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## History of Magnetic Particle Inspection

[Magnetism](#) is the ability of matter to attract other matter to itself. The ancient Greeks were the first to discover this phenomenon in a mineral they named magnetite. Later on Bergmann, Becquerel, and Faraday discovered that all matter including liquids and gasses were affected by magnetism, but only a few responded to a noticeable extent.

The earliest known use of magnetism to inspect an object took place as early as 1868. Cannon barrels were checked for defects by magnetizing the barrel then sliding a magnetic compass along the barrel's length. These early inspectors were able to locate flaws in the barrels by monitoring the needle of the compass. This was a form of nondestructive testing but the term was not commonly used until some time after World War I.

In the early 1920's, William Hoke realized that magnetic particles (colored metal shavings) could be used with magnetism as a means of locating defects. Hoke discovered that a surface or subsurface flaw in a magnetized material caused the magnetic field to distort and extend beyond the part. This discovery was brought to his attention in the machine shop. He noticed that the metallic grindings from hard steel parts (held by a magnetic chuck while being ground) formed patterns on the face of the parts which corresponded to the cracks in the surface. Applying a fine [ferromagnetic](#) powder to the parts caused a build up of powder over flaws and formed a visible indication. The image shows a 1928 Electyro-Magnetic Steel Testing Device (MPI) made by the Equipment and Engineering Company Ltd. (ECO) of Strand, England.



In the early 1930's, magnetic particle inspection was quickly replacing the oil-and-whiting method (an early form of the liquid

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penetrant inspection) as the method of choice by the railroad industry to inspect steam engine boilers, wheels, axles, and tracks. Today, the MPI inspection method is used extensively to check for flaws in a large variety of manufactured materials and components. MPI is used to check materials such as steel bar stock for seams and other flaws prior to investing machining time during the manufacturing of a component. Critical automotive components are inspected for flaws after fabrication to ensure that defective parts are not placed into service. MPI is used to inspect some highly loaded components that have been in-service for a period of time. For example, many components of high performance racecars are inspected whenever the engine, drive train or another system undergoes an overhaul. MPI is also used to evaluate the integrity of structural welds on bridges, storage tanks, and other safety critical structures.

