DEVELOPMENT AND TRIALLING A LAMELLA CLARIFIER KIT FOR BULK WATER TREATMENT.

Location: Kyaka II refugee settlement, Uganda. Timeframe: 2020 – 2021 Project Status: Ongoing

1. PROBLEM/GAP BEING ADDRESSED:

The method of surface water treatment during a first phase emergency response has not changed in 30+ years. Assisted sedimentation through adding a coagulant such as aluminium sulphate (alum) to water has been, and remains, a highly effective and simple treatment process to remove suspended matter and reduce turbidity to enable effective chlorination of water. Batch treatment set-ups work effectively but are labour intensive, require a relatively high level of oversight, a large volume of storage and associated space, and can therefore be costly to operate. Consequently, they are not desirable medium to long term durable solutions.

Oxfam operates such a system in Kyaka II refugee camp. It comprises 6 T70 sedimentation tanks, each of which takes 4-5 hours for a complete cycle (filling, settlement, discharge to clear tanks for chlorination). Whilst these can happen in parallel (so two cycles per tank per day is possible), limiting factors are the pumping rate and capacity of the aerator which reducing the throughput to 40m3/hr (400m3 total daily production per 10 hour day)..

2. SOLUTION:

Oxfam has previously undertaken R&D on Lamella clarifiers with the aim of transferring a technology which is already proven within the Water Industry and demonstrating its relevance for the emergency aid sector. Unlike batch dosing which requires water to be left for up to several hours for sedimentation to occur, Lamella tubes (or plates) operate on a continuous flow basis enabling higher treatment volumes and because less storage is required, they require less space. The "inclined plate settler" trialled in Juba between 2015 and 2018 was a prototype small capacity (5-6m3hr) lamella treatment unit. Field trials were a partial success but due to high staff turnover and the complex political and security environment which restricted close monitoring and set up of equipment in an optimal configuration - it left many questions unanswered. The need therefore remains to complete the research to evaluate the applicability and potential advantages of a lamella clarifier, but in a more controlled environment.

GHT WASH team has identified a supplier specialising in lamella settler treatment systems for the municipal water supply and wastewater industry. The specific advantage of their lamella tubes (a form of inclined plates) is the modular "trapezoidal gutter shaped" construction made from lightweight polypropylene which fit together through tongue and groove joints to form a larger honeycomb structure. Components are also able to nest and stack, so already in a kit form suitable for efficient transportation and assembly on site.

3. RESULTS:

The kit is time consuming but straightforward to set up taking several days from start to finish due to the time it takes for welding individual plastic tube profiles together.

Continuous suction side dosing was used with 10kg of Alum per 70m^3 of raw water (70-80NTU). Initial trials experienced "short circuiting" of water around rather than through the lamella tubes. Different inlet configurations and flow rates were trialled to optimise conditions for floc formation. At reduced inflow of 20m3/hr, the measured outlet turbidity ranged between 20-30 NTU.

During initial trials the system failed to achieve necessary reduction in turbidity (<5NTU) to offer a viable alternative to batch treatment. Further tests are planned to explore whether conditions in the transmission line, inlet pipe and tank are conducive for good floc formation. Further testing is planned to determine the way forward.

4. LEARNING/APPLICABILITY ELSEWHERE:

Ultimately success is benchmarked against the lamella outperforming the existing batch treatment system against any of the following parameters i) producing a greater volume of treated water in a given time within a smaller land footprint, ii) Requiring less inputs (labour/chemicals) and perceived to be simpler, iii) lower set up and operational cost for comparable water output and quality. None of these benchmarks have yet been achieved.

Final results should be known by end of 2021. Further modifications are suggested to address some of the observed weaknesses of the existing design as well as improving the inlet and offtake (e.g. adding these components as part of the kit). However this is only relevant if further testing produces more positive results.

5. ADDITIONAL INFORMATION:

Project documents (Box link), Installation of the lamella system; Testing of the lamella system; A HSP was deployed to manage the field trial. This ensured we had confidence in the process and the results of the tests were reliable, even if they were not what we'd hoped for.

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