

## Operational Performance of Up-Flow Filters for the Treatment of Iron from Synthetic Groundwater

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The most commonly used iron (Fe) removal mechanisms of groundwater involve oxidation-precipitation, electro-coagulation and floc-filtration worldwide. In this study the performance of two different filter media were examined by investigating the removal of Iron (Fe) from synthetic groundwater (SGW) using vertical up-flow filtration technique. Granular Activated Carbon (GAC) particles with the sieve range of 0.8 mm to 2.36 mm, and bio-pac media (BPM) made of Poly-propylene, of size 14 mm x 10 mm (diameter x height) were separately used in column experiment with 80 cm media height for the comparison. Trials were done in 3 different phases for 48 hours duration. In Phase 1 initial Fe concentration had been increased from 1 to 3 mg/L at 7 hours HRT (hydraulic retention time) and in Phase 2 the HRT was reduced from 7 to 3.5 hours with influent having Fe equal to 3 mg/L. Finally, in Phase 3, columns were operated with an air supply from an aquarium air pump with 2.5 L/min along with 3 mg/L influent Fe at 7 hours HRT. The results showed that at the Phase 1 increase of the initial Fe concentration from 1 to 3 mg/L had increased the Fe removal efficiency from 95 % to 98.9 % for GAC filter media while BPM showed a little increment from 69 % to 71 %. Also it was noted that, at the Phase 1, though effluent of GAC filter had met the WHO drinking water standard of 0.3 mg/L for Fe removal, BPM had not met the standard. At Phase 2, it was observed that Fe concentration at the effluent had increased in both filters, with HRT reduction from 7 to 3.5 hours. Finally, at phase 3, it was noted that there was no positive effect of aeration on Fe removal in both filters. Instead, an increment of effluent Fe concentration had observed for both filters and oxygen transfer efficiency is the main factor determining the effective performance of the filter which depends on air/water ratio. The increased air/water ratio of 100:1 was found to be improper in this study and reduced the filter performance. Overall, up-flow filters showed better performance for GAC compared to BPM on Fe removal.

**Keywords:** Bio pac media, Fe removal, Granular activated carbon, Synthetic groundwater