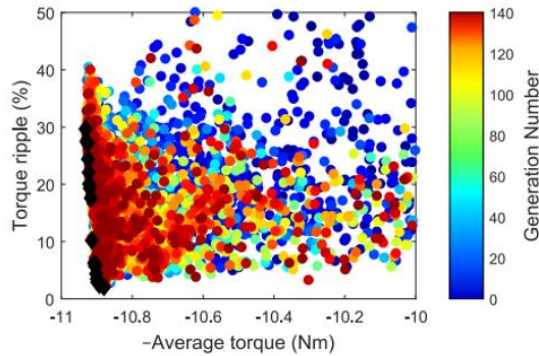
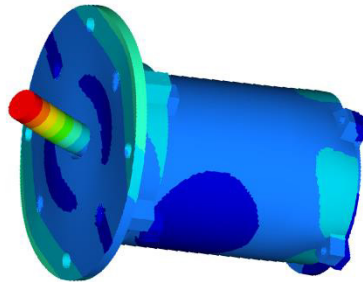


Design of innovative Magnet Free Synchronous Reluctance Motor



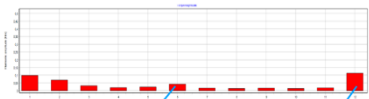
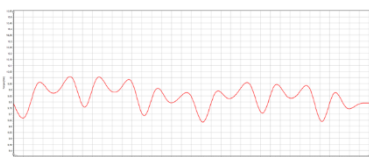
Torque ripple optimization possible using the Hypertudy optimizer linked to parametric FEA Flux2D model



Multi physics approach to get a silent, low cost and efficient Synchronous motor

Asymmetric

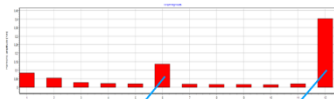
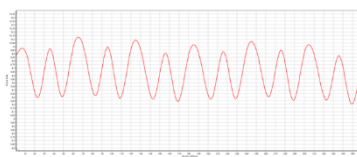
Average shaft torque = 9,6Nm
Ripple : 5,1% (0,46Nm)



VI 0,04Nm XII 0,11Nm

Symmetric

Average shaft torque = 9,6Nm
Ripple : 10,0% (0,96Nm)



VI 0,14Nm XII 0,4Nm



Prototype construction and experimental correlation, not only paper work

| MOTORS OUTPUT | | | | | GEOMETRICAL DATA | | | |
|------------------|--------------|------|-----|--|------------------|-----------|-----|----|
| Rated torque | T_m | 10 | N m | | Outer diameter | D_e | 150 | mm |
| Torque ripple | ΔT_m | 5.1 | % | | Inner diameter | D_i | 90 | mm |
| Rated voltage | V_N | 220 | V | | Number of poles | $2p$ | 4 | - |
| Rated current | I_N | 8.5 | A | | Number of slots | Q | 36 | - |
| Frequency | f | 50 | Hz | | Stack length | L_{stk} | 110 | mm |
| Mechanical speed | n | 1500 | rpm | | Air-gap | g | 0.5 | mm |

A free-magnet solution capable to achieve very high efficiency level without enter in rare hearth magnet supply chain

**Spin**

Design of innovative

**Magnet Free Synchronous
Reluctance**

Motor

Fast

Silent

Low cost & Efficient