Development of LTL Environmental Monitoring System in PRIDE

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Introduction

PRIDE is composed of an integrated system linking the following: engineering-scale oxidation pretreatment, electrolytic reduction, electrolytic refining, and recycling and immobilization of salt waste. PRIDE cell equipments support operations of pyroprocess equipments in the argon cell and supply required utilities to the cell. The argon cell is on the second floor in PRIDE. The argon cell measures 40.3m x 4.8m x 6.4m. The argon cell is on the second floor in PRIDE. The argon cell measures 40.3m x 4.8m x 6.4m.

PRIDE cell equipments include large and small equipment transfer systems, two gravity tubes, in-cell crane, trolley hoist etc. All cell equipments were designed to be remotely operated and maintained.

The utility system of PRIDE was developed for controlling the concentration of impurities (oxygen <100ppm, moisture<100ppm) in the argon cell.

LTL(Large Equipment Transfer system) is to transfer large and small equipment to/from argon atmosphere cell. Capacity of large equipment transfer system : 2.2m(D)x2.2m(H), 2.8ton. It has purging system for exchanging gas interlocked control.

To maintain the Ar-cell atmosphere, an oxygen moisture analysis system was developed to analiyze the impact on the LTL and in-cell environment. This paper shows how the system is configured and can be used in Ar-cell and LTL.

Methods and Results

■Effects of LTL on Ar-cell

The LTL volume is approximately 12㎥, if the oxygen concentration in the LTL chamber is approximately 21%, the total oxygen volume is not purged at 2.5㎥. If the upper lid is opened, the oxygen concentration in the cell will theoretically increase by approximately 2095 ppm.

If the equipments are moved through LTL, the effect on the oxygen concentration of the cell should be minimized by replacing the air in the LTL chamber with Ar.

Fig.1 is the graph for changes in oxygen concentration in-cell when the LTL opened without purging. According to the graph, the oxygen concentration increased dramatically after the LTL opened. Afterwards, the process of slowly reaching equilibrium can be seen.(In the case of AI-301, the oxygen concentration sensor was located near the LTL and changed rapidly in the early stages, the straight part on the graph is the detection limit of the sensor, so it appears as a straight part)

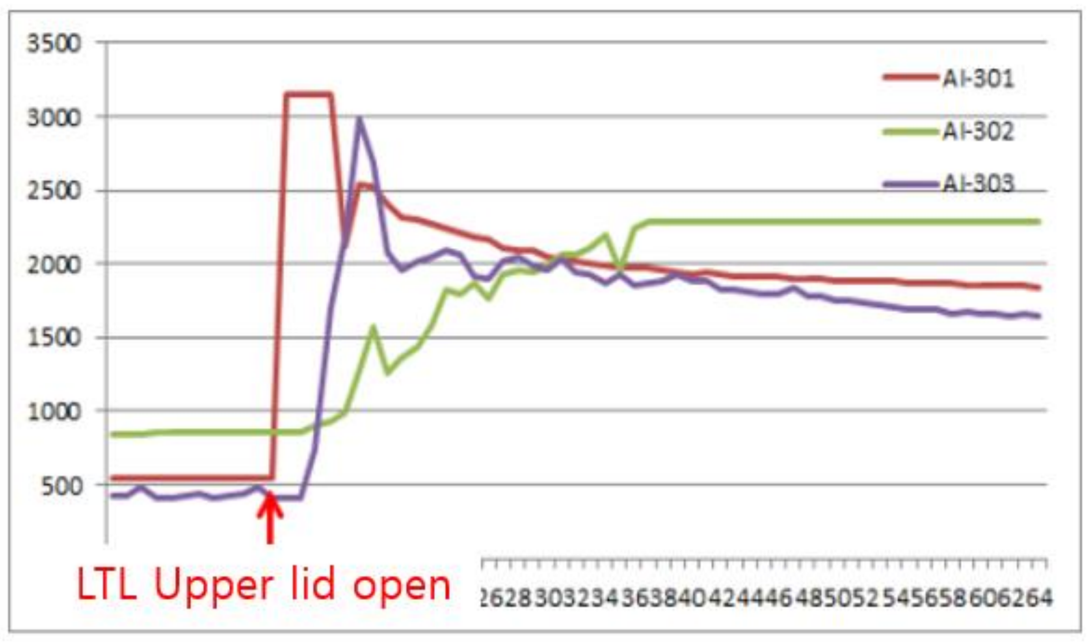

Fig. 1. The oxygen concentration changes without purging

■ Results

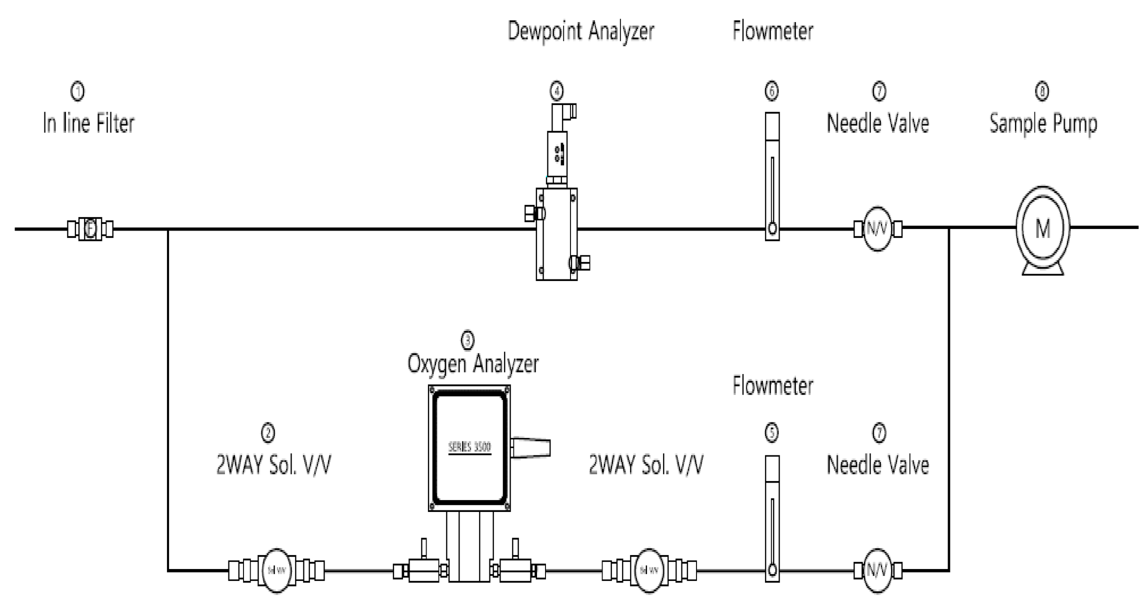

Fig. 2. Oxygen Moisture Analysis System

Fig. 2 is the working design of this system. This shows that through the in line filter, Oxygen and moisture concentration in LTL can be measured. Since the oxygen analyzer is a very sensitive device, so solenoid valve and ball valve are installed both sides to protect the analyzer.

Needle valves were installed in two pipelines from the sample pump to prevent the system from being demaged by pressure. Finally, the flowmeter is installed on the front end of each needle valve to adjust the flow rate of the sample air. Table.1 is the specification of the system.

Number	components	Specifications	
1	In Line Filter	Filtering	Particle
		Pore Size	7 Micron
2	2-way Sol V/V	In-Outlet	1/4" ID A-lock
		Max Pressure	10kg/㎠
3	Oxygen Analyzer	Accuracy	±FS 1%
		Range	0~1000ppm
4	Dewpoint Analyzer	Accuracy	±2℃
		Range	0~1000ppm
5	Flow Meter	Range	0~2.5L/min
		In-Outlet	1/4" ID A-lock
6	Flow Meter	Range	0~10L/min
		In-Outlet	1/4" ID A-lock
7	Needle Valve	In-Outlet	1/4" ID A-lock
		Max Pressure	3000psig
8	Vaccum Pump	Power	200 VAC
		Flow Rate	5~6 LPM

Table. 1. The specification of the system

Conclusion

By using this system, purging conditions for gas exchange in the LTL chamber can be calculated. Oxygen concentration and moisture changes in LTL can be measured when the LTL system is operating. The above conditions will provide more detailed information on the oxygen and moisture between LTL and Ar-cell. Based on this system, it will be more helpful to monitor the in-cell environment.