

Power Generation



Design & supply of magnets and magnetic assemblies for power generation applications

Eclipse Magnetics designs, produces and supplies magnets and magnetic assembly solutions for the varied application requirements for a very diverse range of permanent magnet generator designs.

Power Generation Solutions

Design, improve, optimise, supply, support

Eclipse Magnetics understands the needs of power generation customers to design commercially viable PM generator solutions that have reduced weight, high power density, compact design, longer service life, reduced cost and higher efficiency. This even includes Rare Earth free design replacements.

Whether the application is for magnetically balancing rotors, designing out rare earth magnets using ferrite magnets, increasing power density by miniaturisation, enhanced flux concentration at the poles, designing pancake generators and canister generators, or reducing flux leakage, Eclipse Magnetics will help you achieve your solution.

We can magnetically balance the rotors (as well as mechanically balance the rotors) to give less back emf variation between phases to help simplify the power electronics circuitry.

We like to use mutual NDA. We design to meet requirements for pull forces, torques, field strengths, temperature, sensor specifications, etc. Our magnetic solutions include weight reduction, miniaturisation, higher efficiency, greater holding force, improved pull versus distance, cost reduction and even reduction of rare earth material use.

We have Dr Ewan Goodier, an Electronic & Electrical Engineer with a PhD in the field of motor designs using magnets, to assist with your application design and technical support.

Our China Joint Venture also allows us to supply our solutions with PPAP and C of C.

We also offer methods to allow for better recyclability to help meet WEEE requirements.

With an unrivalled expertise in designing value adding magnetic solutions Eclipse Magnetics is a trusted partner for reliable long-term contract manufacturing supply. This includes holding stock in UK for guaranteed fast call off supply.

Application examples include:-

- Permanent Magnet Generators
- Regenerative braking systems
- Battery chargers
- Wind Turbines
- Water Turbines
- Heat energy reclaim generators
- Linear & Rotary Generators
- Alternators
- Internal and External Rotor Assemblies

Principle of back emf (voltage) generation

Faraday's Law for back emf E generation is:-

$$E = -N \left(\frac{d\phi}{dt}\right) \text{ shown as } E = -NA \left(\frac{dB}{dt}\right)$$

$d\phi/dt$ is the lines of magnetic flux ϕ cutting through the coil over time t . But $\phi=BA$ so the magnetic field strength B in the coil changes with time for electricity generation (A is coil hole area). Lenz's Law gives the minus sign.

The back emf is an alternating voltage (a.c.).

Rectification and smoothing is needed for d.c.

Examples Magnet Shapes available

We can custom produce magnets to nearly any shape to meet customer requirements.

Factors affecting back emf generation

Number of turns – generated voltage is proportional to the number of turns per coil, N .

Number of coils – more coils can mean more voltage if connected in correct sense in series (more N overall) but coil position relative to magnet position can introduce phase-shifted a.c. voltages (used for e.g. three phase a.c.).

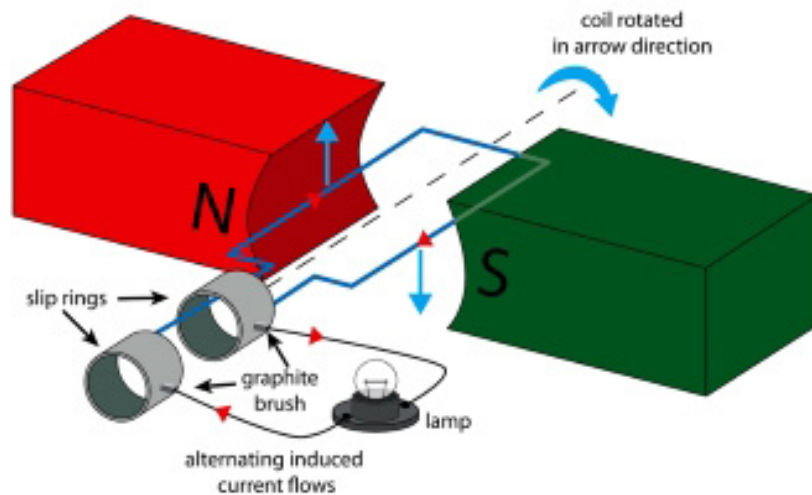
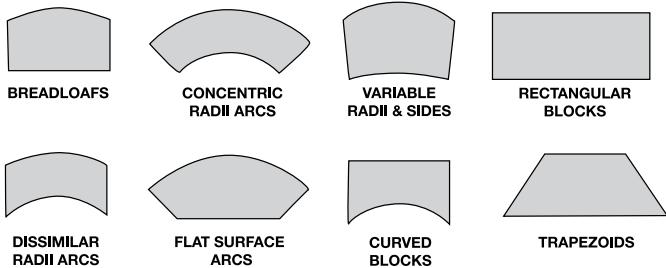
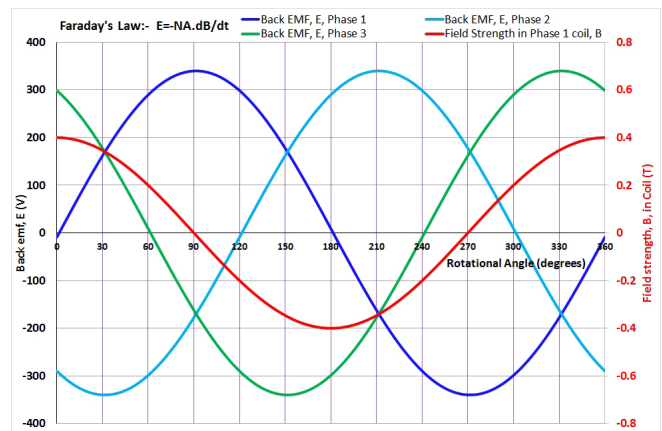
Number of Magnets – If the design can take more magnets then a coil may see more magnets per revolution passing by giving more changes in field per revolution giving a smaller dt hence a higher back emf for the same rotational speed. But this may introduce electrical phases depending on the design.

Magnet strength – a stronger magnetic field gives more field (B) in the coil. This can be achieved by stronger magnet grade or type (e.g. N45 instead of N35, NdFeB instead of Ferrite), flux concentration design, better magnetic pathways (less air gap), etc.

Speed – faster rotation or movement means dt decreases resulting in a higher back emf.

Losses – no design is 100% efficient - factors such as eddy current losses, heat, stray flux etc reduce efficiency. Use of thinner laminations can lower eddy current losses.

Inductance – self inductance and mutual inductance affect magnetic performance.



Please contact us to arrange a visit, request a quotation or to get technical support and design help.

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