On the CO2 Geological Storage Study at AIST in 2009FY and later

Toshiyuki Tosha[1]; Yasuko Okuyama[2]

[1] AIST; [2] Geological Survey of Japan, AIST

1. Introduction

CO_2 geological storage is discussed in many countries. CO_2 injection for Enhance Oil Recovery (EOR) and injection separated from the natural gas are in operation but CO_2 after the capture of the thermal power plant is injected into the reservoir only at demonstration plants. Though the main purpose of the EOR is to obtain more oil and gas, technology about EOR such as how to inject CO_2 into the subsurface formations and the well design becomes an industrial analogue for the CO_2 geological storage. However pressure at the reservoir is expected to increase as there is no production in the CO_2 geological storage. Therefore leakage due to the increase of the reservoir pressure and the risk assessment is very important.

CO_2 leaked above the seal layer will move upward by its buoyancy but another seal layer will prevent CO_2 moving in the alternative layers with sandstone and siltstone. However seal ability should be smaller and the groundwater flow becomes stronger. Hydraulic model at and above the reservoir is very important.

Monitoring of CO_2 movement is necessary not only for getting public acceptance but also for operating safely. Seismic refraction method is widely used. The method is very powerful to reveal the structure in detail but very expensive and is suspicious for the monitoring method in the Post closing. Also seismic velocity change becomes constant if the relative permeability exceeds the limit. A new technology for combination with seismic and other methods is expected.

2. Direction of the research in AIST

Three sub-themes are set for the research works.

1) Development of the monitoring technology

Monitoring has some problems such as how to optimise the survey points and how to use the data fully in order to reduce the cost of the geological storage. To improve these problems the utilization of the post-processor is effective. In this study we will update the post-processors and collect data necessary to the injection project.

2) Development of the analyzing technique collected by the monitoring

Monitoring is essential to carry out the geological storage, which is used for the trace of the procedures and for the confirmation of the safety. To complete the objectives there are many technologies to be proposed and to be realized. However there exist some limitations to carry out the monitoring based on the topographical and geological characterization. To overcome the problems it is necessary to obtain as much data as possible. In this sub-theme we will conduct the update of each monitoring technique and develop an integrate method to analysis.

3) Safety evaluation on the multi-barrier system

The integrity of the seal layer is the requirement for the CO_2 geological storage in the alternative layers. However the characteristic of the seal layer remains unknown at the condition with the high CO_2 pressure and is the problem to be solved. The geological sequence above the seal layer continues alternative layers with sandstones and siltstones and the silt layers are supposed to be natural multi-barriers and act rolls as fail safes. In this sub-theme characteristic of the seal layer is examined to evaluate the safety, trapping mechanism in the reservoir is solved, the idea of the geological fail safe

Is developed and a new geological model is created. A leakage scenario is drawn and the safety evaluation is constructed.

3. Conclusion

A modification based on London protocol was applied to the corresponding Japanese law and the demonstration plant of the CO_2 geological storage is progressed by establishment of Japan CCS Ltd. The CO_2 geological storage study in AIST is being planed to support the demonstration plant based on the research work.