MOTORPRINTER Elevator Speech:

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Bottom Line Up Front:

The overall 3D Printer market is anticipated to be a $34.8B market by 2026 with a compounded annual growth rate (CACR) of 22.5%, even with the absence of a viable 3D Printer for the huge electric motor market.

Best Electric Machine has leveraged a patent method of the *only* electric motor 3D Printer, called MOTORPRINTER™, which enables the just-in-time, additive manufacture of ultrahigh performance axial-flux electric motors, generators, and high frequency transformers with the layered application of "optimally premanufactured" magnet wire, structural steel, and more importantly, electrical steel, amorphous, or nanocrystalline metal ribbon.

As a patented "method that protects both the MOTORPRINTER intellectual property (**IP**) and the electric motor product manufactured with the protected IP," MOTORPRINTER will democratize the global manufacture of electric motors with distributed manufacturing.

Best Electric Machine has already successfully orchestrated and concluded empirical studies with an amorphous metal company and several Fiber Laser companies and as a result, is in the straight-forward process of engineering and fabricating MOTORPRINTER for in-house manufacture of its patented and only symmetric electric motor-generator, called SYNCHRO-SYM™.

Show Me MOTORPRINTER Is The Pinnacle of Electric Motor-Generator 3D Printing Technology:

The additive manufacture of axial flux electric motors, such as SYNCHRO-SYM, with electrical steel, amorphous or nanocrystalline metal ribbon of MOTORPRINTER provides the following attractive attributes:

- Unlike all other 3D Printers, which use materials that are optimized for the 3D Printer instead of the product to be manufactured, MOTORPRINTER additively manufactures electric motors with premanufactured electrical steel, amorphous, or nanocrystalline metal ribbon, structural steel, and magnet wire materials that are premanufactured with the most optimized cost, performance, and production methods.
- Premanufactured amorphous metal has 100 times higher permeability (or lower reluctance) to magnetic flux than electrical steel, ferrite, or soft magnetic composites (SMC) with 80% lower core loss and comparable high flux density saturation limit to electrical steel, for higher electric motor power density and efficiency. Unlike ferrite or SMC, amorphous metal ribbon has comparable structural strength to electrical steel.

- Although the exceptional electromagnetic performance attributes are well studied and documented for nearly the last seventy years, amorphous and nanocrystalline metal ribbon have not had practical success in at least electric motor applications, because of formidable manufacturing challenges that MOTORPRINTER has overcome, such as extremely hard material, extremely thin material, and loss of magnetic performance properties when fabricated into electric motors.
- The axial flux electric motor with the adjacent rotor and stator disk form has been shown to reduce copper by 13-14% and steel by 21-31.5% while providing higher torque density than the traditional radial-flux form with a rotor cylinder inside a stator cylinder form but manufacturing techniques have not matured.[1]

MOTORPRINTER Accomplishments:

As the only practical, portable, scalable, low waste, non-smokestack, and rapid additive manufacture of ultrahigh performance axial flux electric machines, such as electric motors, generators, and transformers, with optimally "premanufactured" amorphous metal ribbon, structural steel, and magnetic wire, MOTORPRINTER will democratize the manufacture of ultrahigh performance, high frequency, and high power axial flux electric machines by localizing the additive manufacture of standardized or customized electric motors at the research facility, the boutique motor manufacturing facility, or the traditional OEM manufacturing facility:

- As a patented "method," which protects both the manufacturing intellectual property (**IP**) and the manufactured product using the IP, MOTORPRINTER will democratize electric motor manufacturing with distributed manufacturing, will eliminate the consolidation of electric machine manufacturing with oppressed labor, and will provide a leverage against unfair trade barriers to prevent trade wars.
- Best Electric Machine has already introduced, orchestrated, and successfully completed empirical studies with Metglas (the pioneer and inventor of amorphous metal ribbon manufacture) and several Fiber Laser companies, such as IPG Photonics, that under the tutelage of BEM, demonstrated modified laser cutting of amorphous metal ribbon into virtually any electric motor shape (as only provided by MOTORPRINTER), without secondary finishing processes, such Blanchard grinding for perfectly flat airgap, and more importantly, without reversibly damaging the delicate properties of the material. BEM is now engineering and fabricating MOTORPRINTER for the in-house additive manufacture of SYNCHRO-SYM.

[1] Theoretical considerations by Polard [*Zahra Nasiri-Gheidari, Hamid Lesani,"A Survey on Axial Flux Induction Motors," PRZEGLAD ELEKTROTECHNICZNY (Electrical Review), ISSN 0033-2097, R.88 NR 2/2012*])