Gas and Condensed Water Sampling Results of Unit 1-3 PCV Gas Control System (the Entrance of HEPA Filter)

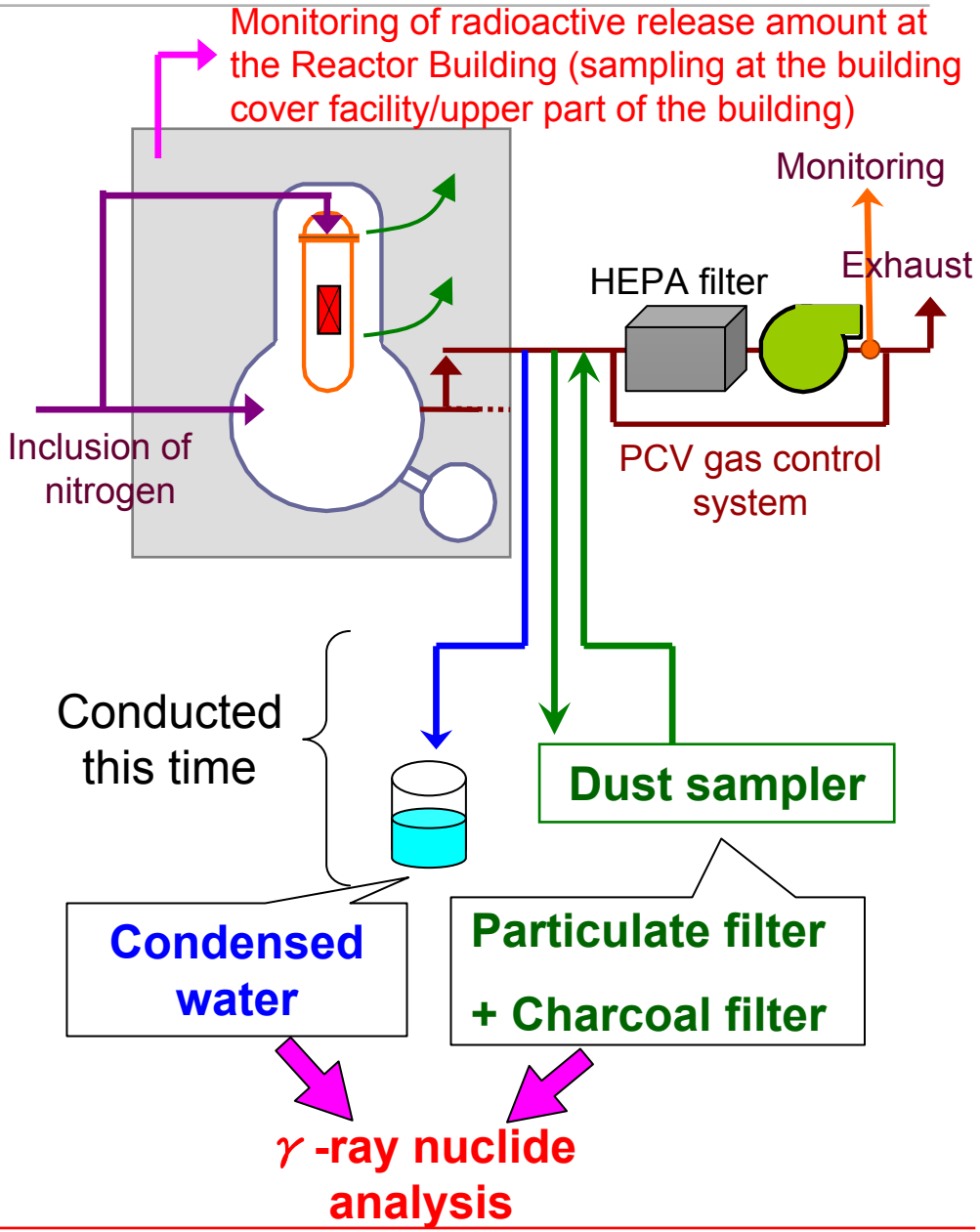
June 7, 2013

Tokyo Electric Power Company

TEPCO 東京電力

Overview

- Monitoring and regular nuclide analysis of exhaust gas are performed at the exit of gas control system in order to reduce and control the emission of PCV gas. No abnormal upward trend was found. (The evaluation of radioactive release amount will be performed once a month.)
- Sampling of dust and drain of air bleed gas obtained at Unit 1-3 PCV gas control system (**the entrance of HEPA filter**) was performed in order to understand the current radioactive density of PCV gas.
- Although analysis utilizing gas vial was performed at the entrance of HEPA filter before, the detection limit was high. Therefore, dust collector filter paper was used to analyze the particulate cesium this time.



(Refer the attachment to acquire data)

Overview of the Sampling Results - Cs -

<Analysis results of the filters> (Units 1-3)

- Analysis results of Cs-134 and Cs-137 (particulate) in PCV gas after steam condensation were 2×10^{-6} - 2×10^{-4}Bq/cm^3.
(Reference) Density limit in the air which radiation workers breathe:
Cs-134: 2×10^{-3}, Cs-137: 3×10^{-3}Bq/cm^3

<Analysis results of the drains> (Units 1-3)

- Analysis results of Cs-134 and Cs-137 in the drains were 10 - 70Bq/cm^3.
- Analysis results of the PCV gas drains are one digit smaller than those obtained in August and September 2011 (300 - 800Bq/cm^3).
- Analysis results of the accumulated water in Unit 1 PCV are 3 digit smaller than those obtained in October 2012 (10^4Bq/cm^3).

(Refer the attachment to acquire data)

Overview of the Sampling Results – Other Nuclides -

<Short half life noble gas Xe-133, Xe-135>

- The short half life noble gas, **Xe-133** and **Xe-135** were detected from the **Unit 1-3 charcoal filter**.
→Detected amount of Xe-133 and Xe-135 was equivalent to those detected at the exit of gas control system. They are generated by the spontaneous fission.

<Sb-125, Ag-110m, Ce-144>

- **Ag-110m** was detected from the **Unit 1 particulate filter** (approx. 1/200 of Cs-137 density).
- **Sb-125** was detected from the **Unit 1-3 drain** (approx. 1/3 - 1/200 of Cs-137 density) and **Ag-110m** and **Ce-144** were detected from the **Unit 3 drain** (approx. 1/20 - 1/60 of Cs-137 density).
→**Sb-125** and **Ce-144** have a long half-life in common with Cs-137, and they are the typical fission product currently remaining in PCV (Sb-125 is also detected in the accumulated water).
→**Ag-110m** is a fission product known for its volatility as a silver iodide which was detected from the environment.

<Co-60, Mn-54>

- **Co-60** was detected from the **Unit 1 particulate filter** (approx. 1/300 of Cs-137 density).
- **Co-60** and **Mn-54** were detected from the **Unit 2, 3 drain** (approx. 1/100 - 1/700 of Cs-137 density).
→Co-60 and Mn-54 are the typical corrosion product which was detected in the accumulated water, and generated by activation of the structure material, etc.

Conclusion

We have obtained the data of current radioactive densities in PCV gas as follows:

- Cesium densities in PCV gas were low, and the densities after steam condensation were lower than the density limit in the air which radiation workers breathe.
- Fission products other than Cesium (Sb-125, Ag-110m, Ce-144) were mainly detected from the drains. Although the movements of them inside PCV are not clear, fission products which were released from fuel and remaining in PCV supposedly transfer to the drains along with air bleed gas.

<Attachment>

Analysis Data

γ-ray Nuclide Analysis Results
- Analysis Results of the Filters with Cesium -

- Radioactive density (Cs) analysis results of the particulate filter and the charcoal filter

(Unit: Bq/cm^3)

Nuclide	Particulate	Charcoal	Particulate	Charcoal	Particulate	Charcoal
	Unit 1(May 10)		**Unit 2** (April 22)		**Unit 3** (May 14)	
Cs-134	7.7E-5	1.2E-6	3.3E-6	ND (<7.4E-7)	1.2E-6	ND (<1.1E-6)
Cs-137	1.6E-4	2.0E-6	5.9E-6	1.9E-6	2.0E-6	ND (<9.4E-7)
	Unit 1(May 13)		**Unit 2** (April 23)		**Unit 3** (May 15)	
Cs-134	6.4E-5	ND (<7.8E-7)	2.4E-6	ND (<4.9E-7)	ND (<1.1E-6)	1.0E-6
Cs-137	1.3E-4	ND (<7.6E-7)	5.6E-6	ND (<6.4E-7)	1.9E-6	2.1E-6

γ-ray Nuclide Analysis Results
- Analysis Results of the Drains with Cesium -

■Radioactive density (Cs) analysis results in the drains

(Unit: Bq/cm^3)

Nuclide	Drain	Drain	Drain	(Past record) Drain
	Unit 1 (May 10)	**Unit 2** (April 22)	**Unit 3** (May 14)	**Unit 1** (Sep. 14, 2011)
Cs-134	2.0E+1	1.0E+1	3.1E+1	3.4E+2 - 3.9E+2
Cs-137	4.3E+1	1.9E+1	6.1E+1	4.2E+2 - 4.4E+2
	Unit 1 (May 13)	**Unit 2** (April 23)	**Unit 3** (May 15)	**Unit 2** (Aug. 9, 2011)
Cs-134	1.9E+1	9.5E+0	1.7E+1	3.1E+2 - 6.9E+2
Cs-137	4.2E+1	1.8E+1	3.2E+1	3.2E+2 - 7.3E+2

γ-ray Nuclide Analysis Results
- Analysis Results of the Filters for the Other Nuclides -

- Radioactive density (nuclides other than cesium) analysis results of the particulate filter and the charcoal filter

(Unit: Bq/cm^3)

Nuclide (Half-life)	Particulate	Charcoal	Particulate	Charcoal	Particulate	Charcoal
	Unit 1(May 10)		**Unit 2** (April 22)		**Unit 3** (May 14)	
Ag-110m (252 days)	9.2E-7	ND (<2.4E-7)	ND (<2.7E-7)	ND (<2.1E-7)	ND (<5.6E-7)	ND (<6.4E-7)
Co-60 (5.3 years)	5.7E-7	ND (<2.3E-7)	ND (<2.6E-7)	ND (<2.2E-7)	ND (<1.0E-6)	ND (<1.2E-6)
	Unit 1(May 13)		**Unit 2** (April 23)		**Unit 3** (May 15)	
Ag-110m (252 days)	ND (<6.1E-7)	ND (<5.6E-7)	ND (<6.9E-7)	ND (<4.4E-7)	ND (<7.7E-7)	ND (<6.8E-7)
Co-60 (5.3 years)	ND (<5.8E-7)	ND (<7.1E-7)	ND (<8.4E-7)	ND (<5.7E-7)	ND (<1.1E-6)	ND (<8.9E-7)

γ-ray Nuclide Analysis Results
- Analysis Results of the Drains for the Other Nuclides -

- Radioactive density (nuclides other than cesium) analysis results in the drain water

(Unit: Bq/cm^3)

Nuclide (Half-life)	Unit 1 drain		Unit 2 drain		Unit 3 drain	
	May 10	May 13	April 22	April 23	May 14	May 15
Sb-125 (2.7 years)	1.4E+1	2.4E-1	1.8E+0	6.3E-1	1.1E+1	2.8E+0
Ag-110m (252 days)	ND (<6.2E-2)	ND (<5.2E-2)	ND (<1.2E-1)	ND (<7.1E-2)	1.0E+0	ND (<8.6E-2)
Ce-144 (285 days)	ND (<3.2E-1)	ND (<2.9E-1)	ND (<6.4E-1)	ND (<3.7E-1)	2.7E+0	7.6E-1
Co-60 (5.3 years)	ND (<1.4E-2)	ND (<1.3E-2)	ND (<5.0E-2)	6.8E-2	4.2E-1	1.4E-1
Mn-54 (312 days)	ND (<2.4E-2)	ND (<2.5E-2)	ND (<6.9E-2)	ND (<3.3E-2)	9.8E-2	ND (<3.4E-2)