Example (Alum requirement, sludge generated)

A raw water supply is treated with an alum dosage of 25 mg/L. Calculate the followings:

1. The amount of alum required to treat a flow of 1 MGD (million gallon /day)
2. The amount of natural alkalinity required to react with the alum added in terms of CaCO3
3. The volume of sludge produced per MGD if it is collected at 2% solids.

Assume that the sludge has a specific gravity of 1.011 (at 4°C)

Example (Paddle wheel flocculator design)

A cross flow horizontal shaft, paddle wheel tapered flocculation basin with 3 compartments square in profile having equal depths are to be designed for a flow of 6.5 MGD. Each horizontal shaft will have 4 paddle wheels and each paddle will have 6 blades each having a width of 6 inch and length of 10 ft. 12in space will be left between each blade.

Detention time is 50 min. The G values determined from lab. tests for 3 compartments are; G1=50 sec-1, G2=25 sec-1, G3=15 sec-1. These give an average G value of 30 sec-1. The compartments are to be separated by baffle fences. The basin should be 50ft in width. The speed of blades relative to the water is 3 quarters of the peripheral blade speed. Determine:

a) The Gt value, b) The basin dimensions, c) The paddle-wheel design, d) Power to be imparted to the water in each compartment, e) The rotational speed of each horizontal shaft in rpm

μ=2.72×10^-5 lb.sec/ft2

<table>
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**EXAMPLE (Baffled flocculator)**

Design a horizontal flow baffled channel flocculator for a treatment plant of 10000m³/day capacity. The flocculation basin is to be divided into 3 sections of equal volume, each section having constant velocity gradients of 50, 35, 25 s⁻¹, respectively. The total flocculation time is to be 21 min and the water temperature is 15° C. The timber baffles have a roughness coefficient of 0.3. A common wall is shared between the flocculation sedimentation basins, hence the length of the flocculator is fixed at 10m. A depth of 1m is reasonable for horizontal flow flocculators.

At 15°C $\rho = 1000 \text{ kg/m}^3 \quad \mu = 1.14\times10^{-3} \text{ kg/m sec}$