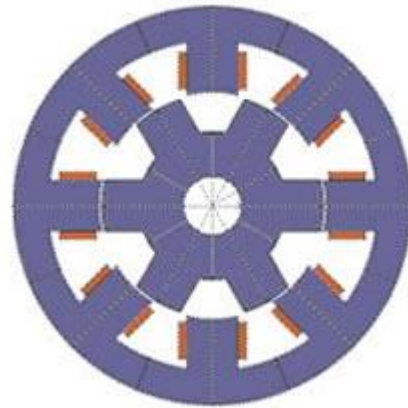
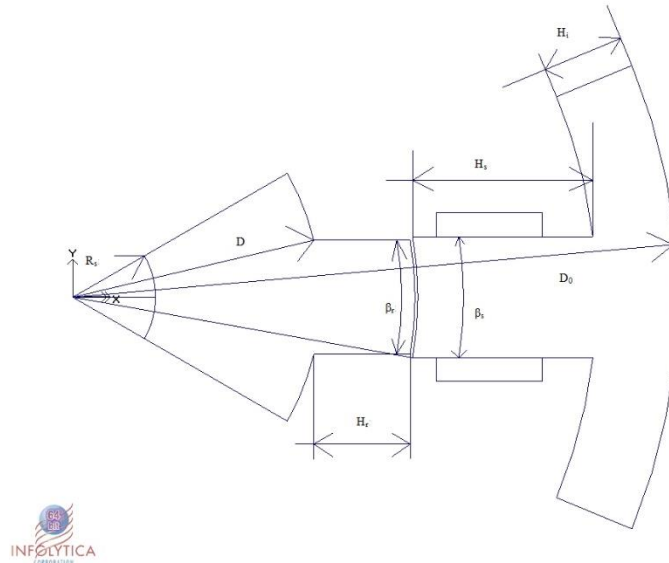


SRM Design Optimization



The design of Switched Reluctance Motors (SRM) is a complex optimization problem involving a large number of geometrical and electrical parameters. In practice, this can be a challenging task involving a large number of iterations and a long design cycle.

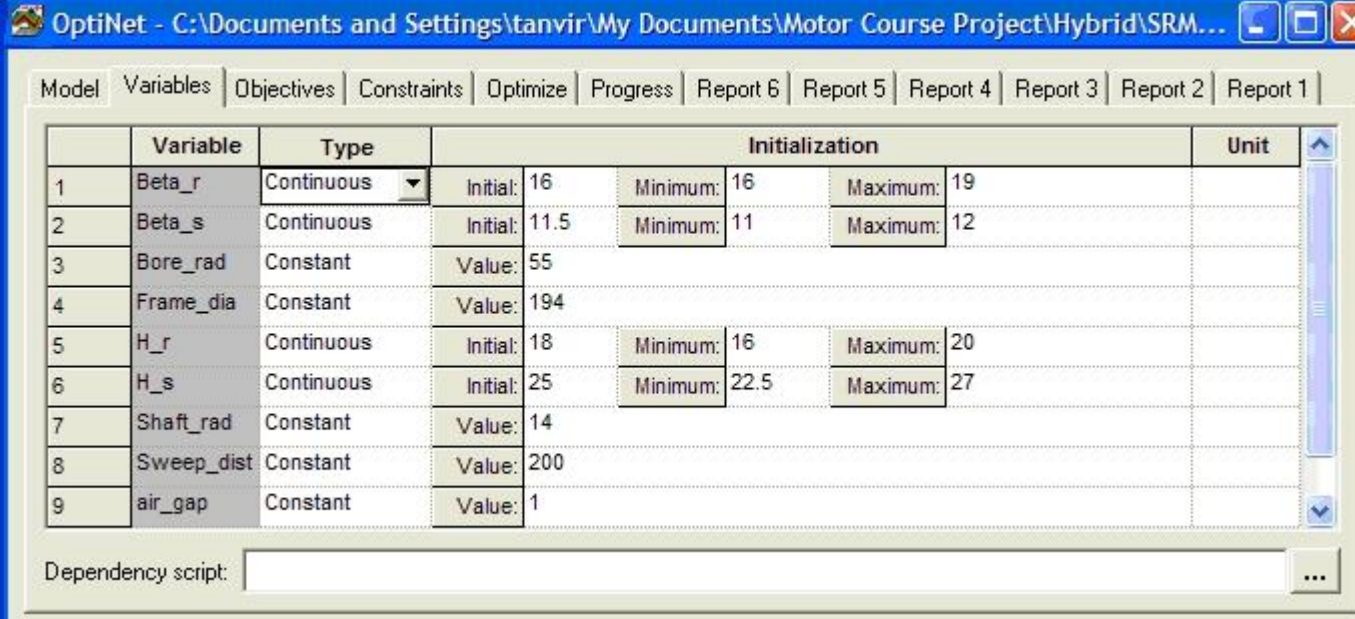
The example presented here demonstrates how OptiNet searches for the improved design of a 8/6 SRM to maximize the torque generated while conforming to manufacturing and operating constraints.



The geometry of the motor is defined based on the parameters shown in this figure:

- Pole angles (β_r , β_s)
- Pole heights (H_r , H_s)
- Back iron depth

SETTING THE VARIABLES IN OPTINET



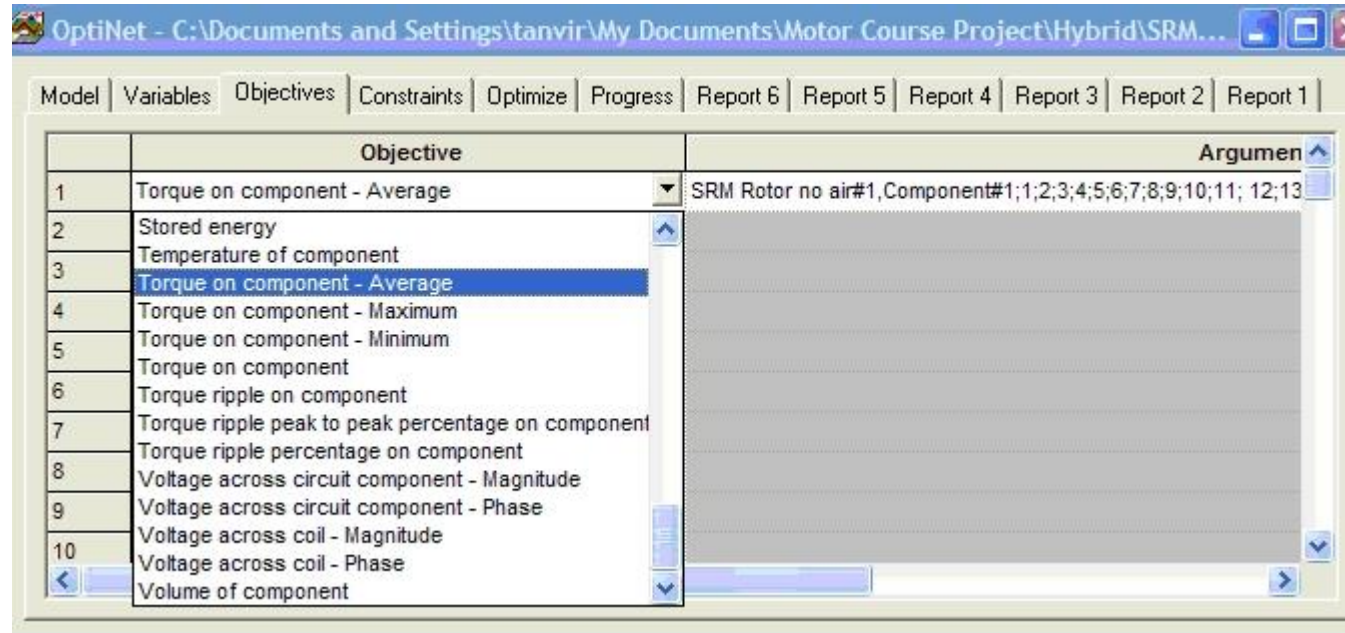
The screenshot shows the OptiNet software window with a menu bar and a table of variables. The table has columns for Variable, Type, Initialization (with sub-columns for Initial, Minimum, and Maximum), and Unit. The variables listed are Beta_r, Beta_s, Bore_rad, Frame_dia, H_r, H_s, Shaft_rad, Sweep_dist, and air_gap.

	Variable	Type	Initialization			Unit
1	Beta_r	Continuous	Initial: 16	Minimum: 16	Maximum: 19	
2	Beta_s	Continuous	Initial: 11.5	Minimum: 11	Maximum: 12	
3	Bore_rad	Constant	Value: 55			
4	Frame_dia	Constant	Value: 194			
5	H_r	Continuous	Initial: 18	Minimum: 16	Maximum: 20	
6	H_s	Continuous	Initial: 25	Minimum: 22.5	Maximum: 27	
7	Shaft_rad	Constant	Value: 14			
8	Sweep_dist	Constant	Value: 200			
9	air_gap	Constant	Value: 1			

Dependency script:

The initial, minimum and maximum values of each variable are entered. The user has the ability to vary the parameters as continuous or discrete variables.

OBJECTIVE FUNCTION - MAXIMIZING THE AVERAGE TORQUE



The objective is to maximize the average torque on the rotor while running at a peak current of 14.5 amps.

CONSTRAINTS - AVERAGE TORQUE

OptiNet - C:\Documents and Settings\tanvir\My Documents\Motor Course Project\Hybrid\SRM\New SRM inverter circuit for ON Oct 4 g...

OptiNet - C:\Documents and Settings\tanvir\My Documents\Motor Course Project\Hybrid\SRM\New SRM in

Model | Variables | Objectives | Constraints | Optimize | Progress | Report 6 | Report 5 | Report 4 | Report 3 | Report 2 | Report 1

	Argument(s)	Type	Value	Weight	Test
1	SRM Rotor no air#1,Component#1;1;2;3;4;5;6;7;8;9;10;11; 12;13;14;15;16;17;18;19;20;21;22;23;24;25;26;27;28;29;30;Z	Must be >	27.0	10000	Test
2		Must be =	False	10000	Test
3		Must be =	False	10000	Test
4		Must be =	False	10000	Test
5		Must be =	False	10000	Test
6		Must be =	False	10000	Test
7		Must be =	False	10000	Test
8		Must be =	False	10000	Test
9		Must be =	False	10000	Test
10		Must be =	False	10000	Test

In this example, there is a constraint that the average torque on the rotor must be greater than 27.0 Nm.

MAXIMUM TORQUE ON ROTOR VS SOLUTION INDEX

After 13 hours, OptiNet has evaluated the design objectives and constraints against over one hundred thirty different SRM designs (as defined by the tolerances on each variable), represented here by each point on the solution index.

	Initial	Final
β_r	16 degrees	18.92 degrees
β_s	11.5 degrees	11.93 degrees
Hr	18.0 mm	18.92 mm
Hs	25.0 mm	26.16 mm
Avg. Torque	33.19 Nm	35.16 Nm