
IRON CREEK
GROUP
Enhanced Thermal Conduction (ETC)
Thermal Remediation for the
Most Challenging Environments

Presentation Details

- Introductions;
- Company Overview;
- Thermal Conduction as a treatment process;
- Overview of ETC Technology;
- Benefits of Thermal Conduction;
- Thermal Conduction at RVAAP;
- Discussion.

Who Is Iron Creek

- Iron Creek Group Inc. is a Thermal Soil Remediation company based out of Bellingham, Washington & Calgary, Alberta, Canada;
- We deliver cost effective and proven thermal remedial technologies for environmental challenges across the globe;
- Our thermal technologies offer an alternative to not only traditional Thermal Desorption Units (TDU's) but conventional remediation techniques, as well;
- Our equipment is easy to transport, setup, and operate - making it a viable option for the most challenging locations, often where thermal treatment would never have been considered possible;
- Iron Creek is working in partnership with CH2M/JACOBS for the RVAAP remediation activities.

Thermal Conduction

- Thermal Conduction - The process of conductively heating soil/sediment/sludge matrices in order to desorb organic contaminants from the material;
- Iron Creek's Thermal Conduction processes are ex-situ and batch based;
- As the impacted soil is heated, organic contaminants (eg: hydrocarbons, PAH's, etc.) are shifted from solids or liquids into gas phase;
- Desorbed organic compounds are evacuated from the ETC system and are either thermally destructed through an off gas afterburner system or cooled & condensed for product recovery;
- Following thermal treatment and confirmation sampling that proves treatment goals have been met, the clean soil material can be utilized to backfill the original excavation area.

Enhanced Thermal Conduction (ETC)

- Impacted soils are excavated and treated ex-situ, in enclosed treatment cells;
- ETC is a batch process and soil remains static during the treatment cycle;
- Treatment cells hold approximately 525 cubic yards of soil;
- Multi fuel burners are utilized to heat the treatment cells via conduction (propane will be used as ETC fuel for the upcoming RVAAP project);
- There is no requirement for soil pre-treatment or screening of rocks, soil lumps and debris prior to placement in the system.

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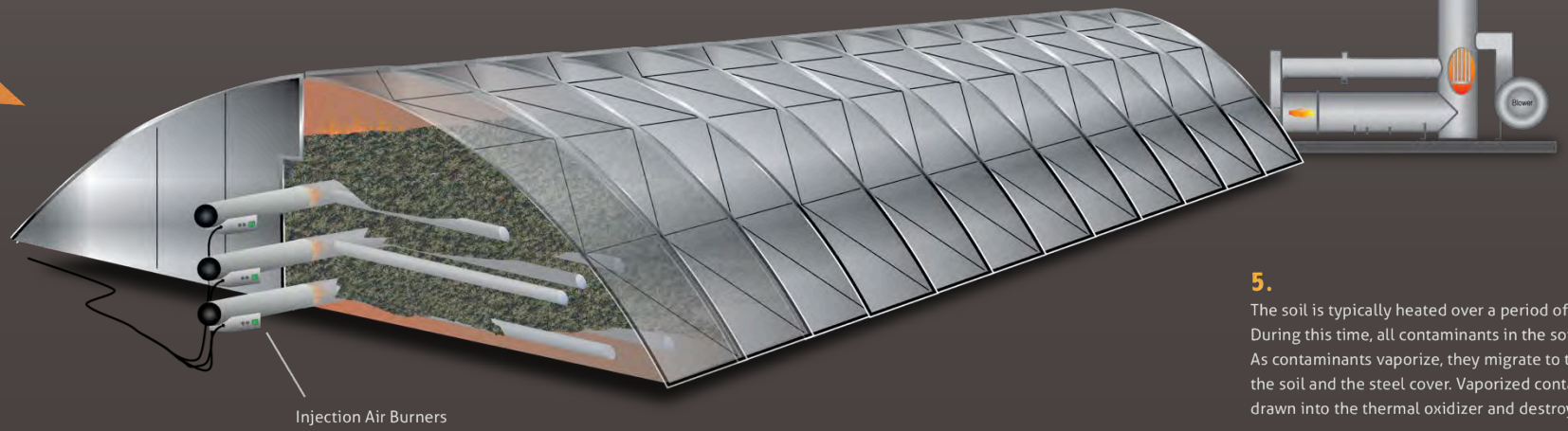
1.
Contaminated soil is placed into a three layered soil cell. Each layer contains steel pipes which are attached to larger manifolds running the length of the treatment cell.

2.
Multi-fuel burners attached to the manifolds generate the heated injection air.

3.
A stainless steel Quonset Hut is assembled over the entire soil cell to prevent the escape of air during the soil treatment process.

4.
Heat is transferred from the pipes to the soil via conduction and the soil is heated to temperatures between 260 and 425 degrees C.



Thermal Oxidizer

5.
The soil is typically heated over a period of 4 to 12 days. During this time, all contaminants in the soil will vaporize. As contaminants vaporize, they migrate to the space between the soil and the steel cover. Vaporized contaminants are drawn into the thermal oxidizer and destroyed.

SIDE VIEW OF BURNERS ATTACHED TO CELL

FRONT VIEW OF ASSEMBLED SOIL CELL

MULTI-FUEL BURNERS

THERMAL OXIDIZER

MULTIPLE CELLS RUNNING

800 CUBIC METER CELL

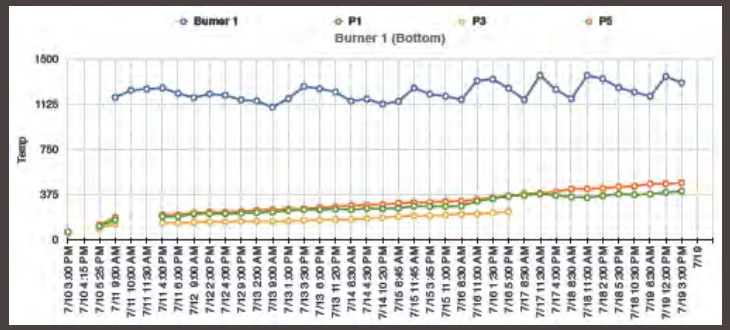
All Season Operations

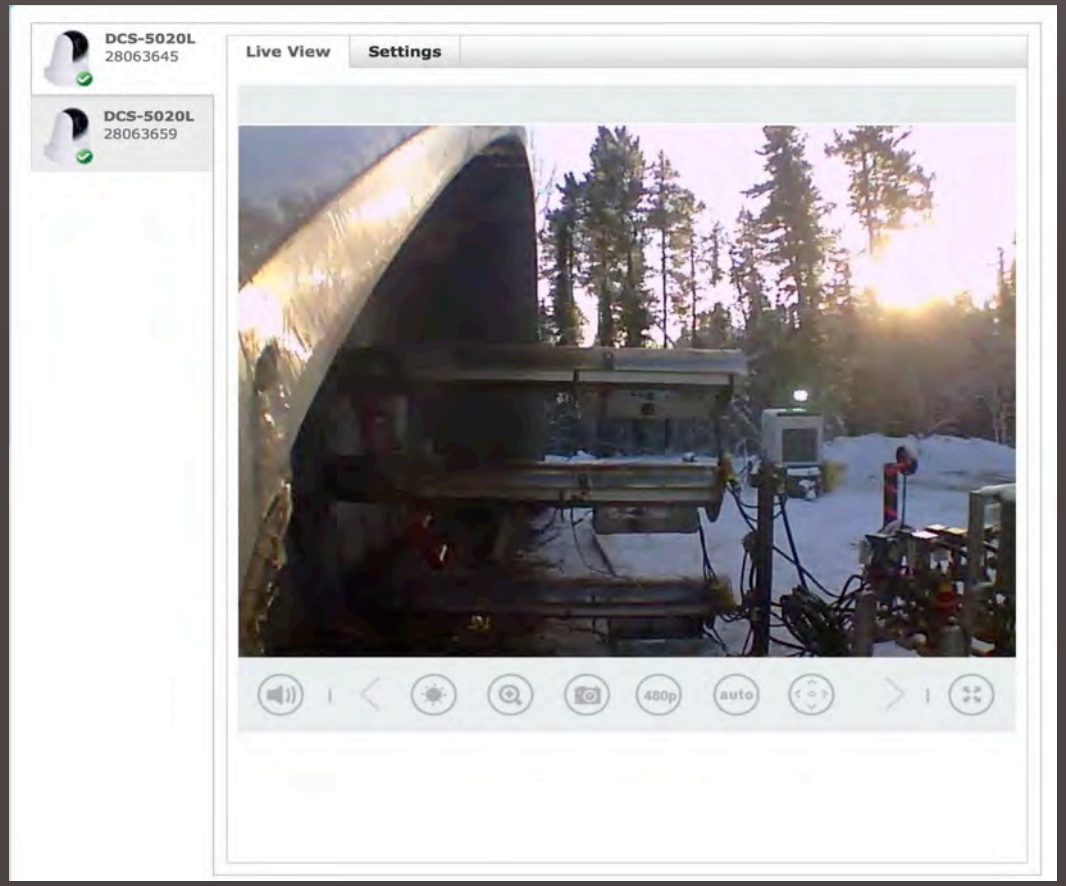
Rain or shine, Iron Creek's Thermal Conduction Technology is capable of operating year round in the most extreme climates. It has been used throughout the winter in the Yukon Territory, Western Canada & Alaska in temperatures as low as minus 40 ° Fahrenheit and has also been deployed in the extreme heat of the Australian summer.

Treatment Monitoring

Remote temperature and video monitoring provides sufficient data to ensure that treatment goals are being achieved – around the clock.

Monitoring of real time data allows for "on the fly" process adjustments and confirms that temperature targets are met. Remote monitoring also provides an added level of job-site security.





Emissions

Off-gases produced by the treated material are collected and processed in an after burner system. A quench unit can also be added to cool and condense the off-gases in situations where product recovery is preferred.

Post Treatment

The photo on the right shows the visible change in the soil once treated. The dark hydrocarbon staining in the soil is eliminated, leaving clean, odourless soil.

Since the Thermal Conduction process is "static" it does not pulverize the soil like other thermal treatments, the soil maintains its structure while the heat penetrates evenly throughout the thickest clays.

Backfill

Once treatment of contaminated soil through the ETC process is complete, the treated soils are sampled and analyzed at an environmental laboratory to ensure Contaminants of Concern have met the required treatment targets. Following receipt of the confirmatory analysis the clean, treated soil can be backfilled into the excavation areas immediately following treatment.

Reclamation

Soil treated via thermal conduction is not hydrophobic and will accept rehydration. As soil is rehydrated, enzymes follow, and nutrients become available for plant growth.

On projects where soil treated by thermal conduction has been utilized for cover, grass, shrubs, and other vegetation have successfully been re-established.

Treated soil can also be enhanced with amendments to enhance the revegetation process.

* The photo on the right shows an example of a government site where soil treated with ETC has been used as "cover" on cells containing ash from a municipal waste incinerator.

Remote Deployment

Iron Creek's Thermal Conduction Technology is equally suited in remote environments as it is in urban settings. Our technology has been deployed to some of the most remote locations in the world ranging from remote Alaskan Islands to Antarctica – and everywhere in between.

By Land, Sea or Air - Our technologies are able to be modified to fit the mobilization requirements for transport via truck, ship, barge or even on aircraft as small as a deHavilland Twin Otter.

Mobilization

Benefits of Enhanced Thermal Conduction (ETC)

- Cost effective thermal remediation;
- Effective with persistent and difficult to treat waste matrices;
- Logistics simplicity & flexibility of operational deployment;
- Scalability;
- Zero reject, no matter the treatment material soil type or moisture content;
- Significantly reduced safety exposure (no rotating equipment – screeners, drums, conveyors, etc.);
- Quiet operations;
- Removes contingent liability and eliminates the need for trucking, landfilling, etc.;
- Guaranteed treatment timelines & treatment outcomes;
- All weather capability.

ETC at the Former Ravenna Army Ammunition Plant

- Upcoming remedial work at the RVAAP facility using the ETC process will focus on remediating residual soil impacts located in Load Lines 1-4 and 12;
- Contaminants of Concern in the soil that will be thermally treated include polycyclic aromatic hydrocarbons (PAH's), polychlorinated biphenyls (PCBs) and explosives (TNT & RDX);
- Excavation of impacted soils will be conducted at 24 separate locations throughout Load Lines 1-4 and 12;
- An estimated 5,703 cubic yards of impacted soil will be thermally treated as part of the remediation;
- Approximately 132 cubic yards of Antimony and Lead impacted soil will be excavated from four separate locations and disposed of at an approved, off site facility;
- 997 cubic yards of abandoned concrete walkways will be demolished and disposed of offsite;
- Work will be completed in partnership with CH2M/JACOBS and is scheduled to commence in Fall 2020 with treatment operations taking approximately 10-12 weeks.

RVAAP Overview Map

Discussion

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