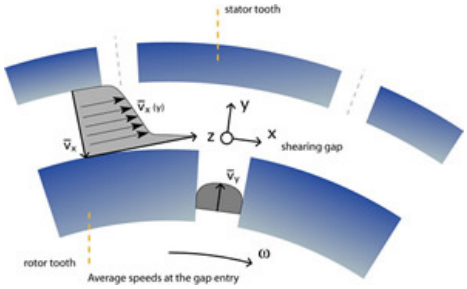
THE DESIGN PRINCIPLE WORKING TECHNOLOGY OF STATOR ROTOR

Rotor- stator technology and high shear mixing: Mixers that utilize a rotor and a stationary stator typically operate at considerably high rotational speeds that produce high rotor tip speeds. The differential speed between the rotor and the stator imparts extremely high shear and turbulent energy in the gap between the rotor and stator. Therefore, the tip speed is a very important factor when considering the amount of shear input into the product. The equation that represents the tip speed is:



Circumference Speed / Tip speed: $V = \frac{\pi D n}{60}$ (m / s)

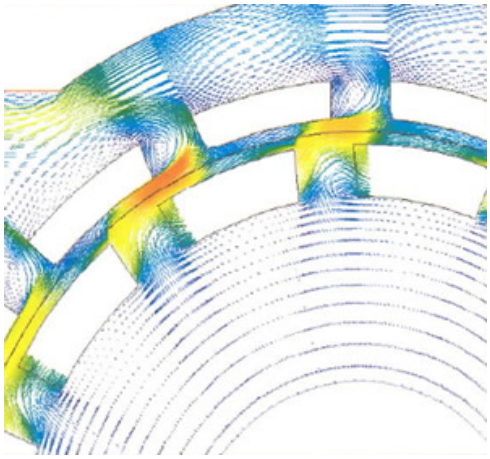
where D = Diameter of rotor (m), and n = rotational speed of rotor (rev / min), rpm, pi =3.142

Additionally, the gap distance between the rotor and the stator will contribute to the amount of shear. The equation that is used for calculating the shear in the gap between rotor and stator is:

Shear rate: $t = V / g (s - 1)$

where V = Tip speed of rotor (m / s), and g = gap distance (m)

Another important factor is the shear frequency, or the number of occurrences that rotor and stator openings mesh. Computational Fluid Dynamics (CFD) is used to analyze what happens when this occurs, as shown in the picture on the right. The shear frequency is given by:



Shear frequency: $f_s = N_r N_s n$

This can be combined with shear rate to determine the shear number:

Shear number: $S = f_s t$

When considering rotor- stator designs, there may be multiple rows of teeth, and the shear number must be applied for each row.