Operation and Maintenance Support System Network for Global DAVINCH Users

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1. Introduction

In Kanda, Japan, Kobe Steel destroyed more than 1250 chemical munitions by DAVINCH™ detonation System.

During the operation, neither single accident nor incident happened fortunately, but a lot of precious experiences have been accumulated and lessons have been learned. This know-how has been mostly reflected to the modification of the system at Kanda and to the newly designed system for Poelkapelle.

Some, however, still remain as operational know-how at Kanda site and submerge in operators. Therefore, how to turn up the useful information and systematize them for utilization is a very important issue. Especially when the DAVINCH™ users expend to two sites of Poelkapelle and Kanda where they destroy different types of munitions in different environmental requirements and technical background, sharing of mutual operation know-how is of significant importance to the safe and productive operation.

Moreover, sharing of operational know-how with many users can help DAVINCH™ System to be more flexible and widely applicable.

The authors et.al, having been in charge of design of Kanda facility and having experience of destruction operation at Kanda, are now conducting systematization of these know-how.

Belgium Ministry of Defense, agreed to enlarge the Kanda System to Poelkapelle for transferring the know-how of Kanda and for sharing the new operational experience at both sites.

Now, the skeleton of the system has been completed. Detailed information to import and export to the system and the user friendly output formats are under consideration.

The system is named as the Global Rapid/Reliable Assistant Network for DAVINCH™,

(GRAND), expecting global expansion of potential customers.

2. Lessons learned from Kanda Operation

Smooth and continuous operation at Kanda is mostly based on Kobe Steel's experiences on nuclear and chemical plant operations.

The notable elements of destruction of chemical weapons, however, are the following three.

1) Impulsive load and vibration on equipment and pipes caused by detonation,
2) Dust generated by detonation,
3) Corrosive gas derived from Chemical Warfare Materiel.

Especially interaction between impulsive loads by each shot and slow by corrosion is one of the issues. It can be avoided by Chlorine Scavenger, selection of appropriate materials and dew prevention at the design stage. But still timely and rapid transfer of operation experience and maintenance know-how is of significant importance.

3. Development Procedure

Development procedure of GRAND is described as follows.

3.1 Analysis of present status at Kanda

At first, present status of the following items were surveyed and analyzed.

1) Workflow of Distributed Control System (DCS) in the control room,
2) Sheets and formats used,
3) Operation management items.

3.2 Implementation of computerization and atomization of input

On the basis of the above mentioned analysis, computerization and atomization of input were implemented as much as possible because it is essential to reduce the operator's load and establish a new system on site.

3.3 Setting major management items for GRAND

Through the analysis of the whole operation management procedures, the following items were selected as major management items to be databased.

1) Munitions to be treated,
2) Operation data (amount of donor-charge, condition of detonation, mount of detonation product gas, etc),
3) Instrument indication (pressure, temperature, flow-rate, analytical results etc.),

4) Operation time,
5) Stock information of spare parts and consumables,
6) Utility consumption and stock information,
7) Operation record(Log Book),
8) Request items for maintenance,
9) Fatigue damage information of each shot.

3.4 Linking of Data Files

All the informations necessary for major management items are classified in the 3 files.

1) Operation data contained by DCS in the control room,
2) Strain and cumulative damage data of the chamber by the damage evaluation system (DESTINY)
3) Other data manually input or independent from above 2 files.

These data files are linked each other through GRAND, where the new informations are generated for the users by Technical Support Logic.

Fig.1 shows Information & Data Acquisition Concept.

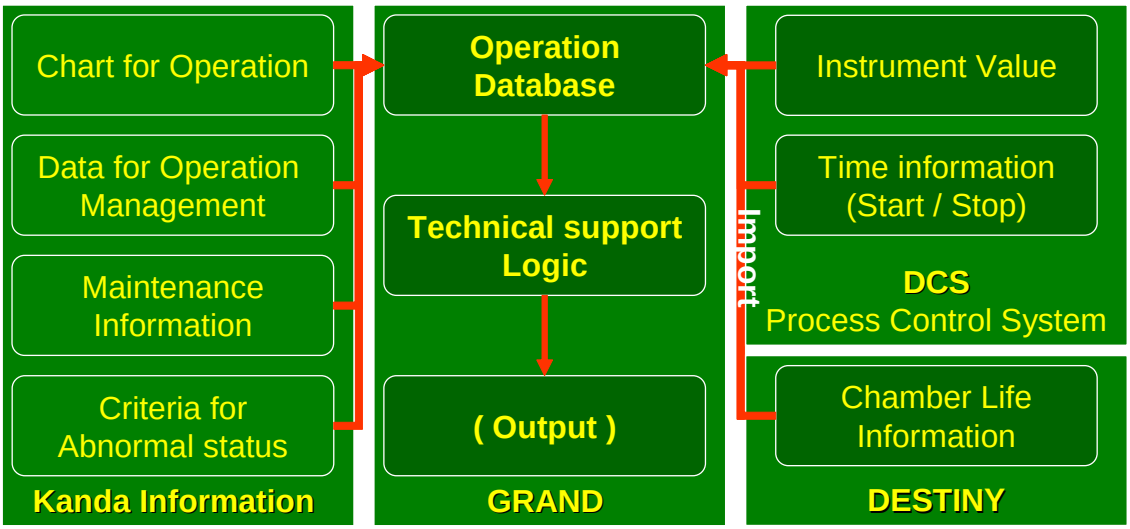

Fig.1 Information & Data Acquisition Concept

3.5 Technical Support Logic

Technical Support Logic processes the data in the linked files and generate various useful informations including but not limited to the followings, to the relevant user(s) and/or all the users of DAVINCH™ as needed.

1) Warning concerning abnormal operation

2) Maintenance/inspection information
3) Special operation information
4) Chamber life prediction
5) Suggestion of purchasing spare parts, consumables and utility

For example, Technical Support Logic watches and analyzes, 1) if a certain indication is above the threshold or 2) is abnormally changed even below the threshold, and when necessary, will send out warning messages, provide information for improvements and/or indicate remediation, according to its stage.

The informations on the life of main equipment, the time of maintenance, the way of maintenance etc are based on the actual operations at Kanda, and shall be renewed from time to time, along with accumulation of additional experience and/or improvement of expanding applications and users.

These renewal and maintenance of Technical Support Logic itself are extremely important for applying a new site's experience to other sites.

Please refer to the paper of ASME[(1)] for detailed information on DESTINY.

4. Access to the Network

Assuming that there is some information not suitable or not necessary to disclose to the other sites, GRAND has two types of information export system, i.e; sight specific closed one and open one, accessible from other site to share the information, which includes but not limited to,

1) Chamber life evaluation information
2) Abnormal event information
3) Special operation (i.e. experimental shot)
4) Modification and repair information
5) inspection record

Figures 2 and 3 shows System configuration of GRAND and Total System of Global Rapid/Reliable Assistant Network for DAVINCH^{TM} (GRAND).

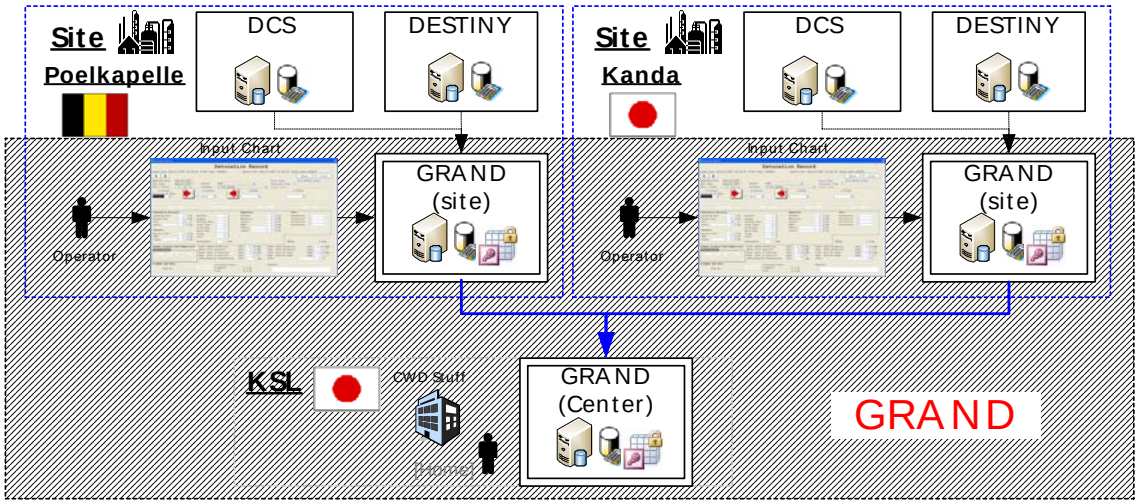

Fig.2 System configuration of GRAND

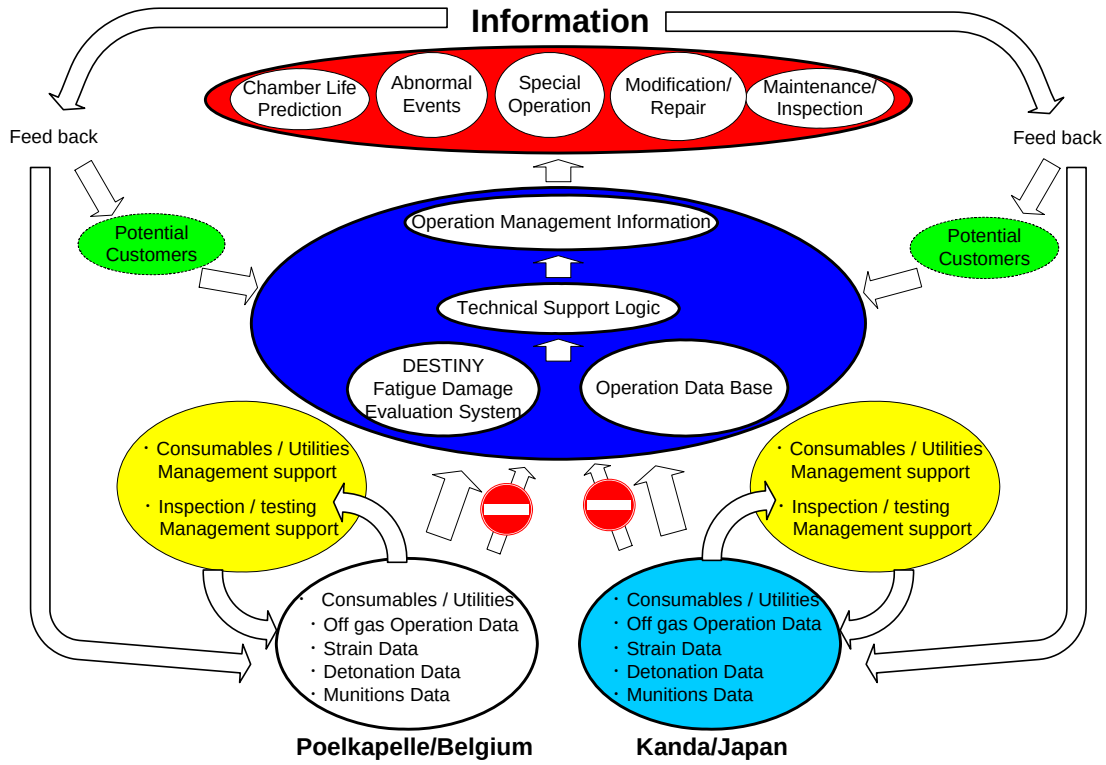

Fig.3 Total System of Global Rapid/Reliable Assistant Network for DAVINCH™ (GRAND)

5. Functions

Detail of functions will be presented at the conference as examples.

6. Target in the future

In early 2008, DAVINCH™ system is scheduled to be in operation at Poelkapelle site.

By utilizing GRAND, both sites at Poelkapelle and Kanda can be connected closely as if they were one site and Poelkapelle can be expected to stand on the same platform of operation at Kanda from the beginning of operation.

Furthermore, the new experiences and know how to be accumulated on the two sites can be transferred to new potential customers of DAVINCH™ and the broader network can enjoy the enlarged common know how and experiences for safer and more productive destruction of chemical weapons.