



## NORM Control Plan

The elements which comprise Naturally Occurring Radioactive Material (NORM) in oil and gas production occur naturally through the earth's crust. These elements include uranium, thorium, and their respective progeny. The isotopes of concern are radium-226, radium-228 and their progeny. Small amounts of uranium are occasionally produced with oil and gas.

Buisier Engineering prepares a comprehensive NORM control plans for oil and gas fields according to IAEA standards. These elements may find their way into production fluids. When brought to the surface with the production, the radioactive

elements undergo a number of changes, but usually stay with the water phase of the production fluids and may either incorporate themselves in pipe scale, or precipitate into sludge. NORM may be found in downhole tubing as well as in above-ground processing equipment, salt water disposal/injection wells and associated equipment; in soils containing NORM as a result of well workover, tank cleaning and leaks, in tubing and in pipe cleaning and other associated operations. In production facilities, water-handling equipment exhibits the greatest NORM activity levels.

The NORM Control Plan (NCP) is established to help E&P operators identify the extent, form and level of NORM contamination associated with their operations. Once NORM contamination is identified, a process for decontamination and responsible disposal is implemented under the NCP. A post decontamination monitoring routine shall be designed to ensure that the E&P operators continue to protect the work force, the general public, and the environment from related hazards intrinsic to management of materials containing NORM. This Plan is based on IAEA, API, ASTM codes, several (US) states regulation, and best industry standards.

The components of NORM Control Plan shall be;

- Baseline survey, the objective of which is to establish a baseline of the spread and level of NORM accumulation in the site and facilities
- Pre-shutdown Survey, the objective of which is to determine the locations of NORM accumulations in facilities where NORM contamination is suspected, and legacy contamination Survey, which is the contamination resulting from operations prior to implementing NORM management strategy. Areas with legacy NORM contamination shall include, evaporation ponds, disposal pits, and equipment storage and maintenance areas. Information and data obtained in the Monitoring phase shall be schemed of field maps for easier and more comprehensive sight of the concentration/orientation of Norm in the field.

1/2



- Workers protection plan; the plan shall include the following procedures; organization and administration measures, area monitoring and control, Recording and documentation, and developing health and safety program. A training for the workforce covering the fields of workers protection measures and contamination control for workers who need to deal directly with NORM contamination such as cleanup of vessels containing NORM contaminated waste.

- Equipment decontamination; a NORM cleaning facility is created at the site. This facility shall be restricted to all persons other than those mandated for the decontamination process. Particular prominence shall be placed on waste cleaning and handling facilities to prevent the spread of NORM material to the surrounding environment. Although NORM removal is more efficient in dedicated facilities, in the cases of separators, tanks the decontamination process shall be conducted on site, certain precautions shall be taken to protect the crew and the environment.

- Interim storage for containerized NORM, such as scale, sludge and contaminated soil shall be in sealed containers, for interim storage before permanent disposal those containers shall be drums made of steel or heavy Polyethylene with sealable openings and marked appropriately with tags. Con

taminated Equipment hard to be cleaned such as filters. The storage area shall be fenced, with limited access, well ventilated and with warning signs at the entrances those signs shall bear the three bladed radiation symbol. The storage area shall be sized so that radiation levels at the perimeters are less than the permissible dose. Stored containers shall be guarded to secure them against unauthorized removal from the storage site. Records for the interim storage area shall be kept and updated.

- Permanent disposal of the NORM waste with the objective to establish a safe, practical and cost effective disposal protocol, shall be designed to prevent contamination of natural resources, such as underground water or soil that can be in the future part of an agricultural or residential area. Such options are; landfill disposal, underground injection, land spreading, salt cavern disposal, offshore discharge, and wetland disposal.