Kagando Hospital Uganda – ClariWash Filter 1

Water Quality Results

To assess the effectiveness of the ClariWash filtration and chlorine treatment a series of water samples were taken on 23rd July 2022 (approximately a week after the filtration system was put in service). Three samples were taken at each of the following locations:

Incoming raw water – at the inlet nozzles to the inlet pipe.

Filtered water – dip samples at the backwash tank.

Chlorinated water – at the sample point immediately downstream of the Dosatron pump.

The samples were tested for the key indicators for health and system operation and are shown overleaf. The results show the following:

ClariWash Filtered Water

On average greater than 98% removal of total coliforms, E.coli and faecal coliforms

94% removal of turbidity.

98% removal of ammonia.

Discussion

The ClariWash system provides a good primary barrier with good removal of total coliforms, E.coli and faecal coliforms. Removals could be further improved (if required) by reducing the filtration rate; possibly after the addition of a second filter when demand can be shared. Currently the single filter is being run 65% greater than its design rate of 5 m3/m2/h to treat a much water as possible.

All values of turbidity are well below the target of 1 NTU before chlorination with maximum being 0.3 NTU.

The high raw water values of ammonia could be an indicator of upstream faecal pollution which is likely given the fact that numerous upstream village communities exist which can discharge sewage without treatment.

High ammonia levels can impact the ability to adequately disinfect the water by achieving a free chlorine residual - due to its significant chlorine demand. If no ammonia reduction was achieved by the ClariWash system prior to disinfection, it would be necessary to carry out breakpoint chlorination to achieve a free chlorine residual. This would significantly increase the amount of chlorine required and the running cost of the scheme. It is also difficult to control the dose with the possibility of under-dosing resulting in not achieving the breakpoint (with no free chlorine and no disinfection) and over-dosing causing taste issues to the consumer. Hence the ammonia reduction is very important. It is thought that this is mainly being achieved by the 200mm GAC top layer in the filter adsorbing the ammonia. In the short/medium term some biological ammonia removal may also develop in this layer. The GAC may need topping up by about 50% a year. Further sample testing should be carried out after 4-6 months to verify whether the ammonia reduction is still being achieved.

Post chlorination

Zero counts for total coliforms, E.coli and faecal coliforms.

Further reduction in turbidity to 0.1 NTU

Further reduction in ammonia possibly due to chloramination

All values comply with Ugandan National Standards.

KAGANDO HOSPITAL WATER SUPPLY

CLARIWASH FILTER NR 1 AND CHLORINATION - WATER QUALITY RESULTS
DATE OF SAMPLING 23 JULY 2022

PARAMETER

MICROBIOLOGY	UNITS	RAW 1	RAW 2	RAW 3	AVERAGE	FILTERED 1	FILTERED 2	FILTERED 3	AVERAGE	REDUCTION %	POST CHLORINE 1	POST CHLORINE 2	POST CHLORINE 3	UGANDA NATIONAL DW STANDARD	
Total Coliforms	CFU/100mls	264	284	252	267	4	3	1	3	99.0	0	0	0	0	CFU/100mls
E.Coli	CFU/100mls	125	132	102	120	3	2	0	2	98.6	0	0	0	0	CFU/100mls
Faecal Coliforms	CFU/100mls	163	152	162	159	3	2	0	2	99.0	0	0	0	0	CFU/100mls
CHEMISTRY															
Turbidity	NTU	5.2	4.5	3.8	5	0.2	0.3	0.29	0.3	94.1	0.1	0.1	0.1	5	NTU
Ammonia	mg/l	24.4	23.7	25.1	24	0.39	0.41	0.36	0.4	98.4	0.24	0.22	0.25	0.5	mg/l
Chlorine	mg/l										0.13	0.14	0.16		