

## Nondestructive Evaluation of Structure and Properties of Cast Irons

This project objective is to develop practical data concerning usage of ultrasonic velocity and sonic testing for quality control of cast irons over a wide range of graphite morphologies and metallic matrices obtained either in as-cast condition or after heat treatment. It was found that the ultrasonic velocity values in ductile irons with the same level of nodularity decrease with increasing the ferrite content. Minimum mechanical properties, required by standard specification for ductile iron ASTM A-536, associated with commercially acceptable level of nodularity greater than 85%, have been achieved, when the ultrasonic velocity exceeded 0.2220 in/microsecond in as-cast ductile iron containing 60 – 70% ferrite, and 0.2250 in/microsecond, when the amount of ferrite decreases to 10—15%.

Dynamic elastic modulus (DEM) depends on ferrite/pearlite ratio in the metallic matrix, and as a result, DEM has different values for the different grades of ductile iron with the same nodularity. With increasing ferrite content and decreasing tensile strength, the dynamic elastic modulus decreases.

For the first time in permanent mold gray iron practice ultrasonic velocity (USV) testing has been successfully applied for microstructure/property evaluation and certification of industrially produced castings.

*Article Written by Dr. Yury Lerner*