ENGINEERING-SCALE TRIALS:
AMEOX™ TREATMENT OF PFAS IN GRANULAR ACTIVATED CARBON

Technology:	**AMEOX™ Treatment for GAC**
Media Types:	**"Spent" Coconut & Coal-Based Carbon**
Media Sources:	**1) Refinery - Michigan 2) Ground – Michigan/OR**
Contact:	**Karl Yost karlyost@ybtechs.com**
Treatment-Scale:	**Engineering**
GAC Mass Treated:	**40# per trial treatment run**
Treatment Duration:	**20 minutes per treatment**
Mode of Treatment:	**Batch Recirculation**
Flow Rate:	**2.2 gpm**
Trial Location:	**Blue Q Labs, Lebanon, OR**

AMEOX™ TECHNOLOGY HIGHLIGHTS FOR SPENT CARBON TREATMENT

- Destroys PFAS and other oxidizable substances in water, fluids, and granular media
- Utilizes electricity, boron-doped diamond electrodes, and other inducements
- Stainless-steel components and piping
- Generates powerful oxidants with latency including: percarbonate, hydroxyl and other radicals, hydrogen peroxide, and/or other mixed oxidants with oxidation potentials all >1.8-2.8V (Fluorine gas = 3.0 V)
- 240V or 480V/3phase, 25 to 100-amp service
- AMEOX oxidizing fluid produced by process recirculated between AMEOX equipment skid and carbon within adsorber removed from water treatment service
- Oxidizing fluid destroys PFAS in & desorbs PFAS from GAC with desorbed PFAS carried to AMEOX equipment where harsh oxidation conditions destroy PFAS and replenish exhausted oxidants
- PFAS end-products include carbon dioxide and salts (e.g., fluoride)

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TRIAL #1
AMEOX TREATMENT OF SPENT REFINERY GAC

	PFAS (mg/Kg in GAC)					
Treatment ID	**PFOS**	**PFOA**	**PFNA**	**PFHXS**	**PFHPA**	**PFBS**
Untreated	0.161	0.0325	<0.015	<0.03	<0.015	<0.06
1	<0.01	0.0138	<0.01	<0.02	<0.01	<0.04
2	<0.015	<0.015	<0.015	<0.03	<0.015	<0.06
3	<0.01	<0.01	<0.01	<0.02	<0.01	<0.04

AMEOX Viability Results: Spent Refinery GAC (coconut)

Yost Brothers, LLC – BlueQ Labs, LLC

NOTES:

1) GAC obtained in 5-gallon buckets sourced from a confidential refinery in Michigan
2) Untreated and treated carbon analyzed by Method 537 for PFAS telomeres
3) 40 lbs. of spent GAC treated in each treatment run.
4) AMEOX equipment operated at 2.2 gpm for approximately 20 minutes per treatment. Treatment was halted when effluent from carbon adsorber had no notable hydrocarbon odor and a turbidity of <10 NTU.
5) Recirculated oxidizing fluid (~15 gallons) reused for each sequential treatment run with makeup water added, as necessary.
6) Suspended solids removed from GAC by oxidizing fluid coagulated and precipitated as settled solids. Supernate was recirculated between carbon treatment absorber and AMEOX equipment.

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TRIAL #2
AMEOX TREATMENT OF SPENT GAC from PIT (GROUND) WATER REMEDIAL TREATMENT SYSTEM

PFAS - Telomere (Analyte)	Acrnym	Units	Untreated	Treated
Perfluorodeconoic acid	PFDA	ug/Kg	4.88	<1.5
Perfluoroundecanoic acid	PFUnDA	ug/Kg	6.16	<1.5
Perfluorobutanesulfonic acid	PFBS	ug/Kg	6.91	<1.5
Perfluoroheptanoic acid	PFHPA	ug/Kg	12.5	<3
Perfluorohexanoic acid	PFHA	ug/Kg	62.1	<10
Perfluorooctanoic acid	**PFOA**	**ug/Kg**	**170**	**<20**
Perfluorononanoic acid	PFNA	ug/Kg	207	<30
Perfluorohexanesulfonic acid	PFHXS	ug/Kg	209	<60
Perfluorooctanesulfonic acid	**PFOS**	**ug/Kg**	**1730**	**<20**
Perfluorododecanoic acid	PFDOA	ug/Kg	<1.5	<1.5
Perfluorotridecanoic acid	PFTriA	ug/Kg	<1.5	<1.5
Perfluorotetradecanoic acid	PFTeA	ug/Kg	<1.5	<1.5

NOTES:

a. GAC obtained from GAC treatment of contaminated groundwater from a PFAS site in Michigan. A 350-gallon tote of site groundwater was shipped to Blue Q Labs, LLC in Lebanon, OR and was treated using 40 lbs. of virgin coal-based granular activated carbon at a flow rate of 5 gpm. To assure full treatment and maximized GAC loading, the GAC treatment was performed with recirculation pumping of water from the tote.

b. The untreated groundwater had a slight musty odor, and yellow-brown color tint. Turbidity was <5 NTU.

c. Untreated and treated carbon was analyzed by Method 537 for reported PFAS telomeres.

d. AMEOX equipment was operated at 2.2 gpm for approximately 20 minutes.

e. Fresh oxidizing fluid (~15 gallons) was prepared for AMEOX processing by circulating within the AMEOX treatment equipment.

f. Some suspended solids appearing iron-like in nature, were removed from the GAC by the AMEOX oxidizing carrier fluid. Suspended solids coagulated and precipitated in a settling tank. Supernate was recirculated between the carbon treatment absorber (reactor) and AMEOX equipment.

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