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Development of a Visualization Program for a Distillation Column for VHTR-assisted Hydrogen Production Systems

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1. Introduction

The sulfur-iodine(SI) cycle and the Westinghouse hybrid sulfur cycle coupled to a very high temperature gas-cooled reactor(VHTR) are well known as a feasible technology to produce hydrogen.[1]

The concentration of the sulfuric acid solution and its decomposition are essential parts in both cycles. A dynamic simulation for a multistage distillation column, which is one of the sulfuric acid concentrators, is important for the establishment of a column's design requirements and its optimum operation.

In this paper, a computer program to visualize dynamic simulation results from a multistage distillation column to concentrate a sulfuric acid has been developed by using conventional and user-friendly interfaces.

2. Methods and Results

A computer code to simulate the sulfuric acid distillation column was prepared by Fortran 77 and the start-up motion of the column was visualized by Visual C^{++}(Ver. 6.0) program. Also, the ActiveX components such as the Measurement Studio (Ver. 8.0) and Spread (Ver. 7.0) were used to improve visualization and control of all the simulated results [2, 3].

By using the computer code, the effect of the internally installed plate numbers on the performance of the distillation column can be analyzed. On the other hand the computer code has the ability not only to optimize the heat duty of the column reboiler but also to determine the feed position of an aqueous solution.

The arrangement of program windows is shown in Fig. 1, where a main window has three sub-windows for each unit process.

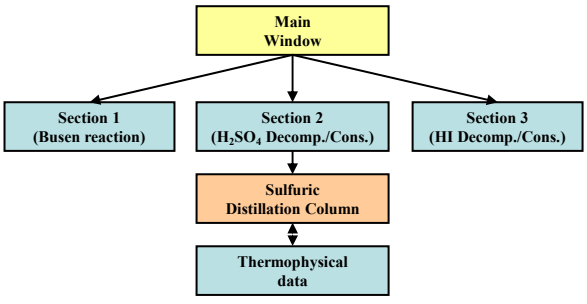

Fig. 1. Arrangement of the program windows.

Fig. 2 shows the main window representing a chemical process which has three sub-window buttons. When a user selects one sub-window button among them, the selected sub-window should be presented on the monitor. Fig. 3 shows an example that is related to the process of sulfuric acid decomposition and concentration.

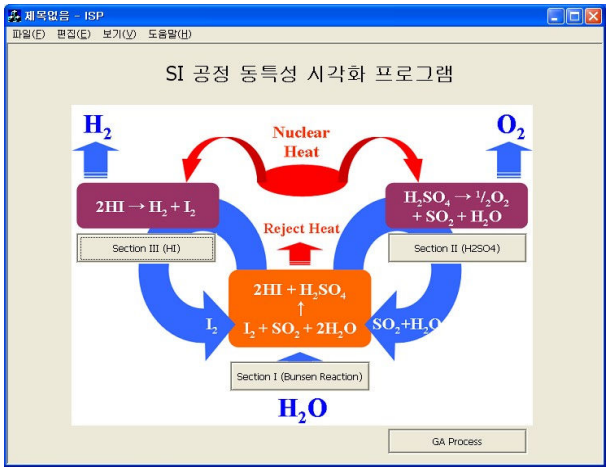

Fig. 2. Main window of developed program.

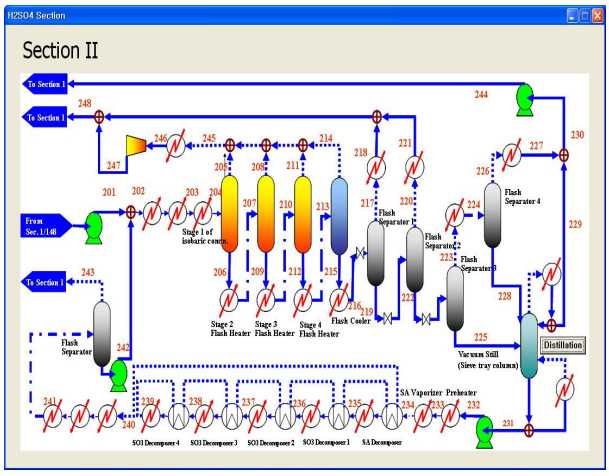

Fig. 3. Sub-window for the process of sulfuric acid decomposition and concentration.

The simulation results including the input data base used in the dynamic simulation can be represented in table or figure forms. Fig. 4 shows a typical calculation

result including the sulfuric acid distillation column system.

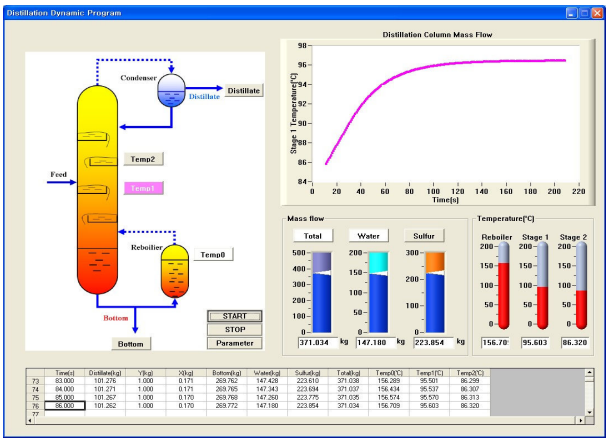

Fig. 4. Typical result of dynamic simulation.

3. Conclusion

The visualization program for the dynamic simulation of a sulfuric acid distillation column has been developed and its performance test has been successfully carried out. By a visualization of the column dynamic behavior, a considerable amount of information can be analyzed effectively and simultaneously.

Acknowledgments

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