Technological Considerations

Environmental Issues | Technological Considerations

[ww-shortcode-divider style=”thin”]The petroleum industry has a proactive approach in evaluating and introducing new engineering and operational techniques aimed at environmental issues protection and implementation.

Atmospheric emissions

A principal target for emissions reduction is flaring and venting which provide the most significant source of air emissions in the industry.

Many process optimization studies have been conducted by industry to identify opportunities for emissions reductions.

This has led to the development of improved process control procedures, design and maintenance systems.

Technological advances in valve design have the potential to reduce fugitive emissions, whilst improved flare design has increased combustion efficiency.

Flare gas recovery and increased NGL recovery have resulted from evolving new technologies.

Various technological initiatives have been introduced to reduce emissions as a result of combustion processes related to power production.

More efficient gas turbines have been developed together with improved turbine maintenance regimes.

Efficiency improvements have also resulted from gas turbine optimization considerations.

Technologies to improve fuel efficiency include:

- Steam injection;
- Combined cycle power generation;
- Electric power distribution;
- Pump and compressor optimization;
- Waste heat recovery.

Technologies aimed at improved combustion performance are:

- Dry low NOX combustion (DLN) technology;
- Selective catalytic reduction (SCR) technology;
- Water and steam injection.

Produced water

A major waste resulting from the oil production process is produced water.

Significant progress has been made to limit water production during the field production.

Water shut–off technology (such as diverting gels) can provide an efficient way of reducing the quantities of water requiring treatment.

Reinjection of produced water, either into the reservoir, or into another formation, may provide a practical and optimum solution if suitable geological formations are available.

Technologies applied for the treatment of produced water include

- Skimming/gas flotation;
- Static hydrocyclones;
- Mechanical centrifugation;

- Gas stripping.

Other processes are currently being examined for potential application onshore and include:

- Bio-oxidation and biological treatments;
- Activated carbon filtration;
- Solvent extraction;
- Wet oxidation and ozonation.

Solid wastes

In the case of drilling fluid discharge, improved solids control equipment and new technology can reduce the volumes discharged to the environment.

The development of more effective drill bits can reduce the need for chemical additions, whilst gravel packs and screens may reduce the volume of formation solids/sludge produced.

Improved controls, procedures and maintenance can help minimize mud changes, engine oil changes and solvent usage.

Re–use, recycling and recovery of waste materials has also been examined, for example

- The use of drill cuttings for brick manufacture and road bed material;
- The use of vent gas for fuel;
- The use of produced or process water as wash water.

Several new technologies are being applied to waste treatment such as:

- Biological treatment (land spreading, com- posting, tank–based reactors);
- Thermal methods (thermal desorption and detoxification);
- Chemical methods (precipitation, extraction; neutralization);

- Gravity separation, filtration, centrifugation.

In evaluating and introducing new practices, the industry examines techniques aimed at minimizing and eliminating environmental effects.

Some drilling techniques that have been developed recently to minimize land take and footprint, reduction in waste material, include:

- Horizontal drilling, heliportable rigs, and slim–hole drilling.

Environmental management in oil and gas exploration and production, UNEP Technical Publication

Environmental, Health, and Safety Guidelines for Onshore Oil and Gas Development, International Finance Corporation

Environmental, Health, and Safety Guidelines for Offshore Oil and Gas Development, International Finance Corporation