

# The NORM Report

Naturally Occurring Radioactive Material Contamination in the Petroleum Industry  
Spring/Summer 1992

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## EPA Regulatory Programs

At the Federal level, NORM can be considered an orphan waste. It has fallen through the cracks of most Federal environmental programs. Federal regulation of radionuclides in solid wastes has been limited to Atomic Energy Act wastes. The primary regulation for the management and disposal of solid wastes commonly produced by the "non-nuclear" industry is RCRA. Although a 1978 proposal under RCRA considered defining radioactive materials with radium concentrations over 5 pCi/gr as hazardous wastes, radioactivity is not currently classified as a characteristic of hazardous wastes. Radioactivity is however evaluated under the CERCLA program. This  
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## Regulations for the Control of NORM - Update

### Louisiana Regulations for the Control of NORM

Title 33

ENVIRONMENTAL QUALITY

Part XV. Radiation Protection

Chapter 14. Regulation and Licensing of Naturally Occurring Radioactive Materials (NORM)

The new Louisiana Regulation and Licensing of Naturally Occurring Radioactive Material (NORM) became effective June 21, 1992. The regulations contain some significant changes from the previous regulations. These are detailed below.

**§1401. Purpose.** No change from previous regulations.

**§1402. Scope - Section B.** Expanded to include sludge as well as scale deposits in tubulars and equipment. Also includes contamination of soil from produced waters.

**§1402. Scope - Section D.** Expanded to include "waste generation and storage" with respect to both inactive and active sites and facilities involved in storage and/or cleaning of tubulars and contaminated equipment. The sentence "in the case of closed or inactive pits, surveys are required only at the time of transfer for unrestricted use" was deleted in the new regulations.

All other sections of §1402 are essentially the same as in the old regulations.

**§1403. Definitions.** Several new definitions are included in the new regulations.

There are significant changes in §1404 (exemptions) which impact the industry in the definition of what materials are exempt from the regulations.

**§1404. Exemptions - Section A.** The new regulations (1) exempt NORM from the regulations if the material contains, or is contaminated at, concentrations less than 5 picocuries per gram (pCi/gr) of radium-226 or radium-228, above background, or concentrations less than 30 pCi/gr of technologically enhanced radium-226 or radium-228, averaged over any 100 square meters, if applicable, provided the radon emanation rate does not exceed 20 pCi per square meter per second, or 150 pCi/gr of any other NORM radionuclides, provided that these concentrations are not exceeded at any time; or (2) equipment, which contains NORM, are exempt from the requirements of these regulations if the maximum radiation exposure level does not exceed 25 microrems per hour above the background radiation level at any accessible point. (The old regulations stated that  
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Louisiana Regulations (Continued from Page 1)

"---- persons who receive, possess, etc. NORM were exempt if the maximum radiation exposure level does not exceed 50 microrems per hour at any accessible point."

Section G has been added to §1404. Section G states that the "tanks, vessels, containers, storage facilities, and distribution lines in refineries, petrochemical and gas plants contaminated with NORM are not exempt from the requirements of these regulations." Although §1404 E (4) And (5) exempt "natural gas and natural gas products, and crude oil and crude oil products", §1404 G makes clear that oil and gas equipment and facilities contaminated with NORM are not exempt.

(As an aside, brazil nuts are not exempted in the new regulations.)

§1405. (Reserved)

§1406. Radiation Survey Instruments. No change from previous regulations.

§1407 through §1409. (Reserved)

§1410. General License - Section A. This section has been expanded to include "store and transfer" of NORM in addition to "mine, extract, receive, possess, own, use, process". The general license does not authorize the landfarming of NORM, or the transfer of NORM for purposes of treatment/disposal, containing levels or concentrations greater than those specified in LAC 33:XV. Chapter 4 from one general licensee to another. This general license does not authorize the excavation of land unless procedures pursuant to LAC 33:XV §1410.C have been approved nor does it authorize the unrestricted transfer of land containing concentrations of NORM greater than 5 pCi/gr of radium-226 or radium-228 above background, if the radon emanation rate exceeds 20 pCi per square meter per second, or concentrations of 0.05% by weight of uranium or thorium, or 150 pCi/gr of any other NORM radionuclide (e.g., lead-210, bismuth-210 or polonium-210).

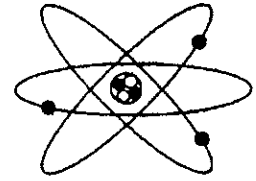
§1410. General License - Section D. The contamination limits in the 1989 regulations for release of land contaminated with radium-226 or radium-228 have been replaced by limits dependent on the radon emanation rate from the soil. That is, (1) for radon emanation rates greater than 20 pCi per square meter per second, the limit is 5 pCi/gr above background averaged over the first 15 centimeters of soil below the surface, and 15 pCi/gr above background averaged over each subsequent 15 centimeters thick layer of soil; or (2) for radon emanation rates less than or equal to 20 pCi per square meter per second, 30 pCi/gr averaged over a maximum depth of 15 centimeters of soil below the surface.

§1410. General License - Section E. The new regulations still require confirmatory surveys, but the survey results have to be submitted to the Radiation Protection Division within 90 days of the effective date of these regulations (June 21, 1992). The previous regulations allowed 180 days for submission of the survey data.

The other sections of §1410 are essentially the same as the previous regulations.

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EPA Programs (Ctd. from p.1) creates the potential for a sufficiently contaminated NORM site meeting RCRA to have a cleanup required for the



radioactive constitutes of its waste under CERCLA.

EPA is currently evaluating the need for a regulatory program specific to solid wastes containing NORM. EPA's Office of Water and Office of Air and Radiation both regulate some sources of naturally occurring radionuclides. Because the Atomic Energy Act excludes NORM radionuclides, the regulatory authority EPA would use for the regulation of NORM waste is Section 6 of the Toxic Substances Control Act (TSCA). Under TSCA Section 6, the Administrator of EPA has the authority to regulate the disposal of substances if he finds that there is a reasonable basis to conclude that the unregulated disposal of the substance would present an unreasonable risk of injury to health or the environment. ■

Disposal Option

Disposal of NORM wastes contained in aluminum cannisters down abandoned wells has been used in selected cases. The cannisters can be a nominal 20 feet long with a diameter dependent upon the well available. This method of disposal is akin to pumping a slurry of NORM wastes in an injection well. One advantage of the use of the cannisters to contain the NORM wastes is that it is not necessary to make a pumpable slurry of the wastes. The cannister method is environmentally safe and safe to employees and the public. ■

Louisiana Regulations (Continued from Page 2)

**§1411. Protection of Workers During Operations.** Each person subject to the general license requirements or have a specific license shall conduct operations in compliance with each of the standards for radiation protection set forth in LAC 33:XV, Chapters 4 and 10. (This is essentially the same as in the previous regulations.)

Several new significant sections have been added to the new regulations. Because of its importance, §1412 is reproduced in its entirety.

**§1412. Disposal and Transfer of Waste for Disposal - Section A.** Each person subject to the general license requirements in LAC 33:XV. 1410, or to a specific license, shall manage and dispose of wastes containing NORM:

1. in accordance with the applicable requirements of LAC 33:XV, chapter 4;
2. in accordance with the applicable requirements of the U.S. Environmental Protection Agency for disposal of such wastes;
3. by transfer of the wastes for disposal to a land disposal facility licensed by the U.S. Nuclear Regulatory Commission, an agreement state, or a licensing state; or
4. in accordance with alternate methods authorized by the division in writing upon application or upon the division's initiative. The application for approval for alternative methods of disposal shall be submitted to the division for approval.

**§1412. Disposal and Transfer of Waste for Disposal - Section B.** Records of disposal, including manifests shall be maintained pursuant to the provisions of LAC 33:XV, Chapter 4.

**§1412. Disposal and Transfer of Waste for Disposal - Section C.** Intrastate transfers of waste containing NORM for disposal shall be made only to persons specifically authorized by the division to receive such wastes. It is the responsibility of the transferor to ascertain that the transferee possesses this specific authorization prior to actual transfer.

**§1412. Disposal and Transfer of Waste for Disposal - Section D.** Each person subject to the general license requirements in LAC 33:XV.1410 may continue to store NORM waste after the effective date of these regulations (June 21, 1992) if the generator submits to the division a viable written plan for NORM waste management pursuant to LAC 33:XV.1412 A and E. If the generator fails to submit a plan or if the plan submitted is not approved, all NORM waste must be transferred to a licensed storage facility or a licensed disposal facility within 90 days. The generator shall initiate implementation of the plan within 30 days of approval by the division.

**§1412. Disposal and Transfer of Waste for Disposal - Section E.** The initial NORM waste management plan shall be submitted to the division in writing within 60 days after the effective date of the regulation (June 21, 1992) or within 30 days following completion of the confirmatory survey. This plan shall include, but is not limited to, the following:

1. current methods of storage,
2. recordkeeping, including inventory and manifest,
3. the proposed method of disposal,
4. the estimated total activity to be disposed,
5. the estimated date of disposal completion, and
6. financial security, if applicable.

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**Correction**

In the Winter 1992 issue of The NORM Report it was reported that the Envirocare site in Utah was regulated by CERCLA. The site is actually regulated under RCRA for hazardous substances and by the NRC for radioactive materials, i.e., it is a permitted mixed waste disposal site. I appreciate that Robert King, Jr. of Unocal brought this to my attention. Envirocare does have some joint programs that are regulated by CERCLA, but the NORM waste disposal is not one of them. ■

**Laboratory Analyses**

Laboratory analyses of samples will be required to comply with parts of the NORM regulations. While many laboratories can make accurate analyses, the turnaround times are not always satisfactory. Fast analyses, e.g. one-day service, are often a necessity when guidance must be provided to contractors doing remediation projects or decontaminations. Methods are available to make these fast analyses, i.e. radium-226, radium-228, and lead-210 analyses can be made quickly, accurately and precisely using gamma spectroscopy with germanium detectors. ■

**“Although potentially hazardous to personnel, NORM contamination is controllable.”**

Your comments, corrections, and contributions for The NORM Report are solicited. Please send them to Peter Gray, P. O. Box 342, Bartlesville, OK 74005, telephone 918-333-9274, or fax 918-333-3880. ■

### Louisiana Regulations (Continued from Page 3)

#### §1412. Disposal and Transfer of Waste for Disposal - Section F.

Surface equipment that has been removed from service and not employed for its designated function, excluding wellheads, shall be decontaminated to the limits specified in LAC 33:XV.1404, or disposed of in accordance with the written plan pursuant to LAC 33:XV.1412.D, within one year from the date the equipment was removed from service or the effective date of this regulation (June 21, 1992), whichever is later. The NORM waste shall be managed pursuant to and in accordance with the disposal plan required by LAC 33:XV.1412.D of these regulations or shall be transferred to a licensed storage facility or a licensed disposal facility within 60 days. This requirement does not apply to equipment that remains subsurface and is associated with production wells or injection wells classified as having future utility.

§1413. Certification - Section A. Upon completion of survey(s) of equipment and facilities that verify that NORM regulated by this chapter is not present, an individual may submit documentation to the division indicating that the equipment and facilities are exempt from the requirements of LAC 33:XV.1410. The surveys shall be performed and documented by persons who have demonstrated to the satisfaction of the division that they possess the knowledge and training to perform such services, and are recognized by the division to do so. Individuals performing and documenting the surveys shall demonstrate competence with the subjects outlined in Appendix A of this chapter. After a complete review and approval of the documentation by the division, the individual may not be subject to any penalty associated with the failure to submit notification required by LAC 33:XV.1410.E if NORM is subsequently discovered at the location.

§1413. Certification - Section B. Establishes requirements for the certification of the documentation of Section A.

§1413. Certification - Section C. If NORM is subsequently discovered by the division at a location at which documentation pursuant to LAC 33:XV.1410.E or LAC 33:XV.1413.A has not been submitted to the division, all NORM waste materials subject to this Chapter shall be transferred to a licensed storage facility or licensed disposal facility within 90 days.

§1414. Containers (1414 Applies to any Licensee that Stores Containers of NORM). §1414 establishes the specifications for containers used for the storage of NORM wastes.

§1415. Waste Piles. Storage of new NORM waste by piles is prohibited. No new NORM waste piles can be initiated and no existing NORM waste piles added to after the effective date of these regulations (June 21, 1992)

§1416. Inspections of Storage Tanks Containing NORM. As part of an inspection, the licensee shall develop a schedule and procedure for assessing the condition of each tank. This schedule and procedure must be adequate to detect cracks, leaks, corrosion, and erosion that may lead to cracks, leaks, or wall thinning to less than the required thickness. Procedures for emptying a tank to allow entry, procedures for personnel protection, and inspection of the interior must be established when necessary to detect corrosion or erosion of the tank sides and bottoms..

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### Louisiana Legislature Note

In the closing days of the recent LA legislative session, three bills were defeated which would have greatly diluted the recently enacted NORM regulations. ■

**“Law cannot persuade  
where it cannot punish”**

Thomas Fuller

### Risk Assessments

Members of 12 state and federal radiation control programs met recently in Columbus, Ohio with four representatives of industries that have problems with NORM contamination and four of the principal investigators of calculations of the radiation dose from residual radioactivity. The meeting was arranged by the Conference of Radiation Control Program Directors.

The contamination problems addressed included radium in soil and resulting indoor radon. The 70 year risk of major health effects to both individuals and to populations was adopted for this discussion as the basis of radiation protection efforts. The dose calculations discussed were those that deal with all significant pathways of exposure and that are being utilized in decision making by regulatory agencies. Much of the discussion focused on the scientific basis of regulatory guidance, standards and regulations on the management of contaminated property and materials, both to review the current information and to identify issues for further study.

The discussion included the topic of dose versus risk limits. The upper risk limit that would be commensurate with the 100 millirem per year dose limit for members of the general public approaches a  $10^{-2}$  lifetime risk of cancer incidence, assuming that

(Continued on page 5)

Louisiana Regulations (Continued from Page 4)

The frequency of these assessments must be based on the material of construction of the tank, type of corrosion or erosion protection used, rate of corrosion or erosion observed during previous inspections, and the characteristics of the waste being treated or stored.

**§1417. Closure Requirements.** 1417 details the requirements for final closure of a NORM site or facility including all pits, ponds and lagoons. The closure application shall include specific details of the NORM site closure plan.

**§1418. Transporter Manifests.** Each shipment of NORM waste to a facility specifically licensed for storage or disposal and that contains radium-226 or radium-228 in concentrations greater than 30 pCi/gr or greater than 25 microrem per hour, excluding background, shall be accompanied by a shipment manifest. §1418 details the requirements for the manifests. (DOT regulations require manifests for radioactive materials containing more than 2,000 pCi/gr.)

**§1419. Financial Responsibility of Transporters.** Details the financial responsibilities of transporters of NORM wastes to a licensee for long-term storage or disposal.

**§1420. Financial Security Requirements for NORM Treaters or Storers.** This section details the financial security requirements for licensees that physically and chemically treat or store NORM waste.

**Appendix A.** Appendix A lists the subjects to be included in training courses for individuals performing NORM surveys in Louisiana.

**Implementation Manual for Management of NORM in Louisiana**

Louisiana's Department of Environmental Quality has also issued an "Implementation Manual for Management of NORM in Louisiana." This manual is intended to assist the public in complying with the NORM requirements in LAC 33:XV. The licensee shall develop a viable NORM waste management plan based on the guidelines in this document if the licensee intends to store NORM wastes for more than 90 days.

Prior to commencing decontamination activities of facilities, sites, equipment and/or land, a remediation plan, survey plan and worker protection procedures shall be submitted to the Radiation Protection Division for review and approval. Decontamination of such facilities, sites, land, and/or equipment shall only be performed by persons specifically licensed by the division or another licensing state to conduct such work. Additionally, the specific licensee must submit form RPD-35 (see attachment #3 in the manual) to the division for temporary job-site authorization.

Recommended procedures for confirmatory surveys, i.e., screening land or containerized NORM waste with a radiation survey instrument to determine the need for further sampling are discussed in this manual. Procedures are also given for surveying all equipment or pipe that will be

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Risk Assessments (Ctd. from p. 4)

this dose rate would occur for every year of an individual's expected life span. Assessments showing lifetime risks of cancer incidence in excess of  $10^{-2}$  should require remediation regardless of the cost. When the assessment objective is the lifetime risk of excess cancer to a maximally exposed individual, the ALARA principle should be involved between a  $10^{-2}$  risk limit and a  $10^{-4}$  upper bound on a risk goal.

Radium-226 at 4 pCi/gr of soil was reported to result in more than 4 pCi radon per liter of indoor air in some cases, for which the 70 year risk may be greater than  $10^{-2}$  depending upon conditions of ventilation and occupancy (using 70 year risk of  $10^{-4}$  for exposure to radon and daughters of 0.5 working-level-months annually). Regulators were advised to accept different concentrations of residual contamination in different cases, e.g. 30 pCi radium-226 per gram of soil in one case (radium contaminated pipe scale), but only 4 pCi/gr in another situation (sludge).

In response to the advice on risk estimate, the regulators recognized that consensus should be sought for a method of determining the acceptable level of residual radioactivity in specific cases, rather than a common limit of contamination for all cases.

The problems of legislating and carrying out restrictions on land must be explored. Further and more widespread consideration should be given to ranges of NORM concentrations that could acceptably be placed in industrial landfills and in sanitary landfills. A uniform method of risk assessment is needed to assess residual radioactivity and NORM problems, and acceptable disposition of these.

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## Louisiana Regulations (Continued from Page 5)

released for uncontrolled or unrestricted use.

The manual includes detailed procedures for submitting a NORM Waste Management Plan. Persons subject to general licensure may store NORM waste longer than 90 days if a NORM Waste Management Plan is submitted and approved by the division.

NORM disposal options are detailed with requirements for each.

The implementation manual is a working document to be used in conjunction with the Louisiana NORM regulations.

Copies of the Louisiana Environmental Regulatory Code Part XV, chapters 4, 10, and 14 are available from:

Department of Environmental Quality  
Enforcement and Regulatory Compliance  
P. O. Box 82282  
Baton Rouge, LA 70884-2282  
(504) 765-0399

at a cost of \$5.00. The NORM Implementation Manual is available from the same source at a cost of \$1.00. Make checks payable to DEQ/ERCD.

Chapter 4 is entitled **Standards For Protection Against Radiation**.  
Chapter 10 is entitled **Notices, Instructions and Reports to Workers; Inspections**.  
Chapter 14 is entitled **Regulation and Licensing of Naturally Occurring Radioactive Materials (NORM)**.

Chapters 4, 10, and 14 are necessary for compliance with the Louisiana regulations for the control of NORM. ■

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## Status of the Texas Regulations

The "final" Texas regulations for the control of NORM were sent to the Radiation Advisory Board on July 28. The regulations are expected to go to the Department of Health on August 22 for final approval. The regulations are expected to become effective in mid-September.

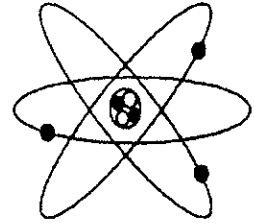
All the comments received from Draft 3 of the proposed regulations were analyzed and some minor revisions were made in the final rules.

The final regulations exempt materials with radiations less than 50 microrems including background. Soils contaminated with less than 30 pCi/gr of radium-226 are exempt from the regulations if the radon emanation rate is less than 20 pCi per square meter per second. There was some controversy about this and Texas made some risk assessments and believe an exempt concentration of 30 pCi/gr coupled with radon emanation rate below 20 pCi per square meter per second to be safe. This exemption applies primarily to radium in pipe scale. Pipe scale is a very dense material and the radon emanation is very low, on the order of

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## Radiation vs. Radioactivity

Some limited data suggest that 500 picocuries of radium-226 and radium-228 per gram of scale corresponds to a contact radiation level of 50 microrems per hour outside of a pipe containing NORM scale on the inside. ■



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## Disposal Options

Louisiana has prepared a NORM disposal acceptability matrix comparing 13 potential options for disposal of NORM wastes within the state. Factors considered in the matrix included environmental exposure acceptability, "public" acceptability, economic acceptability, universal availability, time for the state to make the option viable, and time for industry use once the option is available.

Of the 13 options considered, four met the criteria to qualify as viable options. These are:

1. Non-retrieved surface pipe
2. Commercial oilfield waste facility
3. P&A well, operator/owner controlled and orphan well, state controlled
4. Well injection

Landfarming, with or without dilution was not considered to be a viable option because of lack of acceptability by the public. Other options didn't make the list because of economic reasons or time required to make them viable. ■

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## Status of the Texas Regulations (Continued from Page 6)

2 pCi per square meter per second from soil containing 30 pCi of radium-226 per gram of soil.

The Bureau of Radiation Control is still responsible for the NORM regulations with the exception of disposal options which have been transferred to the Texas Water Commission. ■

### 5 picocuries per gram vs. 30 picocuries per gram ?

There currently is some controversy regarding "safe" levels of radium-226 in soil and other NORM contaminated wastes. Several states, e.g., Louisiana, Texas, Mississippi, Arkansas and Alabama, are proposing an exempt concentration for radium-226 of 30 pCi/gr if the radon emanation rate is less than 20 pCi per 100 square meters per second. Others, e.g., Kentucky and the Conference of Radiation Control Program Directors are proposing 5 pCi/gr with no conditions for the rate of radon emanation.

The rationale for the higher radium-226 concentration is that the rate of radon emanation from scale, particularly barium sulfate scale, is very much less than the radon rate from most sludges, etc. The emanation rate from scale containing 30 pCi/gr Ra-226 can be as low as 2 pCi per square meter per second. Assessments of the risks from these low radon rates indicate that the 30 pCi/gr concentration is a safe concentration.

The 5 pCi concentration level historically is from uranium tailings where the radon emanation rate is more than the 20 pCi rate. The health concern is that with these radon emanation rates from 5 pCi/gr radium-226, the radon levels in a structure built on the contaminated area would give indoor radon concentrations greater than 4 pCi per liter of air which is the current EPA action level for structures contaminated with radon.

Although the radon emanation rate from scale is small (compared with uranium tailings or sludges), there is some concern that when the federal government issues regulations for the control of NORM, the exempt level in these federal regulations will probably be 5 pCi per gram or possibly less. The EPA's Suggested Guidelines for the Disposal of Drinking Water Treatment Wastes Containing NORM uses 3 pCi per gram as the level of radiation which triggers specific waste handling/disposal measures.

At a recent meeting sponsored by the Conference of Radiation Control Program Directors in Columbus, OH in late June, there was some discussion of the 5 pCi vs. 30 pCi controversy. Although representatives from several states supported the 30 pCi level, representatives from the EPA and NRC were dubious of this higher concentration and appeared to support the 5 pCi level. If, as it looks quite possible, the federal government issues NORM regulations, probably by the EPA, it is very possible that the 5 pCi concentration will be used. What will this mean to those who have used the 30 pCi concentration in their disposal activities? Will they have to go back and dispose of the higher concentrations to comply with the 5 pCi regulations? Hopefully not, but when I raised the question, the EPA representative nodded yes!!!! ■

## Status of NORM Regulations

The status of NORM regulations in the petroleum producing states, the federal government and Canada will be summarized in the Fall, 1992 issue of *The NORM Report*. I will contact the various state agencies, the NRC, the EPA, and Canadian agencies just before preparing the newsletter. ■

**“NORM contamination is a regulatory and environmental problem, but is not an immediate risk to industry employees or the public health.”**

### Disposal of Contaminated Pipe

Disposal of scale contaminated pipe in a smelting operation may be a viable technique. The NORM apparently goes primarily into the slag. There is some concern as to radon emanations from the slag, e.g. worker exposures and violations of the Clean Air Act. The disposal of the slag could also be a problem, depending on the concentration of radium in the slag. ■

### Disposal Options

Disposal of NORM wastes down an injection well is probably the "ultimate" method of disposal for those wastes that can be put into a slurry and pumped downhole. This puts the NORM down to depths from which it originated, well below the water table or sources of drinking water. The wastes will almost certainly be in a very water insoluble state so the NORM cannot be produced again with oil and gas production. Radium moves through the formation as a water soluble material, probably as radium chloride. State agencies are looking at these injections on a case-by-case basis. ■

## NORM Training Course Offered by OGCI

OGCI (Oil & Gas Consultants International, Inc.), a world leader in petroleum training, has scheduled training courses in NORM contamination and its control for 1992 and 1993. The course **NORM Contamination in the Petroleum Industry** will cover all aspects of NORM contamination and its control. All the subjects listed in Appendix A of the Louisiana's Chapter 14. **Regulation and Licensing of Naturally Occurring Radioactive Materials (NORM)** are included in the course. Training in these subjects are required prior to being approved as a NORM surveyor as well as providing excellent training in all aspects of NORM contamination and its control. These subjects are:

### I. Fundamentals of Radiation Safety

- A. Characteristics of radiation
- B. Units of radiation dose and quantity of radioactivity
- C. Levels of radiation from sources of radiation
- D. Methods of minimizing radiation dose:
  1. working time;
  2. working distance;
  3. shielding;
  4. respiratory precautions;
  5. use of anti-contamination clothing.

### II. Radiation Detection and Instrumentation to Be Used

- A. Use of radiation survey instruments:
  1. operation;
  2. calibration;
  3. limitations.
- B. Survey techniques
- C. Use of personnel-monitoring equipment

### III. The Requirements of Pertinent State Regulations

In addition, pertinent federal regulations and the prospect for more federal and state regulations

will be discussed. Disposal options will be extensively covered. This in-depth course is taught by Peter Gray who has a background in nuclear and radiochemistry and 25 years experience in the petroleum industry. Dr. Gray has a Ph.D. in Nuclear Chemistry from the University of California at Berkeley. He took early retirement from Phillips Petroleum Company in 1985 after 25 years with the company. Since 1985, Dr. Gray has been a consultant in NORM contamination in the petroleum industry. During his tenure with Phillips, Dr. Gray was in charge of the company's NORM control program from the discovery of NORM contamination in natural gas and natural gas liquids in 1971 until his retirement in 1985. This background uniquely qualifies Dr. Gray as an instructor of the course -- an instructor who understands the origins of NORM, why it contaminates nearly every oil and gas facility, where the contamination occurs, how to set up programs which protect employees, company facilities, the environment and the public, how to survey for NORM contamination, the available options for the disposal of NORM contaminated wastes, and the federal and state regulations for NORM.

The 1992 schedule for the course **NORM Contamination in the Petroleum Industry** is:

November 2-6	Dallas
November 16-20	Calgary

The 1993 schedule includes:

April 27-30	Tulsa
November 2-5	Dallas
November 16-20	Calgary

If there is sufficient interest, the course could also be held in Louisiana, e.g., Baton Rouge, Lafayette, or New Orleans, or in other cities and states. I would appreciate hearing your interest in these courses.

In-house courses can be arranged by contacting Joe Goetz at OGCI.

For additional information about the course, contact Joe Goetz, OGCI, 4554 South Harvard Avenue, Tulsa, OK 74135, or call 1-800-821-5933. Or contact Peter Gray at 918-333-9274 for information about the course content. ■

**It is easier to ask forgiveness than permission** ■

### API Bulletin on NORM Available

The American Petroleum Institute has published Bulletin E2, **Bulletin on Management of Naturally Occurring Radioactive Materials (NORM) in Oil and Gas Production**, First Edition, April 1, 1992.

The bulletin provides information to oil and gas operating companies on the protection of workers, the public, and the environment from NORM associated with oil and gas production. Included among the important topics on NORM covered in the bulletin are Survey Equipment and Methodologies, Worker Protection, Storage and Disposal.

Copies of the bulletin may be purchased for \$18.75 per copy from the American Petroleum Institute, Publications and Distribution Section, 1220 L Street, NW, Washington, D. C. 20005. Telephone 202-682-8375, fax 202-962-4776. ■

The preferred disposal method for NORM is the one that adequately protects the environment at the lowest cost to the operator, ■