The Results of HLS measurement and Geological Investigation at Pohang Light Source

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ABSTRACT
In the PLS (Pohang Light Source) uneven deformations of the storage ring floor slab in a similar manner at every year have been recorded for more than a decade. To understand the yearly time distributions of the deformation we installed the HLS (Hydrostatic Leveling System) along the circumference of storage ring and have gathered data. The gradual and linear like deformations in the several months time span were found from data analysis. No seasonal variations are distinctive. In this poster, the results of the HLS measurement/analysis are reported. And the results of geological investigations to identify the reasons of uneven deformation are also briefly introduced.

I. Status of Storage Ring Floor Deformation
- Measurement of 24 points along with the circumference of SR (3 points/pole)
- Very steady yearly uneven settlement for more than a decade
- Yearly measurement at every summer maintenance period

Geological problem
Tilting movement of imaginary base plate of SR for a year (1)
- Tilting movement along z direction
- Tilting amount of x & y is almost twice of that of z direction.

Tilting movement of imaginary base plate of SR for a year (2)
- Very linear tilting movement toward x & y directions
- Similar deformation shapes from both measurements
- Standard deviation for the long term measurement are undefined

II. HLS Measurement
- Equidistance installation of 24 HLS in the SR along to circumference to monitor the real time vertical movement

The Results of HLS measurement and Geological Investigation

Comparison of HLS measurement with optical leveling

Relative movements of 24 locations along 1 year time span

- Similar deformation shapes from both measurements
- Standard deviation for the long term measurement are undefined

III. Outside Elevation Measurement

Survey posts for absolute elevation changes of SR

Items of Geological Investigation
- Boron Test
- Standard Penetration Test
- Seismic Refraction Survey
- Multichannel Analysis of Surface Waves
- Pressuremeter Test
- Water Penetration test and Hydraulic Test
- Suspension P.S Logging
- Groundwater Flowmeter Test
- Borehole Image processing System

Suggestion after the analysis of the results of geological investigation
- Ground monitoring for the understanding of absolute movement

IV. Summary and Future Plan
- One year HLS measurement of vertical movement of SR floor shows similar deformation shape as that of optical survey measurement
- Uneven settlements of SR floor is very linearly time distributed without any outstanding seasonal effects.
- Outdoor survey shows that the peak area (Cell#1-2) in the deformation graph is splitting instead of settlement of other area
- Geological survey, however, shows that it is a partial settlement due to complex geological status
- To find the real direction of vertical movement and to figure out the size of remedial work, ground monitoring will be performed by use of settlement plate, multi point borehole adamimeter, tiltmeter, etc.
- To assure the stability and usability of the SR floor, floor lifting method or ground reinforcement method will be applied.