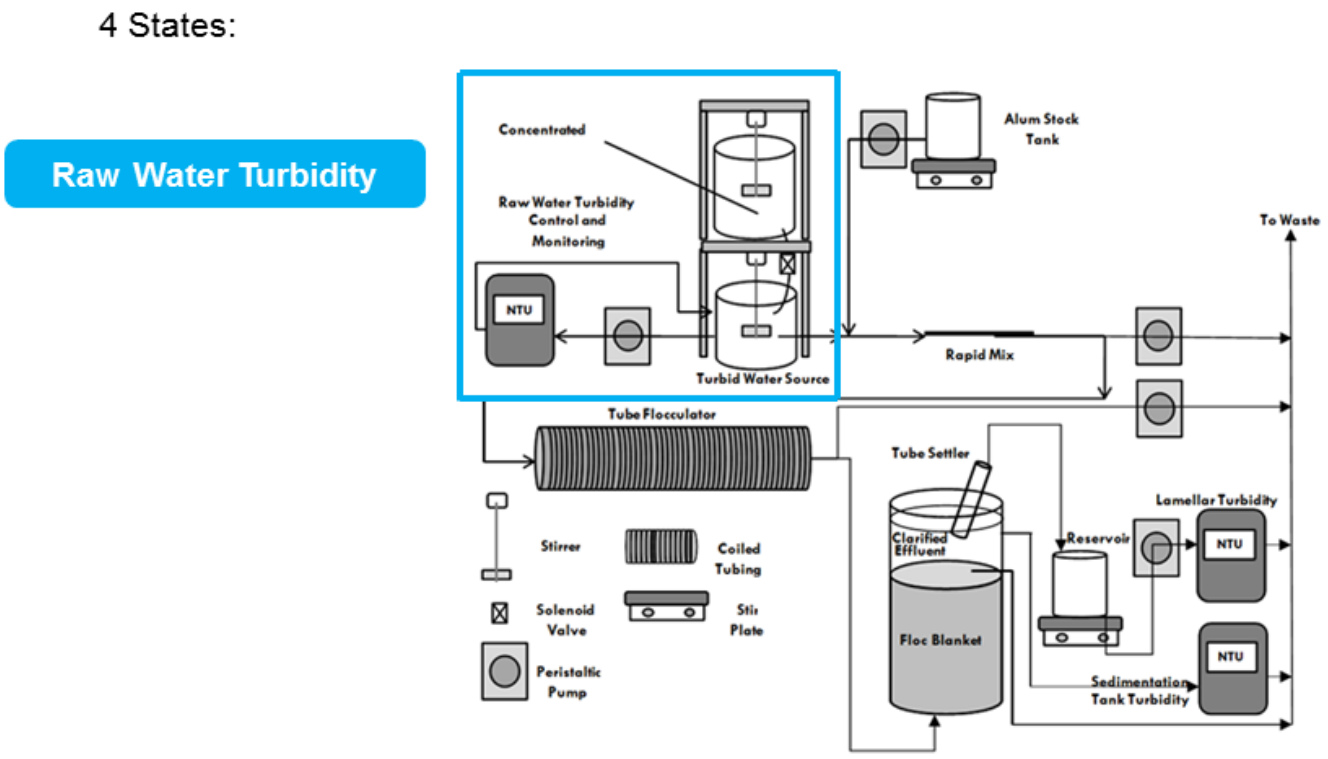
PSS Experimental methods

Experimental Methods

Here the experimental methods consist of 4 stages programmed in the Process Controller.

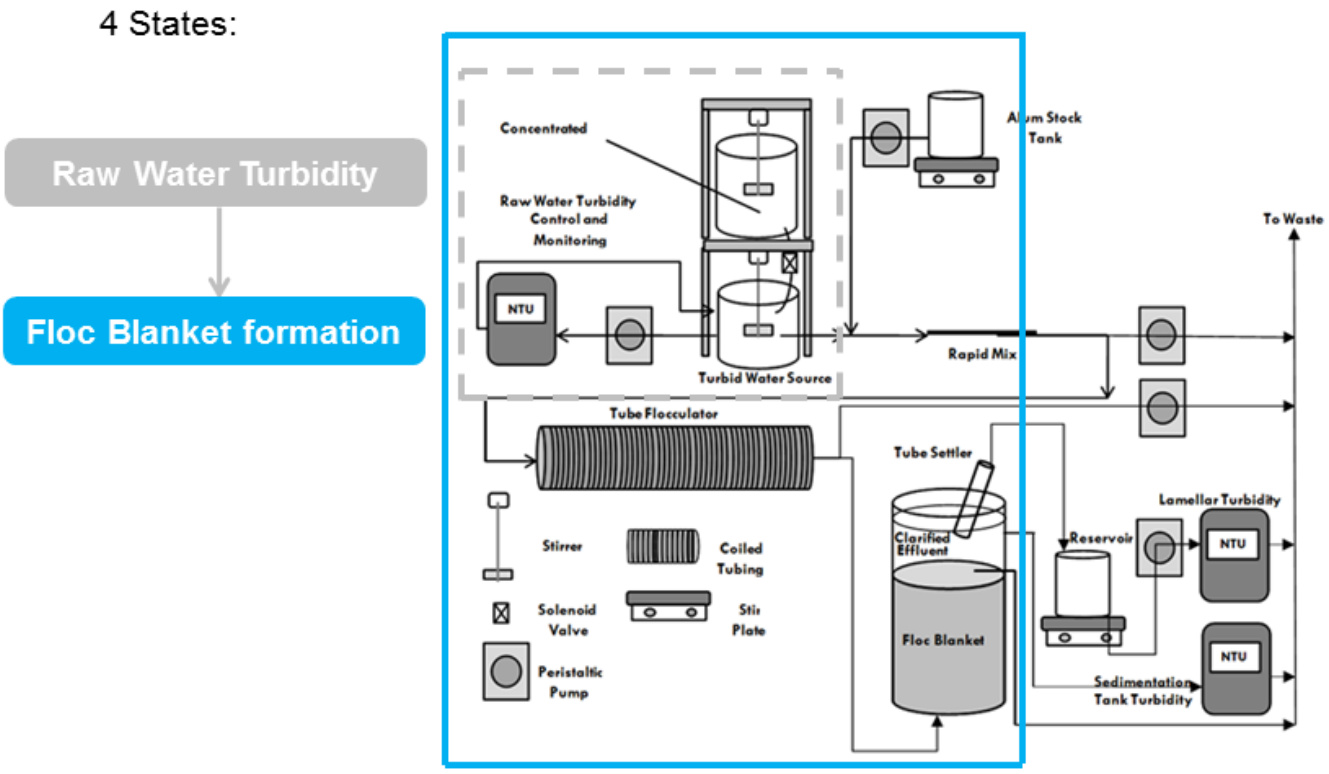
In the “Raw Water Turbidity” stage, a concentrated kaolin clay suspension was added to aerated tap water (we used the university-supplied tap water for all experiments) to produce a raw water source for treatment. The raw water turbidity was continuously sampled by means of a turbiditymeter coupled with a feed-back control loop. The raw water turbidity values were 100 NTU with a coefficient of variation of ±5%.



In the “Floc Blanket formation” stage, the raw water turbidity is combined with the alum solution – dosage of 45 mg/L (4.23 mg/L Al) was utilized. Here we used the flow rate of 712.6 mL/min throughout all experiments. The solution of raw water and alum were rapidly mixed by flowing through a tube 4.8 mm ID (inner diameter), 1 m in length with an energy dissipation rate of 0.1 W/kg.

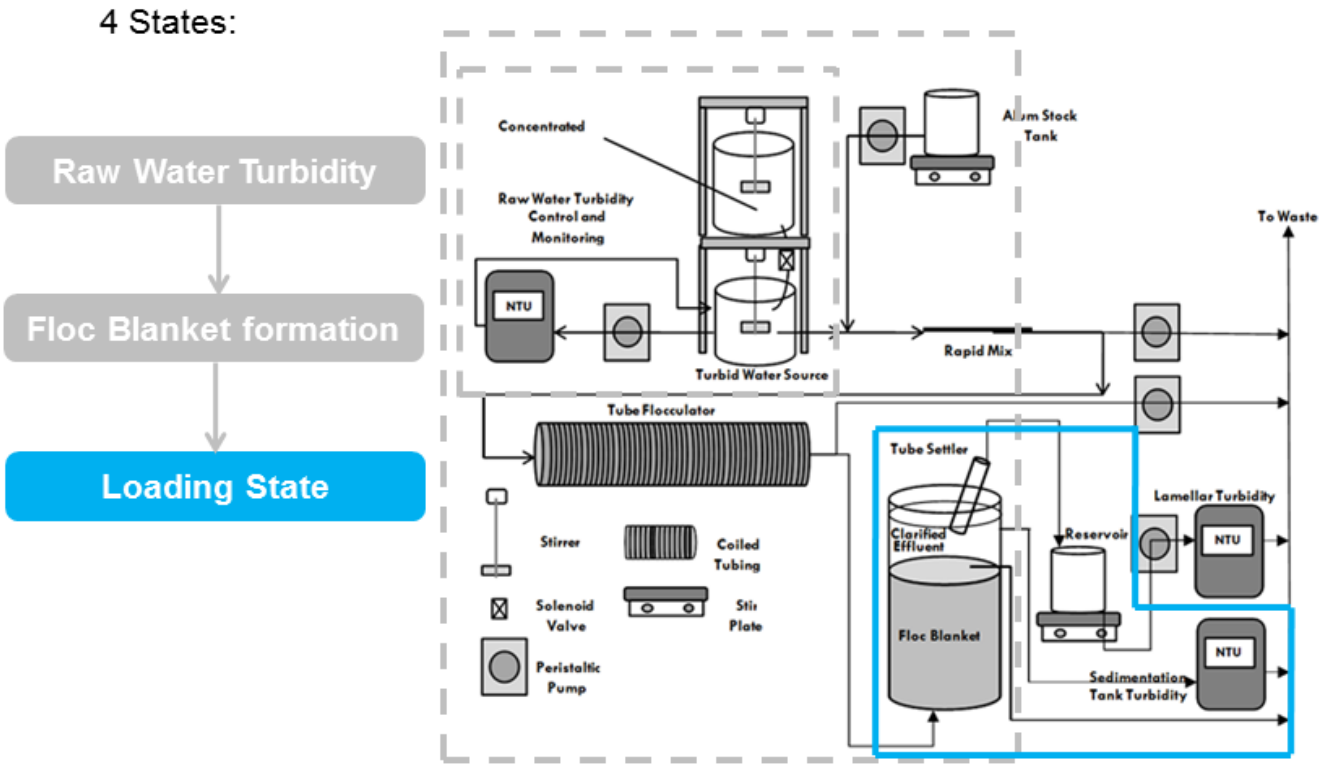
To mimick the conditions in water treatment plants, we used the tubular flocculator to facilitate particle aggregation. The flocculator had a length of 26 m, a coil diameter of 13.5 cm, an inner diameter of 0.95 cm. This resulted in a head loss of 0.159 m and a hydraulic residence time of 156 sec. In the laboratory, we had the Reynolds number of 1590 – well in the laminar flow regime.

4 States:

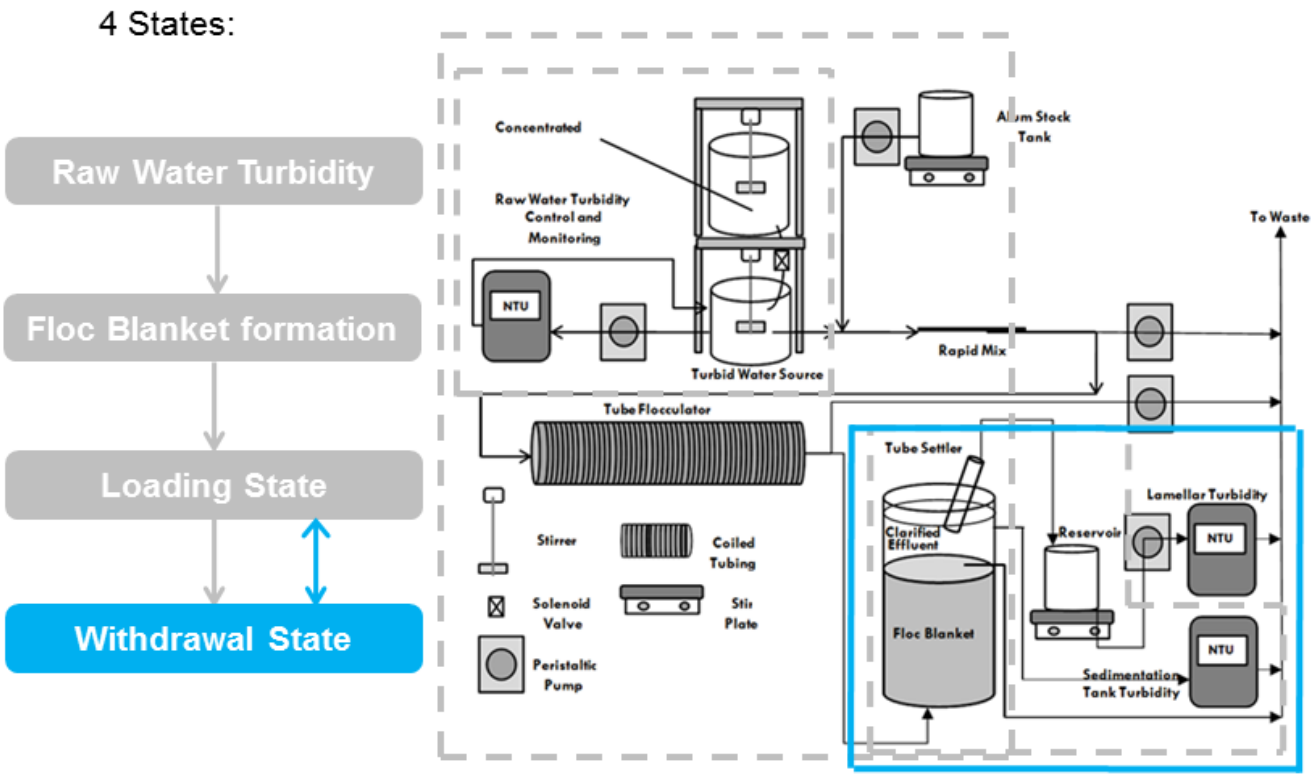


In the “Loading State” the water flows into a sedimentation column and consequently forms a floc blanket. The sedimentation tank upflow velocity was set to 1.2 mm/s – regarded as the optimal up flow velocity for turbidity removal as determined by Hurst et al. (2010). Yet while all our experiments were run with a floc blanket, the results may be vastly different for clarifiers in the absence of the floc blanket. Not only does the floc blanket provides an added clarification process, it also creates a more uniform particle size
distribution for flocs entering the lamellar system.

4 States:



In the “Withdrawal State”, once the floc blanket reaches the height of the floc weir, the effluent turbidity in the tube settler is sampled. For small experimental flow rates, a reservoir is used to accumulate and then sample effluent turbidity. Turbidity data is acquired and recorded every 5 seconds from the turbidimeters. After the task is accomplished the setup then re-enters the “Loading State” and keeps going back-and-forth between the two.



Back to Main Page