Filter sand samples, taken from aerobic rapid sand filters used for treating groundwater at three Danish waterworks, were investigated for their pesticide removal potential and to assess the kinetics of the removal process. Microcosms were set up with filter sand, treated water, and the pesticides or metabolites mecoprop (MCP), bentazone, glyphosate and p-nitrophenol were applied in initial concentrations of 0.03–2.4 μg/L. In all the investigated waterworks the concentration of pesticides in the water decreased – MCPP decreased to 42–85%, bentazone to 15–35%, glyphosate to 7–14% and p-nitrophenol 1–3% – from the initial concentration over a period of 6–13 days. Mineralisation of three out of four investigated pesticides was observed at Sjælsø waterworks Plant II – up to 43% of the initial glyphosate was mineralised within six days. At Sjælsø waterworks Plant II the removal kinetics of bentazone revealed that less than 30 min was needed to remove 50% of the bentazone at all the tested initial concentrations (0.1–2.4 μg/L). Increased oxygen availability led to greater and faster removal of bentazone in the microcosms. After 1 h, bentazone removal (an initial bentazone concentration of 0.1 μg/L) increased from 0.21%/g filter sand to 0.75%/g filter sand, when oxygen availability was increased from 0.28 mg O2/g filter sand to 1.09 mg O2/g filter sand. Bentazone was initially cleaved in the removal process. A metabolite, which contained the carbonyl group, was removed rapidly from the water phase and slowly mineralised after 24 h, while a metabolite which contained the benzene-ring was still present in the water phase. However, the microbial removal of this metabolite was initiated over seven days.