CO2 Injection at Ohaaki Geothermal Field Forecast Predictions

Since 1998, Contact Energy has been extracting mass from the Ohaaki geothermal fields and reinjecting liquified carbon dioxide (CO2) back into the field. Since then the project has been viewed by Contact as a success so they have applied for consent to quadruple the CO2 injection rates for the operation with the Waikato Regional Council (WRC). However, there are concerns with the injections. If the pressure of the field rises with the increase in injections, this can cause CO2 to escape the reservoir and seep into the nearby waterways. In addition, if the CO2 concentrations get too high (exceeding 10 wt%) it could prove corrosive to Contact Energy’s pipe network.

This project has been designed in order to see the effects of the injections being performed on pressure and C02 in the system and extrapolate these results 30 years in the future along with three other potential other scenarios; quadrupled, doubled and halved injection rates, taking into account uncertainty in the data.

**What the Project Contains**

Within the project there are 10 required files:

* “main.py”- Contains the bulk of the functions and the main task
* “concentration\_functions.py”- Contains the concentration specific functions
* “pressure\_functions.py”- Contains the pressure specific functions
* “qloss.py”- Contains the CO2 loss specific functions
* “functions\_for\_plotting.py”- Contains the functions required for plotting
* “benchmarking.py”- Contains the convergence test and benchmarking functions
* “cs\_c.txt”- Data of time vs injections (year vs kg/s)
* “cs\_cc.txt”- Data of time vs C02 concentration (year vs wt%)
* “cs\_p.txt”- Data of time vs pressure (year vs MPa)
* “cs\_q.txt”- Data of time vs production (year vs kg/s)

**How to Use this Project**

1. Install Python and the environments as outlined in the ENGSCI 233 how to literature.
2. Ensure the Numpy, Matplotlib and Scipy packages are all installed by using the following command line:

python -m pip install --user numpy scipy matplotlib

1. Install all the 10 required project files listed above to a single source folder
2. Open and run main.py
3. All relevant figures and information will be outputted to the source folder