ANSYS AIM Permanent Magnetic Circuit with Air Gap -Physics Setup

Authors: Joshua Wallace & Steve Scampoli, ANSYS Inc.

Problem Specification

- 1. Pre-Analysis & Start-Up
- 2. Geometry
- 3. Physics Setup4. Numerical Solution/Results

Physics Setup

In the Workflow, press the Physics button. Right click on the enclosure and select Hide Body.



Specify Material

Next to Material Assignments, press the Add drop down menu Material Assignment > Search for Cast Iron (Material Samples) and select it. Make sure you change the Isotropic relative permeability to 1(10)^5. Next, click on the Body Selection tool in top right corner and select the three beams and click Add.

| N Unsaved Project - Workbench | - 0 | × |
|---|--------------------------|------|
| E Project E Study Cast Iron Assignment 2 | | |
| 🗧 🔿 🏭 Study 🗲 Simulation 1 🛛 Physics) 🔊 Physics Modeling 💙 Material Assignments 💙 Cast Iron Assignment 2 | 11 <mark>8</mark> DP 0 - | ? |
| | | |
| Cast Iron Assignment 2 | ANSYS | 1. |
| Viete Vp-to-date | R18.2 | |
| Location | | * |
| 3 volumes • • • | | |
| Materia Castron v | | 8 |
| Material state | | 0.0 |
| Solid | | |
| ✓Cast Iron (used by 1 object) | | |
| Description | | |
| | | 0.06 |
| | | |
| Density, p | | |
| 7200 kg m ² .3 | | |
| Isotopic electrical conductivity, o | | 0.04 |
| iseruo siir-i | | Ŭ |
| Isotropic magnetic loss tangent tanô _m) | | |
| | | |
| Isotopic relative permeability, µ, 1E+05 • | | 5 |
| I odvoji zabila poznilkih z | | 0.0 |
| 1 source regime permany, c | | |
| v Messages Transcript Solution Monitors | | |
| Net Step - metry - Physics - Results | | |
| > Related Objects and Tasks | | εl |
| | | |
| m 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.1 0.11 0.12 0.13 0.14 0.15 0.16 | 0.17 0.18 | |

Next, a magnetic material will be created. Instead of searching for cast iron, search "Mag" and click on **Create Mag**. Set the **Default State** to **Solid**. To create a material property, select **Add** and choose the following material properties. Input 625000 S m^-1 for Isotropic Electrical Conductivity. Input 5.305 for Isotropic Relative Permeability. Input 150000 A m^-1 for the **Magnetic Coercivity**. (You can use "Type to Search" to find the **Magnetic Coercivity** property.) Select **Cartesian magnetization direction**, then input 3/2 for the **X direction** (you can enter the expression sqrt(3)/2 to define the x direction) and 1/2 for the **Y direction**.

| Up-to-date | |
|---|-------|
| Description ⑦ | |
| Enter a description. | |
| | |
| Default state | |
| Solid | |
| Solid Properties | Add 🗸 |
| Isotropic electrical conductivity, σ | |
| 6.25E+05 S m^-1 | |
| Isotropic relative permeability, µ _r | |
| 5.305 | |
| ✓Magnetic Coercivity IIII | |
| Magnitude | |
| 1.5E+05 A m^-1 | |
| Magnetization direction | |
| Cartesian | |
| X | |
| 7-0.00003 | |
| ۲ 0.5 | |
| 7 | |
| 0 | |
| Liquid Properties | Add 🗸 |
| Gas Properties | Add 🗸 |
| | |
| | |

Go to all ANSYS AIM Learning Modules