

## Technical Information:

**Date:** March 2006  
**Subject:** Density And Specific Gravity  
**Topic :** Definitions with reference to chemicals / liquids and pumps.

### Density And Specific Gravity – What's the difference ?

Although these terms are commonly used, there are slight differences between them. All the following references are to liquids.

The **Density** of a substance is a way of expressing the amount of something per volume. It is normally expressed as a mass per volume, e.g  $1.0 \text{ g/cm}^3$  or  $1000 \text{ kg/m}^3$

The **Specific Gravity** ( SG ) of a solution is a unitless reference. It is the ratio of the mass of the chemical to an equal volume of water at  $4^\circ \text{C}$ . Water is at its densest at  $4^\circ \text{C}$  and has a Specific Gravity of 1.0 – this is the normal reference temperature for water and SG. ( it also has a density of  $1000 \text{ kg/m}^3$  or  $1.0 \text{ g/cm}^3$  at this temperature )

When chemicals change temperature the volume will change slightly - they will increase in volume with increase in temperature while maintaining the same mass. In this case the density will decrease.

As far as the chemicals we work with and the temperature changes involved the difference is minimal maybe one percent or so and in most cases can be ignored.

When using the piping program for our motor driven pumps, the density is required in the calculations, it is entered as  $\text{kg/m}^3$

In the technical data information for each of our pumps, you will find the maximum suction lift for the specific model #', this is based on water with a density of  $1.0 \text{ g/cm}^3$

If a chemical is being used that has a higher density than water then the rated suction lift of the pump has to be divided by the density of the chemical to get the new maximum suction lift,

E.g Pump Gala 0713 – has maximum suction lift of 4m. If you are pumping 93% Sulphuric Acid which has a density of  $1.83 \text{ g/cm}^3$  then the maximum suction lift of the pump would be

$$\text{Rated Suction Lift} / \text{Density} = \text{New Suction lift} , \quad 4 / 1.83 = 2.18\text{m}$$

In this case, the pump would have a maximum suction lift of 2.18m with 93% Sulphuric Acid.