PI Introduction on ERP Project in KHNP

May 13, 2003

Sangyoung Mo[1] and Taegheon Kwag[2]

[1]ERP Project Office, ERP Project Division,
[2]Maint. & Eng. Office, Power Generation Team,

Headquarters,
KOREA HYDRO & NUCLEAR POWER CO., LTD.

Outline

- Introduction
  - Introduction of KHNP
  - ERP Project in KHNP
- PI Installation
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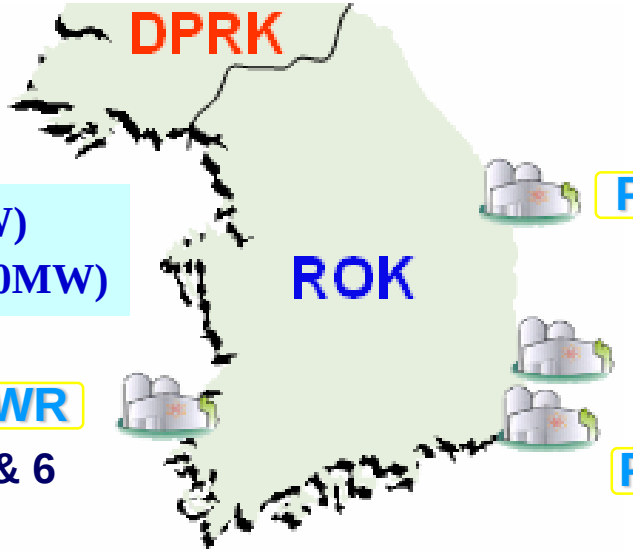
- Trouble-shootings
- Conclusion

Background and Information of KHNP (1/2)

- Korea Electric Power Corp. (KEPCO) officially split up its power generation sector into 6 separate companies on April 2, 2001 by the Korean government's electric power industry restructuring program.
- The goal of the restructuring is to provide users with stable supplies of high-quality and low-cost electricity by maximizing the competitiveness and efficiency of the power generation companies.
  - Korea's electric power exchange market have been operating since April 2002. Although it is currently a Cost-based pool, it will be changed into TWBP (Two Way Bidding Pool) market by April 2004
- As one of the subsidiaries, **KHNP has been formed combining hydro and nuclear generating facilities of KEPCO**.
  - operate 18 nuclear reactors in 4 sites, and 16 hydro plants
  - 2 new reactors are under construction
  - plan to build an additional 10 reactors by 2015

Background and Information of KHNP (2/2)

- Installed nuclear capacity : 15,716 MW (as of the end of 2002)
  - *29.2 % of the nation's total installed capacity*
- Nuclear power output : 119 billion kWh (in 2002)
  - *38.9 % of the country's electricity consumption*
- Average capacity factor of NPPs : 92.7 % (in 2002)



- In Operation : 18 (15,716MW)
- Under Construction : 2 (2,000MW)

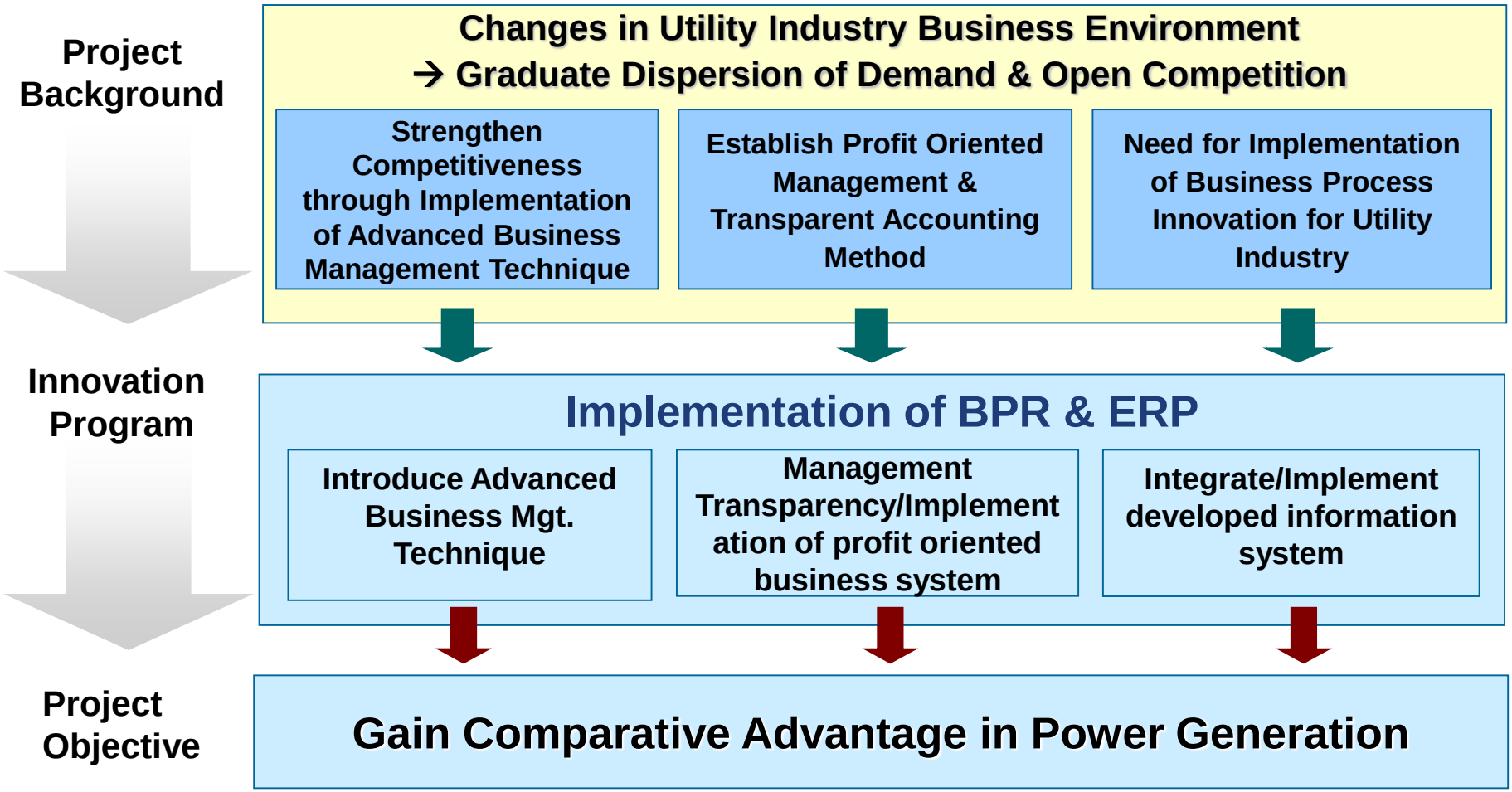
Ulchin PWR
- # 1, 2, 3 & 4
- # 5 & 6

PHWR Wolsong
- # 1, 2, 3 & 4

PWR Kori
- # 1, 2, 3 & 4

Yonggwang PWR
- # 1, 2, 3, 4, 5 & 6

Background and Objective of ERP Implementation



Brief Process of ERP Project

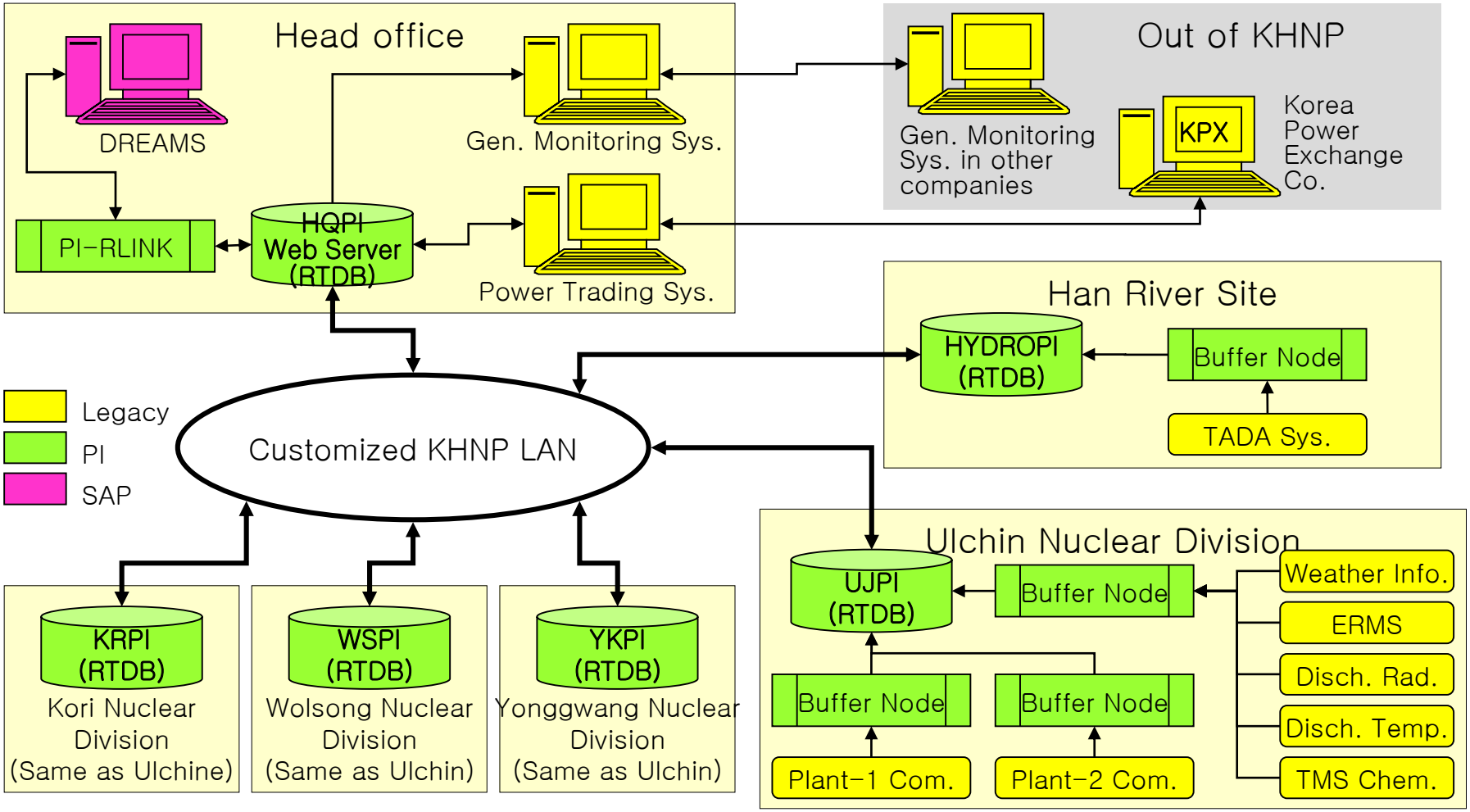
- 2001.4.2 : Split up of KEPCO into KHNP
- 2001.6.1 : Launch ERP project team
- 2001.12.31 : Sign contract (Anderson consortium)
- 2002.1.14~2.28 : SAP module training
- 2002.4.1 : Commence 7 key BPR processes
- 2002.4.10 : Complete As-is analysis
- 2002.7.31 : Complete To-be design
- 2002.10.24 : Contractor change to BP (BearingPoint) consortium
- 2003.1.20~1.25 : Complete final integration test
- 2003.1.29 : Decide on ERP system title as DREAMS (Digital Realtime Enterprise Asset Management System)
- 2003.2.8 : ERP system open (on Ulchin Plant 2)
- 2003.4.12 : Roll-out on All plants excluding Ulchin Plant 2

PI Introduction Scope

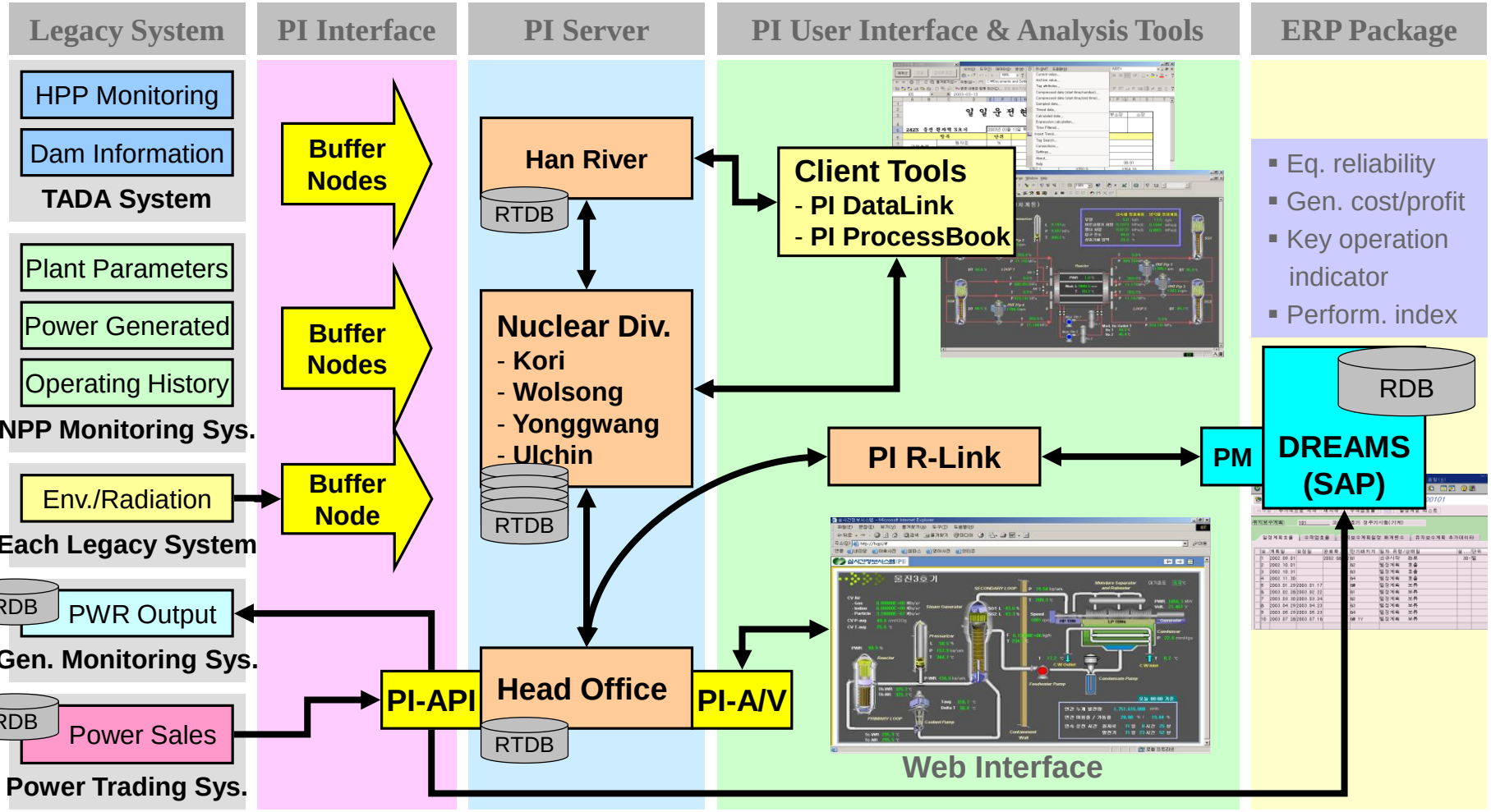
Server Side	▪PI UDS : Data Storage (6 PI Servers)
Interface Side	▪PI RDBMSPI I/F : Site Interface I/F ▪PItoPI I/F : I/F between head office and each site ▪PI API : App. I/F (Manual input, SAP CO module I/F) ▪PI Activeview : Web I/F ▪PI RLINK : SAP PM module I/F
Client Analysis Tool	▪PI DataLink : MS Excel I/F ▪PI PrecessBook : Mimic Implementation

✤ We intended to introduce PI ICE for web interface but PI Activeview was finally installed instead of PI ICE to improve speed on the web.

PI System Layout



Integrated Data Flow

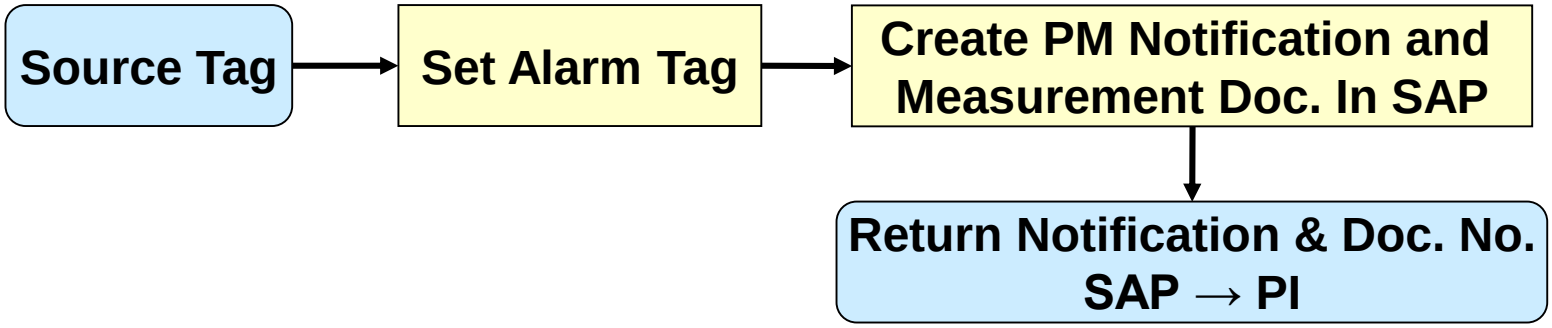


Interface with SAP PM through RLINK

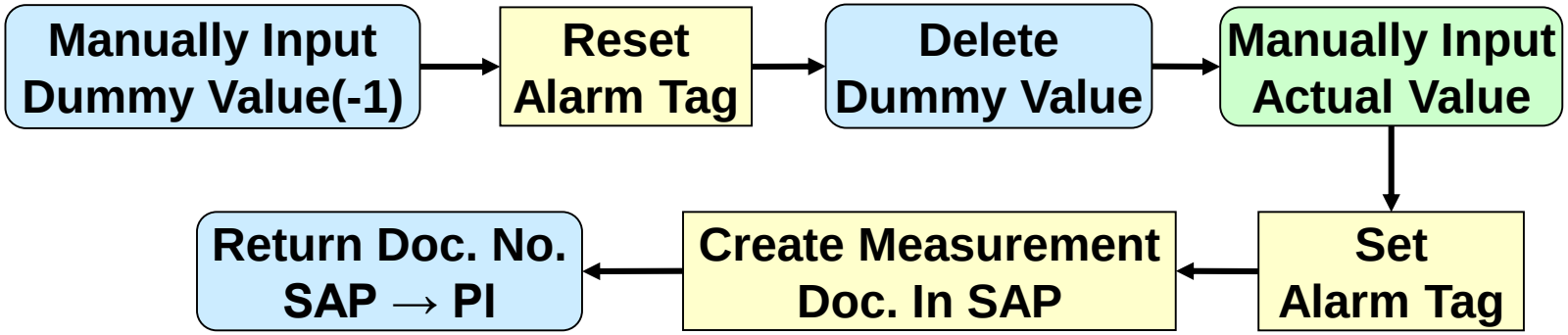
- PI RLINK provides an interface between PI and SAP PM
- Trigger based SAP Transaction
  - Transaction is triggered by the alarm tag
  - Automated PM notifications
  - Measurement document creation in SAP PM
  - Additional tags are needed for alarms, PM notification number, and measurement document number.
- No way to transfer PI analog type data to SAP frequently, through RLINK
  - In case of manual input, the additional step resetting the alarm is necessary
  - Can not deliver any real time analog data from PI to SAP

SAP Transaction Steps in detail

- In case of Run/Stop signal of Rotating Equipment

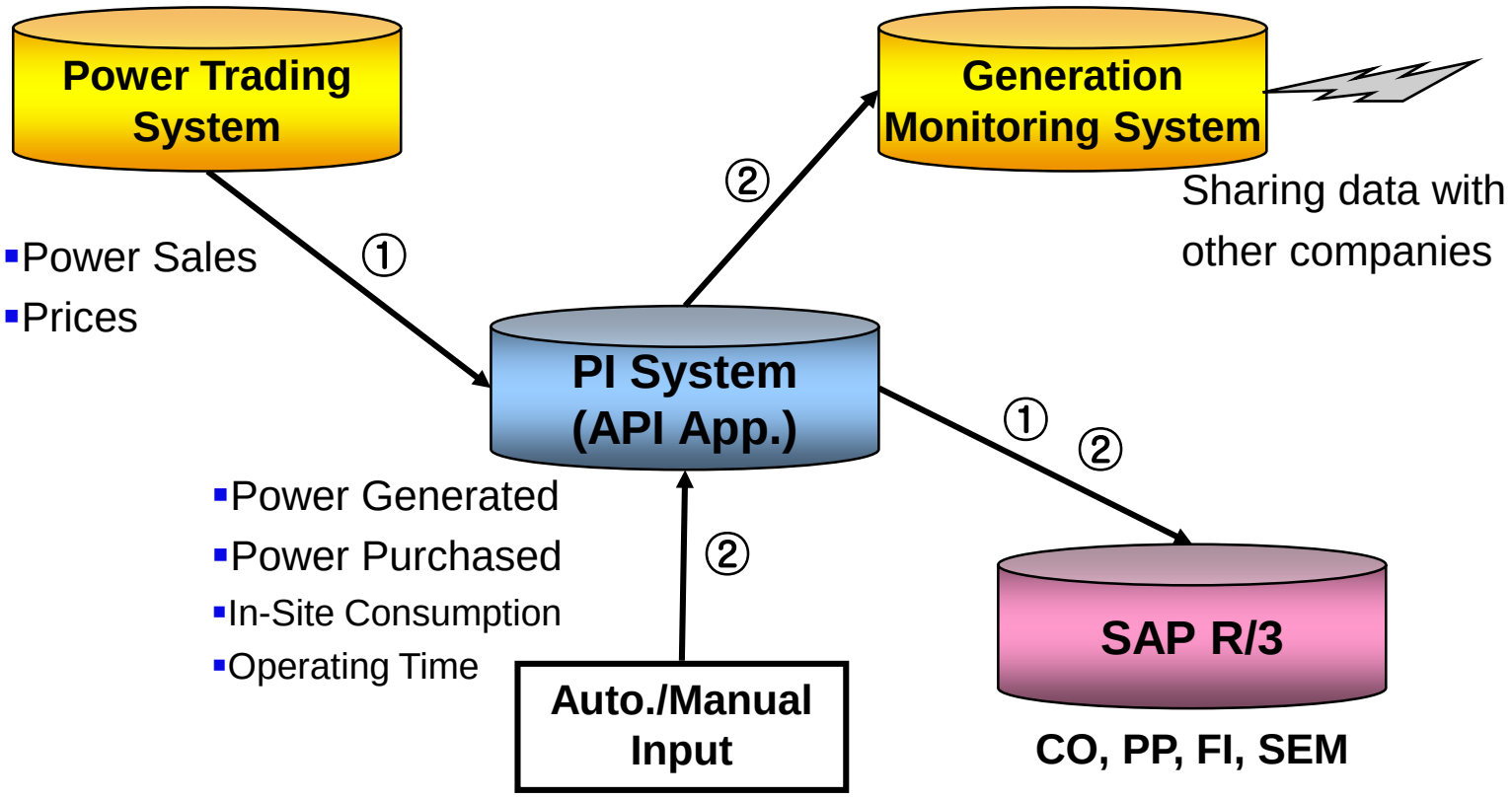


- In case of Manual Input Data

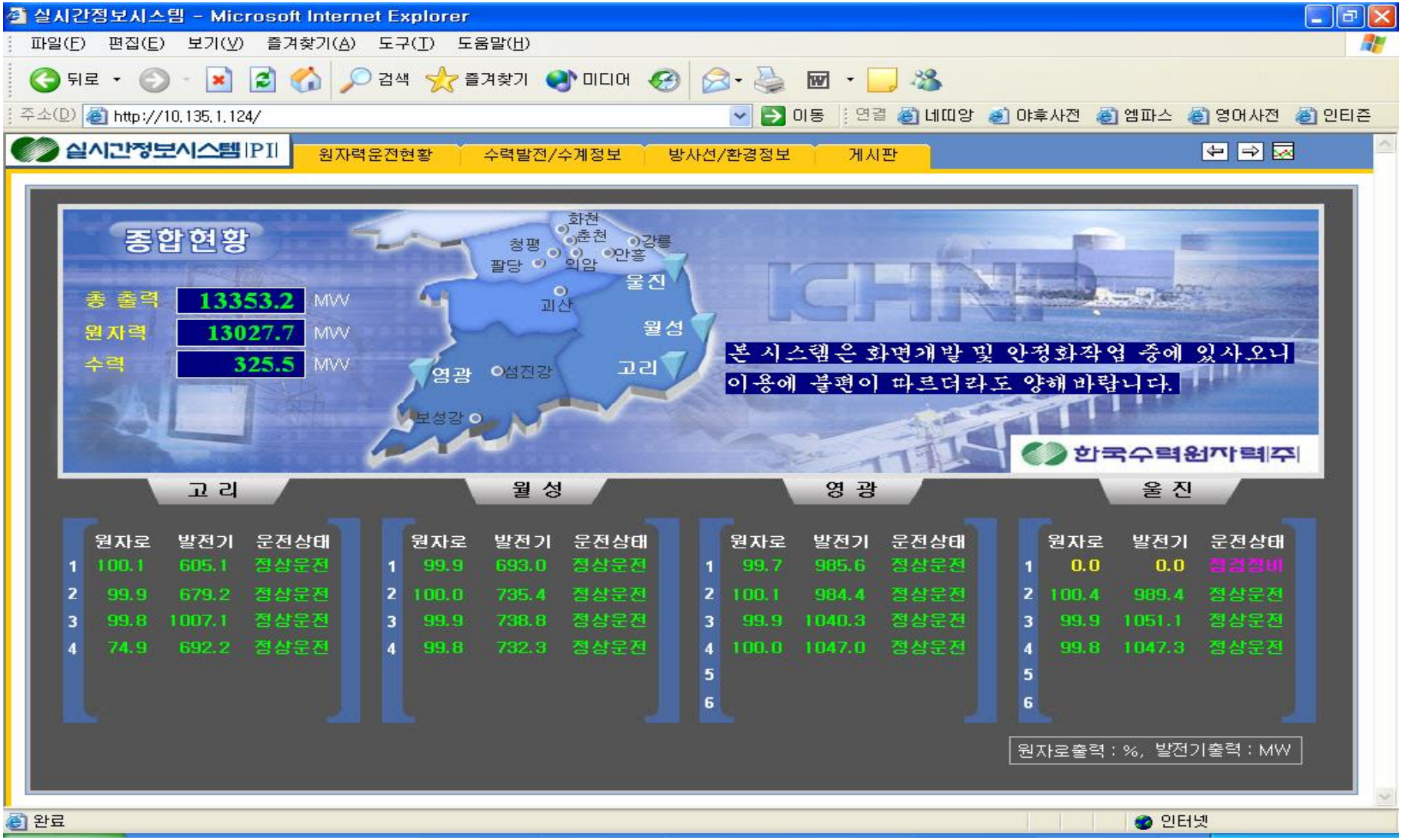


Interface with SAP and Legacy systems

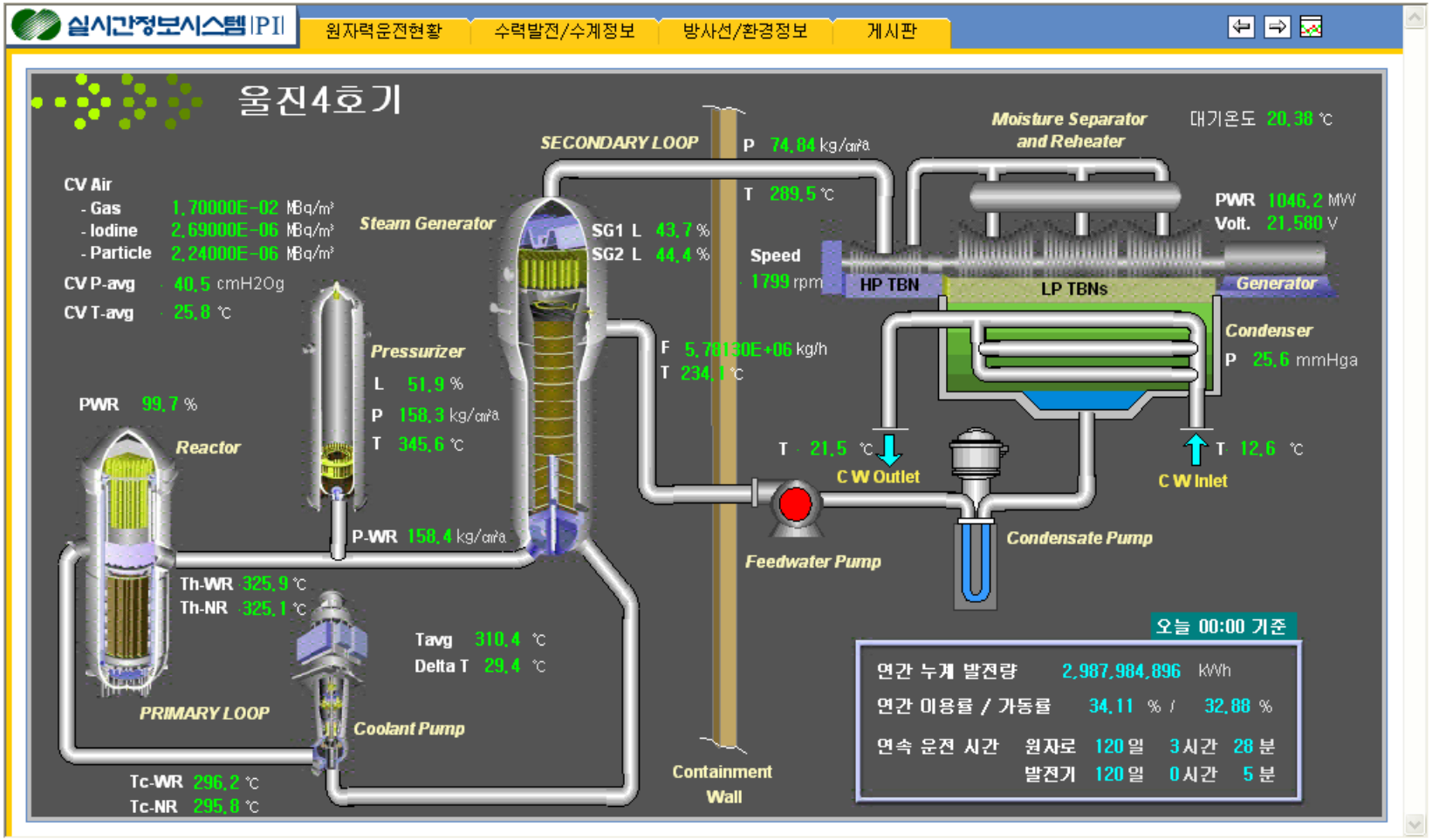
- **We have developed an application using PI-API, PI RDB I/F and BAPI**



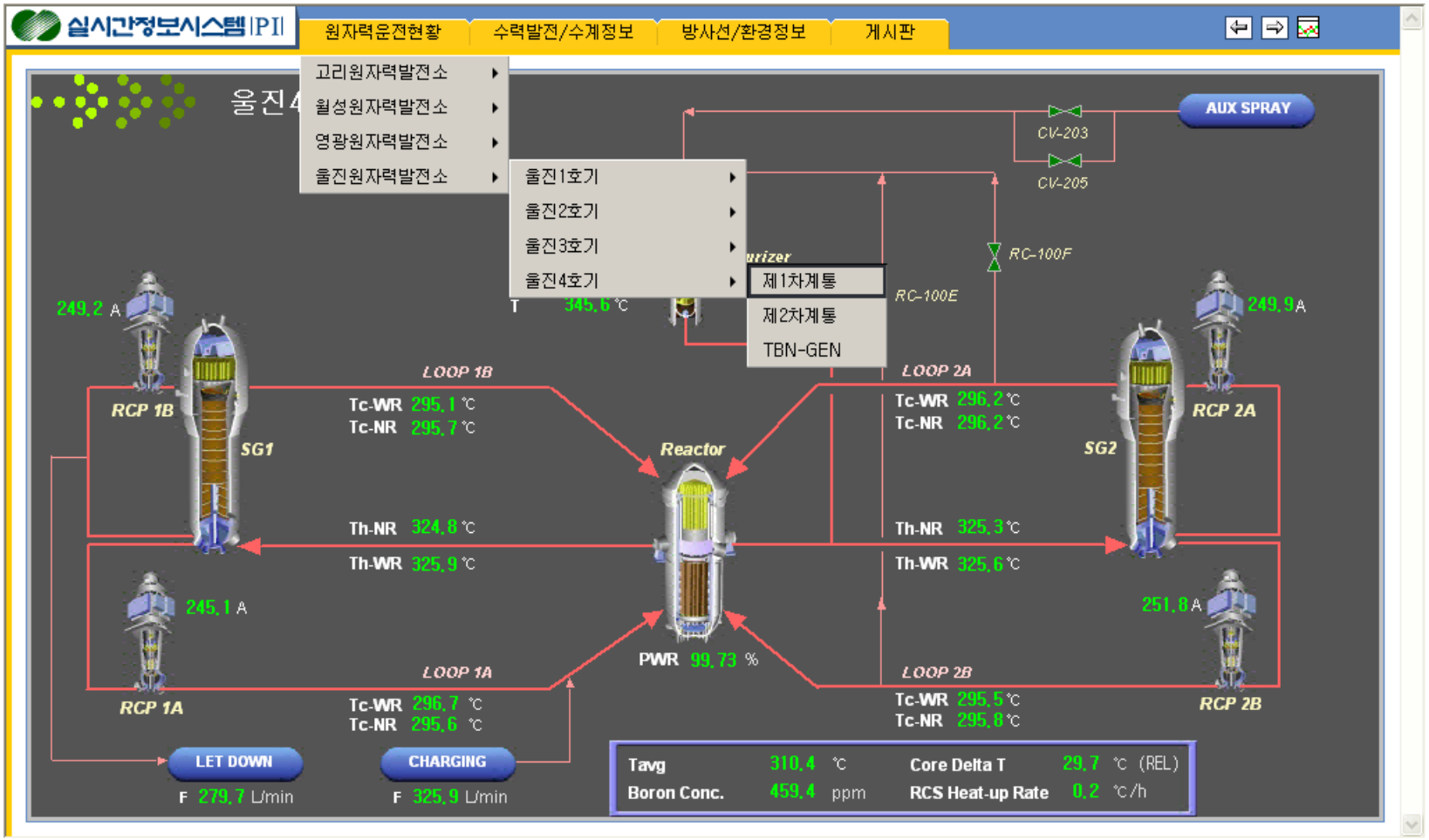
Web Screen Shot – Main page



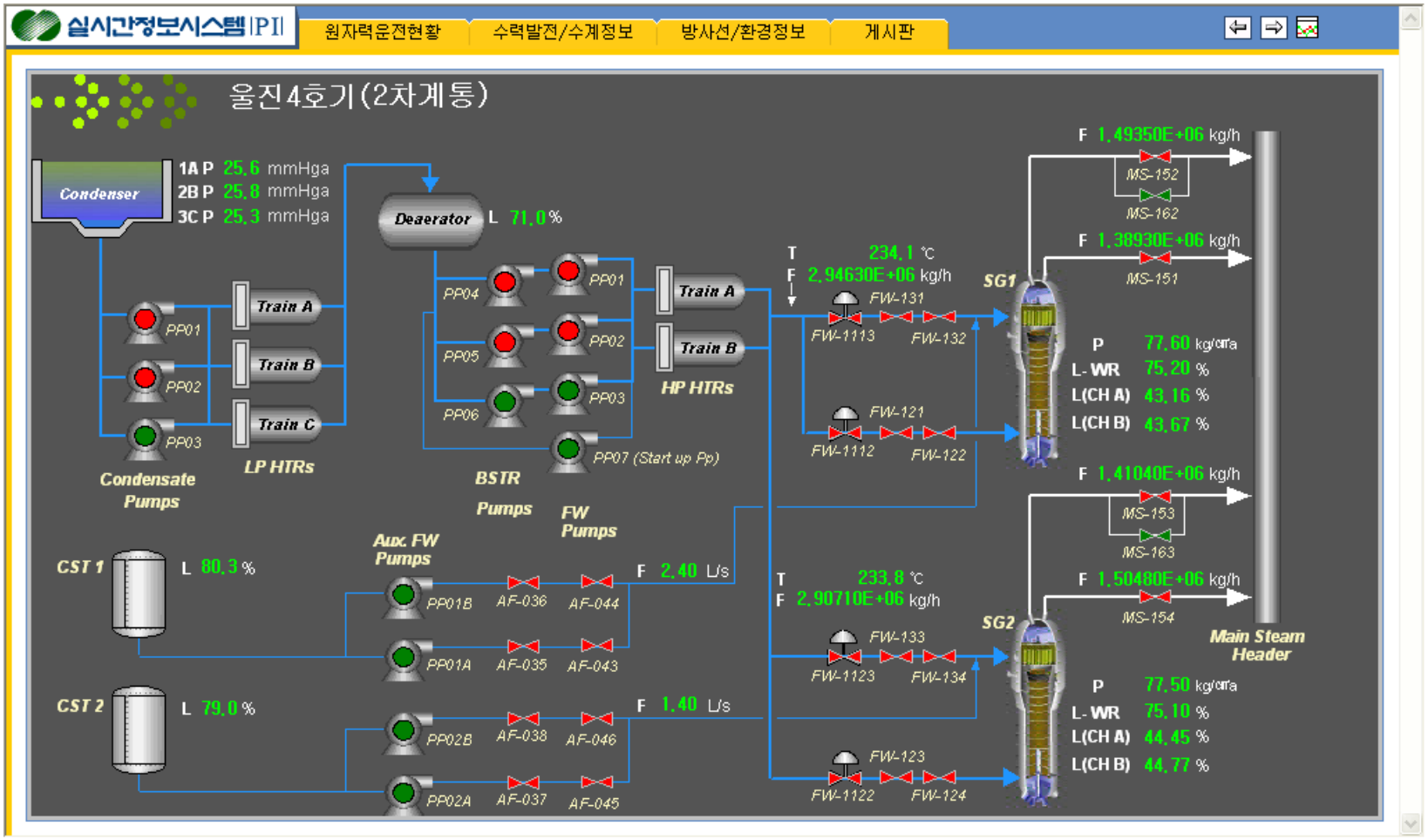
Web Screen Shot – Unit summary page



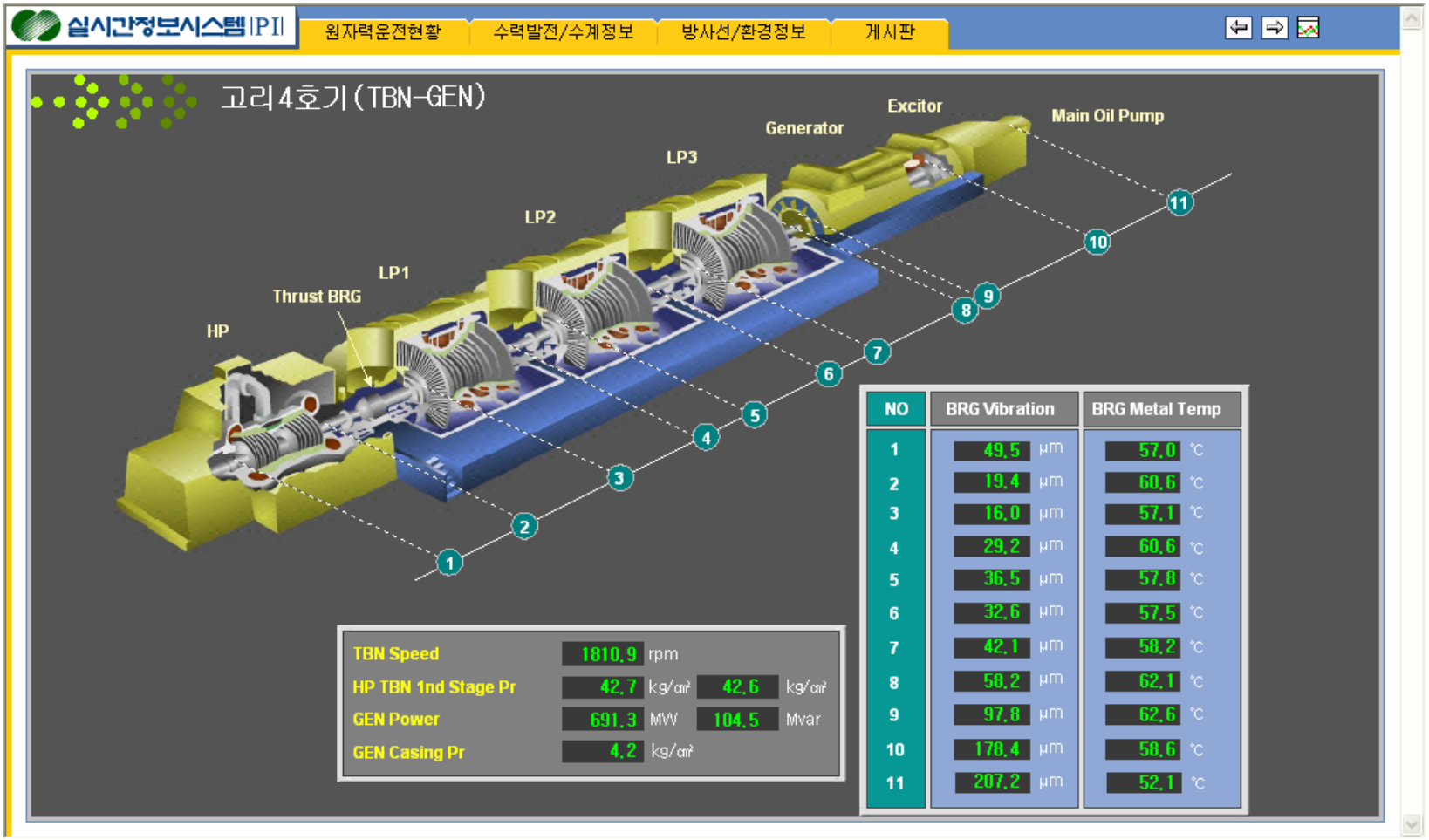
Web Screen Shot – Primary system



Web Screen Shot – Secondary system



Web Screen Shot – TBN-GEN



Trouble Shooting on ProcessBook (1/2)

- **Problem**

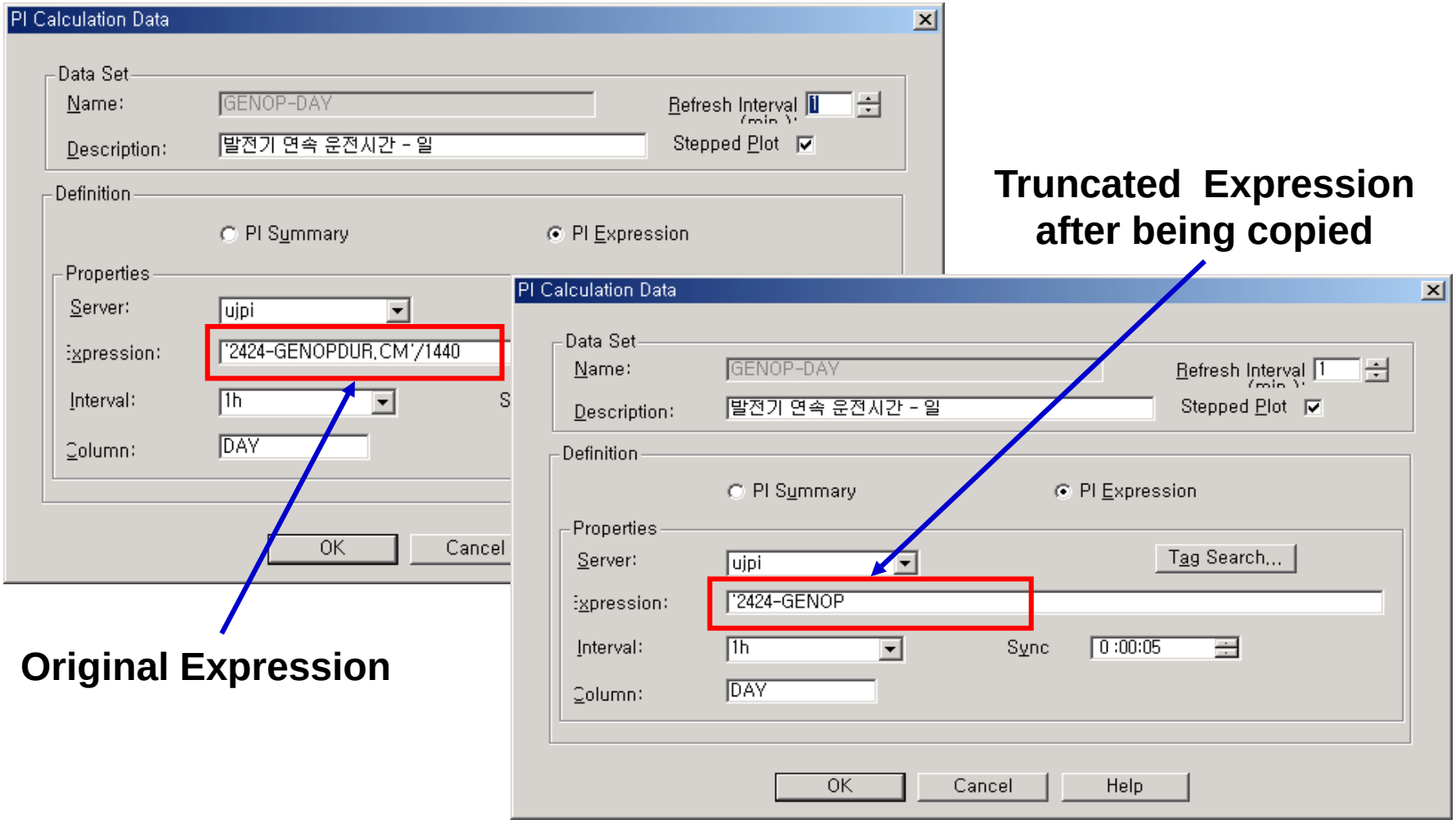
  : DataSet expressions are truncated after the pdi file, which include datasets, is copied to another PC.

  (PB version 2.31)

- **Solution**

  : After upgrading the UDS server from version 3.3.361.93 to version 3.3.362.47, the problem was disappeared.

Trouble Shooting on ProcessBook (2/2)



Trouble Shooting on DataLink

- **Problem**

  : PI time strings (‘Y’,’T’, ‘*’, etc.) are not work in Excel properly (DL version 2.1)

- **Solution**
  - **Use Excel functions such as ‘today()’, ‘Now()’, etc., instead of PI time string**

    OR

  - **Use the Application.CalculateFull method in VBA script OR press ‘Ctrl+Alt+F9’ key combination in the Excel sheet.**

Trouble Shooting on Manual-Logger(1/3)

- **Problem**

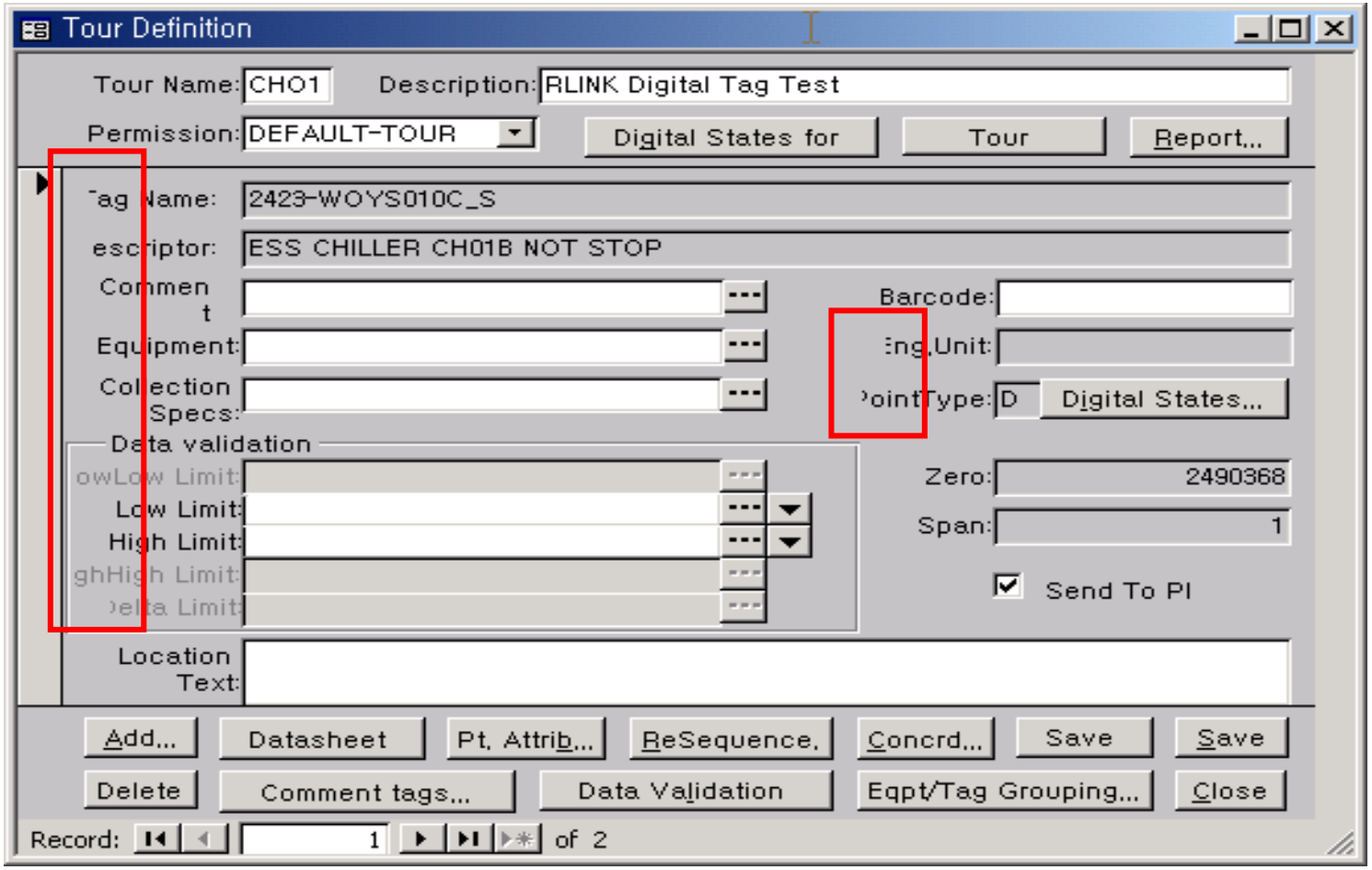
  : Font Broken in Manual-Logger screen (version 1.3)

- **Solution**

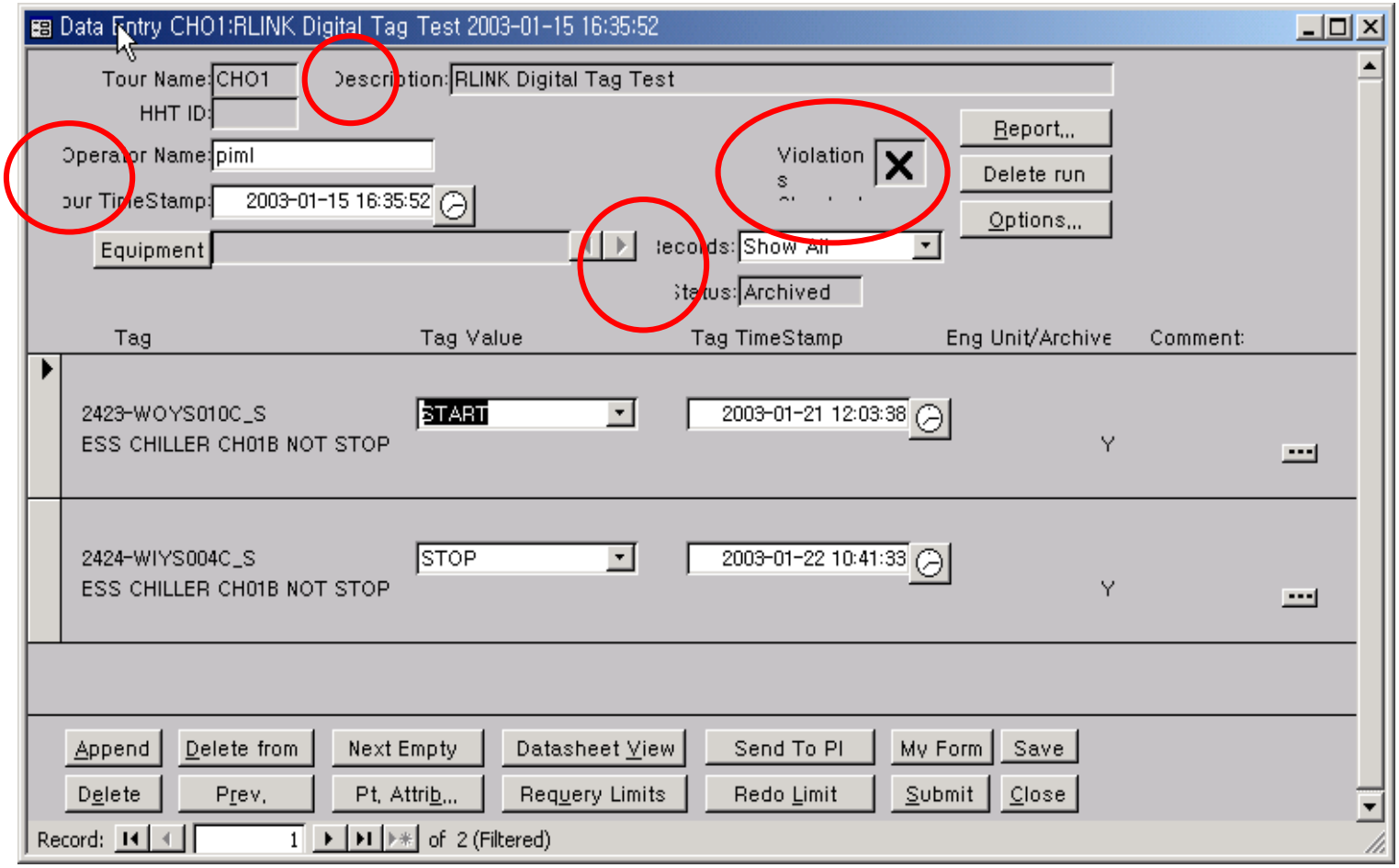
  :not yet

- **Because of this problem, we had to develop API applications instead of Manual-Logger to provide manual input function .**

Trouble Shooting on Manual-Logger(2/3)



Trouble Shooting on Manual-Logger(3/3)



Conclusions

- PI is an important data path among KHNP ERP system, plant computer, and other legacy systems.
- Concept of information system was changed after introducing PI system
  - Scope : Individual plant → Whole company
  - Objectives : Business function based → Business process based
  - Implementation : S/W development → Package configuration
- PI began to change many people who ware opposite to PI, with impressive capabilities.
- Although there is some problem and additional necessary functions, we don't doubt PI system is very flexible, easy to use, and powerful.
- PI agencies and customers must have correct understanding of all features of each PI package as well as OSIsoft, prior to PI introduction.

The end.