Mathematical explanation

For this use case, we will be working on the data from a seawater lift pump on an offshore platform that is used for water injection into the reservoir. In Cognite Charts, there are readily available functions from the Industrial Data Science Library to perform the task.

First, you will need to calculate the **Total head.**

Total head

Head is a measure of the potential of a liquid to reach a certain height. The head is essentially a unit of pressure. The total head is the difference in pressure of the discharge to the suction of the pump.he formula for total head h [m] given inputs discharge pressure $P_{discharge}$ [Pa], suction pressure $P_{suction}$ [Pa] and liquid density ρ_L $[\frac{kg}{m^3}]$.

$$h = \frac{P_{discharge} - P_{suction}}{9.81\rho_L}$$

Parameters:

- Discharge pressure of a centrifugal pump [Pa].
- Suction pressure of a centrifugal pump [Pa].
- Density of the fluid [kgm3]. The liquid here is seawater, so it's about 1025 [kgm3] density.

Then use the output of the Total head to calculate the **Pump's hydraulic power.**

Pump hydraulic power [W] is the amount of energy per unit time delivered to the liquid. Pump hydraulic power can be calculated if the pump liquid flow rate Q_L $[\frac{m^3}{s}]$, total head across the pump h [m], and density of the fluid ρ_L $[\frac{kg}{m^3}]$.

$$Pump\ hydraulic\ power = 9.81 Q_L \rho_L h$$

Parameters:

- Pump liquid flow rate [m3s]. The current flow rate of the pump.
- Total head across pump [m]. Difference in pressure between discharge and suction of pump.
- Density of the fluid [kgm3]. The liquid here is seawater, so it's about 1025 [kgm3] density.