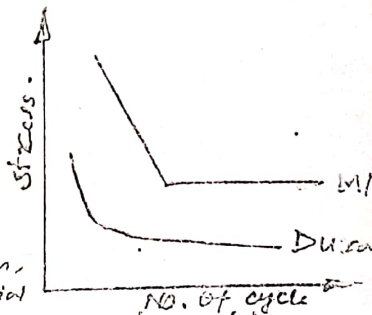
(III) What is the difference between fatigue behaviour of mild steel & Duralumin?



The typical S-N curve for a ferrous Mild steel and any non-ferrous like Duraluminus are shown. In case of steel, there is a knee. However, great the cycle might be. The endurance strength corresponding to that is called endurance limits. For Duraluvin, the graph is horizontal and hence these material dis no endurance limit.

(IV) What is the stress concentration and how does it affect fatigue strength of materials?

(ans) For centrally applied forces on a specimen, the stress at some distance from the ends is uniformly distributed over the cross-section. If there is abrupt change in cross-section happened, it gives rise to great irregularities in stress distribution. This means that at certain points the stress is far above than the average value and, under the action of reversal of stress, progressive cracks are likely to start gradually from such points. It is said, that the points have the 'stress concentration' on their region.

In the region of high stress concentration, crack started to be formed under the reverse of stresses. The crack gradually developed along the helical path following the direction of one of the principal stresses. Finally, failure occured on the material. So, stress-concentration reduce the fatigue strength of material.

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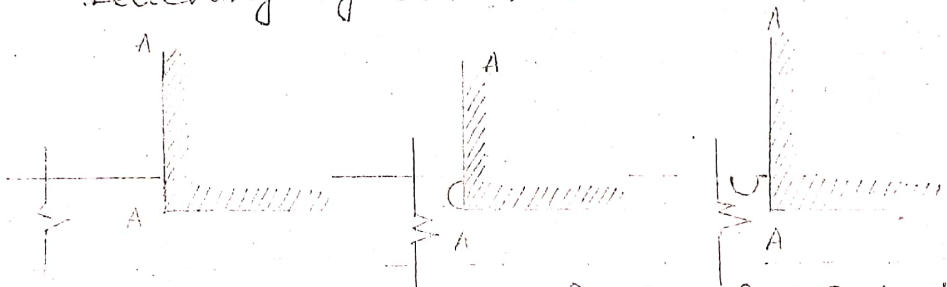
v) How can the damaging effect of stress concentration be reduced?

Ans) Reducing the effect of stress concentration (which cause damages) is of primary importance to designers. Some lowering of stress-concentrations can be obtained by a suitable change in design. For example, a design can be improved considerably by eliminating sharp reentrant corners and introducing fillets of generous radious, by designing fillets of proper shape, by introducing relieving grooves, etc.



Methods for reducing stress concentration at a shoulder of shaft.

vi) What is corrosion fatigue? What precautions are usually recommended against such failures?

Ans) Fatigue test on specimens in the presence of various corrosive agents such as salt water have showed that the endurance limit may be greatly reduced by the combined action of fatigue with corrosion. This type of fatigue is known as corrosion fatigue. ex:- propeller shaft, turbine blades etc.

To protect this type of failure, special corrosion-resistant materials are frequently used. protective coatings and surface cold-working has also been used in guarding against such failures.

Date.....

Signature.....