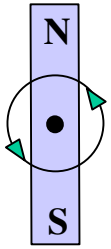
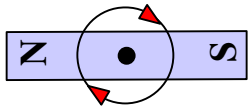
Towards a self-running magnetic motor

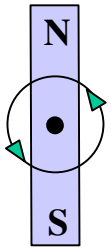
Let's consider a simple rotating bar magnet rotating CCW (a positive rotation in FEMM).



Now let's consider supplying a field that will supply torque to that magnet. Clearly the field must rotate so why not use another rotating magnet to drive this? If the drive shafts are parallel but not on the same axis we get the following situation.

Input magnet on driven shaft





Output magnet driving a shaft

It is found that the best configuration is with the magnets at 90 degrees and this develops almost continuous torque coupling between the two magnets. Of course the input magnet sees the torque as a drag while the output magnet sees the torque as a boost. It is interesting that the input magnet has to rotate in the *opposite* direction, i.e. CW in this case.

So if we want a self-running motor we need the output magnet to create its own rotating field, but is this achievable?

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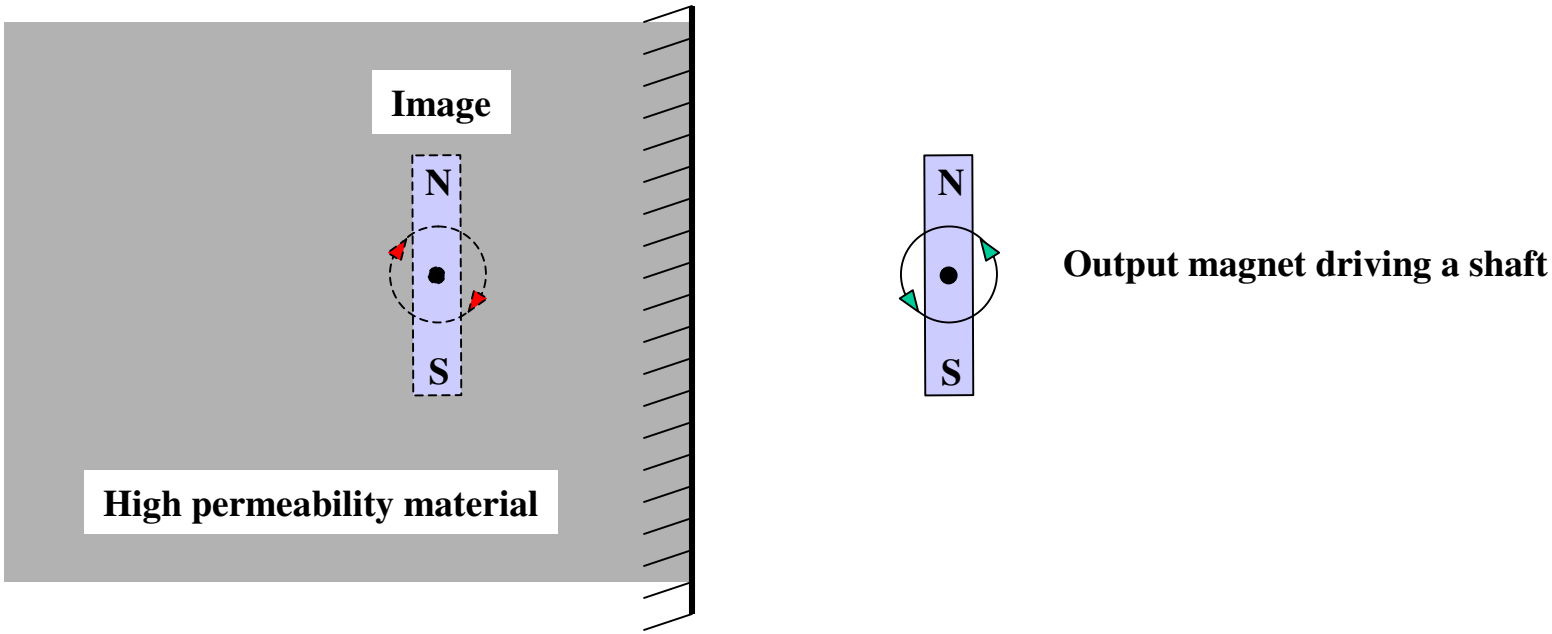
It is well known that magnetic problems can be solved by the method of images. A magnet rotating close to a plane reflector will create a reflected field as though it were coming from the rotating image. So what constitutes a magnetic reflector? The answer is a semi-infinite volume of high permeability material.



The interesting thing here is that the image rotates on the opposite direction, which is exactly what we want. The downside is that the image does not have the correct orientation.

But what happens if there is some magnetic delay in establishing the image? Magnetic delay is a known effect usually considered to be detrimental, but maybe not always so! Also the permeable material need not be infinitely thick, if its permeability is high enough a reasonably thin sheet will make a practical reflector.

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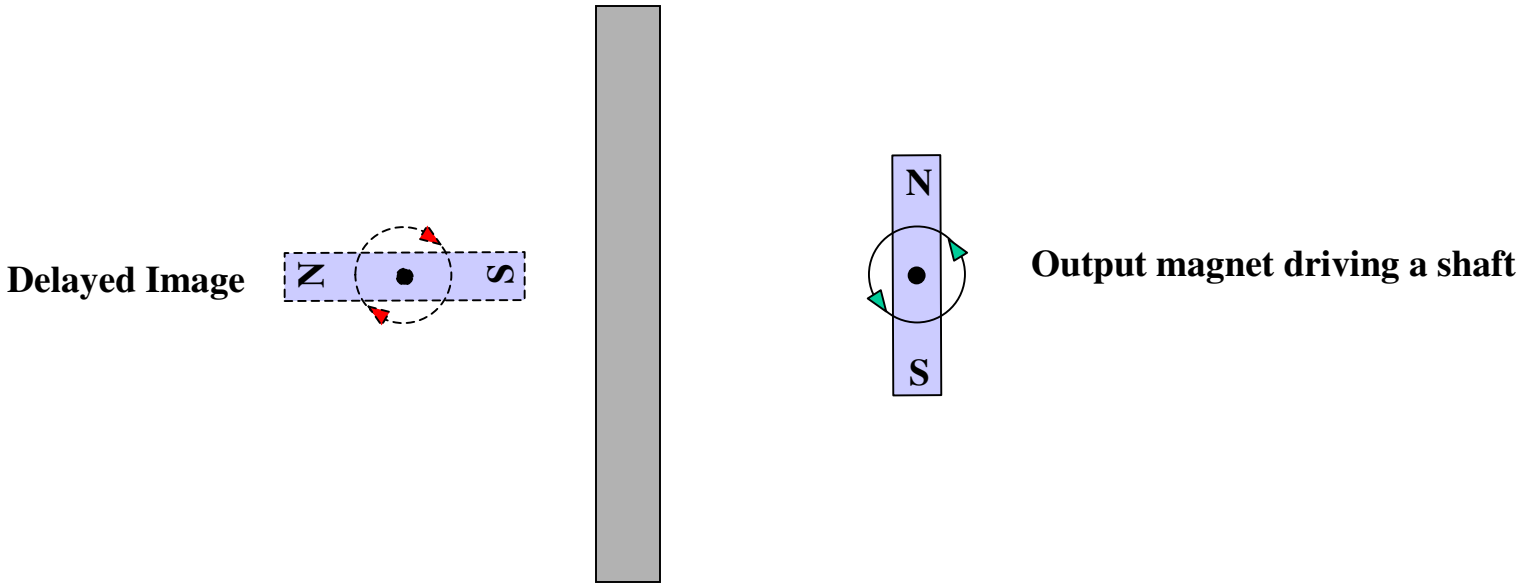
The next picture shows the magnet's image delayed by 90 degrees



This is exactly the right orientation for the output magnet to receive a driving torque. So it seems all we need to achieve self-running is to rotate a magnet close to a sheet of highly permeable material then speed it up until it takes off by itself. Of course life is not that easy, it requires rotation speeds that are too high to be practical. But the principle holds, magnetic delay is a route to overunity.

So is there any way we can achieve a reflector that has significant magnetic delay?

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We know it is possible to create delay along thin permeable rods by encasing them in a high permittivity dielectric. Also ferrites can have a high electrical permittivity, so why not create an array of thin ferrite rods embedded in high K dielectric? Then use this to carry the image onto the reflective sheet rather like a bundle of optical fibres can carry an optical image.