

# THE NRG REPORT

## MODIFIED FENTON'S REAGENT REMEDIATION



Norfolk Ram Group, LLC ("NRG") has been utilizing *hydrogen peroxide with a catalyst, under acidic conditions (also known as modified Fenton's reagent)*, as a treatment for dealing with *localized petroleum and halogenated volatile organic compound ("VOC") problems* for over ten years. With over 100 successfully completed projects under their belts, NRG is the leader in hydrogen peroxide remediation in New England and was the first to employ this innovative treatment technology.



Even though Fenton's remediation has been deemed *useful and cost-effective*, some DEP officials are disapproving Release Abatement Measure ("RAM") Plans where this technique is being suggested and utilized. And, the disapproval comes with good reason.

Although a particularly effective solution to remediating problems involving contaminated soils located under foundations or infrastructures, where traditional *excavate and haul* approaches are either infeasible or not cost-effective, hydrogen peroxide remediation is an extremely dangerous remedial alternative if not understood and executed properly. Some of the results of hydrogen peroxide misuse are:

- fire;
- explosion;
- structural damage; and
- personal injury (*i.e.*, chemical burns).

Below are four important facets to understanding when utilizing hydrogen peroxide as a remedial alternative.

**1. UNDERSTAND ITS CHEMISTRY:** It is extremely important for those using Fenton's reagent to understand its complexity. By using Fenton's, you are *mixing incompatible chemicals, which will result in a highly exothermic oxidation-reduction reaction*. This type of reaction is *first order in nature, in that the rate of the reaction is dependent upon the concentration of the oxidant*. Catalysts are added to increase the speed of the reaction, but they do not themselves actually initiate the reaction. Although many different catalysts are available, the most commonly used catalysts are iron compounds.

**2. CONTROLLING THE REACTION:** One of the major areas of concern for regional DEP offices concerning RAM Plans revolves around the concept of how the reaction will be controlled. In order to

effectively address this concern, you need to know the number of pounds of the reagent involved in the reaction. From these numbers, basic chemistry can be used to calculate the specific quantities needed in order to allow for the reaction to proceed. An excess of Fenton's is necessary in order for the reaction to *take off*. Disastrous events can occur when Fenton's reagent is added to free product.

*If you know how many pounds of contaminant you have, and calculate how much Fenton's reagent you need, the reaction can be controlled in the field by adding the material at a controlled rate, slightly in excess of stoichiometric requirements.* You can also control the reaction by adjusting the pH, since *the more highly reactive hydroxyl radicals occur at low pH's*. It is important to understand that once the chemical kinetics take hold, the reaction cannot be stopped.

**3. VENTILATION & PRESSURE CONTROLS:** *When the Fenton's reagent reacts, soil and/or groundwater temperatures will reach the boiling point of water and liberate copious amounts of steam and carbon dioxide.* Combined with the pressure buildup from the exothermic nature of the reaction, cracks may develop in concrete slabs if vents or relief wells are not properly utilized to lower soil and/or groundwater temperatures, and to reduce the pressure levels. The steam needs to be vented to the outside of the dwelling, and nearby residents should be notified of these events. Temperatures within the treatment zone should be monitored with stainless steel, probe type thermometers.

**4. HEALTH & SAFETY ISSUES:** It is imperative that the proper types of personal protective gear be worn when you are involved with Fenton's. The emitted vapors contain hydrogen peroxide and hydroxyl radicals that when inhaled will oxidize your lungs. As a powerful oxidizer, the reagent also has the ability to oxidize you and your skin, and lighten your hair if you perform many of these projects. If you are using a 50% or stronger material, the outcome can be much more severe. Burns with fatal results can occur. OSHA/NIOSH protocol calls for using supplied air when involved with a material of this strength. A proper health and safety plan, as well as clear directions to the nearest hospital are important items to have on hand when working on any Fenton's reagent project.

If you would like to know more about the details surrounding hydrogen peroxide remediation, please contact NRG's Brian Moran at (508) 429-2368, extension 12.



We're on the Web!  
[www.norfolkram.com](http://www.norfolkram.com)



## NORFOLK RAM GROUP MERGER

Effective November 1, 2001 Norfolk Environmental ("Norfolk") of Raynham, Massachusetts, and RAM Environmental, LLC ("RAM") of Plymouth, Massachusetts merged to create Norfolk Ram Group ("NRG"). Two local environmental engineering firms, NRG joined the expertises of Norfolk and RAM to create a *greater, more efficient entity*.

Headquartered in Plymouth, Massachusetts, with a corporate office located in Holliston, Massachusetts, NRG has a target market, which extends from metro Boston, to metro Worcester, to the South Shore and Cape Cod. Currently, NRG has a staff of 35 employees, consisting of civil and chemical engineers, geologists, hydrogeologists, and environmental scientists and managers.

As an engineering, consulting and project management firm, NRG specializes in comprehensive environmental management for industrial and real estate clients, municipalities and governmental agencies, as well as the military. The company's capabilities include regulatory compliance (including waste minimization), environmental permitting, environmental due diligence, site assessments, site remediation design, construction, development and redevelopment, the design of treatment facilities for wastewater, stormwater, solid waste, and hazardous waste, and hydrogen peroxide remediation.

NRG's primary goal is to solve a client's problems in an effective technical way, on time and within budget. NRG commits itself to being a responsive firm, which strives to keep its clients informed of the progress and direction that a project is taking. By maintaining a pro-active approach to federal, state and municipal regulators, NRG can achieve and maintain regulatory compliance and cost control for its clients.

With an attitude centered around controlled growth and client and employee gratification, NRG is looking to continue developing existing practice areas including, site assessment and remediation, forensics and brownfields work, environmental permitting, 21J management, air and wastewater treatment controls, civil/site development, municipal and industrial consulting, watershed and stormwater management, and TURA/waste minimization over the next five years. Beyond that, NRG is considering expansion into new business arenas, such as design build and construction management, GIS/infrastructure management, management consulting, WWTP operation and maintenance services, and increased utility services for power, gas and cable companies.

If you would like to learn more about the merger between Norfolk and RAM, or would like to speak with someone about the services that NRG provides, please call (508) 429-2368, or visit us on-line at [www.norfolkram.com](http://www.norfolkram.com).



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Norfolk Ram Group is a full-service environmental and civil engineering consulting firm specializing in environmental compliance, permitting, assessment, design/build remediation, and civil engineering.

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