Advanced Air Pollution control

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Course : Air and noise pollution control

CARBON SEQUESTRATION

1.Carbon Sequestration Process Description

Carbon sequestration" refers to activities for capture, separation & storage or reuse of carbon or CO2 .

Carbon sequestration technologies encompass both prevention of CO2 emissions into atmosphere as well as removal of CO2.

1-Carbon Sequestration Process Description

Major GHG is carbon dioxide, and fossil energy combustion accounts for anthropogenic (human-induced) CO_2

There are three primary means to reduce CO2 emissions associated with energy production

I. Improve efficiency of energy conversion Shift to lower-carbon-content fuels

II. Sequester carbon released in energy production

2. Development of Carbon Sequestration Road Map

Climate change is a challenge best measured in generations rather than years or even decades

Accordingly, the DOE has established following program goals to guide its activities

Describing the research that the DOE is examining in the following areas:

1. System studies and assessments
2. Enhanced natural sinks.
3. Capture and separation technology
4. Geologic storage.
5. Ocean sequestration
6. chemical and biological fixation and reuse, advanced CO2 capture technology

3.TERRESTRIAL SEQUESTRATION

Terrestrial sequestration

- The net removal of CO2 from atmosphere or prevention of CO2 emissions from terrestrial ecosystems.

Terrestrial sequestration can be enhanced in four ways

Advantage

Improve soil and water quality, better wildlife habitats, increased water conservatio

4. CO2 SEPARATION AND CAPTURE

- In EOR, CO2 is injected into oil reservoirs to increase mobility of oil and, thus, productivity of reservoir.
- Similar opportunities for CO2 sequestration may exist in production of hydrogen rich fuels (e.g., hydrogen or methanol) from carbon-rich feedstocks (e.g., natural gas, coal, or biomass).

5. GEOLOGIC SEQUESTRATION OPTIONS

- Once captured, CO2 needs to be sequestered. There are a variety of potential geologic sequestration options for long-term storage (ex, CO2 is currently injected into operating oil fields to enhance oil production).
- Deep saline reservoirs may be best long-term underground storage option.

6. OCEAN SEQUESTRATION

Performers will employ seismic methods and geochemical sampling to evaluate distribution of CO_2 in reservoir and chemical reactions that occur between CO_2 and the reservoir rock and fluids.

Abandoned or uneconomic coal seams could become CO_2 storage sites, because CO_2 injected into coal adheres to coal surface & remains within seam.

To implement ocean CO2 sequestration on a larger scale, several methods of injection have been proposed;

Methods to transport the liquid CO_2

1. from shore via a pipeline and to discharge it from manifold lying on ocean bottom, forming rising droplet plume.

2-by tanker and then discharge it from a pipe towed by moving ship.

3. another approach is to inject CO_2 as deeply as possible in order to maximize sequestration efficiency.

7-CHEMICAL AND BIOLOGICAL FIXATION & REUSE

- Goal of CO_2 utilization is to design chemical processes that can convert CO_2 to useful and durable products that have reasonable lifetimes.
- Whereas storing CO_2 can mitigate GHG problem, converting CO2 to useful products can create additional economic and environmental benefits.
- advanced chemical and biological sequestration is aimed at permanent, stable sequestration and at recycling carbon to create new fuels, chemical feedstocks, and other products.
- Three possible end uses include particulate carbon in composite materials and construction materials, CO2 as a feedstock for production of plastics, and carbon to create soil amendments.

Advanced chemical processes

- It might lead to unique sequestration technologies or to improvements of chemistry that will enhance performance of other sequestration approaches.
- Advanced chemical technologies envisioned for future would work with the technologies now being developed to convert recovered CO2 economically into benign, inert, long-lived materials that can be contained and/or have commercial value.

Advanced biological processes

It can improve natural biological processes for carbon sequestration from atmosphere in terrestrial plants, aquatic photosynthetic species, and soil and other microbial communities.

These technologies encompass the use of novel organisms, designed biological systems, and genetic improvements in metabolic networks in terrestrial and marine microbial, plant, and animal species

References

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