

Company Overview

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Company Overview

Company Information

Renovogen is a bioremediation services and consulting company focused on the development and application of unique bioremediation methods to eliminate hazardous environmental pollutants from contaminated soils and groundwater. Our goal is to provide bioremediation solutions that lead to rapid, low cost site cleanup and closure with minimal impact on the surrounding environment. Our product is a unique process which is used to enhance indigenous microbial populations and produce robust and aggressive remedial responses to a wide range of hazardous organic materials. We maintain high quality standards and guarantee all of our services.

Renovogen began operations in 1996 as a private environmental consulting and R&D firm in Sacramento, California. Our proprietary bioremediation methods have been developed and refined in the lab and in the field over the past decade. These methods are in a state of perpetual evolution as we continually look for more efficient and effective ways to remediate soil and groundwater using naturally occurring organisms in combination with the latest available technologies. We have had success with a wide range of contaminants and are currently developing new methods to adapt our process for the bioremediation of pesticides and other persistent chlorinated organic pollutants. We are currently located in Rancho Cordova, California, USA and also maintain offices in Brazil.

Our Philosophy

Our approach to bioremediation is to remove environmentally hazardous substances while maintaining the ecological integrity of the site and surrounding areas. Each contaminated site is home to a unique environment that includes indigenous microbial populations and regional vegetation. Over time, these organisms have evolved and adapted to the local conditions, and each organism occupies a particular niche in the local environment. This local environment can be defined by such variables as: regional weather patterns, soil chemistry, geology, predation conditions, nutrient availability and, most importantly, the interaction and symbioses between all of the species that co-inhabit a defined ecological region. It is our philosophy that this

unique, regional and site-specific set of conditions should be used as a guide when designing bioremediation processes and procedures. We believe that pre-made powders and liquids containing generic strains of bacteria, or genetically modified microbes grown en-masse from unknown sources, while sometimes effective, introduce two important and interrelated problems.

The first potential problem which may arise when us-

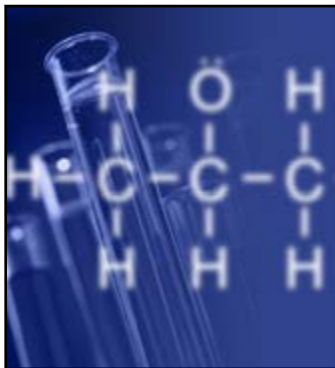


ing a foreign, non-indigenous microorganism concerns survival and ability to propagate and thrive. By introducing a microorganism into a foreign environment where the local environmental conditions differ from those under which that microorganism developed and was isolated from, the odds of that microorganism surviving through a normal life-cycle may be decreased. Specifically, the strategy of introducing a microorganism into an unfamiliar environment can suffer from the following negative factors: (1) An increase in the odds of the foreign microorganism falling prey to unfamiliar predators against which it has not had sufficient time to evolve effective defense mechanisms; (2) The foreign microorganism's reduced ability to compete with indigenous microbes for nutrients; (3) Lack of the symbioses that occurs between the indigenous populations of microbes and also between these microbes and the native vegetation; (4) failure to take into account the regional and site-specific soil conditions, and the effect they will have on a microorganism that has not evolved under and adapted to such conditions.

The second possible problem that can arise from the introduction of foreign microorganisms into an ecosystem is the disruption of the local microenvironment and the delicate symbiotic balance that exists in and around a site. Introduction of non-indigenous species, in contrast to the four potential scenarios noted above, may create a situation where the introduced species is

able to out-compete all other species in that area for nutrients due to a physical advantage, lack of natural predators, superior genetics, etc. This would open the possibility for dramatic changes in the equilibrium of the local microenvironment and could cause deleterious perturbations of the overall ecological system which could possibly propagate throughout the food chain in that area. Further damage could be done to the local environment by the introduction of nutrient supplements that might be required by the foreign microorganism, but which might vastly differ from the natural composition of the indigenous soils, causing nutrient and chemical imbalances to the site and surrounding regions.

Overall, we believe that introducing foreign microorganisms into unfamiliar habitats is tantamount to ignoring the unique characteristics of the ecological system that exists in the area to be treated, and is a failure to acknowledge the idea of bioremediation as a natural system that should work in concert with, and take advantage of, the factors that are natural to the treatment site and surrounding areas. For this reason, Renovogen has developed a system of identifying and conditioning microbes that originate from each specific site, and our custom nutrient blends are based on indigenous soil conditions, and cater to native microbial preferences. This method allows us to reduce the possibility of causing further damage to the environment and ecosystem, while giving the microbes the highest possible chance of survival and success.



Experience

Renovogen has been involved in bioremediation since 1996. Our process has proven to be effective, both ex-situ and in-situ, on a wide range of organic pollutants including:

- **Crude Oil**
- **Diesel**
- **Gasoline**
- **JP-5/JP-8 (Avcat, NATO F-44)**
- **Creosote**
- **BTEX**
- **Asphalt Waste**

Our service has been successfully employed in both soil and groundwater, and under a variety of environmental conditions. We have provided our products and services to national and international clients such as:

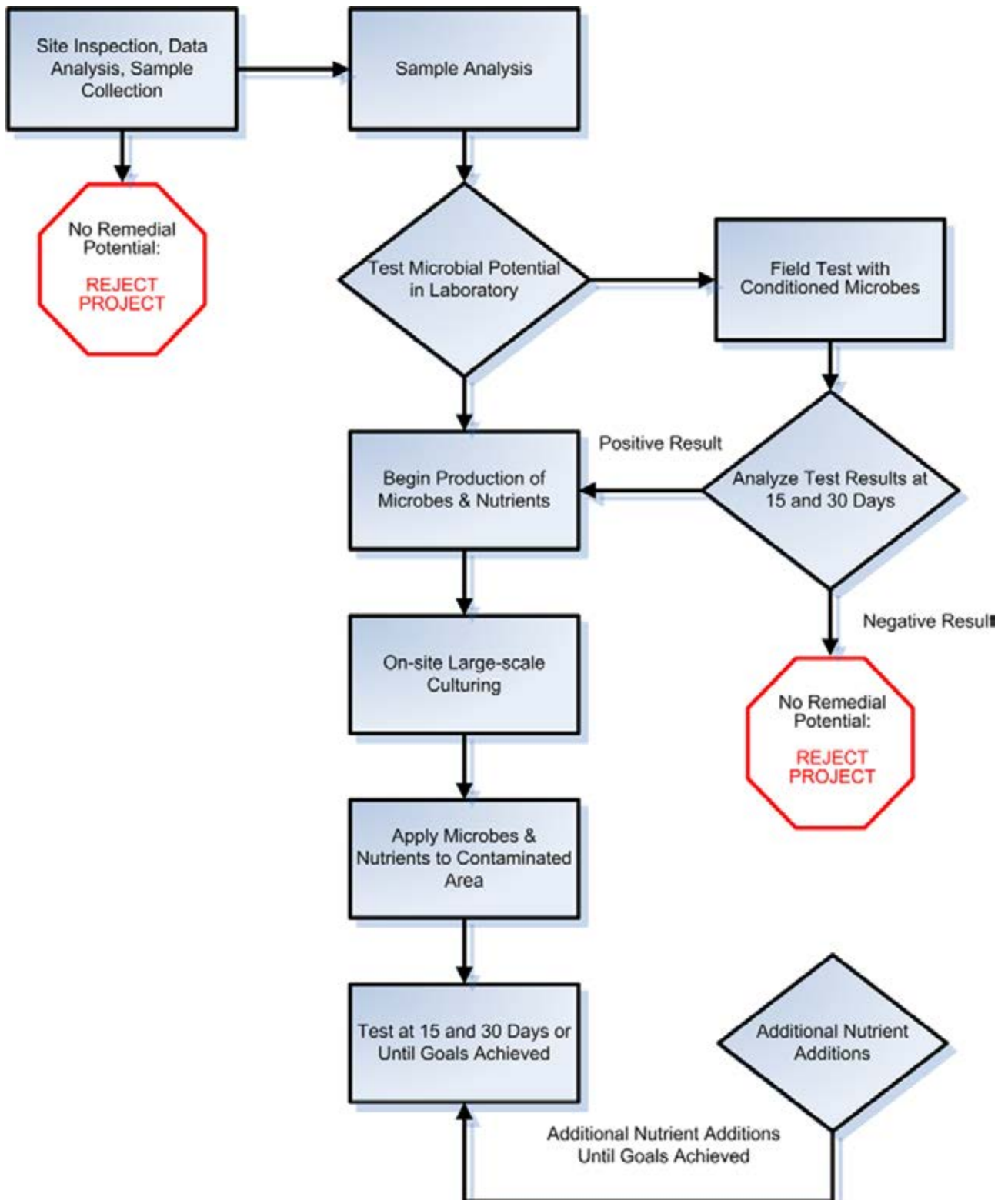
- **Tichert, Inc.**
- **American River Aggregates**
- **U.S. Navy**
- **Tetra Tech Inc.**
- **Baldwin Contracting Company, Inc.**
- **ASRC**
- **City of Redding, California**
- **Valley Farms Trucking**
- **Ramos Oil Company, Inc.**
- **IT Corporation**

Our products and process have been used to meet cleanup goals and quality standards set by the California State Environmental Protection Agency and other state regulatory agencies, demonstrating that our products and process has satisfied some of the most rigorous environmental standards in the USA.

Process & Services

Process Overview

The figure below outlines the steps followed in a typical project using our process. Oversight and consultation can be provided during site preparation and throughout the application of our conditioned microbial cultures and nutrient supplements. Renovogen continues oversight of microbial activity until your cleanup goals are achieved.



Microbial Selection & Conditioning

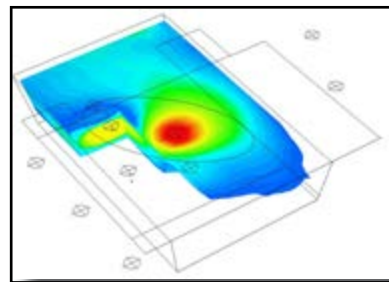
At the core of our service is the creation of customized microbial consortia. These microbial populations are generated in our laboratory using a proprietary identification, conditioning and culturing system. This unique system allows us to select, enhance and enrich those indigenous bacteria and fungi that have developed the ability to rapidly metabolize and degrade the target pollutant.

Advantages

- **Renovogen uses various bioremediation assays designed to evaluate a site's potential for an effective bioremediation program. These tests are performed prior to any bioremediation activity to help us design the most effective remedial plan possible and to ensure the success of the project.**
- **Our identification system specifically isolates indigenous microbes that possess the capability to degrade the target pollutants - making our process adaptable to nearly all organic contaminants.**
- **The use of acclimated, non-pathogenic microbes helps to ensure a stable and viable microbial population throughout the remediation process, thus increasing degradation rates and decreasing project time and costs.**
- **By using microbial populations indigenous to the area, no foreign pathogens are introduced during the remedial process, minimizing the risk of further upsetting the natural ecological balance of the site and surrounding areas.**
- **Our microbial selection process facilitates the development of unique nutrient supplements that create optimum growth conditions for the microbial populations selected. Each nutrient supplement is specific to its respective project and consists of natural, environmentally safe components.**

Site Modeling

Along with microbial identification and enhancement, Renovogen also performs computer-assisted analyses and assessments of each site. Mathematical modeling is used to analyze each site in order to provide the most accurate representation of the extent of contamination. This helps identify the most probable treatment areas - maximizing project efficiency and lowering costs.



Advantages

- **Modeling helps both the client and our technicians understand the site and extent of contamination.**
- **Modeling can aid in identifying the most probable treatment zones, and maximizes distribution of microbial and nutrient solutions.**
- **The use of contaminant zone modeling reduces the amount of microbe and nutrient volume required by helping our technicians apply treatment only where needed. This lowers costs and leads to a more efficient and effective treatment.**

Application & Maintenance

Following the selection and modeling process, the final phase of each project is the large-scale enrichment and application of the unique microbial consortia and nutrient supplement. The final enrichment phase is carried out on-site and when complete, the microbial solution and nutrient are applied to the contaminated area. The final enrichment and application are performed and supervised by trained Renovogen technicians and staff. We offer flexible terms in situations where it is beneficial to use local labor, and always encourage any avenue which helps our customers reduce cost.

Advantages

- **Renovogen's application method is simple, highly scalable, requires minimal infrastructure, and can be used to treat nearly any volume of contaminated material in a short period of time.**
- **Our application procedure and remedial process is highly flexible and can adapt to a wide variety of conditions found in the field.**
- **All phases of bioremediation are coordinated and supervised by Renovogen staff until completion of project.**
- **Our technicians are always available to immediately troubleshoot and solve any problems on site.**
- **Renovogen offers flexible terms and will work with customers to find ways of reducing costs using local labor and businesses.**
- **Renovogen offers a 100% guarantee.**

Project Consolidation & Management

Renovogen can provide, as an option, a full range of analytical and physical soil testing services through certified independent testing laboratories, as well as site preparation and excavation via affiliated contractors. This consolidates all aspects of a project and eliminates the need for any additional subcontracting.

- **Design and coordination of soil sample collection and analysis by trained staff from independent soil testing laboratories.**
- **Site preparation, excavation, and management of all other associated job site activities.**
- **Coordination of all remedial activities with Federal, State and Local agencies.**
- **Underground and above ground fuel storage tank removal and replacement, as well as any additional hazardous site work via licensed, affiliated contractors.**



Past Projects

The following list is a sample of projects where our products and process have been successfully applied. If additional information is desired for any of these projects, please contact our sales department and we will be happy to answer your questions.

Project: Teichert & Sons Kiefer Road Facility
 Client: Tichert Construction
 Contaminants: Gasoline/Diesel
 Initial Levels: $\leq 3,000$ mg/kg
 ≤ 3300 mg/kg
 Final Levels: ≤ 50 mg/kg
 Method: ex-situ, Soil
 Duration: 60 days

Project: American River Asphalt Plant
 Client: ARA / Ramos Oil
 Contaminants: Diesel, Oil
 Initial Levels: Diesel $\leq 3,300$ mg/kg
 Oil $\leq 2,100$ mg/kg
 Final Levels: ≤ 50 mg/kg
 Method: in-situ, Soil & water
 Duration: 60 days

Project: Redding Area Bus Landfill
 Client: City of Redding, CA
 Contaminants: Diesel, Oil
 Initial Levels: Diesel $\leq 1,300$ mg/kg
 Oil $\leq 2,800$ mg/kg
 Final Levels: ≤ 19 mg/kg
 Method: in-situ, Soil
 Duration: 60 days

Project: ARA, Reject Dust
 Client: ARA / Ramos Oil
 Contaminants: Diesel, Oil
 Initial Levels: Diesel ≤ 250 mg/kg,
 Oil ≤ 125 mg/kg
 Final Levels: ≤ 50 mg/kg
 Method: ex-situ
 Duration: 30 days

Project: Lemoore Naval Air Station
 Client: United States Navy / IT Corp.
 Contaminants: JP-5 Jet Fuel
 Initial Levels: $\leq 15,000$ mg/kg
 Final Levels: ≤ 100 mg/kg
 Method: ex-situ, Soil
 Duration: 90 days

Project: Montana Pole Facility - Test
 Client: ASRC
 Contaminants: Creosote
 Initial Levels: $\sim 11,600$ mg/kg
 Final Levels: ~ 950 mg/kg
 Method: ex-situ, Soil
 Duration: 60 days

Project: Doyle Asphalt Plant
 Client: Baldwin Construction
 Contaminants: Diesel
 Initial Levels: $\leq 26,000$ mg/kg
 Final Levels: ≤ 22 mg/kg
 Method: ex-situ, Soil
 Duration: 60 days

Project: Ecuador Crude Oil – Test
 Client: Petroecuador / Tetra Tech Inc.
 Contaminants: Crude Oil
 Initial Levels: $\sim 15,000$ mg/kg
 Final Levels: ~ 800 mg/kg
 Method: ex-situ, Soil
 Duration: 21 days

Project: California Rock and Asphalt
 Client: American River Aggregates
 Contaminants: Diesel
 Initial Levels: $\leq 11,100$ mg/kg
 Final Levels: < 50 mg/kg
 Method: ex-situ, Soil
 Duration: 60 days

Project: Doyle Quarry - Gregg Property
 Client: Baldwin Construction / Alexis
 Contaminants: Diesel
 Initial Levels: $\leq 12,000$ mg/kg
 Final Levels: ≤ 100 mg/kg
 Method: ex-situ, Soil
 Duration: 90 days

Project: Tiger Lines Trucking Facility
 Client: Stanger & Associates /
 Contaminants: Diesel
 Initial Levels: ≤ 1.960 mg/kg
 Final Levels: < 50 mg/kg
 Method: ex-situ, Soil
 Duration: 79 days