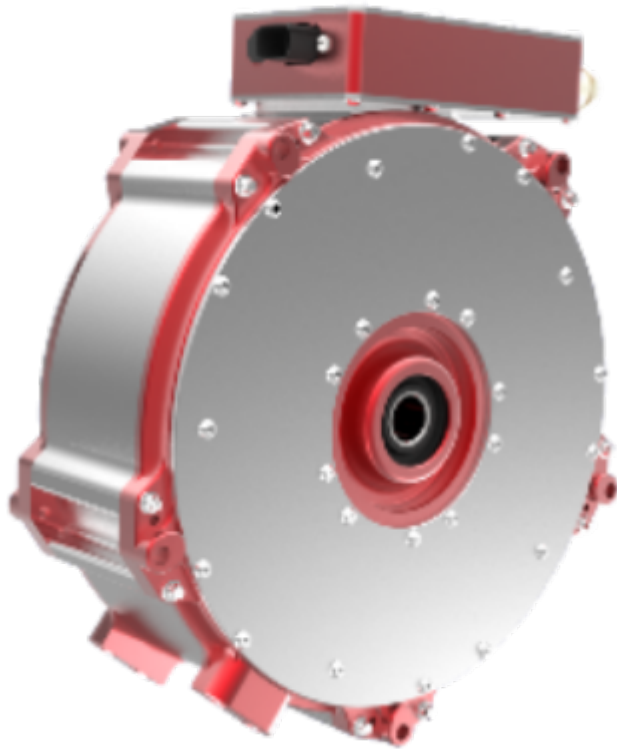


Why Choose SYNCHRO-SYM



SYNCHRO-SYM Technologies

– WHY CHOOSE SYNCHRO-SYM –

Our Mission:

***Innovate For Our Clean, Efficient,
and Sustainable Energy Future!***

Why Choose SYNCHRO-SYM?

SYNCHRO-SYM is a the only *integrated, symmetric multiphase, synchronous electric machine circuit and control architecture* that provides:

1. The only practical Brushless, Symmetric Multiphase Wound-Rotor “Synchronous” Doubly-Fed Electric Machine System:
 - As the classic electric machine study 101 for all electric machines, the symmetric multiphase wound-rotor synchronous doubly-fed electric machine system was known and verified by electric machine experts as the ideal electric machine system with an “active rotor assembly” that contributes additional working power to the electromechanical energy conversion process along with the universally essential active stator assembly of all electric motors but only by hypothetically realizing the invention of a brushless real time emulation control means for synchronous stabilization during its study. The classic electric machine study 101 becomes the follow-on study of all asymmetric electric machine systems by deoptimizing the symmetry with the asymmetry of a “passive rotor assembly” with slip-induction windings, DC field windings, rotor saliencies, or permanent magnets;
 - Never confuse the symmetric multiphase wound-rotor synchronous doubly-fed electric machine system with the so-called Brushless Doubly-Fed Electric Machine System (BDFM or BDFIM) with two directly excited multiphase winding sets located on the

stator assembly or the traditional multiphase wound-rotor induction doubly-fed electric machine system (with a multiphase slip-ring assembly) that always rely on the asymmetry of slip-induction or reluctance between the rotor and stator for overall operation;

- Compared to the century old “asymmetric” circuit and control architecture (of all others) with a “passive rotor” of slip-induction windings, permanent magnets, reluctance saliencies, or DC field windings, the symmetry of an “active rotor” becomes an additional contributor of active power to the electromechanical conversion process together with the “active stator” to effectively halve the size, cost and loss per unit of power rating;

2. The Only Practical Electric Machine System with Brushless Real Time Emulation Control (**BRTEC**):

- BRTEC sensorlessly, automatically, instantaneously, and directly controls *speed-synchronized, bidirectional, multiphase power with nearly pure sinusoidal waveforms* of any frequency (including DC), with any number of phases (including single phase), or electrical phase angle (or impedances) to any other frequency with any number of phases or with any electrical phase angle by a proprietary electromagnetic computer instead of an intermediate DC Link Stage comprising large reactive components, such as low frequency chokes and capacitors;
- Effectively, BRTEC is the only power conditioning and process control technology with the “digital twin” embedded instead of only applied as a tool during engineering development.

3. The Only Practical Electric Machine System with a Rotor Assembly That Actively Contributes to “Real” Electromechanical Power Conversion and Production (along with the universally essential active Stator Assembly):
 - The symmetric (or dual ported) transformer circuit topology of a directly excited rotor multiphase winding set (or active winding set) provides variable speed constant frequency (VSCF) operation, leading, lagging or unity PF control, field weakening, and absolute zero and synchronous speed torque control, unique MMF control, etc., which is unlike the asymmetric transformer circuit topology of a “passive” rotor assembly with winding sets that rely on slip-induction, reluctance saliencies, DC field windings, or rare earth permanent magnets. *Any future development of RE-PM material or cost-performance improvements or even new passive rotor electric machine systems become irrelevant because all “passive” and therefore extraneous rotor components, which effectively waste precious real estate (to only ascertain air-gap flux), can be wirelessly replaced with an “active” rotor winding set that provides additional active power to the electromechanical conversion process.*

4. The Only Practical Electric Machine System with *Twice* the power density at *Half* the Cost and Loss, which includes electrical, core, and friction losses, of all others (Per Unit of Power Rating):
 - With a brushless and independent multiphase electrical power port, the rotor assembly (and real-estate) actively contributes to “real” electromechanical power conversion and production (as does the stator assembly) for twice the power within the same package of materials, form, and

fit as all other electric machine systems.

5. The Only Practical Electric Machine System With Octuple the Peak Torque Potential of All Others:
 - In accordance with the conservation of energy physics of the classic dual-ported (or symmetrical) transformer circuit topology, air-gap flux density remains constant with increasing current (e.g., torque current) beyond magnetizing Magneto-Motive-Force (MMF), which provides for a truly direct drive (e.g., gearbox-less) or magnetic gear propulsion system.

6. The Only Practical Electric Machine System with Twice the Contiguous Constant-Torque Speed (i.e., Maximum Load Speed) Range of All Others for a given Torque, Air-gap Flux Density, and Excitation Frequency and Voltage:
 - Sub-synchronous to super-synchronous rate torque speed range (*without discontinuities*), including absolute zero and synchronous speed, provides constant torque to 7600 RPM @ 60 Hz with two poles compared to 3600 RPM for all other electric machines with the same rated torque.

7. The Only Practical Electric Machine System with **Twice Magnification** of Material, Packaging, Windings, And Manufacturing Performance Enabling Techniques:
 - SYNCHRO-SYM's patented fully integrated symmetric circuit and control architecture (*as only provided by BRTEC*) twice **magnifies** the expect results from applying materials, packaging, winding, electronic component, manufacturing, and performance enabling techniques.
 - As a fully integral circuit and control architecture, SYNCHRO-SYM best [leverages the enabling enhancements of wide bandgap](#)

semiconductor components by at least effectively doubling the performance while halving the cost.

8. The Only Practical Axial-Flux Electric Machine System with Duplicate Rotor and Stator Assemblies with Easy Lengthwise Stacking (and Smaller Diameter Components) To Provide Incremental Increases in Voltage (series connection), Current (parallel connection), and Power Rating:

- Without the large reactive components of a DC Link Stage, the symmetrical integrated circuit and control architecture of only BRTEC easily occupies the empty axial flux annulus space for another level of low cost, system power density, easy component assembly, and reduced component inventory.
- Without extravagantly costly, geopolitically volatile, supply chain limited, environmentally unfriendly, limited life, and formidable safety and handling issues of persistent magnetism of rare-earth permanent magnets.
- Uniquely accommodates wide bandgap semiconductors.

[Interested? Invest in BEM!](#)
