CASE STUDY:

OCRA achieves PFAS non-detection for fire training water

PROJECT
Hobart International Airport
Hot Fire Training Ground

MATERIAL
PFAS Contaminated Fire Fighting Water

VOLUME
400,000 Litres

PRINCIPAL
Airport Emergency Services Provider

LOCATION
Hobart, Tasmania, Australia

evocra
WATER SOLUTIONS:EVOLVED

SUMMARY

Supporting Australian airports, **Evocra** delivered its PFAS 1125 containerised 25kL/day OCRA water treatment plant to remove PFAS from fire-fighting fluids. During live fire training and rainfall events PFAS is leaching from hard surfaces, even though the client has not used PFAS foams at any of its sites since 2010. All the runoff water is collected for treatment.

Installation of the plant occurred in mid-2018, with the plant continuing to operate until demobilisation in late 2019. As required by the Client, the treated water produced by the water treatment plant had no detectable PFAS (<0.01µg/L). All water was batch tested prior to discharge to local infrastructure.

Although the site only required a 10kL/week plant for its current need a larger plant was supplied to allow for storm events and future work.

SOLUTION

Initially the OCRA-PFAS plant was installed with an RO final polish stage, with IX resin to treat the brine from the RO. However, due to performance concerns associated with operating the RO at low temperatures, the plant was reconfigured to utilise the small IX resin bed as the final treated water polish.

IX resin bed volumes before breakthrough are expected to increase by a factor of 10 with the OCRA pretreatment.

RESULTS

The combination of the OCRA-PFAS and IX polishing systems provided non-detection for all measurable PFAS compounds, providing a high level of reliability in meeting Australian, United States of America, Canadian and European drinking water criteria.

CONTAMINANT	RAW WATER QUALITY	OCRA TREATED	PERCENT VARIANCE	IX RESIN POLISH	PERCENT VARIANCE
pH	8.33	4.48		4.34	
PFOS	27.5 µg/L	0.05 µg/L	99.81%	<0.01 µg/L	99.96%
PFOA	1.39 µg/L	<0.01 µg/L	99.22%	<0.01 µg/L	99.28%
PFHxS	3.77 µg/L	0.11 µg/L	97.15%	<0.02 µg/L	99.47%
PFHxA	4.25 µg/L	3.22 µg/L	24.05%	<0.02 µg/L	99.53%
PFBS	1.11 µg/L	1.04 µg/L	6.50%	<0.02 µg/L	98.20%
PFBA	1.77 µg/L	1.67 µg/L	5.45%	<0.1 µg/L	94.35
6:2 FTS	4.03 µg/L	<0.05 µg/L	98.76%	<0.05 µg/L	98.76%
8:2 FTS	28.9 µg/L	0.06 µg/L	99.76%	<0.02 µg/L	99.93%
Sum of PFAS	49.7 µg/L	7.90 µg/L	84.1%	<0.01 µg/L	99.98%

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.