Clean-up of Tank Battery Impoundments & Well Head Areas is Now a Reality

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Cool-Ox™

Site Background

- Tank Battery Site - 1,000 cubic feet of crude oil impacted soil, heavily saturated
- Release occurred approximately 5 years ago
- Site underlain with a hard clay layer at 6”
- Well Head – Approx. 20 sq ft. of aspaltines around well head where ground was impacted by hydrocarbons over time


TK0007004

Challenges:

- Persistent Small Leaks
- Smelly and Unsightly
- Weathered crude oil takes on characteristics of asphalt paving

Plan of Action:

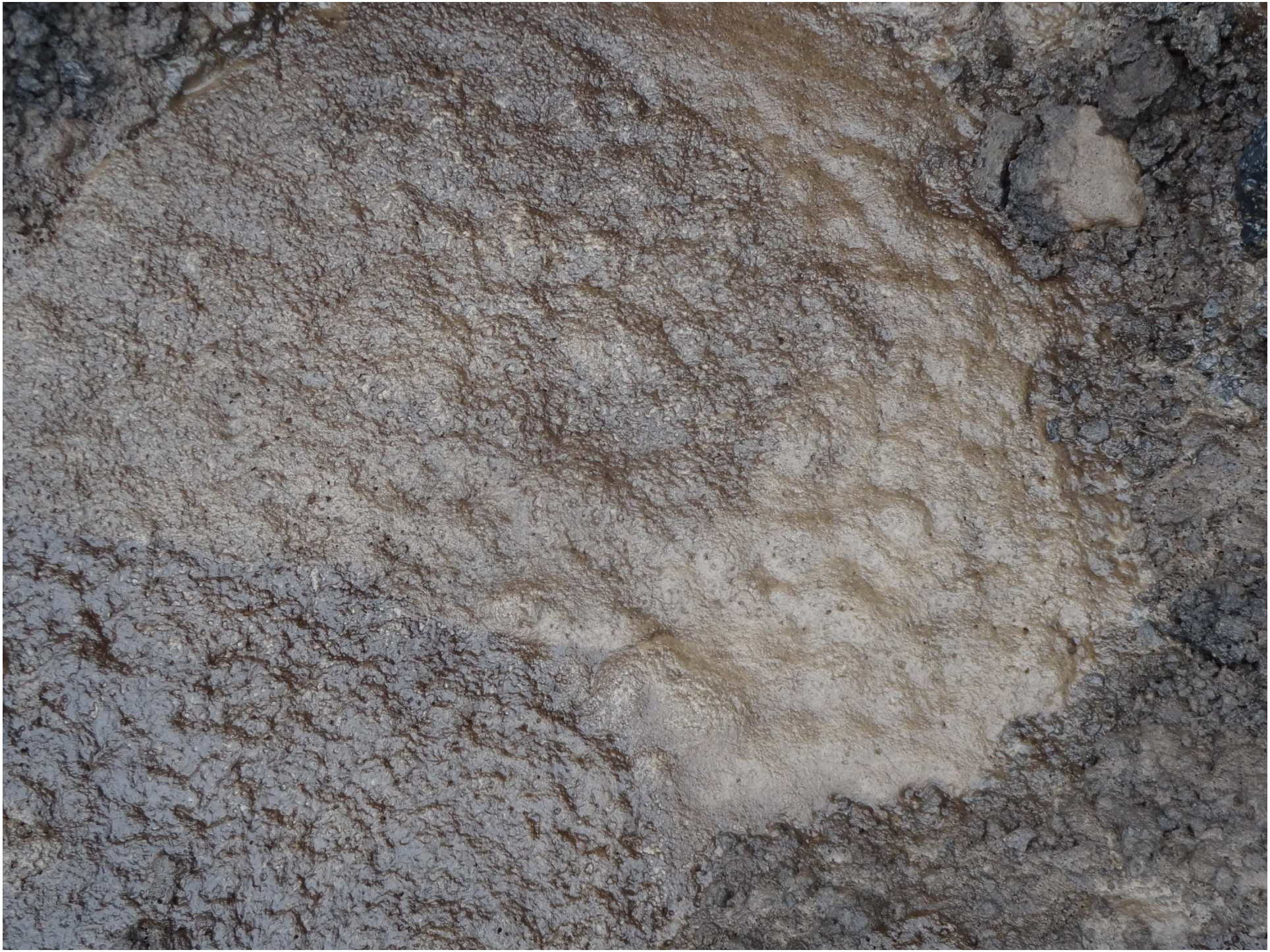
- Kill the strong odors at the site
- Jump start the remediation process at the weathered site
- Demonstrate the *Cool-Ox*® Technology to:
  - Kill Odors upon contact
  - emulsify crudes and allow them to be separated from the soil mass to be recovered or simply disposed of in a fuel program.

Application:

- DTI's Field Crew applied approximately 175 gallons of *Cool-Ox*® reagent to each site

- DTI's *Hydro-Dart*™ Tooling mixed the soils and applied the reagent to penetrate the depth of contamination

Cool-Ox™



How Does it Work?

- ***Cool-Ox***® generates hydrogen peroxide from solid peroxygens that are injected into the soil or groundwater in an aqueous suspension.

- Once in place, the peroxygens react with the water to produce hydrogen peroxide.

- The low solubility of the peroxygens allows them to be distributed throughout the sub-surface prior to reaction and increases the probability of contact with the contaminant!

Results

What Happened?

- Saw good results after treatment but…
- A second release occurred on the site

Additional Sites

- Soil samples treated with *Cool-Ox*® from Natural Gas Production Facilities in Colorado.

- Please note the great reduction in the SAR levels!

Garfield County, CO

Sample #	Description	Reactor Time	pH	EC	SAR	Benzene	Toluene	TRPH
#1	PA 32-3 (Contaminated Soil							
		Day "0"	7.4	14160	76.6	68.5	154	58.7
		Day 28	7.5	35490	4.7	ND	ND	11.7
						100%	100%	80%
#2	PA 11-36 (EC Sludge)							
		Day "0"	9.2	11640	57.3	ND	ND	2,530
		Day 28	10.6	6000	5	ND	ND	804
								68.20%
#3	Suicide							
		Day "0"	8.8	3852	23.3	ND	ND	ND
		Day 28	8.3	13680	1.4	ND	ND	ND
#4	Suicide (Frac							
		Day "0"	8.9	48840	91.2	577	2,580	83,600
		Day 28	8.4	18930	6.7	ND	594	36,500
		% reduction				100%	77%	56.30%
#5	RPW 31-26 (Old Reserve Pit							
		Day "0"	8.5	10740	10.9	161	226	48,800
		Day 28	6.5	8550	2.2	ND	ND	121
						100%	100%	99.8%
#6	PA 22-25 (Frac							
		Day "0"	8.8	969	2.1	2,340	90,200	344
		Day 28	9.6	7920	0.8	ND	2,580	121
						100%	97.3%	64.8%

Garfield County, CO

Sample #	Description	Reactor Time	pH	EC	SAR	Benzene	Toluene	TRPH
#7	**Workover Waste (Piles of**							
		Day "0"	8.5	1290	**4**	ND	ND	796
		Day 28	12.1	8880	**0.6**	ND	ND	376
								52.8%
#8	**Frac Sand (10 -**							
		Day "0"	9	19140	**78**	ND	121	3,330
		Day 28	11.2	7620	**2.5**	ND	ND	1,580
							100%	**52.6%**
#9	**Condensate & Produced**							
		Day "0"	8.7	12840	**29.6**	ND	ND	158
		Day 28	9.5	6300	**9.5**	ND	ND	36
								77.2%
#10	**Cuttings 5200 [**							
		Day "0"	9.5	4272	**70.5**	96.8	84.2	199
		Day 28	10.3	4212	**4.2**	ND	ND	8.4
						100%	**100%**	**95.8%**
#11	**Evap Facility (Tank**							
		Day "0"	8.1	73020	**130.6**	87,000	4,330,000	227,000
		Day 28	8.2	35490	**9.3**	31,900	322,000	79,000
						63.3%	**92.6%**	**65.2%**

Contaminants & Sites

Contaminants

- Free Product (NAPL)
- BTEX
- Coal Tars
- Vinyl Chloride & DCE
- Chlorobenzenes
- PAHs
- Creosote
- Jet Fuel
- Gas Condensate
- Fuel Oil (GRO/DRO/TPH)
- Herbicides
- Pesticides
- Pentachlorophenol (PCP)
- Dioxins
- Chlorinated Solvents
- PCBs
- Ethylene dibromide (EDB)

Sites

- Service Stations
- Railroads
- Pipelines
- Agchem Formulators
- Mfg. Gas Plants (MGP)
- Wood Treating
- Military Bases
- Dry Cleaners
- Marine Bulk Terminals
- Slabs & Basements
- Sediments
- Mixed Plumes
- Refineries & Chem Plants
- Steel Mills

Field Application Techniques

- **DPT Injection**
- ***Hydro-Dart™***
- ***Grizzly™ Soil Blending***
- ***Twister™***
- ***Pit-Stop™* (over spray)**

Experience – The value of DTI Turn-Key Installations

The Cool-Ox® Process

(Producing Hydrogen Peroxide In-Situ)

$$CaO_2 + H_20 \rightarrow Ca(OH)_2 + H_2O_2$$

(Chelates Activate Intrinsic Catalysts)

$$H_2O_2 + Fe^{+2} \rightarrow (OH)^- + [OH]^\bullet + Fe^{+3}$$

$$H_2O_2 + Fe^{+3} \rightarrow (OH)^- + [OOH]^\bullet + Fe^{+2}$$

(Radicals React with Contaminants)

$$[OH]^\bullet \ \& \ [OOH]^\bullet + C_x \rightarrow C_x(OH)_y$$

(Reaction by-products are CO2 and Calcium Carbonate that is not distinguishable from natural Calcium (Limestone) thus, not traceable!)

The only totally Green and Sustainable Process!

Questions?

Thank You !

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for

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Remember Total Green

Cool-Ox™