SRM Design

In SRMs, the ratio of the number of stator poles (m) to the number of rotor poles (n) (m / n) is an important data in motor representation and the ratio of m / n is also given when determining the motor properties. The SRM design phase begins by deciding on stator / rotor combinations. In Figure 1, 6/4 SRM is given.

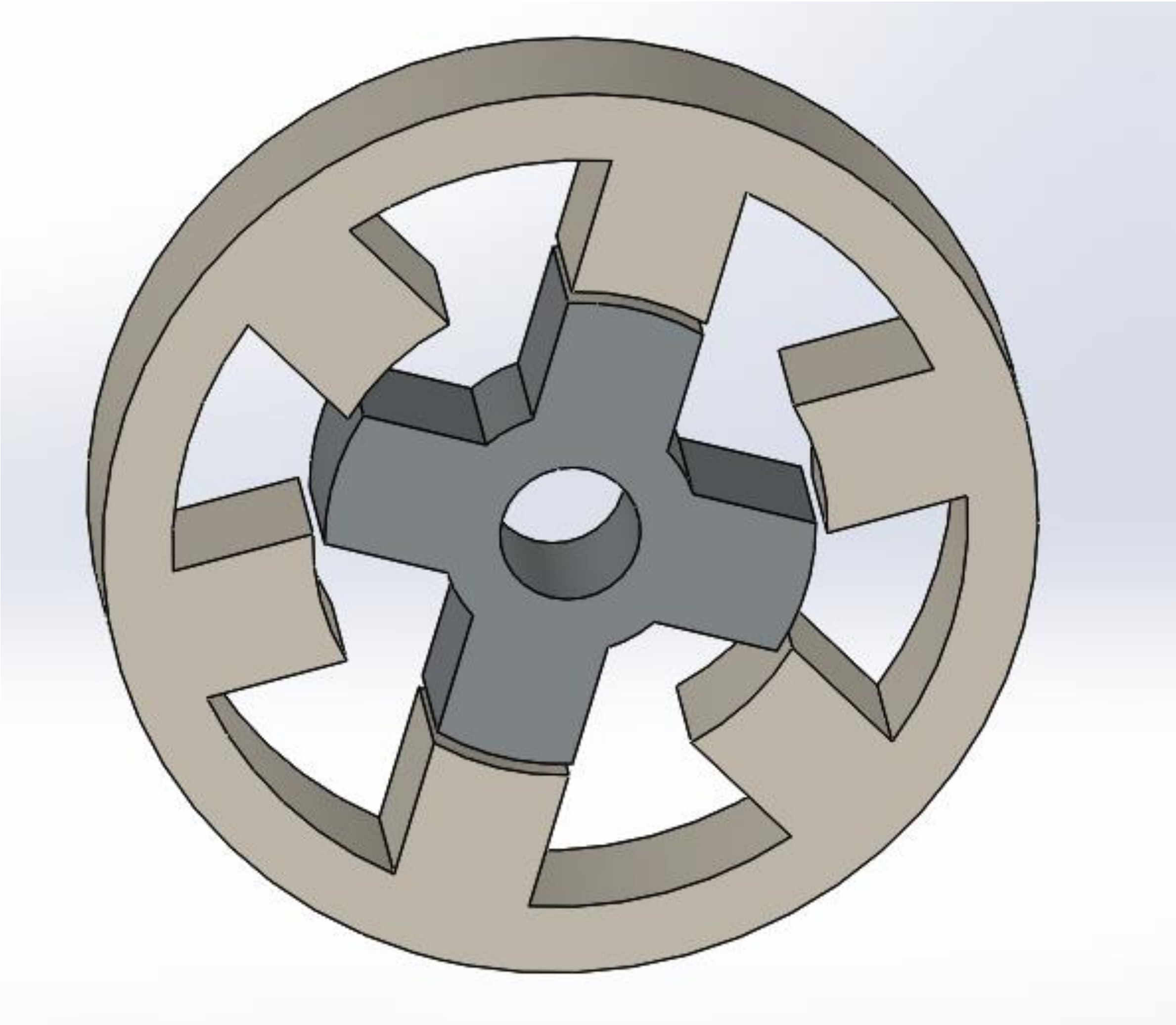


Figure 1: SRM 6/4 yapısı

$$\min[\beta_s] = \frac{4\pi}{P_s P_r}$$

$$\beta_r \geq \beta_s$$

When determining the stator pole angle (βs) and rotor pole angle (belirlenirr), it should be noted that the angle between βs <βr and the angle between the two adjacent rotor poles is greater than βs. It is shown in Table 1.

	β_s	β_r
6/4	30°	32°
8/6	16°	18°

	Sarım sayısı	Stator kutup uzunluğu (mm)	Dış çap uzunluğu (mm)
6/4	94	20	123
8/6	94	18	116

Table 1: Stator and rotor pole angles. **Table 2:** Winding numbers stator pole length and outer diameter.

After calculating the polar angles, starting from the magnetic equation, the outer diameter length was obtained as shown in Table 2 together with the winding number and stator polarity calculations.

Mathematical Model

Although SRM has a nonlinear magnetic characteristic, mutual inductances can be neglected and can be expressed with a simple equivalent circuit as shown in figure 2.

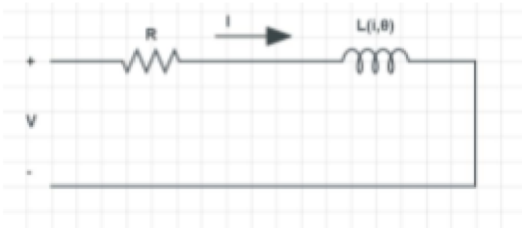
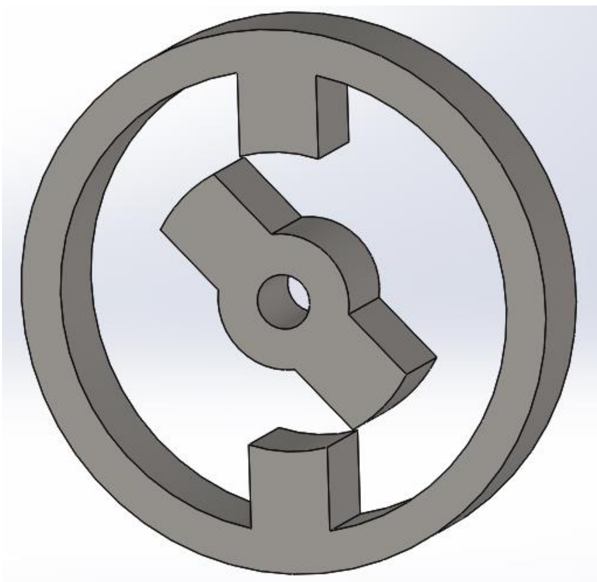


Figure 2: Equivalent circuit

Moment characteristics; it depends on the relationship between the winding currents and the rotor position and is a function of the current. Significant changes in the inductance curve are defined by the term stator and rotor pole springs and rotor pole number. Here the rotor pole spring is considered to be equal to the stator pole spring, which is a general case. In Figure 3, reference engine, matlab analysis software and output graphic are given respectively. On this graph, the graph was drawn as the position where the rotor is distant from the stator, the position it approaches, the position where the stator and the rotor intersect, the position where the rotor is away from the stator, and when the rotor is away from the stator.



```
Bs=180;
Br=180;
P=1;
Q1 = 1/2*((2*180)-(Bs+Br));
Q2 = Q1+Br;
Q3 = Q2+(Br-Bs);
Q4 = Q3-Bs;
Q5 = Q4-Q1;

x = 0:1:20;
y=[0 Q1 Q2 Q3 Q4 Q5 Q1 Q2 Q3 Q4 Q5 Q1 Q2 Q3 Q4 Q5 Q1 Q2 Q3 Q4 Q5];

plot(x,y)
xlabel('rotor konumu')
ylabel('enduktans')
title('ARM')
grid on
hold on
```

Br	180
Bs	180
P	1
Q1	0
Q2	180
Q3	180
Q4	0
Q5	0

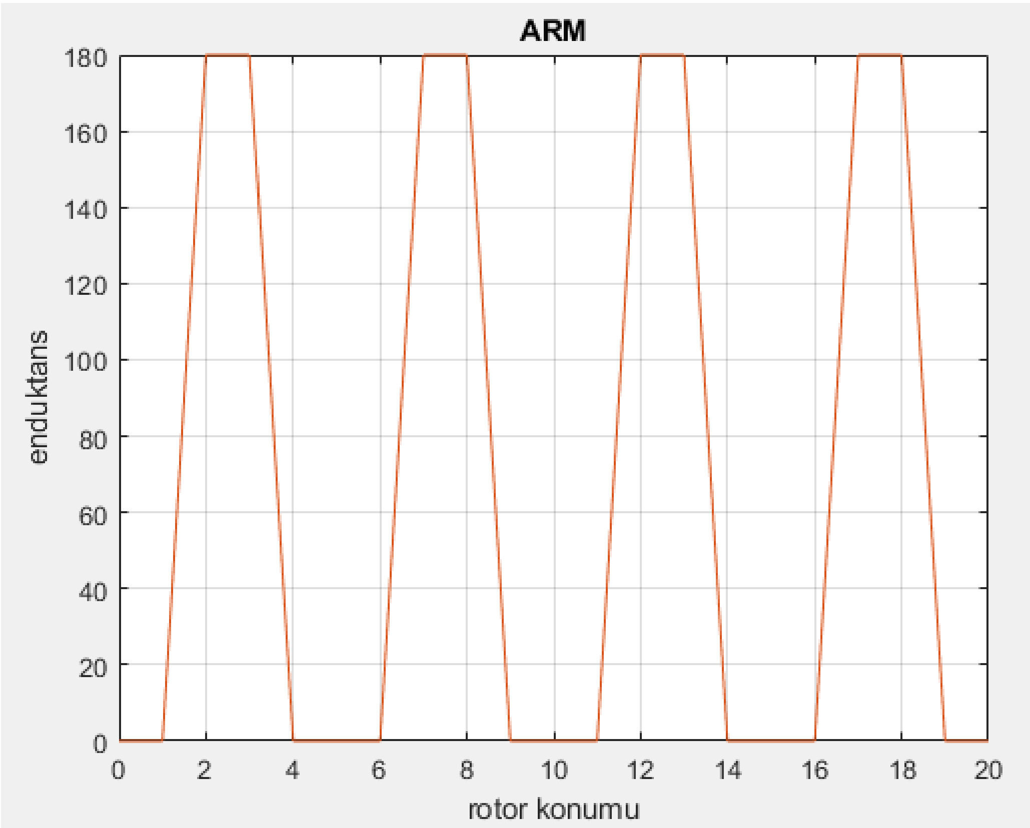


Figure 3: Investigation of a phase inductance with winding current and different rotor position