

Development of Qualified Indication and Alarm System-Non safety

Hyung-soo Lee*, Deok-in Kim, Dae-jae Kim, Jung-jin Park,

DOOSAN Heavy Industries & Co., Nuclear Power Plant, Nuclear Safety System Team

*Corresponding author : Hyungsoo.lee@doosan.com

1 Introduction

The Qualified Indication and Alarm System – Non Safety (QIAS-N) is the system which monitors critical parameters of the safety system and non-safety system. It is also first introduced in SKN 3,4 to satisfy a diversity condition when the IPS(Information Processing System) fails.

The QIAS-N is that it communicates with parameters of safety system and non-safety system through the different and separate network.

The QIAS-N of SKN3,4 acquire Plant Data through information network of IPS, but QIAS-N developed by DOOSAN acquire Plant Data through a separate network from information network of IPS. So operators can acquire Plant Data through QIAS-N during failure of information network. That is the main feature in comparison between QIAS-N of SKN3,4 and QIAS-N developed by DOOSAN. Furthermore QIAS-N performs the cross check with IPS about predefined parameters and QIAS-N give the alarm when the heartbeat value is not valid.

Doosan have developed QIAS-N hardware and software to make sure to supply domestic nuclear power and overseas nuclear power plant.

The QIAS-N developed by Doosan is based on POSAFE-Q PLC which is the output of KNICS project and apply Photon MMI of QNX OS at the

display. In addition, The QIAS-N confirms the reliability by technical test, functional test and integrated test.

2 Outline of Qualified Indication and Alarm System – Non safety

2.1 System Configuration

The QIAS-N consists of Processor, Maintenance and Test Panel (MTP), Interface and Test Processor (ITP), Server, Flat Panel Display (FPD), Mini-LDP and SODP. Processor, MTP, ITP and Server is located at the cabinet of QIAS-N in the I&C room. And FPD, Mini-LDP and SODP is placed Main Control Room (MCR) and Remote Shutdown Room (RSR) respectively.

QIAS-N accepts from each channel on every safety system through Safety Data Link (SDL). In contrast, parameters of non-safety system are inputted through Safety Data Network (SDN) which is separated from the network of IPS. Figure 1 is QIAS-N system diagram.

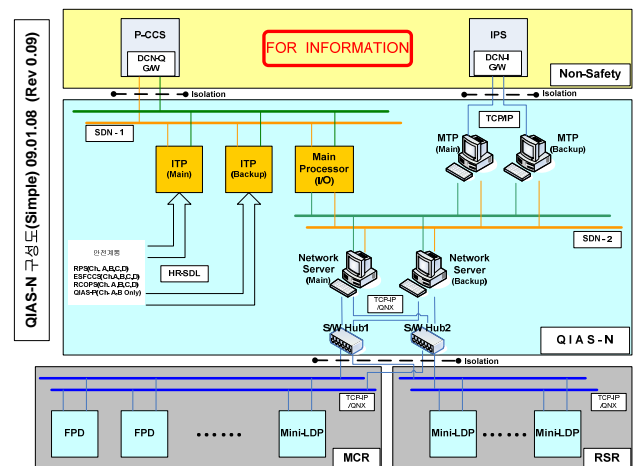


Figure 1. QIAS-N system diagram

2.2 Network Topology

The QIAS-N connects with the whole channel (A, B, C, D) in every safety systems (including PPS, RCOPS, ESF-CCS and QIAS-P) through the redundant SDL network. And Non-safety systems (P-CCS, PCS, NIMS and BOP monitoring system) are connected through SDN by P-CCS G/W or hard-wired. The path to IPS is the other one.

3 Design of Qualified Indication and Alarm System – Non safety

3.1 QIAS-N H/W

The essential point of QIAS-N design is reliability and diversity requirements. Then the QIAS-N is redundant of all components to satisfy full reliability. Moreover, even though the QIAS-N is classified in the non-safety system, it applies PLC which used in safety system to satisfy enough to IPS diverse requirement. Figure 2 is the photo of QIAS-N cabinets.



Figure 2. QIAS-N Cabinets

3.2 QIAS-N S/W

The QIAS-N S/W is developed on the class of Important To Safety (ITS) and performs following functions.

1. Supporting the Real-time process scheduling and Real-time process priority.

2. Offering the signal validation algorithm.
3. Supporting the BIST (Built-In Self Test)
4. PRV calculation and Confirmation

The QIAS-N applications use p-SET which is the engineering tool of POSAFE-Q PLC and Photon Application Builder of QNX.

4 Test

We verified functions of QIAS-N which are integrated H/W module and S/W module using test procedure. And also, we conducted a integration test between QIAS-N and other related systems. It satisfies the design requirement – “the response time between QIAS-N and display should be within 2.5 sec”.

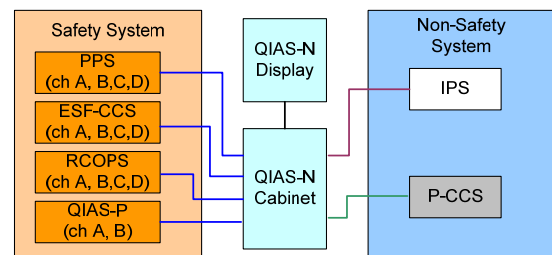


Figure 3. QIAS-N integration Test diagram

5 Conclusions

The QIAS-N is trying to apply to the real nuclear power site. In this situation, Doosan will make up for the insufficient point to participate the future project which is domestic and overseas one.

6 References

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- [2] KOPEC, “The QIAS-N System Design Requirements”, Rev. 00, March 2008
- [3] POSCON, “POSAFE-Q Safety Programmable Logic Controller” Catalog. Rev. 01, 2007