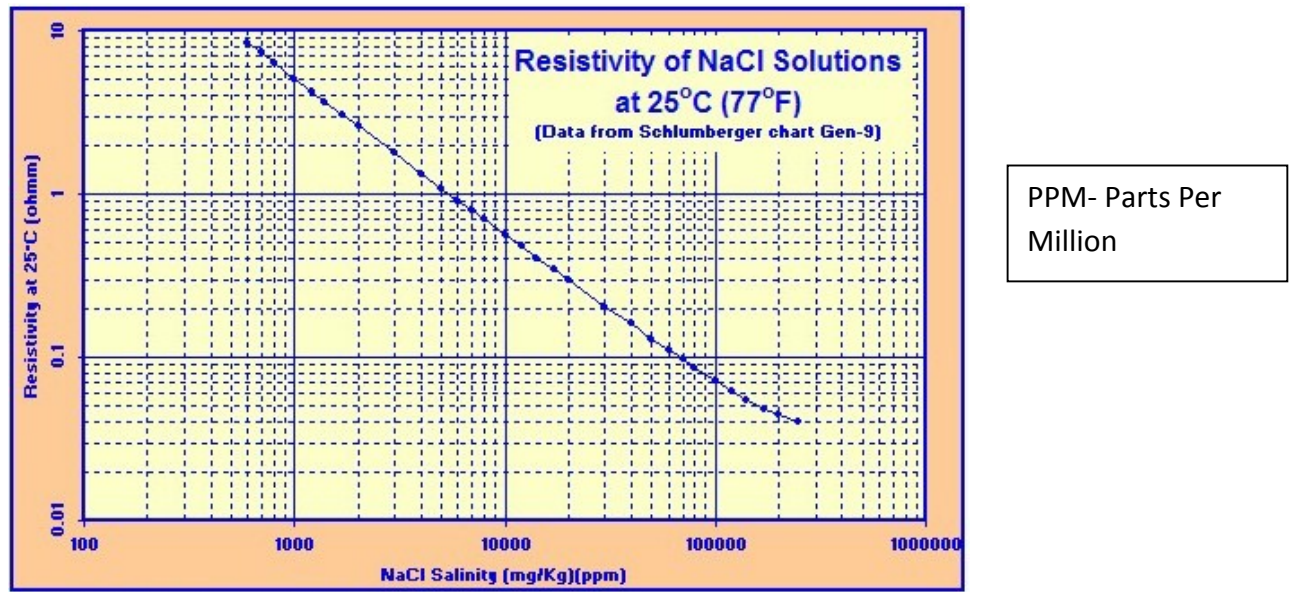


In salt water (Sodium Chloride) this force will act on the free ions (Na^+ , H^+ , Cl^- and OH^-) which carry the current. These ions are accelerated by the Lorentz force and collide with water molecules transferring their momentum to these molecules. Assuming elastic collisions the water will be accelerated out the back of the channel with a force with magnitude equal to that of the Lorentz force. By Newton's third law due to this process there will be an equal but opposite force produced which can be used for propulsion.

The resistivity of salt water will dependent on the salinity of the water. This is a measure of how much salt a body of water contains. The salinity of sea water for instance is 3.5‰ and its resistivity³ is $0.22 \Omega\text{m}$.

Figure 2: Graph of resistivity vs. Salinity of salt water solution



As illustrated on logarithmic scales in Fig. 2, increasing salinity leads to decreasing resistivity at a diminishing rate. For example using the graph above if salinity increases from 10‰ to 25‰ resistivity will decrease from $0.07 \Omega\text{m}$ to $0.03 \Omega\text{m}$.

In order for later analysis of displacement time graphs the equations of uniform accelerated motion can be used. For constant acceleration, a_0 , integrating twice with respect to time, t , gives the following:

$$x = 0.5a_0t^2 + v_0t + x_0 \quad (8)$$

Where x is displacement; v_0 is initial velocity and x_0 initial displacement.

The complete equations of MHD combine Maxwell's equations of electromagnetism and the Navier Stokes continuity and momentum equations for fluids. These shall not be use in this report as they are difficult to solve requiring computer solutions.

³ Henderson Petrophysics, <http://www.hendersonpetrophysics.com/SalinityConversion.html>; date accessed: 14th June 2009