

Effective Use of Neodymium Iron Boron Magnets, Case Studies

S. R. Trout and Yuriy Zhilichev

Magnequench International, Inc.

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Introduction

- A brief history of NdFeB
- The three objections
- The “other” concern: intelligent usage

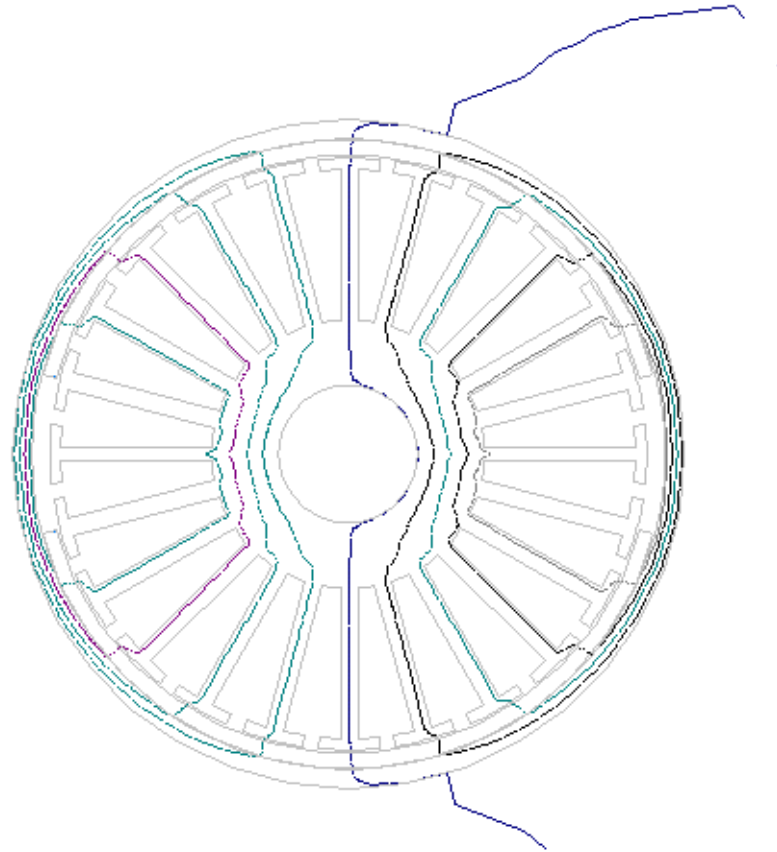
Case Studies

- Ferrite to MQ1 conversion
- Misdirected flux
- Change in magnetization

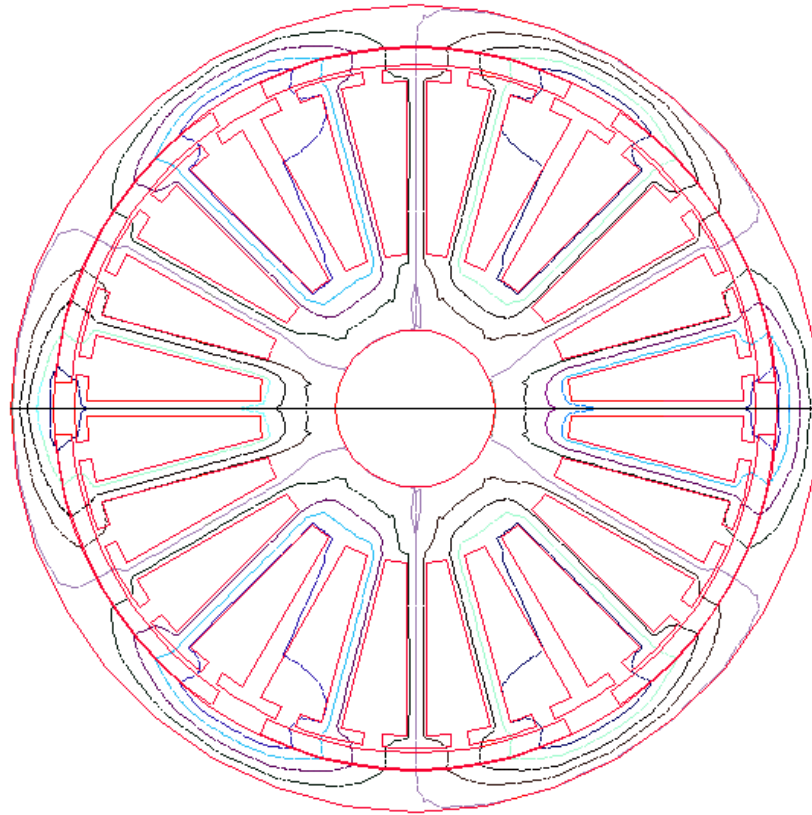
NdFeB Magnetic Characteristics

Property	MQ1	MQ2	MQ3/sintered	Units (CGS)
Energy Product $(BH)_{\max}$	8.5 - 11	14 - 15	32 - 42	MGOe
Residual Induction (B_r)	6.1 - 7.1	8 - 8.25	11.6 - 13.1	kG
Coercive Force (H_c)	5.2 - 5.6	7 - 7.2	11 - 12.3	kOe
Intrinsic Coercive Force (H_{ci})	9 - 16	17.5 - >18	16 - >20	kOe
Magnetizing Field (H_s)	35 - 45	45	35 - 45	kOe
Recoil Permeability (μ_r)	1.15 - 1.22	1.14	1.06 - 1.09	G/Oe
Maximum Operating Temp.	110 - 140	180 - 200	150 - 200	°C
Curie Temperature (T_c)	305 - 470	335 - 370	335 - 370	°C

Ferrite to MQ1 Conversion: The problem

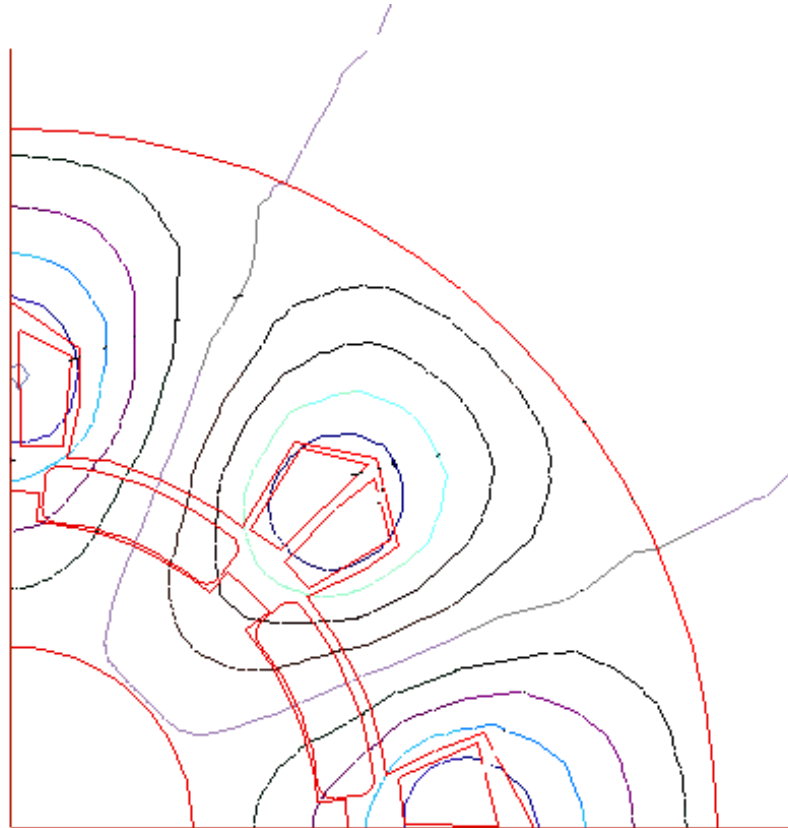


Ferrite to MQ1 Conversion: The solution

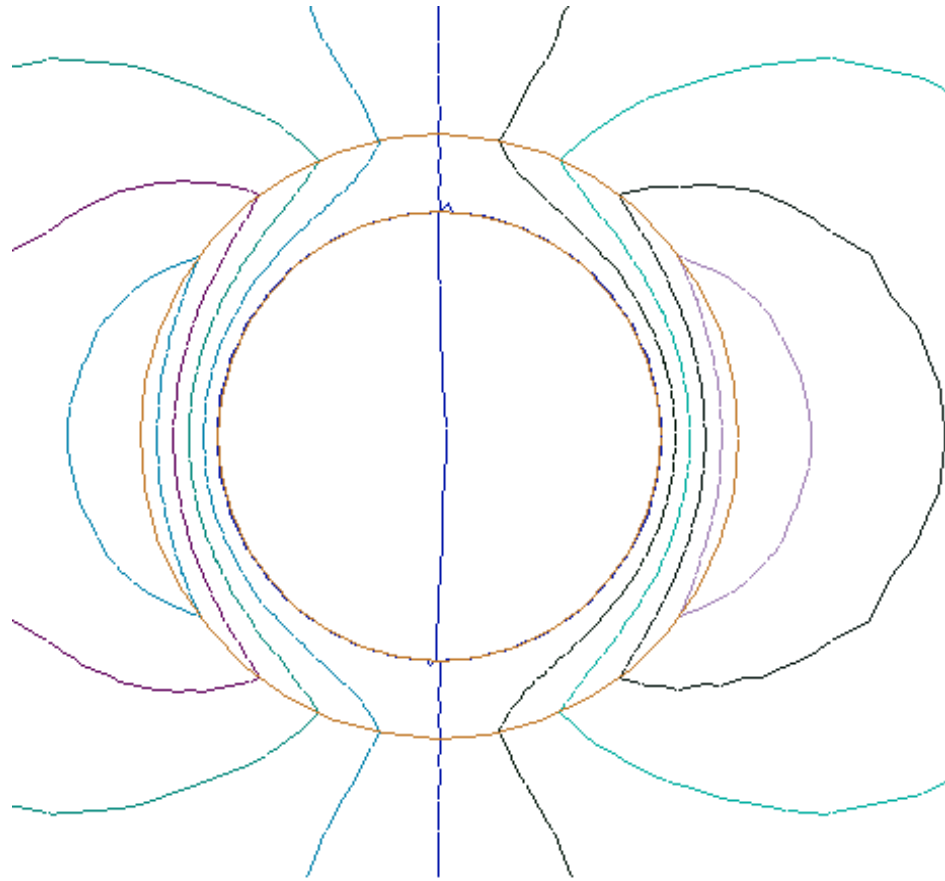


More poles, thicker can

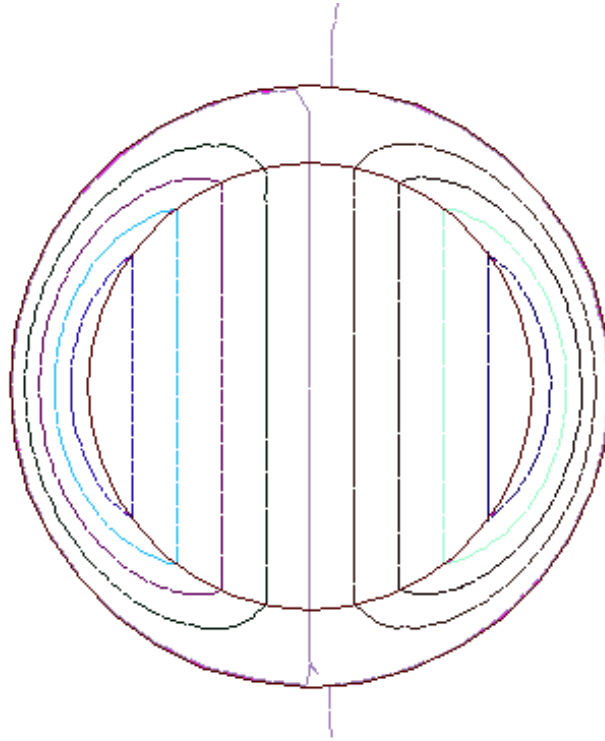
Misdirected Flux



Diametrical Magnetization



Halbach Magnetization



$$B = B_r \ln (d_o/d_i)$$

Conclusions

- Ferrite to MQ1 conversion
 - Allow for the extra flux
- Misdirected flux pattern
 - Model magnetizing field (magnitude and direction) and confirm in practice
- Change in magnetization
 - A method to achieve a uniform field
- If in doubt, ASK