AUTOMATIC MAGNETIC PARTICLE INSPECTION OF STEEL BILLET

This equipment is specifically for use in detecting surface and near surface discontinuities in ferrous billets of sizes from 120mm square to 200mm square, using a non-contact magnetic particle inspection method. See the reverse of this brochure.

Billet Sizes 120mm square to 200mm square.

Billet length cam vary but is not significant.

Billet out of straightness maximum 100mm in 10m.

Non-contact and therefore no wearing parts.

Fast throughput continuous operation, approx inspection speed 500mm per second.

Improves test integrity over traditional methods.

Relatively low capital cost and running cost through lower electrical current requirements.

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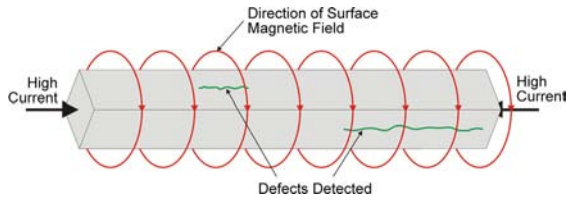
Magnetic Particle Inspection of hot rolled steel billets is a long established technique for the detection of surface breaking longitudinal cracks as part of the mill production routine quality control process.

This system aids grading and provides indication of severity of defects which are the result of the rolling process.

The common method of applying this technique was to pass high amperage current along the length of the billet to induce circular magnetic flux in it.



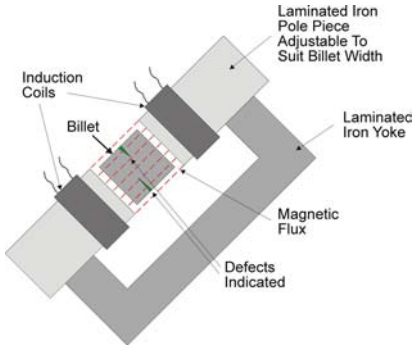
Whilst the above method is an excellent system it suffers from several drawbacks.

- For the range of lengths of billet normally tested exceedingly high output current from the power pack are necessary.
- The high current is passed in to the billet by contact pads. It is essential, in order not to decrease the available current yet further, that the pads are in very firm contact with the billet. Billet ends are normally ragged, sheared faces lacking the flatness necessary for good contact.
- It unlikely that all billets are of an identical length it is necessary that at least one of the pads needs to be moved a significant distance to suit the actual length of the billet.
- The subdued light viewing booth - and the ultraviolet illumination, must be at least the length of the maximum billet which requires the inspector moves along the billet to view the upper half of it.
- The length, along the line, required for this type of system is extensive and the capital cost is high.

A method to overcome these shortcomings but be equally effective - requiring no high current contact, indeed no contact at all, with the billet for magnetising purposes has been developed.

This is the yoke system in which progressively only a short length of billet is magnetised circumferentially and inked whilst the billet moves axially through the system. With the special viewing arrangements adjacent to the magnetising station it is thus not necessary to stop the billet even for inspection purposes.

Transverse flux is induced by the yoke - in square billets two yokes are necessary.



Each yoke magnetises two opposite faces by generating A.C. flux between the pole piece ends.

A.C. flux with its attendant skin effect will traverse the two appropriate sides creating a transverse magnetic field in the required direction. Indicating ink applied immediately before each yoke will allow particles to move through the fluid layer to the defect edges during the magnetising phase.

Immediately after each magnetising position will be a viewing station. The viewing can take either of two forms. Each of the two viewing stations can have a man to view the upper surface and, with the aid of a specially designed mirror system, the lower surface.

The operator would be provided with a remote operated marking device to mark defects appropriately.

Since the yokes are operating continuously with A.C., as the billet moves from the yokes it is subjected to a reducing A.C. reversing polarity field and therefore is automatically demagnetised.