ABSTRACT

Fracture of components due to fatigue is the most common cause of service failure, particularly in shafts, axles and aircraft wings where cyclic stressing is taking place. Fatigue properties are frequently correlated with tensile properties. In general, the fatigue limit of steels is approximately 54 percent of the ultimate tensile strength. The ratio of the fatigue limit (or the fatigue strength at 10^6 cycles) to the tensile strength is called the fatigue ratio. However, the greater structure sensitivity of fatigue properties, compared with tensile properties, is shown in tests comparing the fatigue limit of a S45C raw material notched to a S45C unnotched raw material which has same tensile strength. Even though the steel in the two specimen's conditions had the same tensile strength, the raw material notched resulted in a significantly lower fatigue limit due to concentration stress.

In general, annealed microstructures result in the minimum fatigue properties in heat-treated S45C. However, at a hardness level above about 162,424(kg/mm^2), a ferrite structure produced by annealing results in lower fatigue properties than a raw material with the different hardness.

Stress concentrations have lower influent for machine elements which made from ductile materials, because they will deform appropriately to adjust to these stress concentrations. It's proved that the notch sensitivity of annealed specimens is lower than raw specimens and failure of raw specimens occurs in notch area but failure of annealed specimens doesn't occur in notch area.