

SYNTHET-PM

Synthet-PM is a design software program, which has been under continuous development by Martyn Harris and Alex Molyneaux since the early 1990s. It focusses specifically on the design needs for very-high-speed, polyphase permanent-magnet electrical machines, both generators and motors. All design features that are encountered and are typical of this class of machine are treated in the one program, which is believed to be unique in this coverage: common mechanical topologies and detailed proportions, bearing types, magnet array geometries, choice of coolant fluids (gas, liquid, refrigerant), rotor retaining sleeve stress/strength and prestress characteristics, electromagnetic field and circuit parameters, winding arrangements, terminal drive topologies, hydrodynamic and harmonic eddy-current power losses, heat flow and temperature distribution in all parts of the machine, etc. The accuracy of the program in all these respects has been well demonstrated.

By means of user-friendly menus and intuitively clear symbolism, the designer is able to input a complete set of machine proportions and material data for a given design rapidly and easily, and to obtain quickly a comprehensive solution for all aspects of performance. Many design approaches for a given application can thus be studied, and the design process can converge efficiently toward the best, near-optimum solution. It is noteworthy that the interactions between all the design features listed above, can be quite sensitive, indeed crucial, in this class of machine, and often are so. Synthet-PM is a valuable tool in understanding and balancing this interplay.

The screenshot displays the Synthet-PM software interface with several key components:

- Design Environment:** Shows a cross-section diagram of a machine rotor and a phasor diagram with vectors labeled E_{ph} , V_{ph} , and I_{ph} .
- Design Parameters Panel:**
 - Design Name: harris
 - Design Description: insert; no hub upstand but SPANintmag = 1.0 for
 - Parameters: $V_{lin_tmm_fl}$ (561.9), $V_{lin_tmm_nl}$ (618.3), $I_{lin_tmm_fl}$ (32.5), REGtmm1 (9.1), PWFtmm1 (0.9)
- Design Summary Panel:**
 - Last Mod: 19/03/2008, Designer: M R Harris
 - Design Description: 6Ph wdg, full ptch, large ohgs suit auto coil insert; no hub upstand but SPANintmag = 1.0 for
 - Parameters: Pout (60.00), SPD (58.00), Npole (4), WDG (DbArt6ph)
- Design Program for Electrical Alternators and Motors:**
 - Version 4.3
 - Parameters: $V_{lin_tmm_fl}$ (561.9), $V_{lin_tmm_nl}$ (618.3), $I_{lin_tmm_fl}$ (32.5), REGtmm1 (9.1), PWFtmm1 (0.9)
 - Efficiency: 11.13%, 5.17, 19%
 - Parameters: t_{max_gen} (94.4), t_{tmm_pmax} (413.3), t_{tmm_pmax} (69.6), ANGLoad_pmax (41.3)
- External and Interconnecting Apparatus:**
 - Parameters: CAPin_ser (0.0), Vlink_fl (701.6), Ilink_fl (85.0)

At the bottom, a navigation bar includes buttons for Machine p, External a, Stator cor, Rotor mag, Retaining, Rotor bar, and Temperature. The status bar shows 'Ready' and 'Page 1 of 3'.