HIGH-VACUUM REMEDIATION

Since 1998 Fruits and Associates, Inc. (FRUITS) has been a leader in providing mobile remediation technology for environmental remediation projects across the southeast. Utilizing our High-Vacuum Remediation (HVR) service developed solely for performing Mobile Enhanced Multi-Phase Extraction (MEME) events, FRUITS can provide a customized HVR event to address site-specific conditions. Our equipment is 100% mobile and is designed to provide a turn-key service at each and every site. At FRUITS safety is our number one goal, therefore all of our HVR units are constructed with redundant fail-safe controls and our technicians are OSHA certified and trained to make safety our first concern. Below is a general outline of our equipment:

- Units were designed utilizing NEMA 7 (explosion proof) guidelines and the entire process is monitored and controlled by an onboard Telemetry Computer. This means that during the initial 8-hour event, if all operating conditions are within the established guidelines, the system can continue to operate in unattended mode for up to an additional 16 hours. If conditions change during this period, the system will safely shut down, and notify the technician.

- All process controls include fail safe switches with redundancy switches installed at critical operating points.

- The extraction process is performed using a 30 horsepower - variable speed - rotary lobe compressor, which is capable of 25" of mercury.

- Up to six extraction wells can be connected simultaneously providing individual extraction well flow rates.

- The off-gas destruction is accomplished in our 7 million BTU/hr Thermal Oxidizer (THOX) unit which provides a hydrocarbon destruction rate of approximately 50-75 gallons per hour. All MEME events, even if not required, include off-gas destruction of the extracted vapors at no additional cost to our clients.

- Each HVR Unit has the ability to extract and store 3,000+ gallons of impacted groundwater for disposal, and FRUITS has tanker trucks available to store an additional 5,500 gallons each, if needed.

- Each Unit is equipped with specialty, in-house designed site safety equipment. From the high visibility traffic/safety cones, to the low profile system ramps which allows traffic to cross over unimpeded.

We are extremely proud to say that all of our equipment has been 100% designed and constructed in-house, from the trailers the equipment is placed on to the last electrical circuit installed in the control panel. We have a staff of highly experienced technicians that can address any issues that may arise in the field and an in-house staff that can mobilize to a site to handle any major equipment malfunctions, if they occur (which is very rare), so our clients projects can keep moving forward.

Here at FRUITS our top goal is Quality Service and 100% Client Satisfaction. We have committed to our clients success by providing reliable quality service that focuses on environmental protection and preserving the health and safety of our employees, our clients, and the public.

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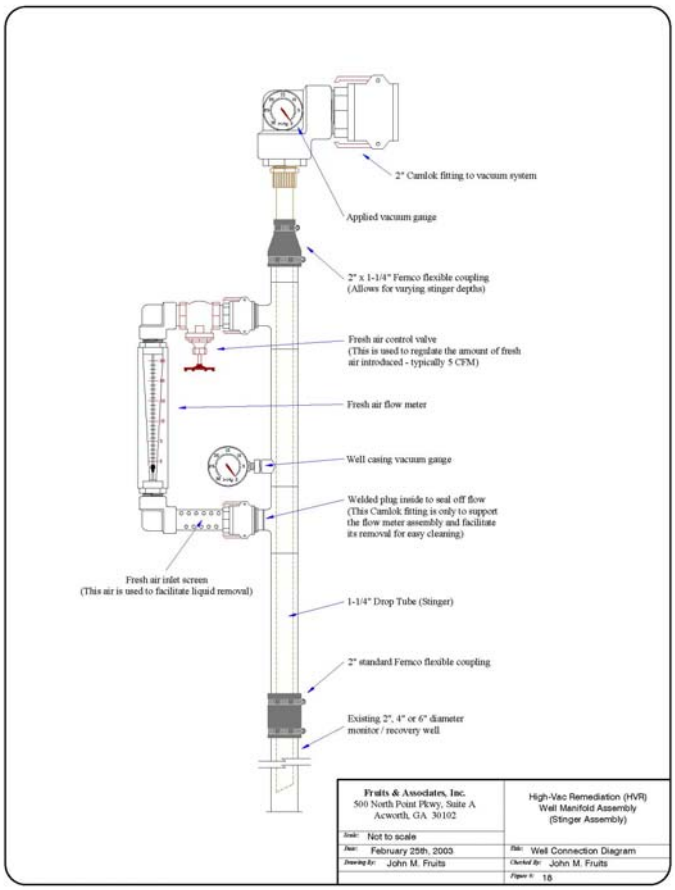
Technology

A MEME event involves the extraction of subsurface vapors and liquids from a monitoring well or recovery well in order to remove the phase separated hydrocarbons (PSH) associated with a product release. This is accomplished by applying high levels of vacuum pressure and flow to the extraction point. To eliminate mounding of the water table, a drop tube (commonly known as a stinger) is initially inserted in the well at the static water level depth. The applied vacuum and airflow extracted from the well is pulled through this drop tube. As the water table attempts to mound due to the application of vacuum, the liquids are "slurped" through this drop tube along with the air flow. This slurping effectively maintains the static conditions of the water table while the elevated vacuum is applied to the well during the event. In order to minimize any changes to the smear zone associated with the seasonal fluctuation of the water table, the drop tube is lowered to the maximum historical water level demonstrated for this extraction point. This drawdown, (one to five feet) below the static water level, depresses the water level in the well and creates a cone of influence. This influence maximizes the available well screen exposed to the vadose zone and allows any PSH to flow back to the extraction well(s).



In order to maximize fluid recovery from the extraction point, small amounts of fresh air is introduced at the well surface. This additional fresh air is measured with an airflow gauge mounted to the inlet valve at the well head and is later deducted from the total flow associated with the extraction process from the well, resulting in an accurate flow rate derived from the vadose zone. Additionally, two vacuum gauges are installed; one on the stinger assembly and one on the well casing to determine the amount of applied vacuum. This type of stinger assembly and piping configuration allows for data to be collected at each individual well head in addition to the overall site data collected at the HVR unit, which can ultimately be used as pilot testing data to determine site/well specific flow rates across the site. The well head stinger assembly setup and piping configuration is shown in Figure #1.

During the extraction process, the combined air and liquids are transferred to the HVR mobile treatment system. The liquids are separated from the airflow with a liquid scrubber/ knock-out system and discharged into an internal storage tank for later disposal. The hydrocarbon vapors are transferred to the off-gas treatment system and are incinerated in our forced air THOX unit at 1800 degrees. After thorough destruction of the contaminants in the air stream, the clean air is discharged into the atmosphere. A complete flow diagram of this process is shown in Figure #2.

Calculations

During the MEME event, measurements are taken of both the influent and effluent flow rates, the concentrations of the vapors removed (before off-gas treatment), as well as the off gas treatment system concentrations. These measurements are used to calculate the mass removal rates and the off-gas emission rates. The extraction flow rates are measured using a Dwyer DS-300 averaging Pitot tube attached to a differential pressure gauge. A separate flow rate is calculated for each influent well (if more than one well is connected). In order to achieve maximum destruction of the hydrocarbon vapors, additional quench air (500-2,000 CFM) is

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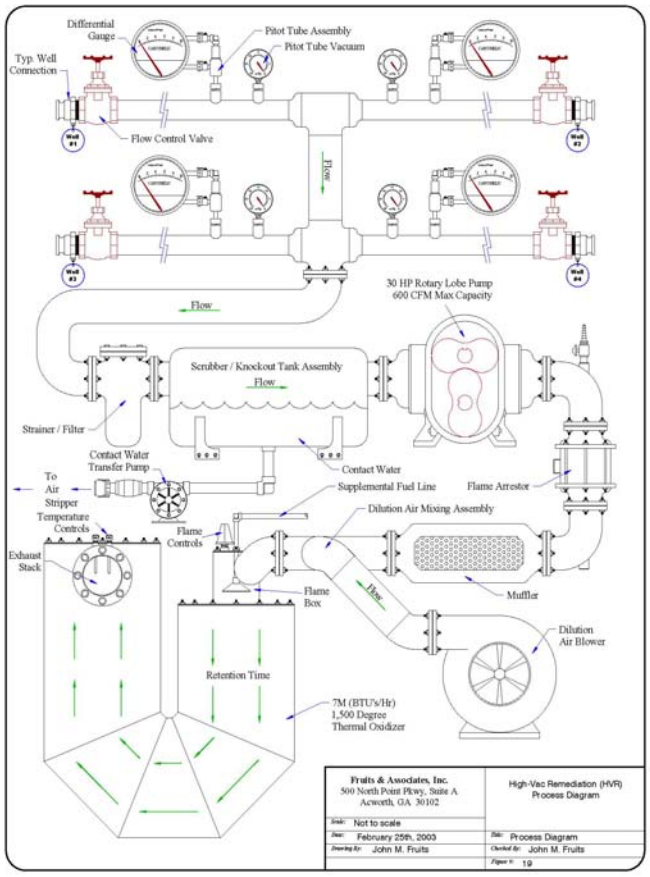
added to the vapor stream just before entering the THOX unit. A separate Pitot tube and differential gauge is installed at the THOX unit inlet and is used to measure the THOX unit's flow rate.

In order to accurately calculate the mass removal rates associated with the MEME event, influent concentration measurements are taken using a TVA-1000 Flame Ionization Detector (FID) instrument calibrated to methane. This FID instrument has a dynamic range of 0-50,000 PPM as methane, 0-100,000 PPM as hydrocarbon. Our concentration samples are collected before any additional bleed or quench air is added to the extracted flow rate. These undiluted concentration measurements exceed the dynamic range of any FID instrument. In order to accurately record the high concentrations observed during a MEME event, a calibrated 10:1 dilution valve is used to cut the sample. This dilution valve, along with the FID instrument, is calibrated before the start of each event.



In order to eliminate the naturally occurring methane that is present during a typical MEME event, each thirty-minute concentration sample is measured twice. The first sample is collected directly from the system, and recorded as the total VOC concentration. The second sample is collected using an in-line activated carbon filter to eliminate the hydrocarbon compounds and is recorded as methane only results. These methane only results are then subtracted from the total VOC concentration measurements, resulting in a Non Methane Organic Compound (NMOC) concentration. As with any field instrument calibrated to methane, the NMOC results are recorded as parts per million by volume (PPMV) as if the concentrations were methane. A conversion is then necessary to calculate an accurate mass removal rate. Using the NMOC total and the TVA-1000's factory certified response ratio for hydrocarbons, the NMOC results are converted to equivalent hydrocarbons in milligrams per liter (mg/L). A TVA-1000 FID has an average response ratio of 600 PPM per mg/L of unleaded gasoline and 200 PPM per mg/L of diesel.

Reporting

During the event, all of the operating data is collected and entered into the onboard computer system. This system processes the information and calculates the mass removal and system flow rates. This operating information is then used by the system operator to further enhance the system's performance. Once the event is complete, this data is used to develop a detailed MEME report. For comparison purposes, the mass removal rates are calculated as pounds of carbon, pounds of hydrocarbon, pounds of methane, and equivalent gallons.

During the MEME event, the following operating measurements are also observed.

- Influent temperature is measured in order to determine the amount of suspended liquid associated with the vapor stream. A psychometric chart is used to determine the Dry Standard Cubic Feet per Minute (DSCFM).
- Using an oil/water interface probe, a complete round of water level measurements are recorded at the associated monitoring wells prior, during, and after the MEME event is complete.
- Using a digital manometer, vacuum measurements (in inches of water column) are measured at the adjacent monitoring wells during the event to determine the maximum radius of vacuum influence.
- Off-gas emission (effluent) concentrations are measured at the THOX unit discharge stack and are analyzed using the TVA-1000. These results are used to calculate the total mass discharged to the atmosphere.

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