

1.2.4 Experiment 4: Fatigue Failure

Principle

When materials are loaded and unloaded many times they fatigue and become weak. So they are no longer capable of carrying the loads that they carried when they were new. This type of failure is called fatigue failure.

Objective

The objective of this experiment is to study the fatigue phenomenon for a simple structural member.

Apparatus

- Twenty paper clips.

Procedure

Straighten out one paper clip and select a point where it is not already bent. Then start turning the paper clip at that point to the left and right (or back and forth) about 30 degrees. Repeat this procedure until the paper clip breaks into two. Count the number of cycles it required to break. A cycle is one complete period of the recurring motions from starting $+30^\circ$ to -30° and back again. Repeat the test for the nineteen remaining paper clips.

Presentation of Results

Draw a bar graph showing the number of clips that broke (vertical axis) versus the number of cycles needed to break them (horizontal axis). This type of graph is called a histogram and will give you an idea about the variability in the results.

Analysis of Results

Explain why the paper clips broke and explain why they broke at different load cycles.