

# The NORM Report

Naturally Occurring Radioactive Material Contamination  
Winter 1994

## Index

Regulations Update	Page 1
Stan Huber Consult.	7
ARS	8
Selective Tools	9
Health Physics Society	9
Core Labs	10
A New NORM Treatment Facility	10
NORMCO	11
Executive Order on Reg'ns	11
Unionhead Engineering	12
Ocean Radioactive Dumping Act	12
Federal Water Pollution Control Act	12
US Ecology	13
Government Spending	13
State Radiation Control Directors	14
Cancer Risks	14
Campbell Wells	15
A Disposal Option?	15
Comparison of NORM Rules	16
H.P. Society Position Statements	17
NORM Training Course	18
NORM Seminar	18
NORM Contamination	18

## Regulations for the Control of NORM - Update

The status of regulations for the control of NORM is summarized below for 14 states, including the five states that have enacted NORM regulations and several others who are currently drafting regulations. Also summarized is the status of regulations in the federal government, especially the Environmental Protection Agency. Each regulatory agency was contacted during the first two weeks of March, 1994. An extensive summary of NORM regulations in about 35 states, the federal government and Canada will be included in the Spring 1994 issue of *The NORM Report*.

Georgia is the latest state to enact regulations for the control of NORM. Georgia's regulations became effective March 16, 1994.

### ARKANSAS

The status quo is being maintained on the Regulations for the Control of Radiation, which although not necessarily specific to NORM, do address some NORM issues. Arkansas is expected to address more NORM-specific issues, e.g., contaminated scale in a future revision, but there is nothing new or planned at present.

### CALIFORNIA

There has been essentially no progress in drafting NORM regulations in California. The NORM survey of California oil and gas facilities to be made by the Divisions of Oil and Gas and the California Department of Health Services hasn't been made yet. Two planning meetings have been held and it is hoped that the next meeting will finalize procedures to be used, including where and what facilities will be surveyed for NORM contamination.

### COLORADO

The commitment to have NORM regulations by the end of 1993 appears to have gone by the boards. There is legislation before the Colorado House which would

put off writing NORM disposal rules until the Environmental Protection Agency publishes NORM rules. Therefore the Department of Health is doing nothing at present while awaiting to see if the pending legislation is passed and the governor signs it.

### GEORGIA

The draft of proposed regulations for the control of NORM was adopted by the Board late in February and became effective on March 16, 1994. Georgia becomes the fifth state to have enacted NORM regulations. The final regulations contain some minor changes from the last proposed draft.

### ILLINOIS

The draft of proposed NORM regulations is still being circulated to a few selected people within the Illinois Department of Nuclear Safety for their comments prior to making "final" changes before releasing the draft to industry and the public for comments. The Department is busy working on a priority project which is delaying the finalization of the NORM

(Continued on page 2)

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**ILLINOIS** (Continued)

draft. They are working with a "big company" in West Chicago trying to dispose of 13 million cubic feet of thorium mill tailings as soon as possible. Realistically, it looks like it will be sometime in the second quarter of 1994 before the final draft is ready -- the other priority projects are slowing down the process.

**KENTUCKY**

NORM regulations in Kentucky are still sitting on idle awaiting screening of the Martha oilfield for background radiation levels, etc. The Martha field has been identified by an oil company as having NORM contamination problems. The survey was to be made March 16th but was cancelled due to a budget meeting with the legislature. There will be a public meeting with residents in the area of the Martha oilfield and other concerned parties to talk about NORM in general and how the area will be screened for what is being looked for in the survey, i.e., areas with radiation readings greater than background plus 20 microrems per hour. That is the level that will determine whether further analyses are indicated. The public is being involved in the process because there is considerable concern about the public's understanding about NORM. It is hoped that providing good information will displace much of the misinformation and misunderstanding the public has at present. Once the public has a good understanding, the Cabinet for Human Resources should be able to work with all concerned to move the regulations ahead.

**LOUISIANA**

Revisions are again being considered for the Louisiana NORM regulations -- some of the revisions may be major. The revisions are not generally available for public comment, but should be available later in April or

in May. The expected revisions are discussed below.

Other NORM-related issues in Louisiana include the following.

- (1) The DEQ is being contacted daily by industry with questions and NORM concerns.
- (2) A guide for use in applying for a specific NORM license was recently issued by the DEQ.
- (3) Disposal options are under study, particularly down hole injections of NORM-contaminated materials.

The expected revisions to the Louisiana NORM regulations include: (Only the sections expected to be revised are included)

§1402. Scope.

Recycling operations will be included as an area to which the regulations will apply.

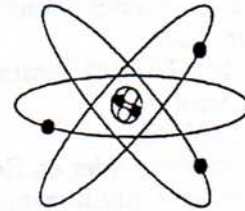
§1403. Definitions.

Definitions for Confirmatory Surveys, NORM Supervisor, On-Site Maintenance, Recycling, Temporary Jobsite, and Unrestricted Use have been added. Definitions for Barrier, Commercial Storage Facility, and Decontamination Facility have been deleted. Definitions for Container, Equipment, NORM Waste, Site, and Tank have been modified.

§1404. Exemptions.

The NORM exempt from the regulations has been modified to: (1) NORM are exempt from the requirements of these regulations if the materials contain, or are contaminated at, concentrations of: (a) 5 picocuries per gram or less of radium-226 or radium-228, above background; or, concentrations less than 30 picocuries per gram of technologically enhanced radium-226 or radium-228 in soil, averaged over any 100 square meters with no single sample to exceed 60 pCi/gm, provided the radon emanation rate is less than 20 picocuries per square meter per

- second,
- (b) 30 picocuries per gram or less of technologically enhanced radium-226 or radium-228 in media other than soil, provided the radon emanation rate is less than 20 picocuries per square meter per second, the material is classified as Non-hazardous Oilfield Waste, and the material is transferred to a



Nonhazardous Oilfield Waste facility in accordance with LAC 33:XV.1412.A.5, or (c) 150 picocuries per gram of any other NORM radionuclide, provided that these concentrations are not exceeded at any time. *5 Bq/g = 120 pCi/g. The 252 on its a - 120 pCi/g. The in equilibrium.*

2. Equipment, which contains NORM, is exempt from the requirements of these regulations if the maximum radiation exposure level does not exceed 50 microrentgens per hour at any accessible point.

§1406. Radiation Survey Instruments and Surveys

- A. Instrumentation utilized to determine exposure rates pursuant to this Chapter shall be capable of measuring 1 microrentgen per hour through at least 500 microrentgens per hour.
  - C. 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 documentation must include
- (Continued on page 3)

*18 pCi/g.*

*2 Bq/g.*

**LOUISIANA** (Continued)

the qualifications of the individual performing the survey. Individuals performing and documenting the surveys shall demonstrate understanding of the subjects outlined in Appendix A of this Chapter.

§1408. General License (formerly §1410)

B. This general license does not authorize the manufacturing or distribution of products containing NORM, or the landfarming of NORM, or the transfer from one general licensee to another of NORM for purposes of treatment or disposal with levels or concentrations greater than those specified in LAC 33:XV.1404.A.

D. The melting of scrap metal is authorized by the general license if the dilution of the NORM in the end-products or melt byproducts is sufficient to reduce any expected average concentration of NORM to levels not to exceed the concentration specified in 1404.A.a, after receiving specific approval from the Department.

E. (Formerly B). Facilities, equipment, and sites contaminated with NORM in excess of the levels set forth in LAC 33:XV.1404.A shall not be released for unrestricted use. The decontamination of such facilities, sites, and/or equipment shall only be performed by persons specifically licensed by the Division, the U.S. Nuclear Regulatory Commission, another agreement state, or another licensing state to conduct such work. The decontamination of soil shall be to 5 picocuries per gram above background, of radium-226 or radium-228.

D. (Formerly E) Persons subject to the general license established by LAC 33:XV.1404.A shall notify the Division by filing the Notification of NORM Form (Form RPD-36). A confirmatory survey for each potentially contaminated site shall be performed and the results

submitted to the Division within 90 days of the effective date of these regulations.

E. The handling or processing by a general licensee of NORM-contaminated materials not otherwise exempted from these rules for the purpose of recycling is authorized if the radiation level 18 inches from the NORM-contaminated material does not exceed 2 millirem per hour.

§1409. Transfer of NORM-Contaminated Land

Section D has been renamed Section A.

B. General or specific licensee's that have an area of soil with contamination above the limits of LAC 33:XV.1404 and soil decontamination must be performed, the decontamination of soil shall be to 5 picocuries per gram above background, of radium-226 or radium-228.

§1410. General Licenses: Pipe Yards or Production Facilities Receiving Exempt Items

A general license is hereby issued for pipe yards or production facilities to receive, possess, process, and clean tubular goods or equipment which are contaminated with scale or residue but do not exceed 50 microontgens per hour, provided the following requirements are followed:

A. The Department is notified within 90 days of the effective date of these regulations, of the intention of the facility to receive tubular goods.

B. A program shall be developed and used to screen incoming shipments to insure that the 50 microontgens per hour limit is not exceeded.

C. Worker protection, as outlined in Appendix B of this chapter.

D. Ground cover or other appropriate precautions are taken to prevent soil contamination.

E. Procedures to prevent release of NORM contamination beyond the site boundary.

F. A program for surveying and

decontamination is developed to insure that soil contamination is not allowed to exceed 200 pCi/gm at any time, and that NORM contamination does not go beyond the site boundary.

G. Existing facilities that have NORM contaminated soil in excess of the limit in LAC 33:XV.1410.F. must submit a plan for clean up within 180 days of the effective date of these regulations. The plan shall include a schedule for clean up that is to be approved by the Division. The general licensee may include in this plan an application to the Division for a one time authorization to perform this clean up or use a specific licensee.

H. Before releasing the property for unrestricted use, the soil shall be decontaminated to a level not to exceed 5 picocuries per gram above background unless other limits are approved by the department.

I. A specific license pursuant to LAC 33:XV Chapter 3 is required for tubular goods or equipment that exceed the 50 microontgens per hour limit.

§1412. Disposal and Transfer of Waste for Disposal

A-5. Non-Hazardous Oilfield Waste containing concentrations of NORM in excess of the limits in LAC 33:XV.1404.A.1., but not to exceed 200 pCi/gm may be treated at 29.B facilities specifically licensed by the Division for such purposes. Regulation of such sites is set forth in a memorandum of understanding between DEQ and DNR and contained in Appendix C of this Chapter.

D. Each person subject to the general license requirements in LAC 33:XV.1410 may store NORM waste if the generator submits to the division a viable written plan for NORM waste management pursuant to LAC 33:XV.1412.A.4 and E. If the generator fails to submit a plan or if the plan submitted is not

(Continued on page 4)

**Louisiana** (Continued)

approved, all NORM waste must be transferred to an authorized facility within 90 days. The generator shall initiate implementation of the plan within 30 days of approval by the division.

E. The initial NORM waste management plan shall be submitted to the Division, in writing, within 69 days following completion of the confirmatory survey. This plan shall include, but is not limited to, the following: (no change from present regulations)

☐ 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 submitted pursuant to LAC 33:XV.1412.D, within one year from the date the equipment was removed from service. The NORM waste shall be managed pursuant to and in accordance with the disposal plan required by LAC 33:XV.1412.D or shall be transferred to an authorized 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**

This entire chapter has been deleted.

**§1417. Closure Requirements**

B. If closure activities involve construction, prior approval by the Groundwater Protection Division must be attached as part of the application addressing the certification of the ground water quality. All pits, ponds, and lagoons must comply with departmental regulations and/or policies dealing with ground water quality.

F. The licensee shall monitor the NORM site, and perform necessary maintenance and repairs at the NORM site until the site closure is complete.

**§1418. Transporter Manifests**

A. Each shipment of NORM waste to a facility specifically licensed for storage or disposal and that contains Ra-226 or Ra-228 in concentrations greater than 30 pci.gm or exposure rates greater than 50 microroentgens per hour, shall be accompanied by a shipment manifest.

**Appendix A. Subjects to Be Included in Training Courses for Individuals Performing NORM Surveys**

The last three paragraphs of Appendix A dealing with documentation of qualifications and training of surveyors have been deleted.

**Appendix B**

This is a new appendix detailing what must be included in required worker protection plans and the additional precautions that must be taken for operations that have the potential to produce NORM contaminated dusts (i.e., cutting, grinding, sand-blasting, welding, drilling, polishing, or handling soil) or when loose contamination is expected.

**Appendix C**

This is a new appendix detailing a Memorandum of Understanding between Louisiana Department of Natural Resources Office of Conservation and Louisiana Department of Environmental Quality Regarding the Regulation of Naturally Occurring Radioactive Material at Commercial Oilfield Waste Disposal Facilities.

**MICHIGAN**

There have been no new developments in the control of NORM in Michigan. Michigan

has standards and guidelines for NORM control in draft form. There has been interest for further discussions as to what the state should do, but no decisions have been made. A survey by the state of oil and gas sites in Michigan was made in 1990 and indicated significant NORM contamination in the state.

**MISSISSIPPI**

No amendments or revisions to the NORM regulations are planned for anytime soon. In the meantime there is plenty of NORM-related work to keep the staff busy. Mississippi has a significant number of NORM litigations pending.

**NEW JERSEY**

There has been no change in the status of NORM regulations since the last summary in the Fall 1993 newsletter. The draft of the NORM regulations is still undergoing revision. Plans are being made for the next interested party draft sometime this summer.

**NEW MEXICO**

New Mexico is in the final process of drafting the NORM regulations with their other amended radiation protection regulations. The NORM regulations are currently undergoing legal review. After the legal review and assuming no major changes will be required, the draft will be put on the docket of the Environmental Improvement Board during the second quarter of 1994. The Department of Environment is looking for a promulgation date of June or July, 1994.

**OKLAHOMA**

The Radiation Management Advisory Council of the Department of Environmental Quality met on March 3 in Oklahoma City to discuss the 1993 proposed NORM regulations drafted by the previous Radiation  
(Continued on page 5)

**Oklahoma** (Continued)  
Council. At the March 3rd meeting the new members of the Council became acquainted with the NORM draft. Nothing was adopted at the meeting; just discussions. Approximately 20 people from the public attended, primarily consultants and others from the petroleum industry. The next meeting of the Council will be June 2 in Tulsa. They are anticipating that significant progress will be made at this meeting because the Council members will be more familiar with the NORM draft. Oklahoma's regulations for the control of NORM may be adopted by the end of 1994.

### **SOUTH CAROLINA**

The Radiation Waste Management Division took a proposed draft of NORM regulations to the Board of Health and Environmental Control on March 10. The Board approved the request to put the proposed regulation out for public comment. The draft will also be reviewed by the Technical Advisory Radiation and Control Council on March 24. The Council is an advisory group to the Board. Following public comment, the Board will reconsider the regulation. If approved by the Board, it has to be submitted to the General Assembly, and because of the legislative schedule, cannot become effective before next spring.

### **TEXAS**

The Bureau of Radiation Control is considering some revisions in the NORM regulations which became effective July 1, 1993. One area under consideration for revision is the 30 pCi/gm exempt level for radium. The present 30 pCi/gm concentration is coupled to the radon emanation rate from the material. Only material that has an emanation rate less than 20

pCi/liter per second per square meter is exempt at the 30 level. Since the radon emanation rate is difficult to measure and very dependent upon soil and atmospheric conditions, the Bureau is considering replacing the requirement to measure the emanation rate with specific limits or concentrations of radium in the material based upon what is known about radon emanation rates. The Bureau would also like to incorporate rules requiring specific licensing of NORM processing facilities that will be doing processing and storage of NORM wastes on a commercial level.

A training manual for Parts 11 and 21 Texas Regulations for Control of Radiation (TRCR) has been developed as a training aid for use in training seminars. It may also be used as a reference document for licensees, registrants, and others in the transition from the current radiation protection standards to the revised radiation protection standards contained in TRCR Parts 11 and 21. The manual was compiled by the Bureau of Radiation Control, Texas Department of Health.

The Texas Railroad Commission is making very good progress on options for the disposal of oil and gas industry NORM wastes. The Commission hopes to have a draft ready for review in April. By legislative directive, the disposal rules must be finalized by January 1, 1995.

### **CRCPD** (Conference of Radiation Control Program Directors, Inc.)

The SR-5 Committee responsible for the NORM guidelines met in January for three days to discuss finalizing the draft. It is planned to submit the revised Part N NORM guidelines in May to the Board of Directors for final approval.

CRCPD's E-4 Committee on Naturally Occurring Radioactive Material/Decontamination and Decommissioning has prepared a draft report. The report is a continuation of the work of the Committee to provide information to state radiation control program and to Federal agencies charged with responsibility for establishing policy for the management and disposal of naturally occurring radioactive materials. Report 1 and 2 of this series described various observed instances of NORM contamination or of NORM incorporated into product and materials resulting in unintended radiation exposure to the general public. The present report, Number 3, concentrates on diffuse NORM sources, rather than discrete sources such as radium needles, and describes both the mechanisms by which diffuse NORM is made available for human exposure and the risk assessment which must precede any decisions concerning final disposition of diffuse NORM. It attempts to point out the possibility of "orphan" diffuse NORM sites resulting from past and present industrial activities which have not been explicitly associated with radioactive material use and management.

The SR-5 "Part N" Committee on suggested State Regulations regarding NORM contamination met with the E-4 Committee on Natural Radioactivity Contamination in January, 1994. The two groups met jointly to discuss the final recommendations for disposal of NORM-contaminated pipe scale for inclusion in the NORM-3 report. The E-4 Committee made several changes to the recommendations which have been incorporated into the final report. The NORM-3 report will be submitted to the Board of Directors for approval for  
(Continued on page 6)

## CRCPD (Continued) publication.

The Abstract of the report follows:

*Report Number 3 summarizes the work reported in Reports 1 and 2, and further describes the mechanisms by which NORM is brought into the biosphere, sometimes concentrated, and deposited. The report further describes specific examples of such technologically enhanced concentrations of diffuse NORM and provides estimates of the man radiation exposure which results. Examples of diffuse NORM sources resulting from past mining and mineral extraction as well as from current industrial activities are given. The criteria to be applied to determine appropriate control and disposal methods are given; finally, the report discusses three alternative methods for approving disposal methods.*

Following resolution of the E-4 recommendations, the SR-5 Committee, with E-4 participation, discussed revision of the Part N proposed regulations to ensure consistency with the E-4 recommendations. As stated previously, SR-5 plans to complete the revision of Part N by May, 1994.

## NUCLEAR REGULATORY COMMISSION (NRC)

The NRC is proposing to amend 10 CFR Part 20 of its regulations to provide specific radiological criteria for the decommissioning of soils and structures. Although these proposed rules are only applicable to the decommissioning of all facilities subject to the Commission's jurisdiction under the Atomic Energy Act and the Energy Reorganization Act, the proposed rules could set a precedent for the decommissioning

of non-licensed soil and structures. Once licensed activities have ceased, licensees are required to decommission their facilities so that their licenses can be terminated. The proposed rules will apply to these decommissioning activities. At present, this requires that radioactivity in land, groundwater, surface water, buildings, and equipment resulting from the licensed operation be reduced to levels that allow the property to be

released for unrestricted use. Licensees must then demonstrate that all facilities have been properly decontaminated and that, except for any residual radiological contamination found to be acceptable to remain at the site, radioactive material has been transferred to authorized recipients. Confirmatory surveys are conducted by NRC, where appropriate, to verify that sites meet NRC radiological criteria for decommissioning.

## ENVIRONMENTAL PROTECTION AGENCY (EPA)

Eugene Durman, Deputy Office Director of EPA's Office of Air and Radiation has asked me to clarify what Margo Oge, Director of the US EPA's Office of Radiation and Indoor Air, said as the luncheon speaker at the First National Forum on NORM held in Washington, DC on December 7, 1993. I reported remarks attributed to Ms. Oge in the Fall 1993 issue of **The NORM Report**. What was reported were comments received from one of the sponsors of the Forum who in addition to hearing Ms. Oge speak at the luncheon, reportedly had a lengthy private conversation with her. What Ms. Oge said at the luncheon was the following in brief:

- EPA is developing clean-up regulations for sites contaminated with radionuclides and will also develop waste management regulations. An internal draft of the radiation cleanup regulation is expected to be ready in late February, with a proposal for the Administrator's signature in September.
- EPA has recently published an Advance Notice of Proposed Rulemaking for the clean-up regulations in which one of the issues outlined was NARM/NORM.
- EPA has drafted a report, "Diffuse NORM: Waste Characterization and Preliminary Risk Assessment" which is being revised by EPA's Science Advisory Board.
- EPA is aware of a number of sources of NORM, which are being evaluated. However, no decisions have been made with regard to those sources.
- EPA is not developing regulations for NORM at the present time, although the Agency is evaluating the issue of NORM at Federal Facility cleanups.

I certainly apologize to Ms. Oge if I misquoted her.

The Radiation Advisory Committee (RAC) of EPA's Science Advisory Board (SAB) has been reviewing the EPA Diffuse NORM Draft Scoping Document. Closure of the Document was originally scheduled for the October 1993 meeting of the RAC but was deferred to the February 1994 meeting. Closure was attempted at that meeting, but there were too many

(Continued on page 7)

## Stan A. Huber Consultants, Inc. (SAHCI)

Stan A. Huber Consultants, Inc. (SAHCI) has specialized for 25 years in providing full health physics support services to industrial facilities that use or may be contaminated with radioactive materials or NORM. We offer a full range of professional services including, but not limited to:

1. Providing professionally recognized radiological surveys of materials and facilities to define the true scope of any NORM contamination that may exist.
2. Preparing or assisting with licensing, permits, and regulatory compliance needs and documentation.
3. Providing health physics services, such as:
  - a. Decontamination/decommissioning projects. Termination of licensed facilities require that a close-out radiation survey be made to ensure that the facility is free of NORM contamination and can be released for unrestricted use.
  - b. Certified calibration of NORM survey meters (required by regulations to be done every 6 or 12 months).
  - c. Soil and water analyses.
  - d. Routine radiation surveys.
  - e. Radiation safety programs.
4. Drum or container packaging and transport arrangements (including manifesting, labeling, load preparation, etc.) can be done for each shipment of NORM wastes.
5. Providing on-the-job training for your personnel to assume the radiation survey requirements and the shipping functions for continuing NORM disposal projects.
6. Coordinating decontamination projects and acting as liaison between waste removal personnel, facility management, and regulatory agencies.

We can provide references of previous projects.

If any of these services are of interest, or if you would like a no-obligation discussion or additional information, please contact our office by phone (815/485-6161), FAX (815/485-4433), or by letter to:

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### EPA (Continued)

those ends so it was deferred again to a March 28 teleconference. Closure did occur at the teleconference. On March 31 the RAC report was sent to the SAB Executive Committee for review and approval. The Executive Committee will conduct their closure review of the report on April 22/23, 1994. The Executive Committee is expected to spend no more than 35 to 45 minutes on the NORM report at the April meeting. (They will be reviewing several other EPA reports at the meeting also.) The SAB Executive Committee can accept the RAC report as is, or they may make some minor tweaks to the report. The Executive Committee will try to finalize the RAC review report

and send it to the Administrator of the EPA, probably in early May. Following the transmission of the final approved RAC report to the Administrator, the SAB will release copies of the final report to the interested public. The RAC report is titled *An SAB Report: Review of Diffuse NORM Draft Scoping Document. Review of the Office of Radiation and Indoor Air Draft Document on Diffuse Naturally-Occurring Radioactive Material (NORM): Waste Characterization and Preliminary Risk Assessment.*

At the RAC February meeting, Kevin Grice (Texaco) presented API Comments on Oilfield NORM. The Utility Solid Waste Activities Group of the Edison Electric Institute also made comments at the meeting. Both groups were critical of the scoping document believing it to be scientifically flawed and would like the opportunity to work with EPA so that any NORM document published reflects accurate and appropriate information. The American Mining Congress also submitted a review of the EPA scoping document for consideration by the RAC.

The RAC believes that the issue of NORM deserves substantial attention within EPA, and is concerned that the issue may not be resolved in a timely manner without increased resources being devoted to it. Despite its shortcomings, the NORM document nonetheless provides clear

(Continued on page 8)



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## Resource Recovery Waste Minimization Treatability Studies

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### EPA (Continued)

indications that some categories of NORM may produce risks that exceed those of concern from other sources of radiation. In fact, both individual as well as population risk may be substantial (in comparison to other EPA-regulated hazards) for some categories of NORM (e.g., oil production wastes, rare earth processing residuals, etc.). It is therefore advisable that EPA move forward toward a decision on the necessity to regulate NORM. The EPA budget isn't geared at present to make NORM a priority activity. This may change after the RAC report comes out. The EPA may have to reassess budgets and resource allocations.

RAC members indicated they do not consider the EPA document to be an adequate basis to initiate

regulation, but they may suggest it be used as guidance and that a second document be prepared to screen NORM categories for regulatory attention.

Bill Dornsife, CRCPD's Chairperson of the Committee on Decontamination and Decommissioning has been asked to be the Chairperson of the EPA National Advisory Committee on Environmental Policy and Technology (NACEPT) Subcommittee on Radiation Cleanup Standards. Dornsife is the Director of the Bureau of Radiation Protection, Pennsylvania Department of Environmental Resources. EPA is on an extremely aggressive schedule to develop a draft rule. The schedule is as follows:

- Advanced Notice of Proposed Rulemaking: early November 1993
- Draft proposed rule: December 1993
- Second NACEPT Subcommittee Meeting: February 1994
- Office of Management and Budget Review: summer 1994
- Publication of Final Proposed Rule: fall 1994
- Final Rule promulgated: fall 1995

(Continued on page 9)



## Selective Tools, Inc. (STI)

STI was incorporated under the laws of Texas in 1986. The primary activities of the company are oilfield related and over 100 oil and gas firms have been serviced during the past seven years. On August 30, 1993, STI received the first Specific License granted by the Bureau of Radiation Control, Texas Department of Health for the decontamination of NORM-contaminated equipment, facilities and land including the containerization of NOF wastes. Under their license, STI is authorized to handle NORM as defined in the Texas Regulations for the Control of Radiation (46.3), both liquids and solids of unlimited maximum activity. In addition to the petroleum industry, STI has serviced the phosphoric acid industry as well as tanker loading and offloading facilities. Relative to their Specific License, STI services include:

- Soil remediation
- Pipe and equipment decontamination
- Automated tank/enclosed vessel decontamination
- Pipeline descaling
- NORM slurrification and disposal operations
- NORM surveys
- Worker training and certification
- Project design and implementation relating to unique NORM problems

For additional information on these services, please contact our office by phone (713-626-0091), FAX (713-960-0832), or to:

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### EPA (Continued)

The Committee discussions primarily center upon the following issues and questions:

- **Clean up levels:** What incremental level of risk over background should be achieved in site clean up? What is the role of technological feasibility and cost of clean up in the selection of a clean up level?
- **Future land use:** What is the relationship between clean up levels and future land uses? How should the EPA define future land use scenarios for a site?
- **Site specific public involvement:** What issues should be resolved on a site specific basis, as opposed to being included in a generic national rule? Are the existing public involvement processes used by the EPA adequate for use at radiation sites?

Dr. Ambika Bathija of EPA's Office of Air and Radiation commented that the regulations are being developed for federal facilities, e.g., DOD and DOE contaminated facilities that have to be cleaned up. Work has been started on a waste management rule for managing all the extra wastes that will be generated by the site clean ups. Issues have been identified and an outline developed for the issues paper that will be written. The issues paper should be ready in 7 or 8 months after the clean up rule. ■

### Health Physics Society

The Health Physics Society has established a NORM working group to prepare a *Guide for Control and Release of Naturally Occurring Radioactive Material*. The project will provide guidelines for limiting radiological impacts resulting from release or use of equipment, materials, waste, buildings, or land containing NORM. Environmental radiation specialists and state and federal regulatory agencies are concerned about the past and on-going generation of NORM, for example, large quantities of oil and gas piping, construction materials, and residue from mineral processing which are contaminated with NORM. This standard will provide guidance on such contamination and determination of appropriate disposal criteria. ■

## Core Laboratories — Your Experts in NORM Analysis

Core Laboratories offers extensive experience in the analysis of NORM material. Over the past 15 years, our NORM group located in Casper, Wyoming has performed the majority of the analytical NORM analysis for LAMOGA, API, EPA, DOE, and many major oil companies.

Core Laboratories maintains a full-service radio-chemistry laboratory with:

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For more information, please contact the Core Laboratories representative nearest you.



### Core Laboratories

Casper, WY	800-666-0306
Lake Charles, LA	800-259-4926
Lafayette, LA	800-259-4926
New Orleans, LA	504-581-5222
Aurora, CO	800-972-2673
Corpus Christi, TX	800-548-8228
Houston, TX	800-734-2673
Carrollton, TX	214-466-2673
San Antonio, TX	210-344-9751
Anaheim, CA	800-404-2673

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## A NEW COMMERCIAL NORM TREATMENT FACILITY

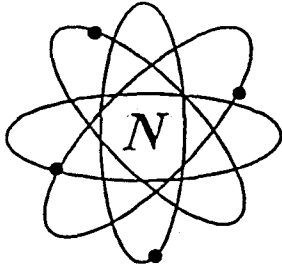
Campbell Wells Corporation, a wholly owned subsidiary of Sanifill Inc., is constructing a facility near Lacassine, Louisiana designed to treat non-hazardous oilfield waste (NOW) contaminated with NORM (NOW-NORM). This facility, the first of its kind in the United States, is expected to begin receiving waste for treatment in early May. The facility is allowed to receive NOW-NORM generated throughout Louisiana, other states and the Outer Continental Shelf (OCS).

The permits issued to the Lacassine facility by the Louisiana Department of Natural Resources (LADNR) and the Louisiana Department of Environmental Quality (LADEQ), specifies that the facility may receive NOW-NORM for treatment that contains not more than 200 picocuries per gram (pCi/gm) of NORM, as defined by the LADEQ. The results of the NOW-NORM treatment procedures at the Lacassine facility will be to (i) bring the NOW element of the waste stream to the "reusable" standards under Order 29-B as monitored by the LADNR, and (ii) bring the NORM element (radium) of the waste stream to levels that do not exceed 5 pCi/gm above the radium background in the vicinity, which qualifies such waste for "unrestricted transfer" pursuant to the LADEQ's NORM regulations.

I recently visited the Lacassine facility and am impressed with the development. On-site NORM analyses using sophisticated germanium crystal scintillation spectroscopy will monitor the waste treatment insuring

compliance with DNR and DEQ regulations. Site monitoring of radon, both on the facility itself and around the perimeter will record any significant increase in radon in the environment. Details of construction of the stockpiled treated NOW-NORM should minimize radon emanation into the environment. Barrier and dike construction around the facility should eliminate any possibility of water runoff from the facility. My impression of the Lacassine facility is that has been designed to provide an environmentally safe facility for the treatment of NOW-NORM wastes.

NOW-NORM waste streams having concentrations in excess of 200 pCi/gm, other NORM-  
(Continued on page 11)



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1900 West Loop South, Suite 400

Houston, Texas 77027

713/871-7158

**Mel Hebert**

P. O. Box 1409

Amelia, Louisiana 70340

504/631-9002

## **NORM FACILITY (Cont'd)**

contaminated oilfield wastes, and NORM-contaminated materials not associated with oilfield wastes may be managed through Campbell Wells' Sunrise Supply Limited facility. Sunrise Supply is the only LADEQ licensed commercial storage facility in Louisiana. Through the combination of the Lacassine facility and the Sunrise Supply facility, Campbell Wells provides the oil and gas industry with a comprehensive basis for compliance with NORM regulations.

Sammy Cooper or Jerry Brazzel can provide more information on Campbell Wells NORM services at 318/981-4004. ■

**“There's as much risk in doing nothing as doing something.”**

**Trammell Crow**

## **Executive Order on Regulatory Planning and Review**

On October 1, 1993, President Clinton signed an Executive Order on Regulatory Planning and Review, which should be of interest to industries facing regulations for the control of NORM as well as other regulations impacting industry. Specifically, the Executive Order requires federal agencies to:

- Assess all costs and benefits of available regulatory alternatives;
- consider the degree and nature of the risks posed by the substance and activities within their respective jurisdiction;
- base decisions on best obtainable scientific, technical, economic, and other information;
- avoid regulations that are inconsistent, incompatible, or duplicative with other regulations or those of other agencies; and
- prepare a statement of the need for regulation, including: how the action will reduce risks to public health, safety, or the environment; and how the magnitude of the risk addressed by the action relates to other risks within jurisdiction of the agency.

The action by the President is seen as an important step necessary to improve the quality of federal regulation, which will ultimately reduce environmental, health and safety risks, without compromising the health and safety of workers and the general public. ■

## Lionhead Engineering and Consulting Ltd.

Naturally Occurring Radioactive Barium Sulfate Scales present major environmental and health hazard problems in parts of Western Canada. Lionhead Engineering and Consulting Ltd. specializes in the **SAFE HANDLING, REMOVAL AND DISPOSAL OF RADIOACTIVE BARIUM SULFATE SCALES.**

Lionhead Engineering and Consulting Ltd. specializes in the removal of LSA radioactive scales from both surface and sub-surface equipment. Operations are conducted in a totally controlled environment where the radioactive scale and dust are collected in dry, wet and air filtration systems. After collection, the material is loaded in specially designed canisters for sub-surface disposal in specifically designated oil and gas wells that have been scheduled for abandonment.

In addition to removal, collection and disposal of radioactive scales, Lionhead Engineering and Consulting Ltd. specializes in the design of well bore abandonment programs including regulatory clearance for sub-surface disposal.

For more information or to discuss your needs, call or write:

Lionhead Engineering and Consulting Ltd.  
203, 622-5th Avenue S.W.  
Calgary, Alberta T2P 0M6  
Tel: (403) 262-2694  
FAX: (403) 237-7111

## The Ocean Radioactive Dumping Ban Act of 1994

At the November 1993 Meeting of Contracting Parties to the London Convention, the United States and 36 other countries voted to ban the dumping of radioactive wastes or other radioactive matter at sea by amending Annex I of the Convention which had previously listed only high-level radioactive wastes. This legally binding ban will be implemented in the United States through enactment of proposed bill, H.R. 3982, the Ocean Radioactive Dumping Ban Act of 1994. At this time what is meant by radioactive wastes has not been defined. It is not known whether NORM will be included in the definition of radioactive material.

Oil and gas production wastes have been considered exempt from the London Convention requirements because of an exemption given to "wastes derived from the normal operations of platforms and other man-made structures at sea". However, there is talk that the current industry practice of transporting the wastes prior to disposal may negate this exemption. For example, solid wastes may be taken ashore where they may be consolidated and then approved by MMS for offshore encapsulation and reinjection.

Contracting parties to the London convention will also decide in future meetings (the first set for May 9 - 13, 1994) on a proposed amendment that would prohibit the emplacement of radioactive wastes in the sub-seabed. Contracting parties have already agreed to a voluntary, non-binding ban on the disposal of radioactive wastes and other radioactive matter into sub-seabed repositories. Depending on the definition given to "radioactive wastes" and future interpretations of the "exempt" status for wastes derived from offshore oil and gas operations, such a prohibition may affect the current policy of permitting encapsulation and reinjection of NORM-contaminated offshore oilfield wastes in the Gulf of Mexico.

## Federal Water Pollution Control Act

A Bill to amend the Federal Water Pollution Control Act (FWPCA) relating to Federal facilities pollution control was introduced as H.R. 2580 in the House, July 1, 1993 by Representative DeFazio. Section 502 of the FWPCA is amended by adding at the end following:

*"(21) the term "radioactive materials" includes source materials, special nuclear materials, and byproduct materials (as such terms are defined under the Atomic Energy Act of 1954) which are used, produced, or managed at facilities not licensed by the Nuclear Regulatory Commission."*

This amendment to Section 502 changes the definition of radioactive materials subject to regulation under The Clean Water Act as defined by the U.S. Supreme Court in 1976.

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**Government Spending to Avert Various Risks**

Based upon past experience, the United States government is apparently willing to spend the following dollars per life saved to avert various risks:

Medical screening and treatment	\$75,000
Highway safety	150,000
Radium in drinking water	2,500,000
Nuclear reactor safety	2,500,000,000
Radioactive waste storage	Billions

Since U. S. government spending is closely tied to public concerns, this indicates that public concern about dangers of radiation is out of proportion by at least a factor of 10,000 where nuclear power and radiation are involved. One strange aspect of this is that radon in homes, which gives 1000 times as much radiation as nuclear power, is feared very much less.

**The NORM Report**

The NORM Report is a newsletter dedicated to naturally occurring radioactive contamination. Previously it was directed at the petroleum/petrochemical industry but it more and more is reporting on other industries as well who have problems with NORM contamination.

The newsletter is published four times a year and a one-year subscription is \$95 (\$49 for government and non-profit subscribers).

For more information, please call:

**Peter Gray and Associates**  
 918-250-6042

## State Radiation Control Directors

The following is a list of persons responsible for radiation programs in the United States. These people can be contacted with regard to questions about NORM regulations.

<u>State</u>	<u>Name</u>	<u>Office Telephone Number</u>
AK	Vacant	907/465-3019
AL	Kirksey E. Whatley	205/613-5391
AR	Greta J. Dicus	501/661-2301
AZ	Aubrey V. Godwin	602/255-4845
CA	Edgar D. Bailey	916/322-3482
CO	Robert M. Quillin	303/692-3030
CT	Kevin T. A. McCarthy	203/566-5134
DC	James R. Murphy	202/727-7190
DE	Allan C. Tapert	302/739-3787
FL	Lyle E. Jerrett	904/487-1004
GA	Thomas E. Hill	404/362-2675
GUAM	Dr. O. V. Natarajan	671/734-7209
HI	Russell S. Takata	808/586-4700
IA	Donald A. Flater	515/281-3478
ID	Grant W. Klokeid	208/334-2235
IL	Paul Eastvoid	217/785-9918
IN	David Nauth	317/633-0152
KS	Gerard W. Allen	913/296-1562
KY	John A. Volpe	502/564-3700
LA	William H. Spell	504/765-0160
MA	Robert M. Hallisey	617/727-6214
MD	Roland G. Fletcher	410/631-3300
ME	W. Clough Toppan	207/287-5676
MI	George W. Bruchmann	517/335-8200
MN	Larry D. Souther	612/627-5480
MO	Vacant	314/751-6083
MS	Eddie S. Fuente	601/354-6657
MT	Adrian C. Howe	406/444-3671
NC	Dayne H. Brown	919/571-4141
ND	Dana K. Mount	701/221-5188
NE	Harold R. Borchert	402/471-2168
NH	Diane E. Tefft	603/271-4588
NJ	Jill Lipoti	609/987-6389
NM	William M. Floyd	505.827-4300
NV	Stanley R. Marshall	702/687-5394
NYC Health	Robert R. Kulikowski	718/643-7967
NY Environ.	Paul J. Merges	518/457-2225
NY Health	Karim Rimawi	518/458-6461
NY Labor	Rita Aldrich	718/797-7641
OH	Robert E. Owen	614/644-2727
OK	Lloyd A. Kirk	405/271-7484

(Continued on page 15)

## Cancer Risk from Low-Level Radiation

There is considerable controversy developing as to whether the linear-no threshold (L-NT) theory of cancer risk is valid. According to the L-NT theory, the risk of cancer from low-level radiation (LLR) can be estimated from known effects at high radiation levels. That is, if R is the known risk at dose D, it is assumed that the risk from dose 0.001 D is 0.001 R. The basis for this assumption is that, in the low dose region, cancer is normally initiated by a single particle of radiation interacting with a single DNA molecule, whence the probability for such an initiation is just proportional to the number of radiation particles, and hence to the dose. However, the opponents of this theory argue that the theory ignores the role of biological defense mechanisms (BDM) which prevent the overwhelming majority of these initiations from developing. If BDM are affected by radiation in a non-linear manner, the basis for L-NT disappears.

Professor Bernard Cohen (University of Pittsburgh) has written several articles of late with evidence he purports to show the L-NT theory is invalid. An example of Bernard's data was given in the Fall 1993 issue of *The NORM Report*. The item in the newsletter was taken from a recent issue of the *Health Physics Newsletter* and did not necessarily reflect the views of this newsletter.

Evidence supporting the N-RT theory was reported in the January 20, 1994 edition of the *New England Journal of Medicine*. This Swedish study was the largest residential radon case-control study reported to date with 1,300 lung cancer cases and 2,847 controls. The authors found an increased risk of lung cancer with

(Continued on page 18)

## State Radiation Control Directors (Continued)

## A Disposal Option?

State	Name	Office Telephone Number
OR	Ray D. Paris	503/731-4014
PA	William P. Dornsife	717/787-2480
Puerto Rico	David Saldana	809/767-3563
RI	Charles V. McMahan	401/277-2438
SC	Max K. Batavia	803/737-7400
SD	David Micklos	605/773-3364
TN	Michael H. Mobley	615/532-0360
TX	Richard A. Ratliff	512/834-6688
UT	Bill Sinclair	801/536-4250
VA	Leslie P. Foldesi	804/786-5932
Virgin Islds.	Francine Lang	809/774-3320
VT	Raymond N. McCandless	802/865-7730
WA	T. R. Strong	206/586-8949
WI	Paul S. Schmidt	608/267-4782
WV	Beattie L. DeBord	304/558-3526
WY	has no program for radiation control	

The export of NORM-contaminated metal, e.g., tubular goods, is increasing. China, in particular, is purchasing the still contaminated material as scrap steel and smelting it to recover the steel. Apparently this has caused some reduction in the number of tubulars descaled in this country. One exemption is NORM-contaminated tubulars and other vessels made of special steels.

CRCPD's Committee on Natural Radioactivity Contamination (ENRAC) recently recommended a standard for allowing NORM waste to be shipped to a third world nation that does not have a regulatory program. ■

A complete directory is available from the Conference of Radiation Control Program directors for \$30. Ask for "Directory of Personnel Responsible for Radiological Health Programs." ■

**NORM Contamination should be respected, but not feared.**

## Campbell Wells Corporation

Campbell Wells Corporation, a wholly owned subsidiary of Sanifill Inc. expects to begin receiving NORM waste for treatment and disposal in early May at its new facility located near Lacassine, LA. The Lacassine facility is designed to treat non-hazardous oilfield waste (NOW) contaminated with naturally occurring radioactive materials (NORM). This commercial facility, the first of its kind in the United States, is permitted to receive NOW-NORM generated throughout Louisiana, other states, and the Outer Continental Shelf.

The permits issued to the Lacassine facility by the Louisiana Department of Natural Resources and the Louisiana Department of Environmental Quality (LADEQ) specifies that the facility may receive NOW-NORM that contains not more than 200 picocuries of radium per gram (pCi/gm). The waste material will be treated at the Lacassine facility to (i) bring the NOW element of the wastes to the "reusable material" standards as specified in Order 29-B and monitored by the LADEQ, and (ii) reduce the radium content of the NORM wastes to levels that do not exceed 5 pCi/gm above radium background concentrations in the vicinity. This will qualify the treated waste materials for "unrestricted transfer" as defined in the LADEQ's regulations for the control of NORM.

NOW-NORM waste materials containing radium in excess of 200 pCi/gm, other NORM-contaminated oilfield wastes, and NORM-contaminated materials not associated with oilfield wastes may be managed through Campbell Well's Sunrise Supply Limited facility. Sunrise Supply is the only LADEQ licensed commercial storage facility in Louisiana. Through the combination of the new Lacassine NORM facility and the Sunrise Supply storage facility, Campbell Wells provides the oil and gas industry with a comprehensive program for compliance with NORM regulations.

For additional information on the NORM services provided by Campbell Wells, contact:

**Sammy Cooper or Jerry Brazzel at (318) 981-4004** ■

## Comparison of NORM Rules by State

<u>Radium Exemption Concentration</u>		<u>Radium Cleanup Standard</u>	
AR	5 pCi/g	AR	5/15 pCi/g(3)
GA	5 pCi/g	GA	5/15 pCi/g
LA (Current)	5 pCi/g with high radon factor(1) 30 pCi/g with low Rn factor(2)	LA (Current)	5/15 pCi/g with high radon factc 30 pCi/g with low radon factor
LA (Proposed)	5 pCi/g with high Rn factor 30 pCi/g in soil, low Rn factor 30 pCi/g other than soil, low Rn	LA (Proposed)	5/15 pCi/g with high radon factc 30 pCi/g with low radon factor Decontamination of soil necessary, shall be to 5 pCi/g o Radium-226 or Radium-228
MS	5 pCi/g with high radon factor 30 pCi/g with low radon factor	MS	5/15 pCi/g with high radon facto 30 pCi/g with low radon factor
TX	5 pCi/g with high radon factor 30 pCi.g with low radon factor	TX	5/15 pCi/g with high radon factor 30 /Ci/g with low radon factor
CO (Proposed)	5 pCi/g	CO (Proposed)	5 pCi/g
MI (proposed)	5 pCi/g	MI (Proposed)	5/15 pCi/g
NM (Proposed)	5 pCi/g	NM (Proposed)	5/15 pCi/g
OK (Proposed)	30 pCi/g in soil 30 pCi/g in media other than soil	OK (Proposed)	30/15 pCi/g(4)
SC (Proposed)	5 pCi/g with high radon factor 30 pCi/g with low radon factor	SC (Proposed)	5/15 pCi/g with high radon factor 30 pCi/g with low radon factor
CRCPD (Proposed)	5 pCi/g	CRCPD (Proposed)	5/15 pCi/g

(1) High Rn factor is a Rn emanation rate greater than 20 pCi per square meter per second.  
 (2) Low Rn factor is a Rn emanation rate less than 20 pCi/g per square meter per second.

(3) 5/15 pCi/g is 5 pCi/g of radium in soil, averaged over any 100 square meters and averaged over the first 15 centimeters of soil below the surface.  
 (4) 30/15 pCi/g is 30 pCi/g of radium in soil, averaged over any 100 square meters and averaged over the first 15 centimeters of soil below the surface.

(Continued on page 17)



## Comparison of NORM Rules by State (Continued)

### Exemption for Contaminated Equipment

AR	Concentration limit only (5 pCi/g)	TX	50 $\mu$ R/hr including background
GA	50 $\mu$ R/hr including background	CO (Proposed)	Concentration limit only (5 pCi/g)
LA (Current)	25 $\mu$ R/hr above background	MI (Proposed)	Concentration limit only in disintegrations per minute <sup>(5)</sup>
LA (Proposed)	50 $\mu$ R/hr including background	NM (Proposed)	50 $\mu$ R/hr including background
MS	25 $\mu$ R/hr above background	OK (Proposed)	50 $\mu$ R/hr including background
		SC (Proposed)	50 $\mu$ R/hr including background
		CRCPD (Proposed)	Concentration limit only in

(5) See Table or Appendix in proposed regulations for details

It is proposed to include this Comparison of NORM Rules by State table in all future issues of The NORM Report, updating the information as states revise their regulations or propose and enact new ones. As the federal government and Canada propose NORM regulations, they will be included in the table also. ■

### Health Physics Society Position Statements

During the last few years, the Health Physics Society has prepared Position Statements on various topics of interest to health physicists and related personnel. These Position Statements are available from the:

Health Physics Society  
8000 Westpark Drive, Suite 499  
McLean, VA 22102  
(703) 790-1745; FAX (703) 893-4632

The Health Physics Society Position Statements include the following:

- Radiation Standards for Site Cleanup and Restoration (no date)
- Comments on the Nuclear Regulatory Commission Policy Statement on the Exemption of Very Low-Level Radioactive Materials, Wastes and Practices (BRC Policy) (December 1990)
- Perspectives and Recommendations on Indoor Radon (October 1990)
- Compatibility in Radiation Protection Regulations (January 1992)
- Radiation Dose Limits for the General Public (September 1992)
- Radiation Dose Limits for the General Public, Part II (no date) ■

## NORM Training Course Offered by OGCI & Peter Gray

OGCI (Oil & Gas Consultants International, Inc.), a world leader in petroleum training, has scheduled training courses in NORM control for 1994. The course *NORM Contamination in the Petroleum Industry* will cover all aspects of NORM contamination and its control, including:

- Fundamentals of Radiation
- Fundamentals of NORM
- NORM (Radium) Contamination
- NORM (Radon) Contamination
- State and Federal Regulations
- NORM Surveys including hands-on practice
- Maintenance Procedures
- Disposal of NORM Wastes
- Decontaminations
- Release of Facilities
- Recommended Programs
- Liability and Litigation

This course builds a rigorous and complete foundation for the control of NORM contamination. The 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 the control of NORM. The course meets all requirements for Radiation Safety Officer training as outlined by Louisiana's DEQ.

Peter Gray is the editor/publisher of *The NORM Report*, a newsletter about NORM contamination in the petroleum and other industries.

The 1994 schedule for the course *NORM Contamination in the Petroleum Industry* is:

May 17 - 20	Houston
Nov. 1 - 4	Calgary
Nov. 29 - Dec. 2	Houston

For further information about the course, contact Joseph Goetz, Vice President, OGCI, 4554 South Harvard Avenue, Tulsa, OK 74135, 800-821-5933. Or contact Peter Gray at 918-250-6042 for additional information about the course content. ■

### NORM Seminar

The law firm of Moreno, Purcell and Schindler is presenting a seminar on NORM and the SEC Staff Accounting Bulletin 92-A in Santa Monica April 22, 1994. The seminar is open to the public, but is primarily for defense and corporate attorneys. Contact Peter McDowell for additional information.

Peter McDowell Associates  
2204 East Second Street  
Long Beach, CA 90803  
(310) 439-0003 ■

**"People who are only good with hammers see everything as a nail"**

### Cancer Risk from Low-Level Radiation (Cont'd)

with elevated radon exposure. Lung cancer risk was 30% higher when people were exposed to average home radon concentrations of 3.8 to 10.8 pCi/liter, and 80% higher when average home radon levels exceeded 10.8 pCi/liter than that of people whose home exposure averaged below 1.4 pCi/liter. EPA's current "action Level" is 4 pCi/liter. The findings appear to be consistent with EPA's risk estimates. This Swedish study will be considered in the on-going EPA-sponsored National Academy of Sciences Biological Effects of Ionizing Radiation VI review of radon risk estimates. ■

### NORM Contamination

I presented a plenary paper at the recent *International Petroleum Environmental Conference --- Issues and Solutions in Exploration, Production and Refining*, March 2-4, 1994 in Houston, Texas. The conference was sponsored by the University of Tulsa and PennWell Publishers. If you would like a copy of the paper I presented please call me at 918-250-6042 or fax 918-250-6311. The paper is entitled *NORM Contamination in the Petroleum Industry*. The proceedings of the conference will be published by PennWell Publishers this summer. ■