CASE STUDY:

OCRA technology removes PFAS from industrial sewage

REMEDIATION PROJECT
Brisbane International Airport AFFF System Malfunction

MATERIAL
PFAS Contaminated Industrial Sewer, Estuarine Water & Industrial Cleaning Fluids

VOLUME
19.8 Million Litres

PRINCIPAL
Airline Operator

LOCATION
Brisbane, Queensland, Australia

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evocra
WATER SOLUTIONS:EVOLVED

SUMMARY

Responding to an emergency request to remediate a PFAS impacted industrial sewer and surface water, **Evocra** rapidly deployed a mobile water treatment plant equipped to resolve the complex treatment challenge. The plant was required to manage significant inlet quality fluctuation and meet strict regulatory criteria for discharge to the local municipal utility.

Upon the safe and successful completion of the Client's initial scope, without variations, the project was extended to PFAS-impacted industrial cleaning fluids. All project expectations were met with treated materials discharged to contract specification and extracted PFAS concentrated for off-site destruction, removing the captured PFAS from the environment permanently.

SOLUTION

Evocra's innovative first generation Ozofractionative Catalysed Reagent Addition (OCRA) technology reduced the PFAS into a concentrate of less than 1% of the original impacted volume. This reduction in volume conservatively saved the client an estimated $25M in water management costs. Subsequent improvements to the process have decreased the concentrate volume to less than 0.2%.

Utilising a single OCRA-PFAS process train, **Evocra** was able to successfully remove the bulk PFAS and biological load from industrial sewer, storm water, estuarine water, caustic solvent cleaning solutions and trade waste. This allowed processing by an RO-NF final polish system to meet the project discharge objectives.

Evocra's competitive OCRA technology, with its whole-of-project economic benefits and minimal footprint integrated into the clients work place, allowing the Client to maintain all core operations while meeting their remediation obligations.

RESULTS

OCRA consistently achieved treatment levels to below those of the Australian, USA EPA and Canadian drinking water standards for PFAS. The average discharge quality for key PFAS compounds PFOA, PFOS and PFHxS was <0.01µg/L.

Combining OCRA with an RO-NF polishing unit reduced the total PFAS by over **99.9%**, as measured via TOP Assay. The average sum of PFAS (TOP Assay) of 762µg/L in the influent was reduced to an average sum of PFAS (TOP Assay) of <0.56µg/L in the treated discharge water across the impacted sewage.

ISSUE

Historical use of PFAS in aqueous film forming foam (AFFF), industrial surface coatings and other household products, coupled with their persistent nature and high mobility, has led to a widespread global problem. PFAS is a group of over 4,600 synthetic compounds, with current human health concerns dominated by three specific compounds being PFOS, PFOA and PFHxS. Additionally there is growing apprehension over the potential toxicity of many shorter chain PFAS precursor compounds.

Traditional adsorbent methods do not provide a complete solution for PFAS. Adsorbent media, such as ion exchange resins and activated carbon, primarily target specific compounds such as PFOS, PFOA and other long chain PFAS. Limitations of adsorbent media include an inability to capture short chain PFAS, high susceptibility to fouling when exposed to biology, blinding of the resin by many co-contaminants and the generation of relatively large volumes of spent media that requires landfill disposal at specialised facilities.

OCRA offers a solution that produces clean treated water (>99.8%$_{vol}$) and a PFAS concentrate (<0.2%$_{vol}$). The concentrate is then sent for thermal destruction, aligning with **Evocra**'s commitment to removing PFAS from the environment.

Evocra has developed and successfully deployed its patented advanced bubble technology for removing PFAS and other contaminants from the environment. We strive to produce high quality treated water streams with whole-of-project cost efficacy. We have achieved drinking water PFAS specifications from complex co-contaminated fluids, without pre-treatment.

TECHNOLOGY

Evocra's patented OCRA process is a new generation technology that can be customised to meet the demands of the raw materials being treated. OCRA utilises micro-bubbles of ozone in a multiphase process that provides great versatility for the removal of contaminants and sediments via oxidation-reduction, precipitation, electrostatic flotation and if required reagent absorption, dependent upon the chemical group and species of interest.

OCRA's vast gas-liquid interface elevates oxidation-reduction potential (ORP) conditions of the OCRA chambers, degrading organic co-contaminants including petroleum hydrocarbons, and persistent contaminants as well as transforming metal ions into stable compounds and facilitating bubble adhesion for PFAS compounds. Degraded or stabilised byproducts are captured and removed via a number of industry established methods, providing a high-quality treated water. Collected contaminants can either be destroyed or disposed externally or where possible beneficially reused on site.

OCRA's ability to carry out several extractive techniques within a single reaction vessel provides significant advantages in reducing overall footprint and cost.

PROCESS

The multiple OzoFractionation columns of an OCRA-PFAS plant remove greater than 99.5% of regulated PFAS from raw influents. This arrangement also reduces the total measured PFAS concentration by more than 85%, in the treated water.

The OCRA process provides the following benefits:

- **Eliminates** down time from organic fouling due to its destructive treatment of almost all organic compounds.
- **Eliminates** process obstructions by removing suspended solids from the process fluid.
- **Reduces** the number of unit operations required for complex water contaminations by using the multifunction reaction chambers.
- **Reduces** waste volumes, which reduces on site costs and external transport and disposal costs.
- **Recovers** resources, water and valuable minerals.
- **Reduces** reagent usage, by up to 75% in comparison to traditional methods. Reagents include adsorption media, if required for polishing to higher quality discharges.
- **Removes** contaminants from the environment eliminating risks to human health as well as other ecology.

APPLICATION

OCRA can be installed either as a stand-alone process, an upstream bulk cleansing process for ultra-trace polishing processes or as a (pre- or post-) bolt-on to existing infrastructure. This versatility minimises any potential disruptions to present operations. OCRA plants are modular and can be scaled to meet any site requirements. OCRA is designed to be energy efficient, while the energised process fluid, produced in the high oxidation-reduction environment, increases reagent efficiencies.