

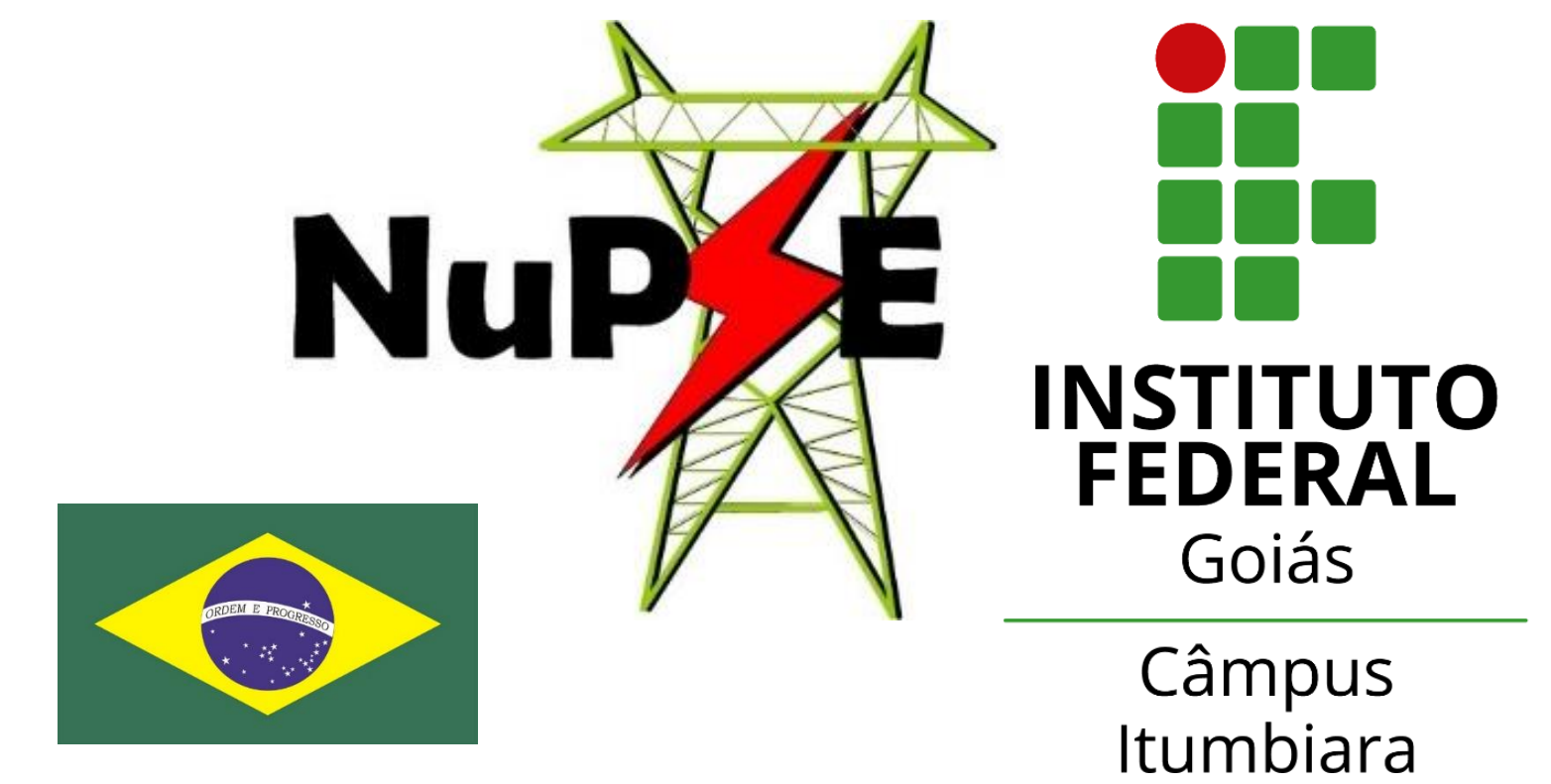
Comparative Analysis of Dynamic Performance Between Switched Reluctance Motors 6x4 and 8x6

276-21-Pinto



M.B.S.Pinto¹, G.P.Viajante¹, E.N. Chaves¹, M.A.A. Freitas¹, M.E. Oliveira¹ and J.A. Santos¹.

¹Núcleo de Pesquisas em Sistemas de Energia – NuPSE
Federal Institute of Education, Science and Technology of Goiás - IFG
E-mail: ghuterp@gmail.com and mathheusbueno@gmail.com



1. Introduction

This paper presents a comparative study between the Switched Reluctance Machine (SRM) 8x6 and 6x4 operating as a motor with both 60kW of power.

The computer simulation was performed in Matlab™ / Simulink® environment and allowed the machine behavior under various operating conditions

It's possible to evaluate: phase voltage and current, speed, torque and efficiency.

Comparative results between the two machines will be presented and discussed

2. Switched Reluctance Machine

The SRM has a structure with rotor excitation using phase separated windings. Each phase of the machine contains its windings gathered only on the stator projections, while the rotor is composed only of ferromagnetic material.



Fig.1. SRM 6x4 (a) and 8x6 (b) building structure

Table I. – Parameters of SRM 6x4 and 8x6.

Parameters	Values
Number of poles (stator and rotor)	8x6 e 6x4
Phase number	4 e 3
Output power	60KW
Stator resistance	0,05Ω
Moment of inertia	0,05 Kg·m ²
Alignment inductance	23,6mH
Misalignment inductance	0,67mH

3. Half-bridge converter

Half-bridge (HB) converter was used. The converter is similar for both machines being the SRM 8x6 with 4 phases and the SRM 6x4 with three phases.

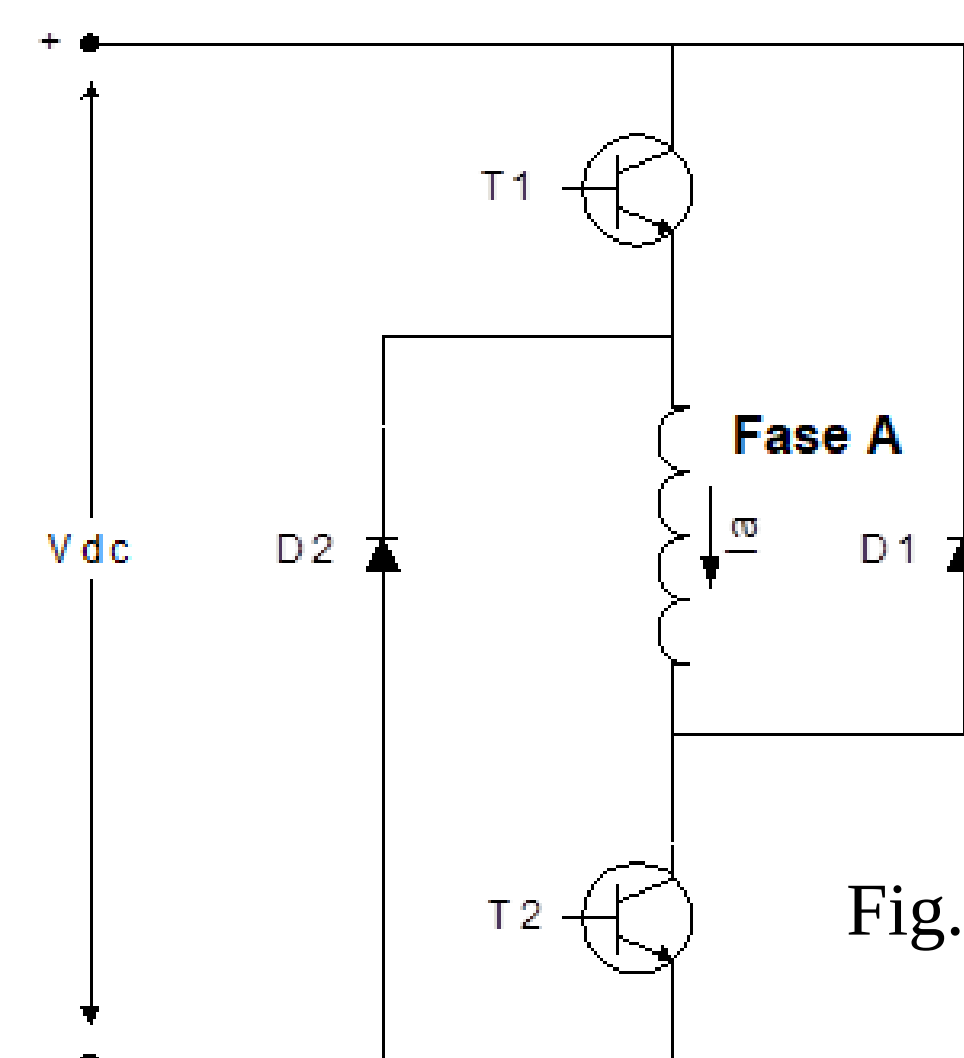


Fig.2. Half-bridge converter structure

4. Switching System

The most common SRM drive is **single pulse**. In this system, during inductance growth, both switches of the HB converter. receive at their control terminals a pulse to allow the phase coil to magnetize or demagnetize.

Soft chopping switching system was employed, in which the lower switch of the HB converter is kept constant during the driving angle, while the upper switch of the converter is switching according to the required control need.

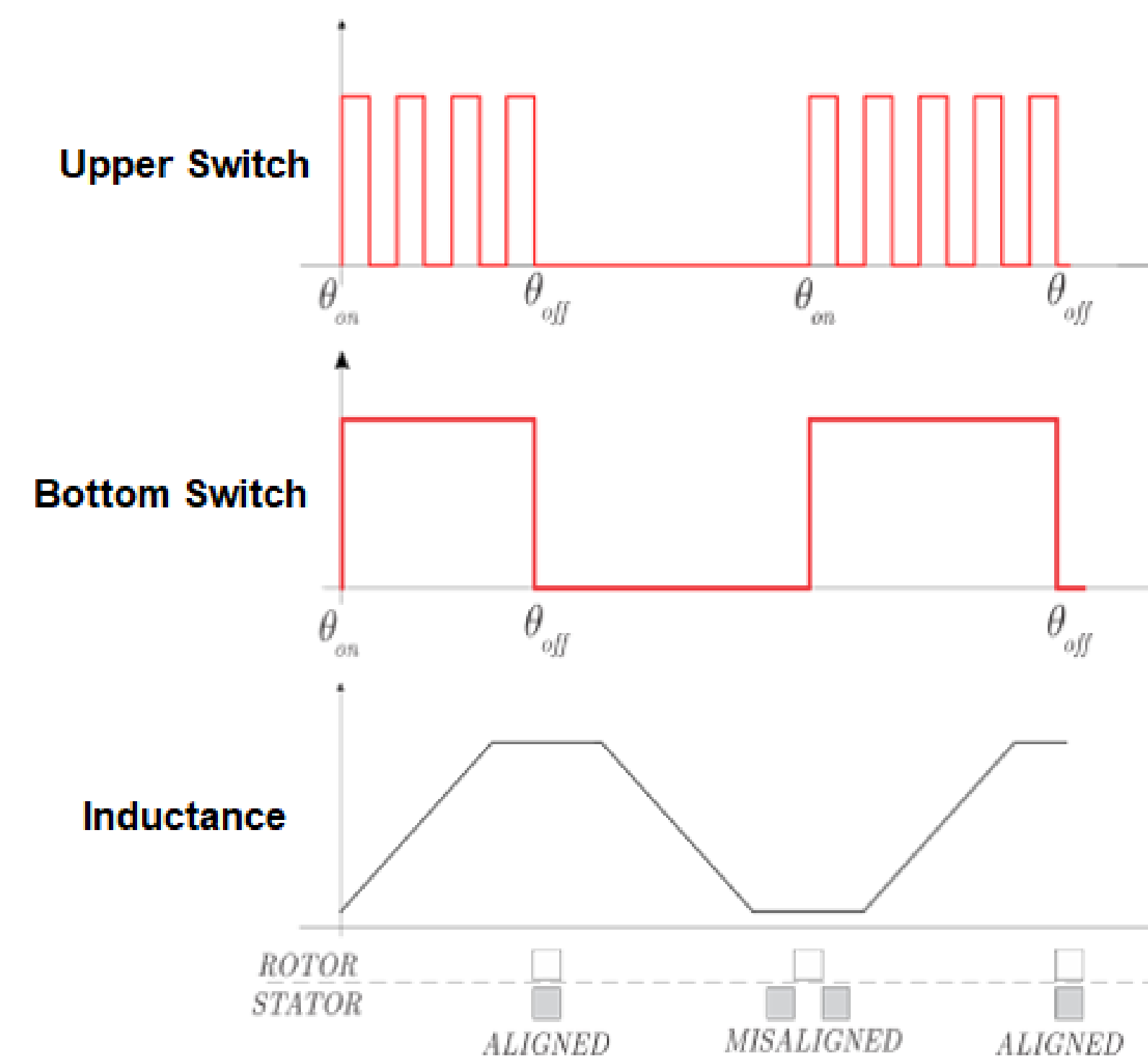


Fig.3. Switching system waveforms.

5. Simulation Results

• Speed Control using PI Compensator and Current Control by Hysteresis

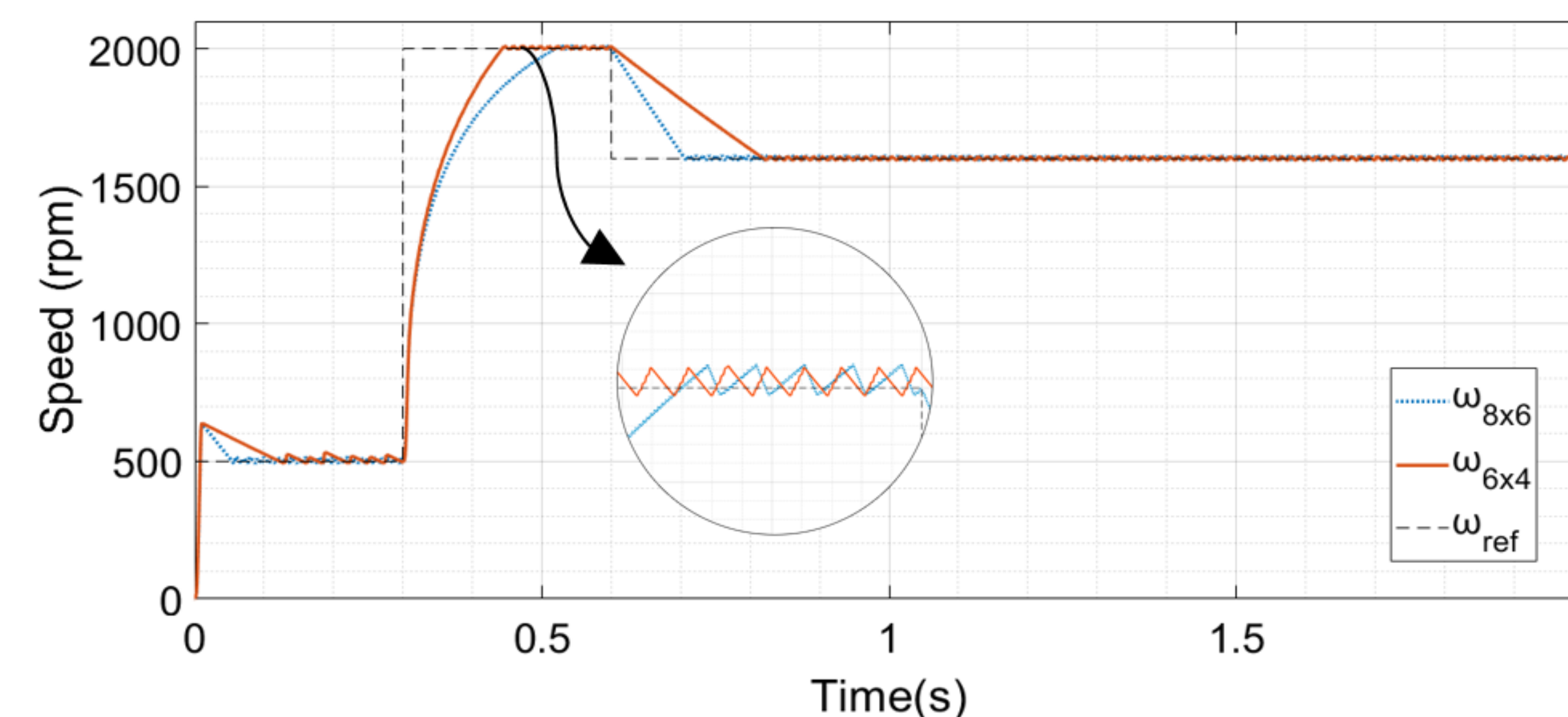


Fig 4 - SRM speed with controllers actuation

• SRM 6x4 and 8x6 Efficiency

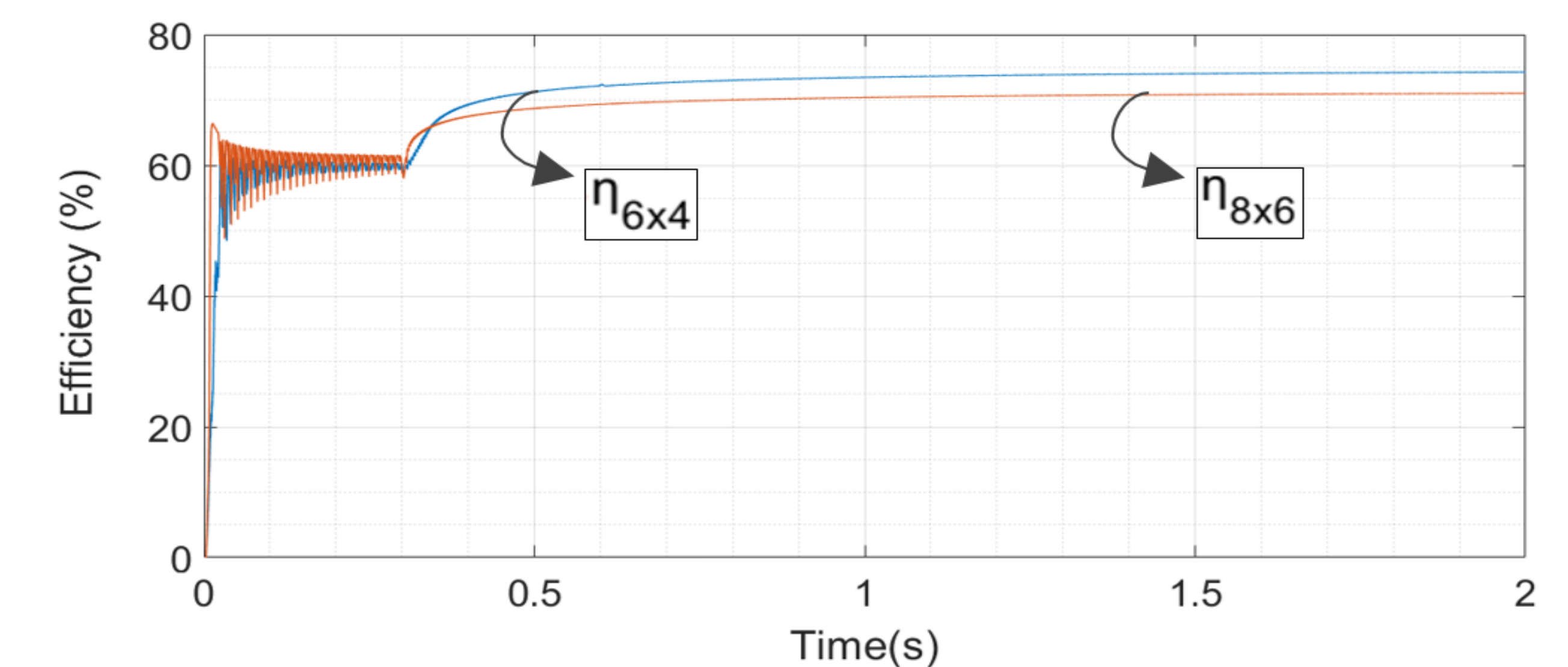


Fig 5 - SRM Efficiency

• SRM 8x6 efficiency with soft chopping

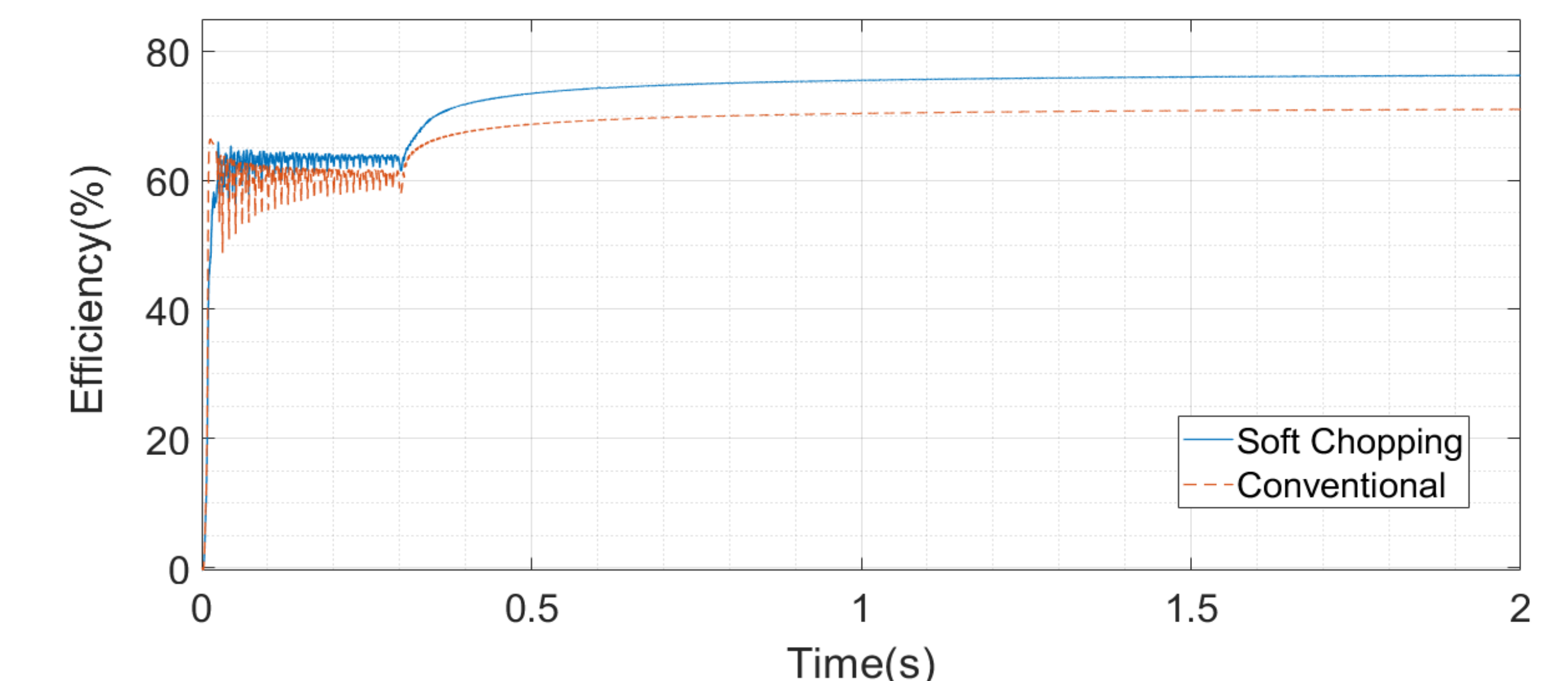


Fig 6 – 8x6 SRM Efficiency

6. Conclusion

- This paper presents a comparative study between two 60 kW SRM.
- The computer simulation was modeled from the magnetization curves of the machines.
- It was verified that the SRM 8x6, presents less oscillation in the conjugate than the SRM 6x4, under the same operating conditions.
- It was found that SRM 8x6 has lower performance than SRM 6x4

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