

Application note

Quality control and inspection of permanent magnet assemblies

Custom Triaxial magnet scanner and M800-400kj magnetiser

Objectives

The triaxial magnet scanner can be used for production quality control, to verify levels of magnetisation on a production line across the surface of the magnet. A minimum field strength must be achieved for the magnets to be passed and suitable for use in separators. The system is linked to a barcode and database system to capture results per magnet and provides traceable quality records. The scanner system is ideal for large area magnets used in over-band separators that are widely used in the recycling and waste processing industries.

The scanner works with magnet blocks up to 1.4m x 0.8m surface area with depths less than 0.9m these can be up to 1.4tonnes in weight so conveyor handling is used. Below the is 3 axis scanner as a stand-alone prior to integration into the production line.



Instrumentation

- Custom 3 axis magnet scanner using a 3 axis Gaussmeters and 3 axis probe to record field strength with vision system.
- M800 – 400kj magnetiser and automated conveyer handling.
- Handheld QR / Barcode scanner and PC control system for data logging.
- Paraview software for 3D visualisation of magnetic field strength.

Key benefits

- Precise and accurate verification technique.
- Non-destructive and automated method of testing magnet assemblies.
- Barcode scanning, system reads barcodes on the magnet assemblies allowing for quick and easy operation, and eliminating human error when inputting.
- Measurements the magnetic flux density and records in database enabling analysis of production cycles for QC purposes.

Applications

- Quality control of large magnets magnetised used in over-band separators

Integrated system

Scanner shown installed on production line placed over a conveyor on the exit of a M800-400kj magnetiser



Measurement basics and method

The sensor head on the scanner contains 3 hall probe sensors to measure the magnetic field on each of the orthogonal axes, these are processed by a 3-axis Gaussmeter, and captured by the software running on the computer.

A vision camera identifies the position of the magnet assemblies relative to the scanner and zeros in on the edge of the magnet block, the scanner then works in a grid pattern taking samples of the magnetic field at each point.

Optional pass/fail criteria can be specified at the end of a scan an overall pass or fail result will be presented.

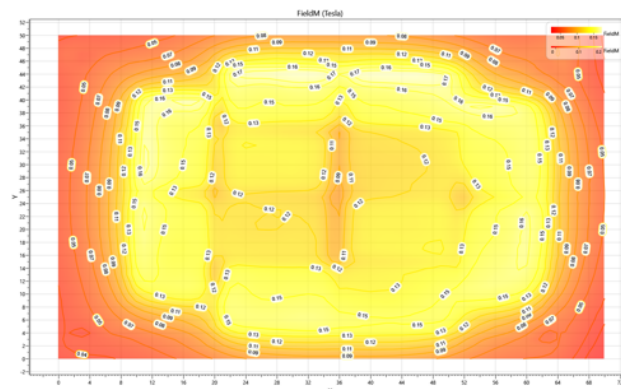
All data is outputted in a CSV format and logged to a database.

Additional data processing and Graphical Representation

Whilst not strictly part of the routine quality procedure datasets can be processed and viewed in software in various formats:

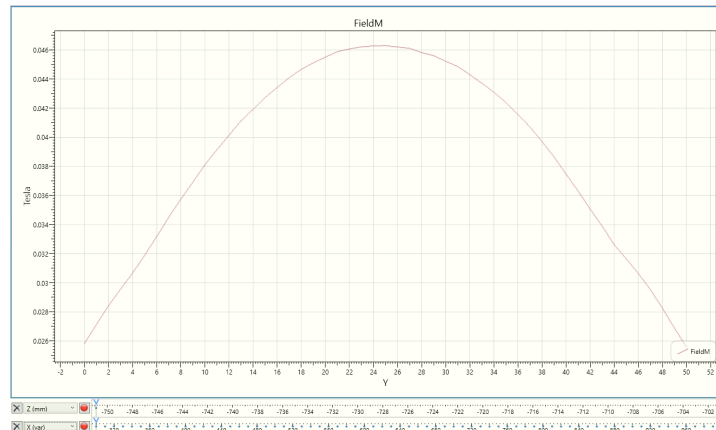
2D contour map

DataSet Viewer is a Microsoft application and can be used to present a 2D contour map showing the field strength on a cross-section through the 3D magnetic field.



1D Slice Chart

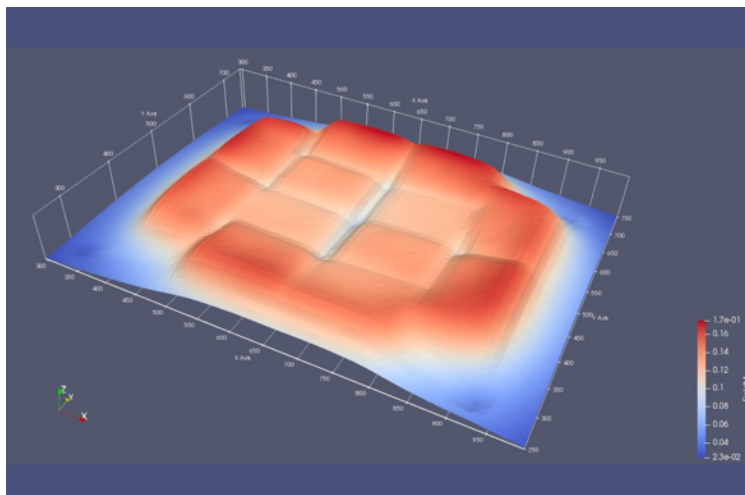
Data can be sliced to display a graph of the magnetic field strength along a 1D line:



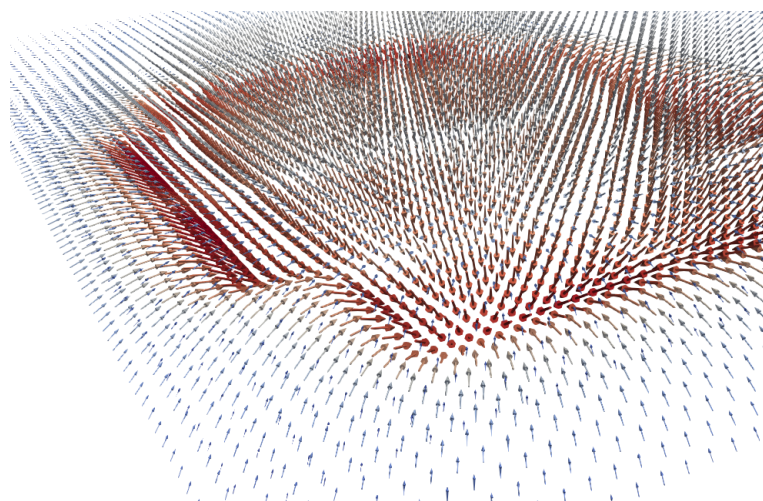
3D Data Visualisation

Using ParaView data can be visualised in 3D. ParaView by Kitware is an extremely powerful open-source 3D data visualisation package

Magnetic fields can be represented as a smoothed translucent volume as shown below:



The direction of the magnetic field can be shown as an array of field arrows:



Conclusions

A post magnetising verification and quality control process such as this provides a quick, accurate result to give both the supplier and end customer confidence in the product being supplied. When implemented it can ultimately save the user time and money.

The database of records containing the magnetic field strength. These records can form a traceable quality certificate for products and be part of larger quality procedure.



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