Attachment 7

Radioactive Wastes

Origin

There are two general categories of radioactive wastes that are associated with oil and gas drilling; naturally occurring radioactive material and radioactive tracers.

Naturally occurring radioactive materials (NORM) are derived from subsurface formations that also contain oil and gas. NORM that becomes concentrated in the form of scale can be found in separators, pipes, tubing, and other oilfield equipment. The most common isotopes of radium most often associated with barite scale are radium-226 and radium-228. The half-life of radium-226 is 1,600 years and for radium-228, 5.8 years.

Radioactive tracers are radioactive isotopes with half-lives of less than 120 days which are injected into a well or wells to allow observation of fluid or gas movements by means of a radioactive-tracer survey. *Tracer studies* involve a single well and use an electronic well logging tool. *Field flood or enhanced oil and gas recovery studies* involve multiple wells with one or more radioactive isotopes being injected and multiple oil or gas samples containing radioactive material collected from each of the wells to determine the direction and rate of flow through a formation. *Labeled frac sands* have radioactive isotopes that are chemically bonded to glass and/or resin beads and are injected into a single well. Frac sand operations require the use of an electronic well logging tool to assess the amount of radioactive isotope remaining in the underground reservoir formation. Normally, radioactive tracer materials are recycled and not disposed of in a reserve or production pit.

Impacts

The two main isotopes associated with NORM, radium-226 and radium-228, are generally not an exposure risk to humans because they accumulate inside pipe and other equipment on production sites that are open to the public. Additionally, the pipe and equipment is usually sufficient to shield anyone nearby from radioactive exposure. However, if produced water containing elevated levels of radium are proposed for dust abatement then additional health and safety analysis should be performed.

Radioactive tracer material and labeled frac sands have short half-lives (less than 120 days) and if used incorrectly, have both internal and external exposure hazards to humans. Disposable gloves and clothing will provide a barrier to protect users from exposure.

Regulatory Authority

The use of radioactive tracers requires licensing by the Utah Department of Environmental Quality, Division of Radiation Control (DRC). Radioactive tracer waste is considered a low level radioactive waste as defined by the Low-level Radioactive Waste Policy Amendments Act of 1985. This act gave the states responsibility for the disposal of their low-level radioactive waste.

The DRC also has the authority to regulate the disposal of radioactive oilfield wastes, which are uniquely associated with exploration and production operations.

Disposal Actions

For each radioactive waste disposal action, the DRC reviews the operator's disposal plan and, approves the disposal method(s) through the issuance of a radioactive materials license. The BLM should receive the operator's disposal request and the subsequent disposal report. Currently, the DRC is requiring all radioactive tracer waste to be solidified in place at the site it was generated. Scale from NORM waste may also be solidified on location with the possible requirement of signing and/or fencing of the location. If NORM scale from piping, tubing, or other equipment is not removed, the DRC recommends the disposal of equipment at a licensed facility authorized to accept low level radioactive waste.

It is important to note that the information provided for the regulation of radioactive waste in the State of Utah applies to areas where the Utah Division of Radiation Control has jurisdiction. If the area in Utah where radioactive material is being used or radioactive waste is stored is under "exclusive Federal jurisdiction," the requirements of the U.S. Nuclear Regulatory Commission would apply.

From NUREG-1556, Vol.20:
In the special situation of work at Federally-controlled sites in Agreement States, it is necessary to know the jurisdictional status of the land in order to determine whether NRC or the Agreement State has regulatory authority. NRC has regulatory authority over land determined to be "exclusive Federal jurisdiction," while the Agreement State has jurisdiction over non-exclusive Federal jurisdiction land. Licensees are responsible for finding out, in advance, the jurisdictional status of the specific areas where they plan to conduct licensed operations. NRC recommends that licensees ask their local contact for the Federal Agency controlling the site (e.g., Contract Officer, Base Environmental Health Officer, District Office staff) to help determine the jurisdictional status of the land and to provide the information in writing, so that licensees can comply with NRC or Agreement State regulatory requirements, as appropriate, see http://nrc-stp.ornl.gov/asdirectory.html. Additional guidance on determining jurisdictional status is found in All Agreement States Letter, SP-96-022, dated February 16, 1996. This letter is available on NRC's Home Page, at the link above. Go to *Resources & Tools* and click *FSME Letters*, then paste 'SP-96-022' in the *Freeform Search* box.