

## Assessment of Ultra-High Cycle Fatigue Behavior of EN-GJL-250 Cast Iron Using Ultrasonic Fatigue Testing Machine

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**Abstract :** High cycle fatigue comprising up to  $10^7$  load cycles has been the subject of many studies, and the behavior of many materials was recorded adequately in this regime. However, many applications involve larger numbers of load cycles during the lifetime of machine components. In this ultra-high cycle regime, other failure mechanisms play, and the concept of a fatigue endurance limit (assumed for materials such as steel) is often an oversimplification of reality. When machine component design demands a high geometrical complexity, cast iron grades become interesting candidate materials. Grey cast iron is known for its low cost, high compressive strength, and good damping properties. However, the ultra-high cycle fatigue behavior of cast iron is poorly documented. The current work focuses on the ultra-high cycle fatigue behavior of EN-GJL-250 (GG25) grey cast iron by developing an ultrasonic (20 kHz) fatigue testing system. Moreover, the testing machine is instrumented to measure the temperature and the displacement of the specimen, and to control the temperature. The high resonance frequency allowed to assess the behavior of the cast iron of interest within a matter of days for ultra-high numbers of cycles, and repeat the tests to quantify the natural scatter in fatigue resistance.

**Keywords :** GG25, cast iron, ultra-high cycle fatigue, ultrasonic test

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