

**BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL  
(SOUTHERN ZONE BENCH, CHENNAI)  
IN  
ORIGINAL APPLICATION NO. 24 OF 2021 (SZ)**

**RECYCLING OF FILTER BACKWASH WATER IN DRINKING WATER  
TREATMENT PLANTS/ KERALA WATER AUTHORITY**

***Index***

<b>S.No</b>	<b>Particulars</b>	<b>Page No.</b>
1	Recycling of Filter Backwash Water in Drinking Water Treatment Plants	1-6

Dated at Chennai on this the 22<sup>nd</sup> day of July 2022.

**M/s. E.K.KUMARESAN**

Standing Counsel for State Government of Kerala - NGT(SZ) Chennai Bench

## RECYCLING OF FILTER BACKWASH WATER IN DRINKING WATER TREATMENT PLANTS

Conventional treatment plants, employ the following four-unit processes: coagulation, flocculation, sedimentation, and filtration. The coagulation and rapid mix process usually has a short reaction time and is followed by the flocculation process. The flocculation process forms floc, which then settle in the sedimentation basin. Periodically, accumulated solids from sedimentation basins are removed. Solids can either be disposed to the sanitary sewer, discharged to a sewer or surface water (this option requires a discharge permit), or thickened and possibly dewatered, with ultimate disposal to a landfill or land-application. Particles not removed by coagulation, flocculation, and sedimentation are typically removed by the filters. Typical conventional treatment system with potential recycle stream origin locations are shown in Figure 1. These recycle streams are:

- Spent filter backwash water;
- Thickener supernatant (sometimes referred to as sludge thickener supernatant); and,
- Liquids from dewatering processes.

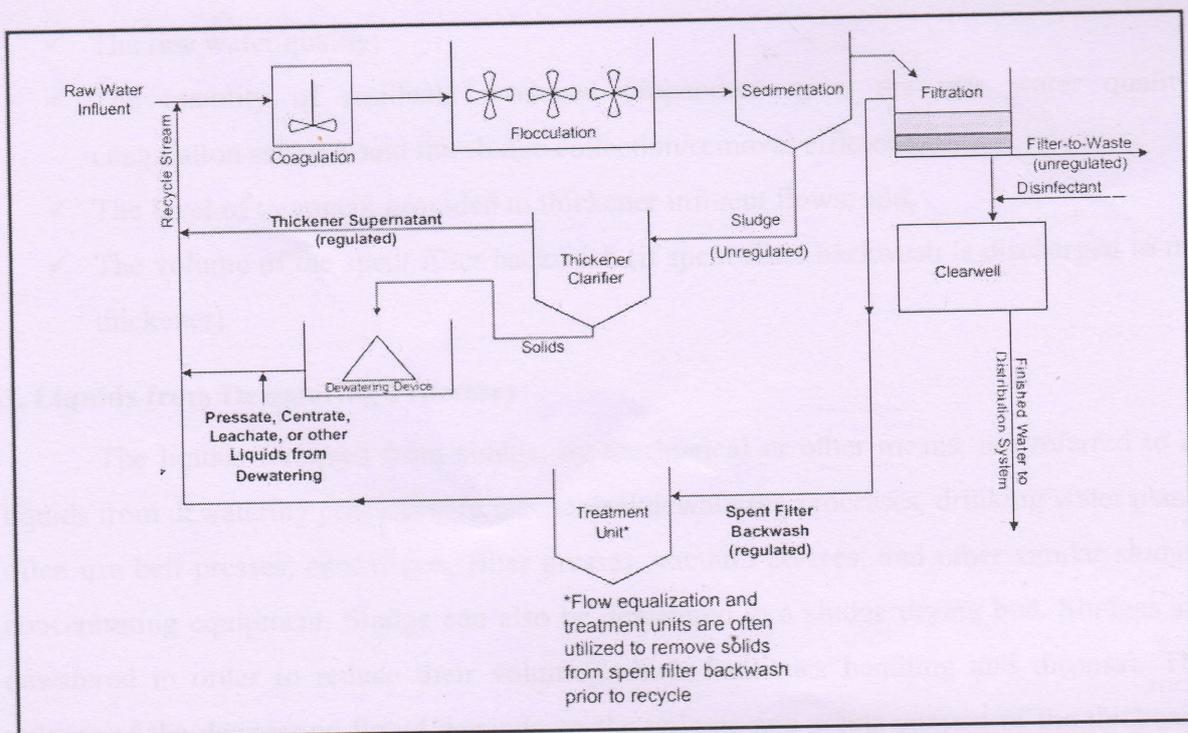


Figure 1. Example Conventional Filtration System with Recycle



### 1. Spent Filter Backwash

Spent filter backwash is generated when water is forced through the filter, counter to the flow direction used during treatment operations. This action cleans the media by dislodging accumulated particles, including microorganisms, captured by the filter media. Consequently, the resulting spent filter backwash contains particles trapped in the filter during treatment operations, including particles produced from coagulation and various pathogens. The practice of recycling may reintroduce these particles into the treatment process. Spent filter backwash water typically averages 3% to 6% of total plant production.

### 2. Thickener Supernatant

Thickener supernatant is the decanted clear water that exits a sludge thickening basin after gravity settling. Some plants recycle the supernatant from the thickener. Depending on whether the thickener is operated in a batch mode or a continuous mode, the supernatant can be recycled to the plant intermittently or continuously. Some plants combine the flows from several plant processes prior to thickening. The flow entering gravity thickeners primarily consist of sedimentation basin sludge but can also include spent filter backwash and flows from dewatering devices. Factors affecting the quantity of thickener supernatant produced include:

- ✓ The raw water quality;
- ✓ The quantity of residuals produced (dependent upon the raw water quality, coagulation scheme, and the sludge collection/removal efficiency);
- ✓ The level of treatment provided to thickener influent flows; and,
- ✓ The volume of the spent filter backwash (if spent filter backwash is discharged to the thickener).

### 3. Liquids from Dewatering Processes

The liquids removed from sludge, by mechanical or other means, are referred to as liquids from dewatering processes. In mechanical dewatering processes, drinking water plants often use belt presses, centrifuges, filter presses, vacuum presses, and other similar sludge-concentrating equipment. Sludge can also be dewatered in a sludge drying bed. Sludges are dewatered in order to reduce their volume, which facilitates handling and disposal. The volume of the dewatering liquid depends on the volume and solids content of the thickened sludge fed to the dewatering devices.









- ✓ Perform a similar process as previously described on individual treatment unit processes in the main treatment train for more information on how individual units are being impacted during recycle events.
- ✓ Examine flows and hydraulic loading rates during periods of recycle events. Make sure that hydraulic surge, plant capacity exceedance, and/or hydraulic loading rates of individual treatment units in excess of design rates are not occurring.

As a system considers treatment options for recycle streams, the following items should be considered:

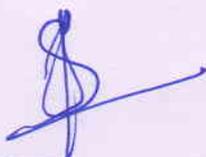
- Estimate or measure the amount of residual produced by the plant. Mass balance calculations can be used to determine residual stream loading rates. The liquid and solid residual stream quantities (peak and overall volume) should be obtained to properly size treatment units.
- Consider the benefits of adding equalization. Equalizing the recycle stream may allow a reduction in the required treatment unit loading rates.
- When designing any treatment process, allow for future modifications- flexibility is key.

#### **Waste sludge in brick production.**

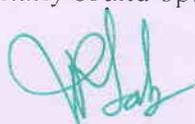
The water treatment plant sludge is extremely close to brick clay in chemical composition. So, the sludge could be a potential substitute for brick clay. The water treatment process generates a sludge that must be disposed of in an environmentally sound manner. The sludge generated in most of the treatment systems around the world is discharged into the nearest watercourse, which leads to accumulative rise of Aluminium concentrations in water and human bodies. This practice has been linked to occurrence of Alzheimer's disease. Among all disposal options, the use of sludge in producing constructional elements is considered to be the most economic and environmentally sound option.



**ASSISTANT EXECUTIVE ENGINEER I**  
PPD & Sewerage Circle  
Kerala Water Authority  
Jalabhavan, Vellayambalam  
Thiruvananthapuram-33



**Executive Engineer,**  
PPD & Sewerage Circle,  
Jalabhavan,  
Kerala Water Authority,  
Thiruvananthapuram



**Superintending Engineer,**  
PPD & Sewerage Circle,  
Jalabhavan,  
Kerala Water Authority,  
Thiruvananthapuram