

Sundine Enterprises Strategic Partner
Foremost Environmental Solutions



Office: 303.985.0609
Cell: 720.363.0548
www.foremostsolutions.com
isolite@ix.netcom.com



BioLuxingCase Studies

Biological Reactive BioNets Enhanced Bioaugmentation and Biostimulation

Retail Gasoline Station, Lakewood, CO

System Type:

Installed with teaming partner FRx

Location:

Retail Gasoline Facility, Lakewood, CO

Client:

Peerless Tire Company, Denver, CO

Project Description:

In August of 1997 and in cooperation with Terracon Environmental, FES designed and installed a Colorado State Oil Inspection Section approved Corrective Action Plan at an operating gasoline retail station in Lakewood, Colorado. In FES's first commercial BioLuxing™ project, seven BioNets™ with 31 total BioLuxes™ were installed 20 feet below grade to bioremediate BTEX and TPH compounds in the clay soils and groundwater.

The enhanced in situ X-PeRT™ (Permeable Reactive Treatment System) was installed in 12 days with hydraulic fracturing methods. Isolite®CG was pre-inoculated with indigenous aerobic microbes that were tested, colonized and then pumped into three of the BioNets™ which included 13 BioLuxes. Three other BioNets™ with 13 BioLuxes were established with Isolite® Isolite®CG saturated with nutrients and selected microbes known to remediate BTEX from a commercial supplier. The application at these six BioNets™ is called bioaugmentation. The seventh BioNet™ with five BioLuxes™ received only Isolite®CG and nutrients in order to test and prove that inoculation of microbes was not necessary and just the Isolite®CG and nutrients were adequate for biostimulation.

After 6 weeks, core samples were taken from each of the BioNets™ to check the conditions and activity of the microbes—a stress test. All of the pre-inoculated BioLuxes™ had large and active populations of the added microbes and bioremediation was working well. The BioLuxes™ with only Isolite®CG and nutrients had already attracted and naturally been inoculated to about 50% levels by indigenous microbes. Signs of bioremediation were present. With periodic injections of nutrients and air to all BioNets™, the site was being bioremediated.

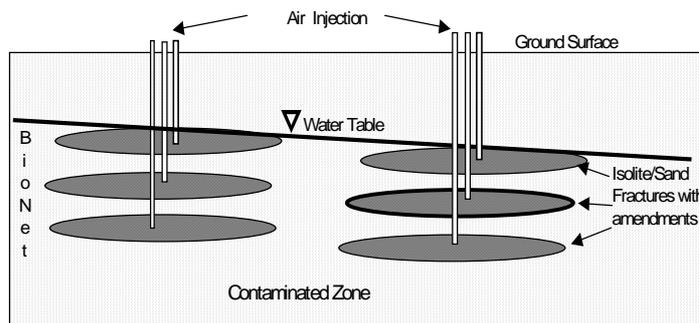
At the time FES turned the project back to the contractor for further O & M and monitoring, concentrations of BTEX and TPH had been reduced in groundwater by up to 94 percent with the greatest results coming from the BioNet™ area that had been fully biostimulated. Prior estimates to clean up the site using traditional methods ranged from the lowest bid being 2.1 times more than the BioNet™ cost, and the highest bid being 12.1 times more. New homes have been built on the lot immediately down-gradient of the site.

The fracturing/injection wells were pre-drilled and pipes were set at selected depths prior to the arrival of the fracturing unit and the three-man installation team. The drilling and installation of the injection wells were the most disruptive part of BioLuxing. The compounds used in the treatment slurry, inoculation tanks and the fracturing equipment were set up outside traffic areas to reduce noise and disruption for customers and employees. The service station remained in operation as only half of an island at a time ever had to be closed. Minimal waste was generated and was treated on-site. Thirty-one fractures (BioLuxes™) were installed around the south and west boundaries to ensure the BTEX contamination did not leave the property. Only surface-mounted well caps remained in sight and provided continuous access to the treatment system for the addition of nutrients and/or oxygen. The system was successfully installed for one-fourth the cost of the next lowest estimate and one-thirteenth of the highest of 11 estimates for traditional cleanup methods. Another bonus—the operator of the station reported that he received record-high daily sales while the installation was in progress.

**Foremost Environmental Solutions’
Hydraulic Fracturing Unit**



Bioremediation process Using Isolite® CG and SOS



US Patent #5,733,067 is a multi-purpose system for in situ remediation that we call The "X-PerT System." This patent can utilize permeable biologically and/or chemically reactive treatment sheets to destroy various contaminants. The X factor refers to all the variables at a specific site that they need to be accounted for and identified.