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Chemeca 2026 and Hazards Australasia
28 – 30 September, Melbourne, Australia

Removal of Short Chain PFAS from Landfill Leachate

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ABSTRACT

Foam fractionation (FF) is a mature process, which is increasingly deployed to remove PFAS from landfill leachate. Leachate has a complex chemical matrix including high concentrations of organic and inorganic co-contaminants, such as TOC (humic and fulvic acids), TSS, TDS, alkalinity, ammonia, volatile fatty acids, and putrefaction products. PFAS removal using FF is not influenced by the leachate co-contaminants and therefore avoids pitfalls of traditional adsorption technologies such as GAC and IX resin, which are negatively impacted by the leachate chemistry, which causes rapid fouling and as a result high rates of media disposal. FF also generates much smaller waste streams than the other competing adsorption technologies, <1% of the feed flow. FF is very efficient in removing long chain PFAS due to inherent hydrophobic attachment between the PFAS carbon tail and the bubbles in the foam. However, the removal of short chain compounds remains challenging due to their lack of hydrophobicity. Some studies have investigated the addition of a cationic co-surfactant, such as Cetrimonium Bromide (CTAB), to various synthetic and relatively simple wastewater sources. In these environments, CTAB was able to enhance the removal of short chain PFAS to varying degrees. However, CTAB is ineffective in landfill leachate due to the leachate's chemical complexity, and CTAB is also highly toxic to marine and aquatic life. This study investigated an alternative cationic additive with a significantly lower human, marine, and aquatic toxicity when compared to CTAB. The improvement in short chain removal was significant. For example, PFPeA (C5) had zero removal without the additive and up to 68% removal with the additive. PFHxA (C6) had 0-41% removal without the additive and up to 77% removal with the additive. PFBS (C4) had a 0-20% removal without the additive and up to 75% removal with the additive. This new additive significantly enhances FF as a primary treatment option.

KEY WORDS

PFAS, Foam Fractionation, Leachate

BIOGRAPHY

Sean is a senior process engineer experienced in process design, site supervision, commissioning and project management. He has significant experience working experience in water and wastewater projects, and brings extensive expertise to the research and design teams. Sean's eight years in the industry included concept designs, managing teams of people to deliver projects, and working closely with contractors, consultants, and clients to ensure delivery within budget and time parameters. He possesses experience in Australian and New Zealand standards across mining, municipal and

industrial industries. He currently holds the positions of Research and Innovation Project Manager and Senior Research Engineer.

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