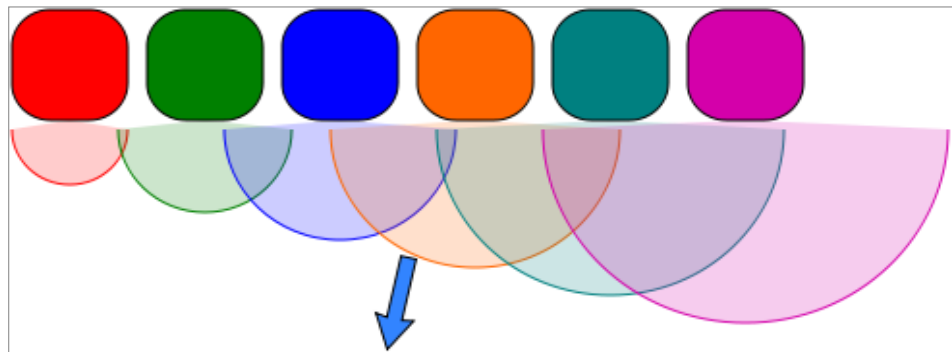
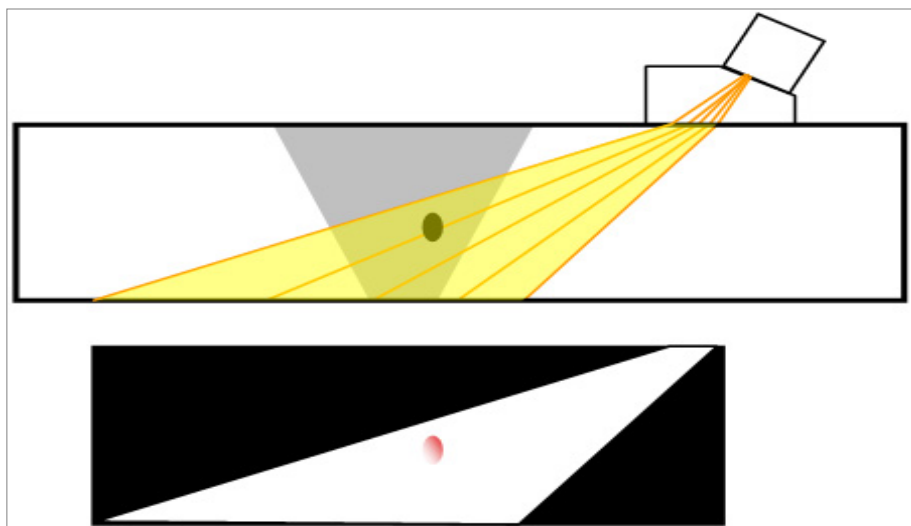


Phased array Vs Eddy current array.

Phased array is a technology that is based on ultrasonic testing where ultra-high frequency sound waves



The PA probe consists of many small ultrasonic elements, each of which can be pulsed individually. By varying the timing, for instance by pulsing the elements one by one in sequence along a row, a pattern of constructive interference is set up that results in a beam at a set angle. In other words, the beam can be steered electronically. The beam is swept like a search-light through the tissue or object being examined, and the data from multiple beams are put together to make a visual image showing a slice through the object



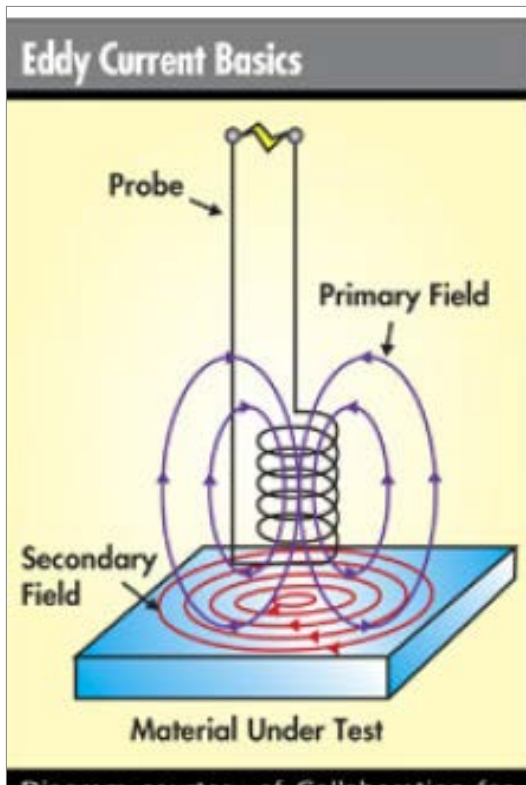
As can be seen by the second image – there is an area at the surface that is not visible to the instrument. If the Ultrasonic signal cannot be tuned to be sensitive to the area at the material surface – therefore there is a dead band for detection at the material surface.

Phased array is performed through a couplant – so some lubricant can act as a couplant in the inspection process. This is the same technology used for imaging in medical situations such as in-utero scanning during pregnancy.

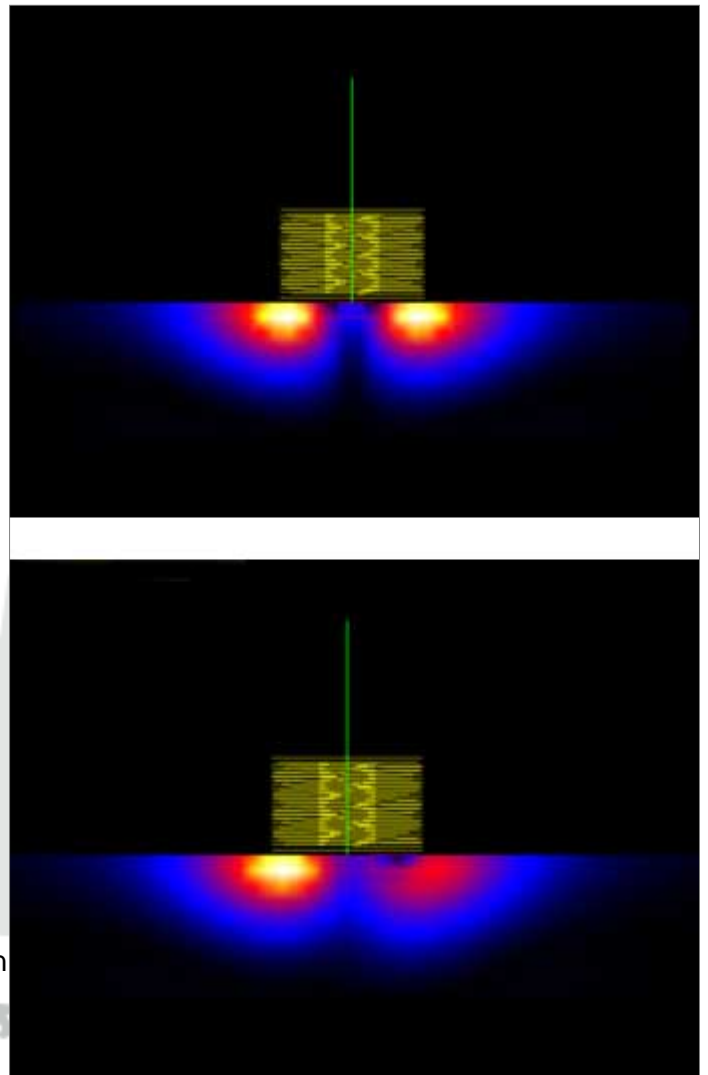
(images and some text courtesy of Wikipedia)

For mechanical inspection for evidence of fatigue cracking, the benefits of a sectional cut through the machine component is limited. The maximum tensile stress is usually present at a machine component surface particularly when the component is subject to cyclical bending stresses which gear teeth naturally are.

Eddy Current



A magnetic field generated by a current passing through a coil generates a current in the area near the surface of a conductive material. This eddy current in turn creates a magnetic field which produces a back emf (electromotive force) or voltage in a secondary coil.



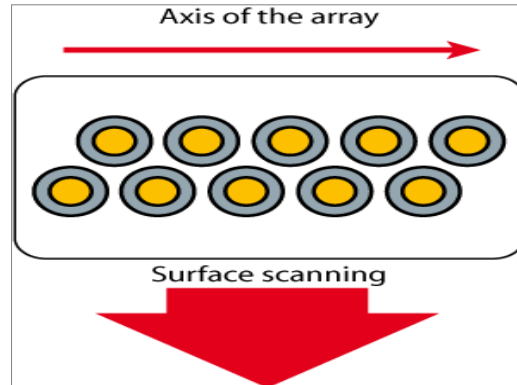
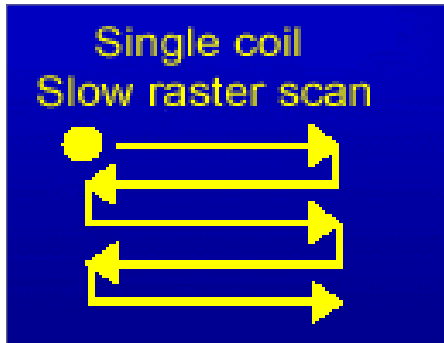
The figure on the right illustrates the difference in magnetic intensity (voltage) when a surface or near surface breaking anomaly is encountered.

The material being inspected only needs to be conductive and does not need to be ferromagnetic. It therefore doesn't matter if there is a non conductive material such as lubricant between the specimen to be inspected and the probe.

Eddy current array:

Eddy current array takes the principles of the eddy current single probe illustrated above and fires an array of coils in such a manner that the area under the coil array is inspected. The coils are sequenced at an appropriate rate to prevent

magnetic interference with each other and to provide complete coverage of the area under the coil array.



Eddy current array instruments process the voltage signals into a colour coded isometric representation of the voltage signal which provides an image provides the untrained observer with some visual insight of the condition of the surface and near surface material. The illustration below demonstrates the variables at play which dictate the depth of effect of eddy current inspection.

