

# Improved Facility Exhaust Stability Using Drive Synch System

Heeseok Kang\*, Seonho Noh, Youngkuk Jang, Wonkyoung Lee, Daeyong Song, and Ilje Cho

Korea Atomic Energy Research Institute, 111, Daedeok-daero 989beon-gil, Yuseong-gu, Daejeon, Republic of Korea

\*hskang1@kaeri.re.kr

## 1. Introduction

The Korea Atomic Energy Research Institute (KAERI) operates a Nuclear Cycle Experimental Research Facility, which is a testing facility capable of simulating all processes of nuclear material process testing on a laboratory scale for the purpose of peaceful use of nuclear materials. Argon gas for maintaining the atmosphere in the glove box and various types of toxic gases generated during the experiment should be discharged outside the facility. If the exhaust becomes unstable due to the abnormality of the exhaust system, there is a concern that the radioactive contaminants may spread out of the facility and become a social problem, which can cause serious health problems to workers in the facility. Therefore, Nuclear Cycle Experimental Research Facility center introduced a drive synch system to improve the operation stability of the exhaust system of the facility. After the drive synch system was installed, stability improvement of the exhaust system was compiled by comparing the stability of operation with existing facilities.

## 2. Drive Synch System

### 2.1 Overview of drive synch system

A drive sync systems are systems double(multiple) a drive in a critical facility that requires continuous operation, as shown in Figure 1. It synchronizes single AC motor control with a drive-load N: 1 configuration drive. Even if one of the drives fails, the remaining drives can be continuously operated,

so that replacement or repair during operation can be performed without stopping the drive facility in which the failure occurs. In addition, it is possible to perform normal operation continuously after repairing the fault of the equipment, and it is possible to prevent preventive maintenance and maintenance of the drive even during normal operation of the facility. Even momentary power failure has the advantage of being able to maintain normal operation without stopping for a few seconds, so that it is ready for some power failure. Therefore, the stability of such continuous operation is widely used in various industries such as steel, automobile, chemical, shipbuilding, marine, waterworks, sewage and sewage relay pumping stations. Nuclear Cycle Experimental Research Facility introduced this system to improve the operation stability of the exhaust system of the facility by taking advantage of the above mentioned drive synch system.



Fig. 1. Drives synch system configuration.

### 2.2 Improved operation stability after installation of drive synch system

Nuclear Cycle Experimental Research Center omic runs a total of six exhaust systems for the exhaust gas generated during the process test and the facility vent for ventilation. In the past, a single inverter was

connected to one exhaust system to control each exhaust system. However, in this system, the intermittent momentary power interruption in the researcher has been shut down whenever the plant is out of power, and sometimes the exhaust fan has been shut down due to an unknown electrical shock. In some cases, some of the exhaust fans were shut down unintentionally, causing some workers in the laboratory to experience discomfort. In order to improve the instability of the exhaust system, a drive synch system of C-1 type was installed as shown in Fig. 2 and Fig. 3. The three exhaust systems are grouped together and connected in parallel by two drive sync systems. In this facility, six exhaust systems are in operation, requiring four drive synch systems.

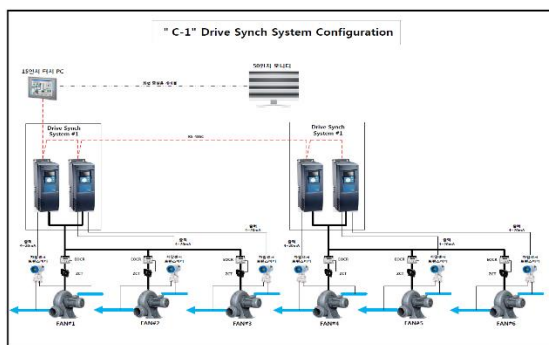


Fig. 2. C-1 drive synch system configuration.

The post-installation effect of the drive synch system has been proven by the operational stability of the exhaust system. There was no single shutdown of the exhaust system even during several instantaneous power failures and I have not experienced the shutdown of the exhaust system, No shutdowns had been experienced in some devices or no shutdowns that had been seen in the entire exhaust. Currently, two parallel inverters are connected to three



Fig. 3. Control panel of C-1 drive synch system.

exhaust systems, respectively, so that parallel operation is possible, and maintenance of power unit and control unit can be separated easily. In addition, it is possible to program in the form desired by the built-in PLC function. Even if one inverter failed, the inverter was repaired or replaced without stopping the exhaust system. After replacement of the failed inverter, the unit was returned without stopping the plant, and the exhaust system was ready for 100% operation. The operation stability of the exhaust system is improved compared with the previous system because it is designed not to stop the operation of the plant even in case of power failure in a moment that does not exceed 1 second.

### 3. Conclusions

The control of the existing exhaust system has a disadvantageous effect on ventilation in the laboratory and exhaust of the toxic gas generated during the experiment due to the stopping of the exhaust system when the inverter failure occurs due to the operation of operating one exhaust fan according to the inverter. System, it was possible to maintain a comfortable laboratory environment by completely solving the operation stop of the exhaust system due to the failure of the inverter, and it was possible to realize safer working environment by strengthening the monitoring of the operating condition of the exhaust system.