CASE STUDY:

OCRA remediates PFAS-impacted sewer, beyond detection limits

REMEDIATION PROJECT
Brisbane International Airport Sewer Remediation

MATERIAL
PFAS Contaminated Industrial Sewer

VOLUME
1.2 Million Litres

PRINCIPAL
Airport Operator

LOCATION
Brisbane, Queensland, Australia

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WATER SOLUTIONS:EVOLVED

SUMMARY

Following the successful remediation of the industrial sewer associated with a spill from a maintenance hangar at the airport, the airport operator awarded an additional sewer cleanup project. This new assignment trailed the materials of the previous client with the previously established WTP.

Given a luxury of time, waiting for the WTP's availability, the airport was able to provide detailed characterisation of their material. This allowed **Evocra** to assess and assign a processing strategy to minimised project duration by maximising treated water production rate, with no non-conforming batches. All treated water was discharged back to the sewer, once validated.

Waste production was also minimised to around 1% of the original influent volume, via a single pass of the process. By reducing the volume of PFAS impacted materials **Evocra** was able to reduce the Client's disposal costs by an estimated $3.2M.

SOLUTION

Utilising a single OCRA-PFAS process train, **Evocra** was able to successfully remove the bulk PFAS and biological load from industrial sewer. By fine tuning the OCRA process the efficiency of the NF/RO final polish system was increased, while continuing to meet the projects discharge objectives.

OCRA eliminates the need for pre-treatment and avoids landfill disposal by eliminating hazardous solid waste production. In addition, OCRA purges PFAS from the environment through its concentrating capabilities which prepares the waste for incineration.

OCRA truly is an evolved water solution.

RESULTS

Using OCRA as a bulk cleansing pre-treatment for an NF/RO polishing unit provided an overall total PFAS reduction of well over 99.9% for both TOP Assay and standard PFAS analysis.

CONTAMINANT	RAW INFLUENT		TREATED DISCHARGE	
	STD Analysis	TOP Assay	STD Analysis	TOP Assay
PFOS	87.44 µg/L	76.08 µg/L	< 0.01 µg/L	< 0.01 µg/L
PFOA	3.80 µg/L	3.62 µg/L	< 0.01 µg/L	< 0.01 µg/L
PFHxS	18.35 µg/L	19.10 µg/L	< 0.01 µg/L	< 0.01 µg/L
PFHxA	7.41 µg/L	30.78 µg/L	< 0.01 µg/L	< 0.01 µg/L
PFBS	3.23 µg/L	2.69 µg/L	< 0.01 µg/L	< 0.01 µg/L
PFBA	0.93 µg/L	6.52 µg/L	< 0.01 µg/L	< 0.01 µg/L
Sum of PFAS	134.7 µg/L	160.2 µg/L	< 0.01 µg/L	< 0.01 µg/L

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.