Permanent magnets modeling with QuickField

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Magnetic analysis with QuickField

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Permanent magnets simulation in QuickField
Magnetic analysis with QuickField

Vladimir Podnos,
Director of Marketing and Support,
Tera Analysis Ltd.
# QuickField

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<thead>
<tr>
<th>Magnetic analysis suite</th>
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<th>AC Magnetics</th>
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### Magnetic analysis suite

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Stages of solution

Model

Physical parameters

Result
Magnetic material properties

\[ \mu = \tan(\alpha) \]
Magnetic material properties

[Diagram showing permeability and coercive force properties with a graph and table data]
Permanent magnet properties

\[ \mu = \tan(\alpha) \]
Permanent magnet properties

![Diagram showing magnetic properties with a graph and a table of data points.](image)
## Types of analysis with permanent magnets

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Permanent magnets modeling with QuickField

Sergey Ionin
Support engineer, Tera Analysis Ltd.
Permanent magnets modeling

1. Single magnet.
2. Two magnets.
3. Magnet and ferromagnetic.
4. Magnet and direct current.
5. Magnet and transient current.
6. Automation.
1. Single magnet

Given:

- $D = 15 \text{ mm}$,
- $l = 5 \text{ mm}$,
- $H_c = 955 000 \text{ A/m}$,
- $B_r = 1.3 \text{ T}$

Calculate field distribution on the axis, $B[T]$.
2. Two magnets

Given:

\[ D = 15 \text{ mm}, \]
\[ l = 5 \text{ mm}, \]
\[ \delta = 5 \text{ mm}, \]
\[ H_c = 955 \, 000 \text{ A/m}, \]
\[ B_r = 1.3 \text{ T} \]

Calculate repelling and attractive forces of the magnets, \( F[H] \)
Given:

\[ D = 15 \text{ mm}, \]
\[ l = 5 \text{ mm}, \]
\[ \delta = 5 \text{ mm}, \]
\[ t = 5 \text{ mm}, \]
\[ H_c = 955 \, 000 \, \text{A/m}, \]
\[ B_r = 1.3 \, \text{T}, \]
\[ \mu = 1000. \]

Calculate force of the magnet attraction to the ferromagnetic, \( F[H] \).
4. Magnet and direct current

Given:

\[ H_c = 500 \, 000 \, \text{A/m}, \]
\[ B_r = 0.65 \, \text{T}, \]
\[ I = 0.1 \, \text{A}, \]
\[ \mu \text{ - nonlinear.} \]

\[ \Phi_{\text{total}} = \Phi_{\text{PM}} + \Phi_{\text{coil}} \]
\[ L = \frac{\Phi_{\text{coil}}}{i} \]
5. Magnet and transient current

Given:

\( H_c = 500 \, 000 \, \text{A/m} \),
\( B_r = 0.65 \, \text{T} \),
\( f = 10 \, \text{kHz} \),
\( C = 2 \, \mu \text{F} \),
\( U = 5 \, \text{V} \).

Calculate force as a function of time, \( F[N] \).
6. Automation

Given:

\[ l = 5 \text{ mm}, \]
\[ w = 20 \text{ mm}, \]
\[ t = 7.5 \text{ mm} \]
\[ H_c = 955 \ 000 \ \text{A/m}, \]
\[ B_r = 1.3 \ \text{T} \]

Calculate force of attraction as a function of the distance between magnets \( \delta \), \( F[H] \)
More information

www.QuickField.com

Examples gallery

Here is the full list of examples published on our website.

Search: permanent magnet  Find

Pages: 1 2

Thermal issues in the design of permanent magnet based electrical motors
Dr. Jose Camino

Model class: Plane-parallel
Analysis type: DC magnetics, Transient Heat Transfer
Application: electrical engineering, thermal engineering

Calculation of the temperature of the rotor under the different working conditions

Tags: motor, electric machine, temperature

Nonlinear permanent magnet
QuickField Support team