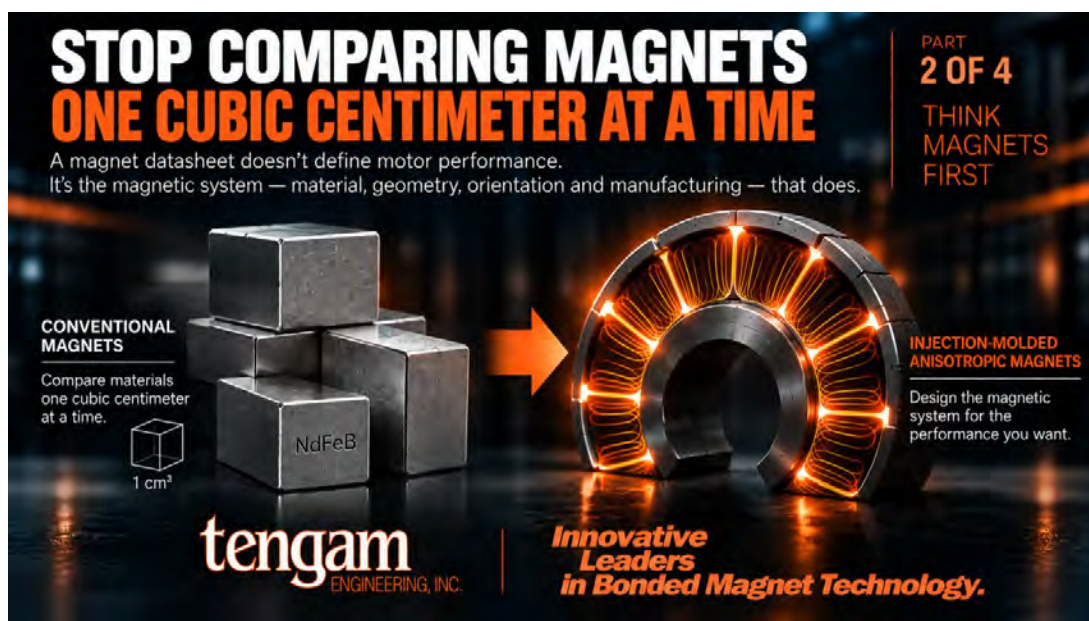


Stop Comparing Magnets One Cubic Centimeter at a Time

Tengam Engineering Inc | September 11, 2026



Conceptual illustration only. Conventional magnets versus unique magnetic geometry with anisotropic orientation.

STOP COMPARING MAGNETS ONE CUBIC CENTIMETER AT A TIME

In Part 1, I proposed a simple idea: THINK MAGNETS FIRST.

That doesn't mean designing a motor around a predetermined magnet. It means considering the magnetic material, geometry, orientation and manufacturing process early enough in the design process that they can influence the motor topology.

If we accept that premise, it also changes how we should compare magnetic materials.

One of the persistent problems with evaluating bonded permanent magnets is that the comparison often begins, and ends, with the material datasheet.

Remanence. Coercivity. Maximum energy product. Those properties obviously matter, but a motor does not operate on a magnet datasheet. It operates as an electromagnetic system.

Bonded anisotropic SmFeN has lower remanence than high-grade sintered NdFeB. If the exercise is simply to remove an existing sintered NdFeB magnet and replace it with an identical-volume bonded SmFeN magnet, SmFeN will generally lose that comparison. Why

would we evaluate a fundamentally different manufacturing technology by requiring it to reproduce the geometry dictated by the technology it is intended to challenge?

Injection molding changes the design problem.

It gives us the opportunity to:

- Use more magnetic volume where the rotor geometry allows it.
- Optimize where that magnetic material is located.
- Fill geometries that cannot practically be filled with conventional sintered magnets.
- Eliminate insertion clearances and unused portions of magnet cavities.
- Mold magnetic material directly into a lamination stack.
- Engineer particle orientation around the magnetic field the machine actually requires.

Material properties still matter enormously. Br, Hcj and BHmax remain important inputs to the electromagnetic system but they are not the entire system.

Geometry, magnetic volume, location, orientation, thermal behavior, demagnetization resistance and manufacturability all influence what the motor designer can do with those material properties. Comparing one cubic centimeter of SmFeN with one cubic centimeter of NdFeB can become misleading. If injection molding allows us to use a different geometry, more magnetic volume, better placement and an engineered anisotropic orientation, why should we assume the motor itself remain unchanged?

That is not a material substitution. It is a rotor redesign.

And that distinction is important. The question we are asking is not simply can SmFeN replace NdFeB in an existing magnet cavity, at the same volume, using the same motor topology? That is not the most useful question. Instead, we are asking, “What happens when we redesign the magnetic system around what anisotropic injection molding allows us to manufacture?”

That is a very different engineering problem, and we have already modeled it in a 380 kW, 700 Nm motor. The results surprised even us.

Part 3: Does it work? This question will be discussed soon.

#PermanentMagnets #SmFeN #NdFeB #ElectricMotors #MotorDesign #Magnetics #Engineering #AdvancedManufacturing
#Tengam

Part 1 of 4 - THINK MAGNETS FIRST

Part 2 of 4 - STOP COMPARING MAGNETS ONE CUBIC CENTIMETER AT A TIME

Part 3 of 4 - WE MODELED IT. HERE'S WHAT HAPPENED

Part 4 of 4 - FROM MANUFACTURING MAGNETS TO MANUFACTURING MAGNETIC FIELDS

Read the original article on LinkedIn