

## **Fatigue Failure and Improvement in Welded Structures**

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Fatigue failure accounts for about 90% of failures in welded structures and it is a gradual deterioration of materials and welded connections when subjected to cyclic stresses. This poster will illustrate the fatigue failure mechanism in welded structure, by showing the cause, consequences, scientific understanding and how it is managed, all in pictorial and graphic forms.

The poster will show an offshore platform as the welded structure, in severe weather. The waves, wind and current will be noted as the source of the induced cyclic stresses that eventually result in fatigue failure. Since fatigue conditions eventually lead to failure, the next sets of illustrations (#2) will show fatigue failures. First, a failed shaft to show the unique feature of all fatigue failure. It will be mentioned as a note that these failure features depict the main phases of fatigue life (propagation phase and fracture) and constitute what engineers used in recognizing this failure. The other picture will show how catastrophic a fatigue failure can get. The commonly referenced fatigue of the Liberty Ship will be shown, with fractured hull.

Since fatigue is never fully understood and cyclic loading is unavoidable most times. All the same, the basic tools used in predicting life fatigue will be illustrated graphically and briefly explained in short words. That is, the S-N Diagram curve of a ferrous material and the cumulative fatigue damage equation called Miner's Rule.

Finally, three methods by which this unavoidable problem is effectively managed in welding are shown. A GTAW picture will depict improved welding process. Then burr grinding and peening of welded joints will be shown, as a method of fabricating welded joint less susceptible to fatigue failure.