

CHAPTER 7 SKILLS ENHANCEMENT

As the asset strategies become increasingly sophisticated, maintenance and process personnel need to get additional training or have access to data sheets or information bulletins in order to make them aware of new technologies being implemented at modern plants. Improved maintenance strategies demand better maintenance procedures that are supported by up to date maintenance plans (Emerson 2005b).

This chapter will consider the different information available on the asset management solution to address the problem of introducing new technologies and processes as been discussed in the previous chapters. The system must help maintenance and process personnel become more effective and efficient, optimising operations and reduces costs (Honeywell 2004:1).

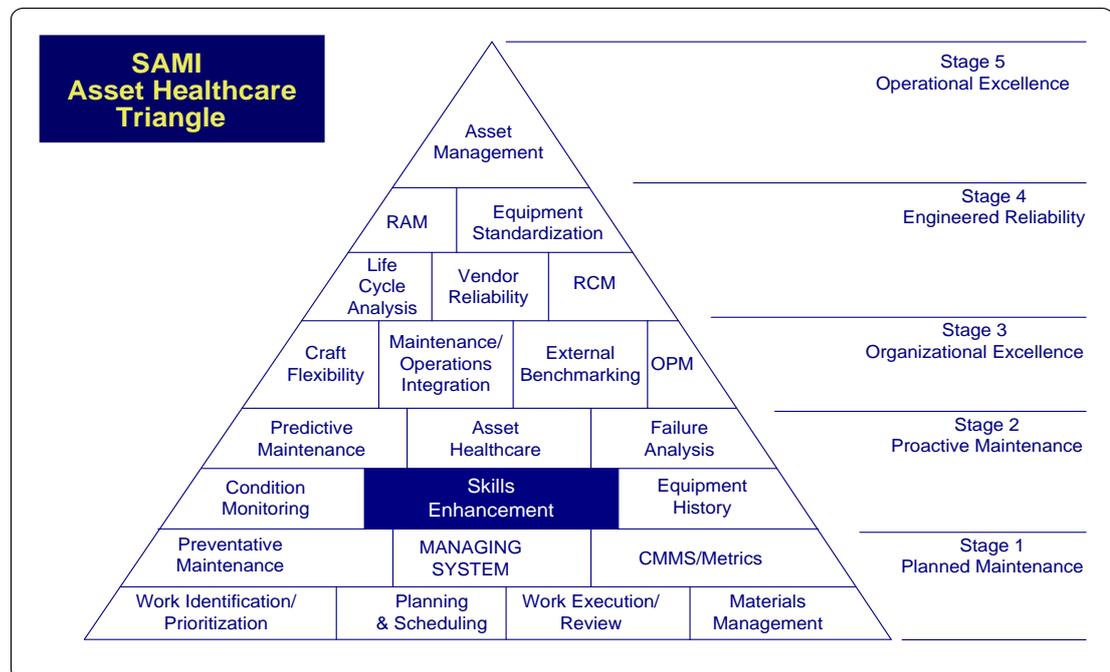


Figure 76: Skills enhancement

7.1 Maintenance Information

Maintenance procedures address the safety aspects and the actual work that must be done on the plant by maintenance staff such as the artisans. Each maintenance procedure is captured in a general procedure that addresses competencies of people working with instrumentation on specific areas of the plants. It is a reference document that will assist artisans and process staff to do a specific task or tasks in a specific way.

Making a maintenance procedure or plan effective requires that it be available at a central point, where it will be used for training purposes for new staff or to refresh existing staff on new field equipment, or what the need may be. This is achieved in the AlertManager. Besides the fact that the maintenance staff can use the software to see what assets are in alert, it is also the central point to access relevant data associated with the asset.

Maintenance procedures were developed for access by maintenance staff from the AlertManager. The procedures were designed as web pages so that it is accessible using any web-based interface software. This would allow any of the maintenance staff to have access to these procedures from the different equipment rooms or central control room.

Figure 77 shows an example of a procedure that is embedded in the AlertManager. It is located in the maintenance folder under the asset folders. If the user double clicks on the procedure, it would open in the right pane. The procedure shown in the example is the one for replacing a FSC module. If the technician is in the equipment room and needs to replace an interface card, he/she can open AlertManager from any one of the web clients to access the required maintenance procedure. The technician can then refer to the procedure to make sure the correct replacement steps are followed.

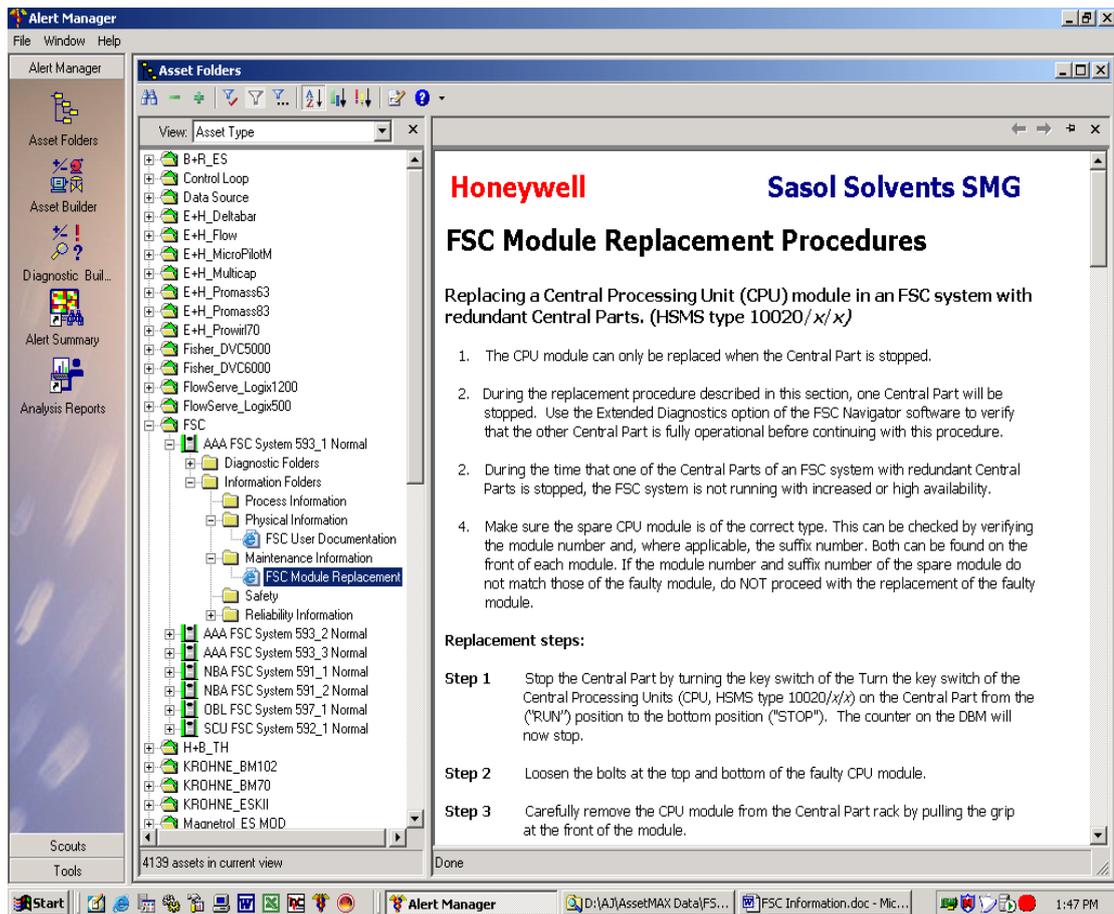


Figure 77: FSC Module replacement procedure

For all the assets configured in the AlertManager, a maintenance procedure was developed. Figure 78 shows the web path to the specific web page based maintenance procedures. The right pane in the example indicates the name of the maintenance procedure and the web path to access its web page.

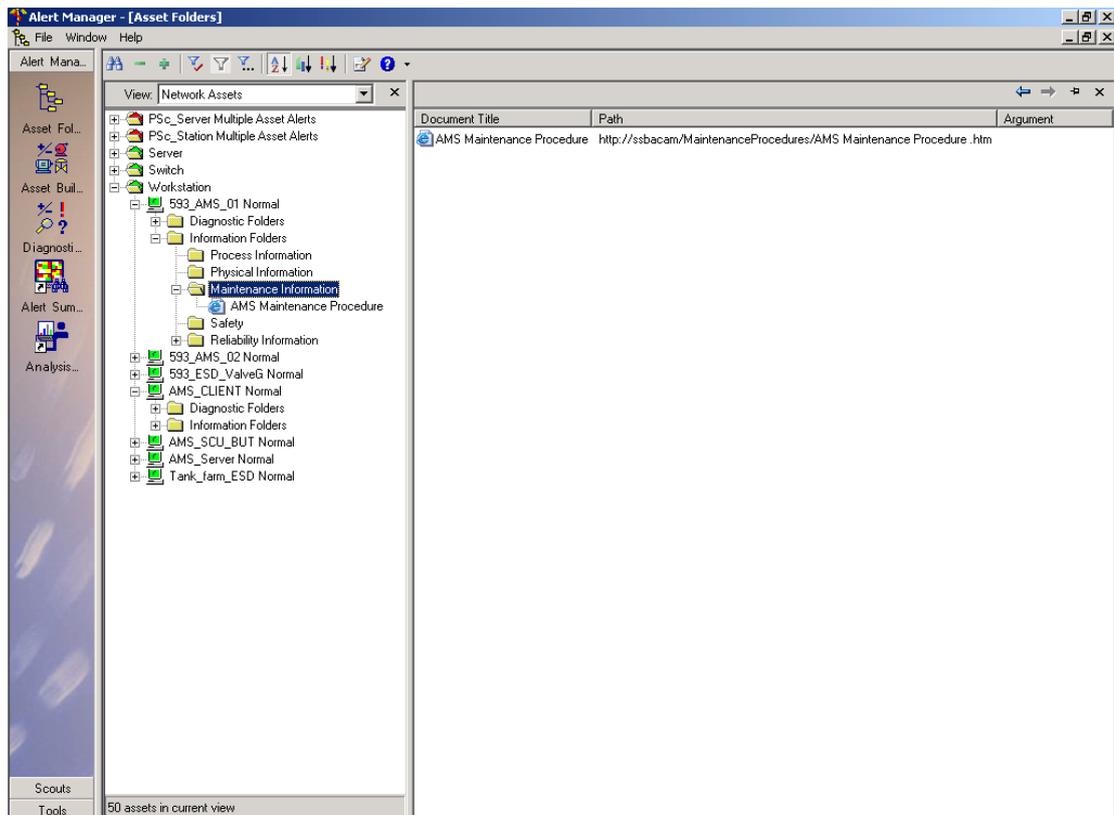


Figure 78: Web path for maintenance procedures

In the maintenance folder, the document name can be seen and this was created in this specific procedure format so that the maintenance staff will identify the procedure with the specific asset. Certain assets are linked to more than one document.

7.2 Physical Information

This folder contains the physical details that are available for the specific assets. Figure 79 shows FSC user documentation which is associated with a specific revision of software which in this case is all equipment related to R60x. The document is in Acrobat Reader format and is activated by double clicking on the “FSC User Documentation” name; the document is opened and displayed in the right

pane. This information will assist maintenance staff to use asset related documentation and to learn from the contents thereof.

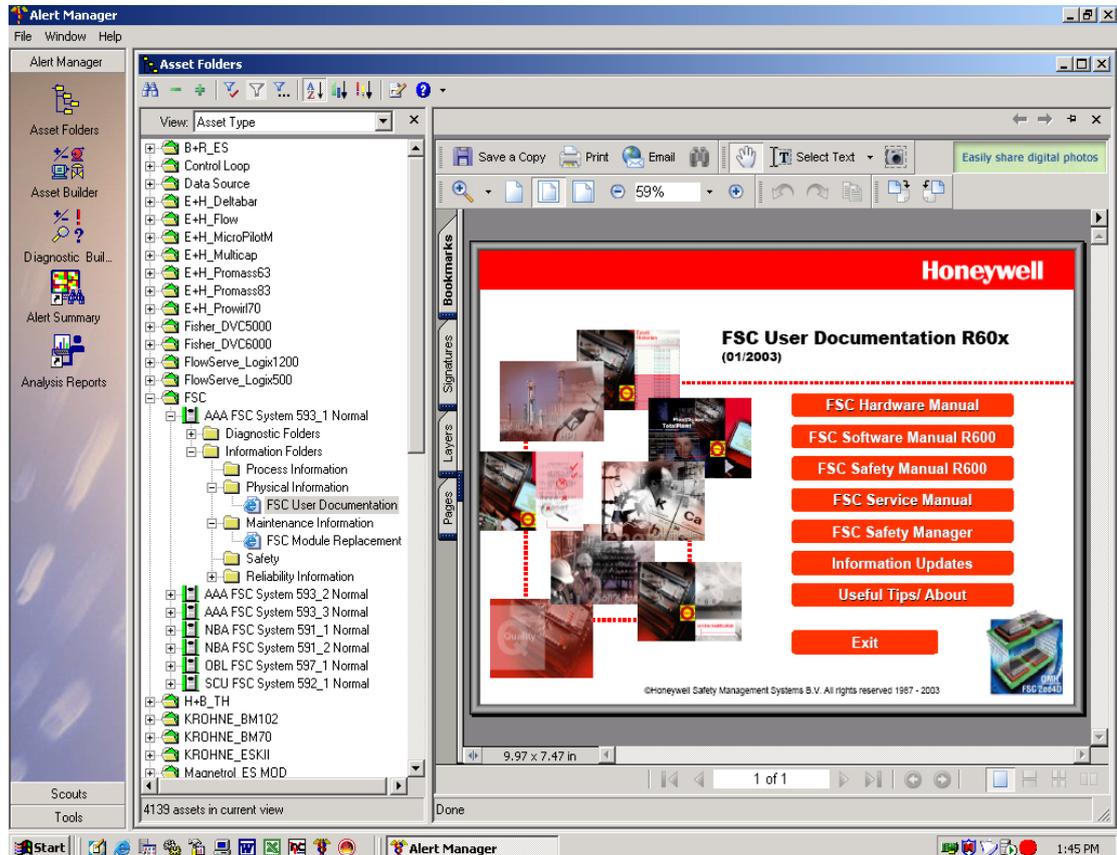


Figure 79: FSC user documentation

In the example shown in Figure 80, the Knowledge Builder software that is supplied with the Honeywell PlantScape DCS is activated to access relevant information for the hardware modules that are installed on the plant. The example shows the redundancy module details. The user can browse within the Knowledge Builder software without interfering with the AlertManager. Additional information can also be accessed from this software as shown in the example, where the user can access specific application notes for the piece of hardware asset.

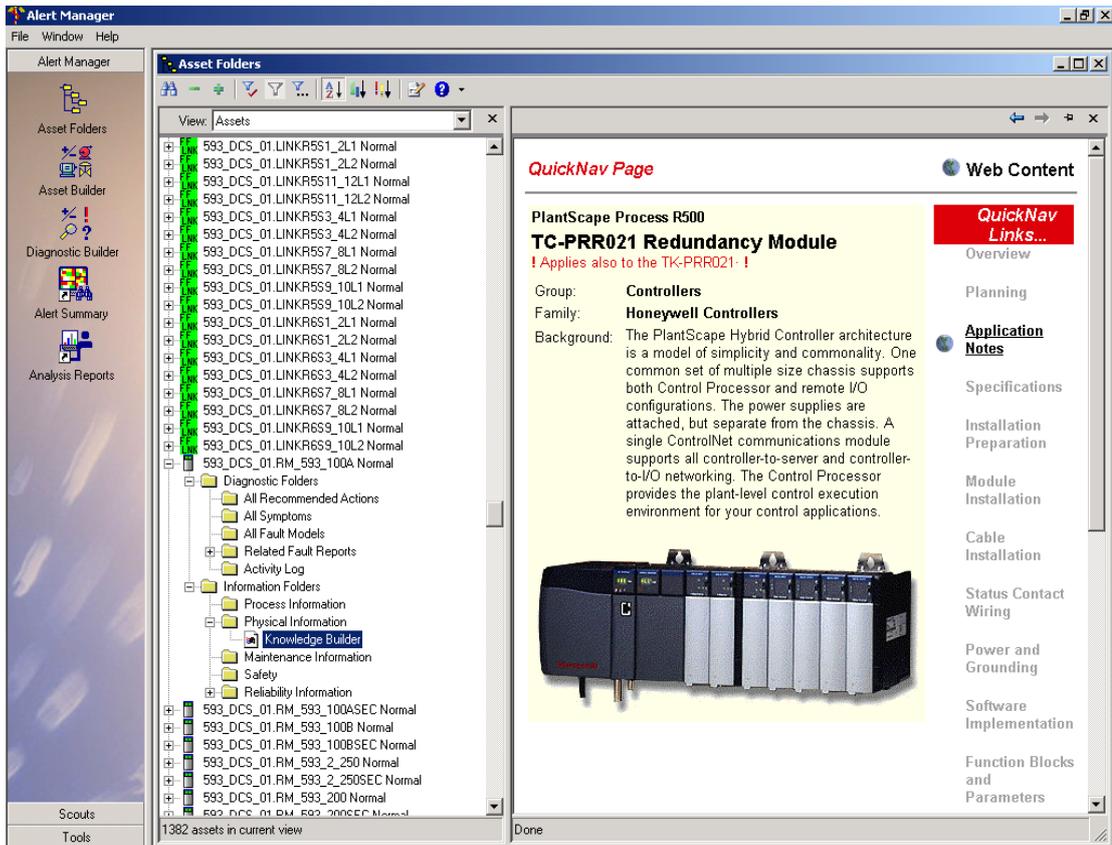


Figure 80: Knowledge Builder software

The example in Figure 81 shows a reference manual that is part of the Rosemount 3051 pressure transmitter asset. This reference manual is accessible via Acrobat reader. All reference manuals for all the HART-enabled field devices were scanned and converted to the .pdf format. These manuals are linked to their referenced assets in AlertManager. Incorporating these manuals into the AlertManager ensures that all manuals and data sheets are at a central point of access.

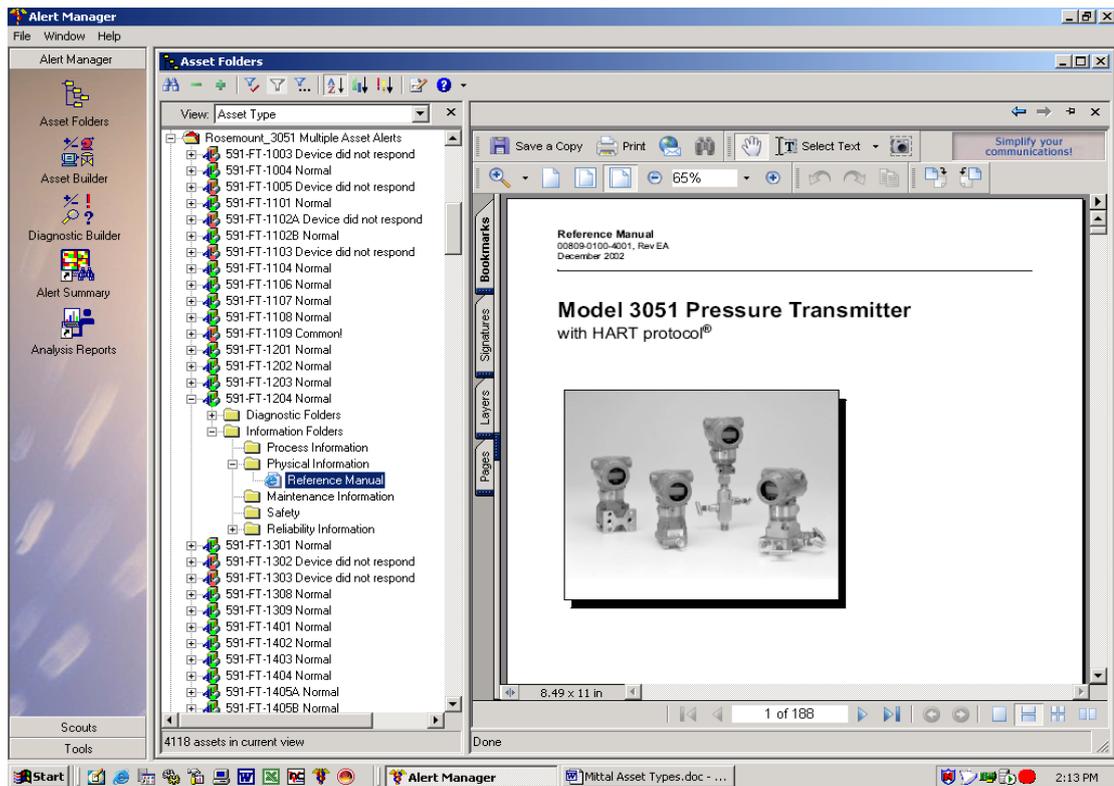


Figure 81: Instrument reference manual

7.3 Process Information

The PHD software suite that is used to allow users to access data may be constrained by License limitation. The Uniformance TotalPlant Process Trend for PHD for example has a limited number of licenses available for access to certain plant trends and views. This software is used to configure certain process trends that may be used to monitor asset tags behavior in a particular process.

The PHD process trend is configured under the process information folder. Double clicking on the name will start the TotalPlant application, and the configured trend for the specific asset will be shown. This can be seen in Figures 83 and 84. These trends were configured in the TotalPlant software and interfaced to the AlertManager. Instead of using four or five licenses to access the software, only one

license is used and can be accessed from more than one web-based client using the AlertManager with integrated software produces a major cost saving.

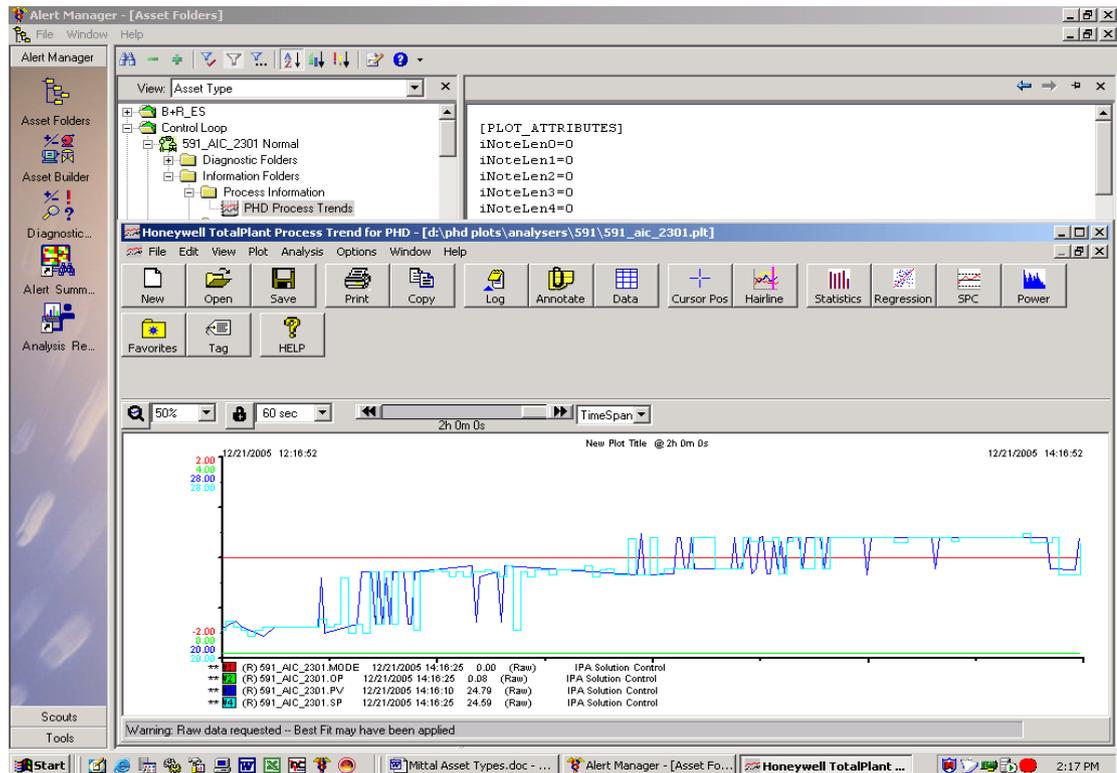


Figure 82: Process trend for an analyzer control loop

The trend data shown in the right pane is in real-time and the asset tags can be monitored especially when doing maintenance on these assets to see whether, for example, an overhauled valve makes a difference to the process. The trend data within the TotalPlant software can still be manipulated as though the user was working on a PHD client.

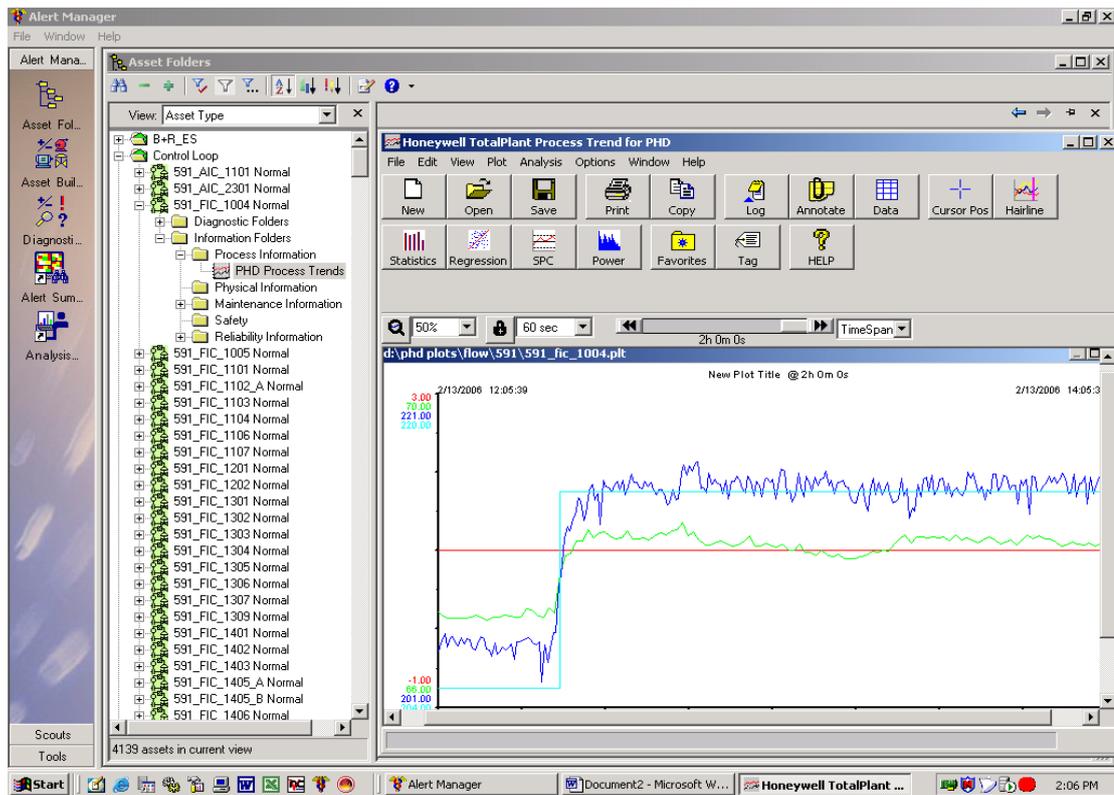


Figure 83: Process trend for a flow control loop

7.4 Recommended Actions

The maintenance information folder includes recommended actions/procedures that have been developed for some of the assets to assist in maintenance actions. These recommended actions/procedures are part of the asset maintenance blueprint and the devices that form part of these actions are typical network assets, specialized FSC assets, PlantScape hardware, control-net equipment and all the different servers used on the control network.

As shown in chapter 5 with figure 46, an e-mail is generated when an asset produces a fault. The e-mail informs to “Please check AlertManager for Recommended Action.” This recommended action needs to be checked to assist maintenance staff to try and solve the fault or problem on the specific asset. This may also be accessed

from any web-based client. In Figure 84, the recommended action for a network switch is shown. These steps are used as a reference for the maintenance staff.

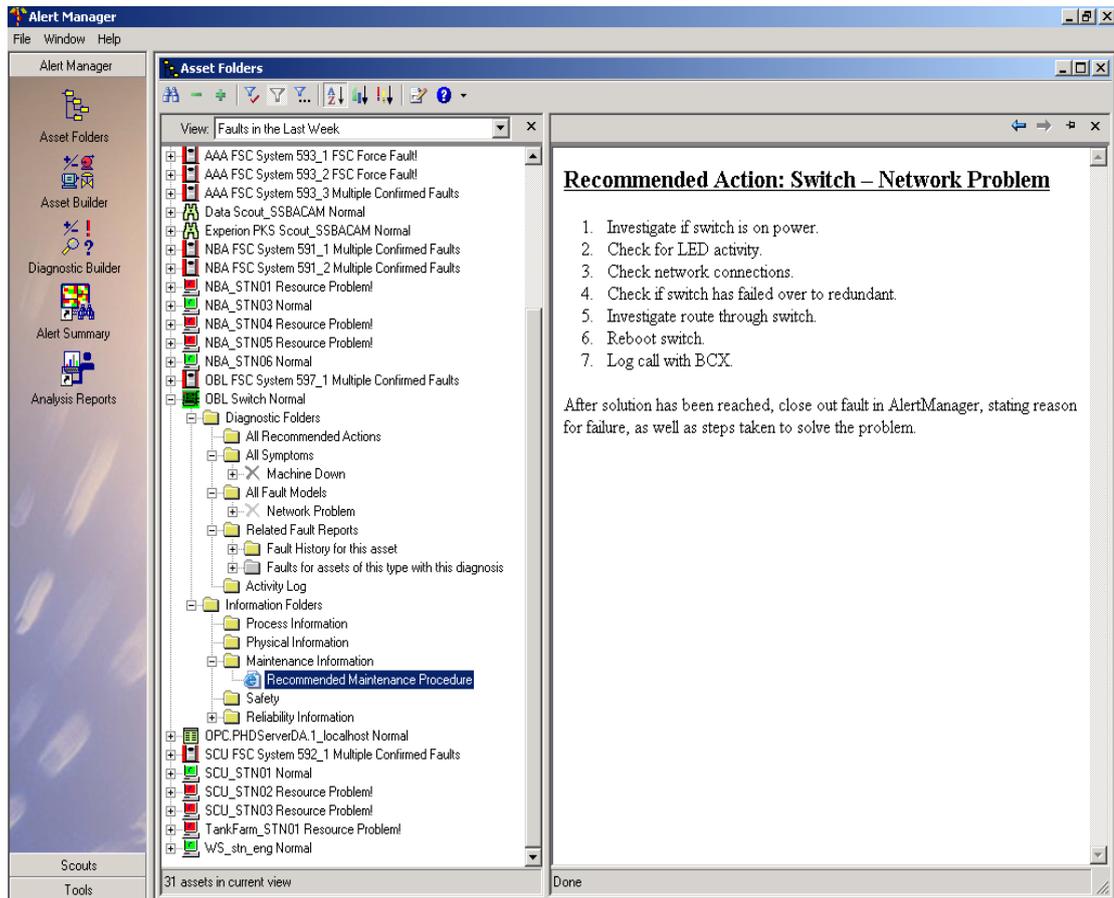


Figure 84: Recommended action for a network switch

7.5 LoopScout Detail Performance Assessment

In previous chapters the LoopScout interface and feedback data from 1000 Oaks in the USA were discussed. The received detail performance assessment is interfaced to the AlertManager in two ways. The first method, namely the flat file process was discussed in chapter four. The second is the assessment report as shown in Figure 86. For each of the control loops configured in AlertManager, this assessment report is available. The report is received every month and the assessments are stored in the maintenance information folder. It also forms part of the history that is made

available to maintenance and process staff. From the example shown, it can be seen that the feedback reports are web-based and accessible via a web-based client. When the assessment is double clicked, the detailed information of the specific point on the assessment will be displayed as shown in the example.

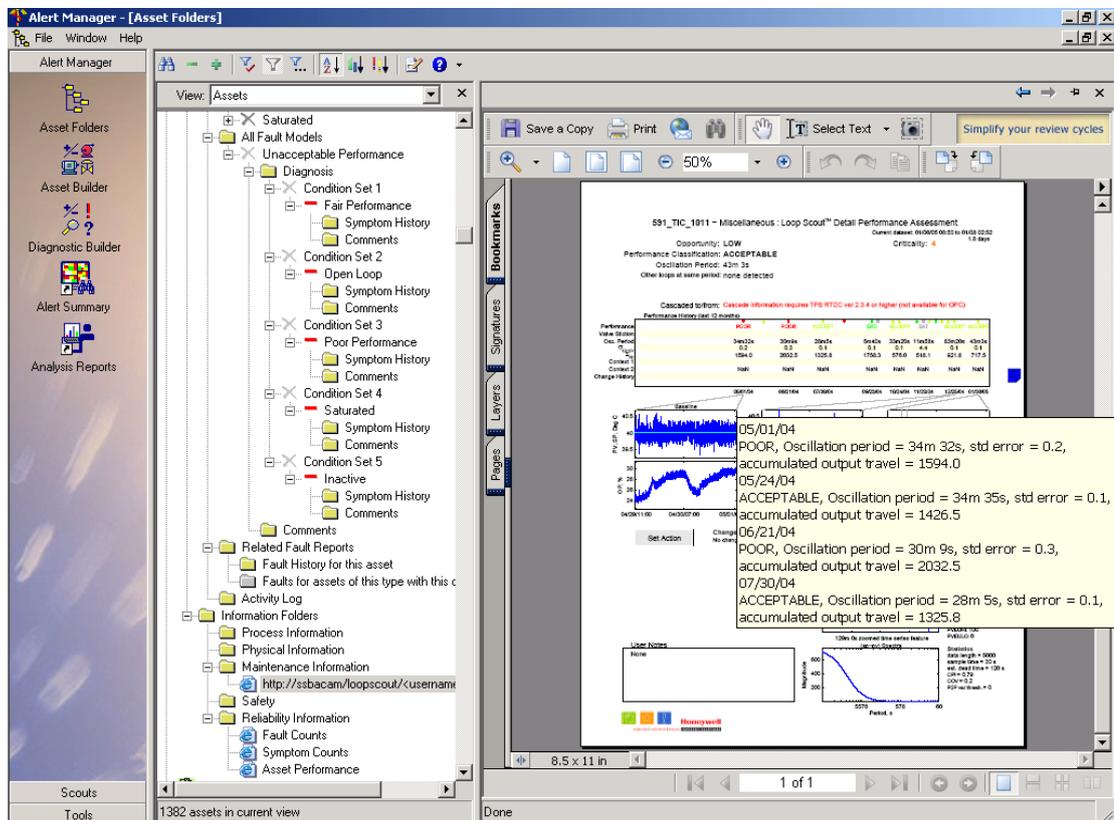


Figure 85: LoopScout performance assessment

More detail is available from the assessment as shown in figure 86. This report will assist the process and maintenance technicians to see where there are problems on the specific control loops. This example shows certain parameters for the control loop. This particular loop is not a critical loop in the process and its probability for stiction is very low. There is a good opportunity to tune this for better performance, which will change its performance classification. From this type of assessment, process people and maintenance staff can be taught how to use the information from this report and to optimize the control loops so as to get a more tuned and optimized

plant producing at design specifications. Further particulars on the assessment are not discussed in this thesis.

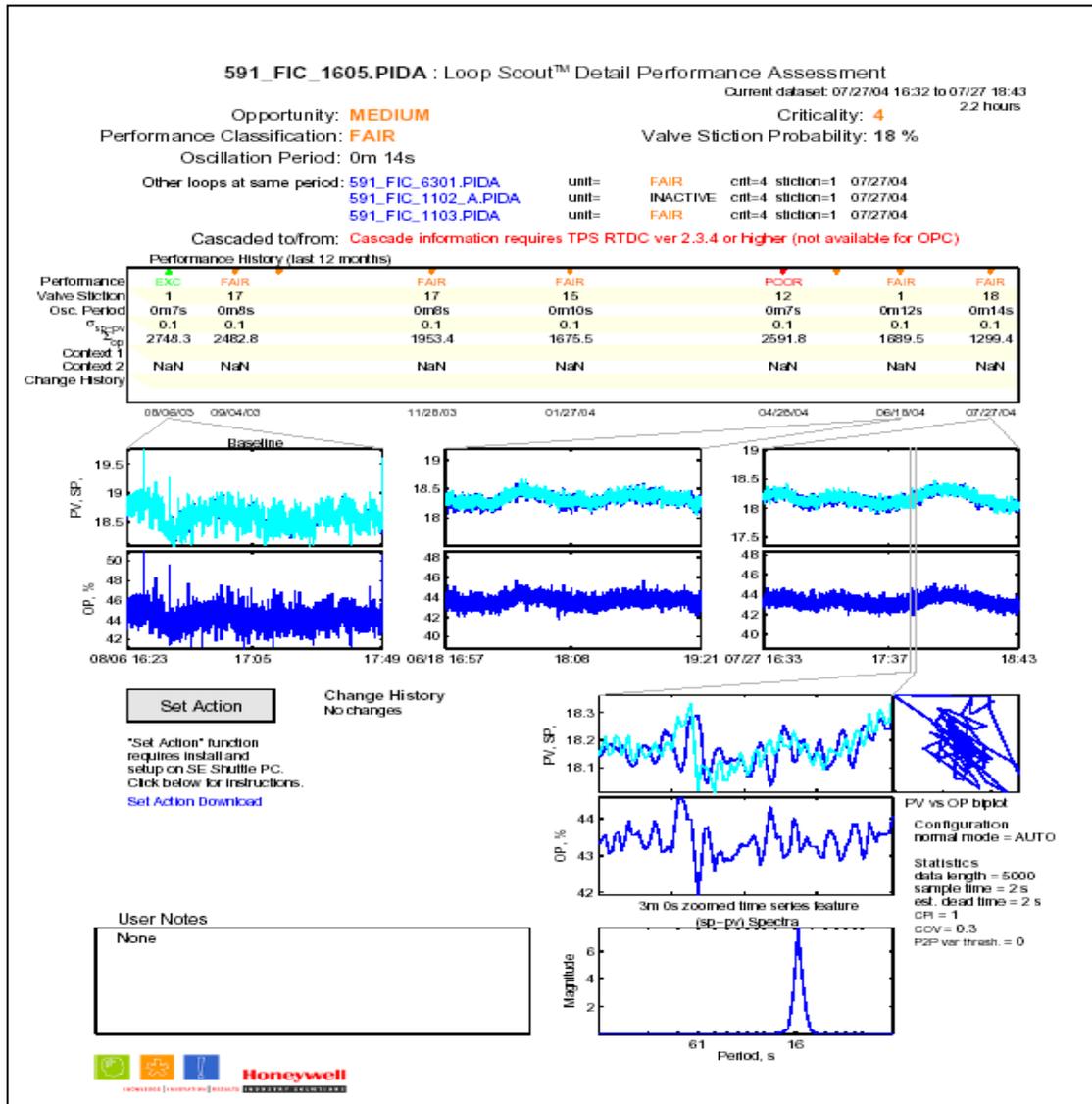


Figure 86: Detail performance assessment

Loop Scout - Sort & Filter - Windows Internet Explorer

C:\1_DTech\Research 2005_2006_2007\System Integration Work_DTECH\LoopScout\3V1\AssetDisplay.htm

| Tagname | DCS Unit | Area | APC Name | Description | Opportunity | Maint. Flag | Criticality | Performance | Perf. vs Last | Valve Stiction | OP Travel | Grade Tag | Grade | Rate Tag |
|---------------|----------|-------|----------|-------------|-------------|-------------|-------------|-------------|---------------|----------------|-----------|-----------|-------|----------|
| (All) | (All) | (All) | (All) | | (All) | (All) | (All) | (All) | (All) | | | (All) | (All) | (All) |
| 593_FIC_20042 | 593 | - | - | | 16 | No | 3 | openloop | ltoO | 1 | 6 | none | none | none |
| 593_FIC_30029 | 593 | - | - | | 28 | No | 4 | openloop | ltoO | 1 | 27 | none | none | none |
| 593_FIC_20022 | 593 | - | - | | 16 | No | 3 | openloop | ltoO | 1 | 5 | none | none | none |
| 593_FIC_20027 | 593 | - | - | | 16 | No | 3 | openloop | ltoO | 1 | 1 | none | none | none |
| 593_FIC_40028 | 593 | - | - | | 0 | No | 3 | inactive | Otol | 1 | 2 | none | none | none |
| 593_FIC_40026 | 593 | - | - | | 28 | No | 4 | openloop | ltoO | 1 | 0 | none | none | none |
| 593_FIC_40017 | 593 | - | - | | 0 | No | 3 | inactive | Otol | 1 | 2 | none | none | none |
| 593_FIC_40002 | 593 | - | - | | 14 | No | 4 | acceptable | AtoA | 1 | 562 | none | none | none |
| 593_FIC_20035 | 593 | - | - | | 40 | No | 3 | poor | PtoP | 31 | 1343 | none | none | none |
| 593_FIC_30031 | 593 | - | - | | 70 | No | 4 | poor | AtoP | 32 | 3291 | none | none | none |
| 593_FIC_40063 | 593 | - | - | | 0 | No | 3 | inactive | Otol | 1 | 0 | none | none | none |
| 593_FIC_40016 | 593 | - | - | | 14 | No | 4 | acceptable | FtoA | 1 | 1321 | none | none | none |
| 593_FIC_40030 | 593 | - | - | | 40 | No | 3 | poor | PtoP | 1 | 1035 | none | none | none |
| 593_FIC_40020 | 593 | - | - | | 14 | No | 4 | acceptable | AtoA | 1 | 509 | none | none | none |
| 593_FIC_20046 | 593 | - | - | | 40 | No | 3 | poor | ItoP | 2 | 834 | none | none | none |
| 593_FIC_30037 | 593 | - | - | | 28 | No | 4 | openloop | PtoO | 14 | 555 | none | none | none |
| 593_FIC_20032 | 593 | - | - | | 4 | No | 3 | excellent | ItoE | 1 | 431 | none | none | none |
| 593_FIC_20014 | 593 | - | - | | 0 | No | 3 | inactive | ltoI | 1 | 0 | none | none | none |
| 593_FIC_40047 | 593 | - | - | | 0 | No | 4 | inactive | Etol | 1 | 0 | none | none | none |
| 593_FIC_40044 | 593 | - | - | | 14 | No | 4 | acceptable | EtoA | 1 | 401 | none | none | none |
| 593_FIC_40038 | 593 | - | - | | 4 | No | 3 | excellent | EtoE | 1 | 688 | none | none | none |
| 593_FIC_40006 | 593 | - | - | | 14 | No | 4 | acceptable | EtoA | 1 | 131 | none | none | none |
| 593_FIC_40012 | 593 | - | - | | 56 | No | 4 | fair | PtoF | 3 | 412 | none | none | none |
| 593_FIC_40039 | 593 | - | - | | 8 | No | 3 | acceptable | PtoA | 1 | 428 | none | none | none |
| 593_FIC_40041 | 593 | - | - | | 7 | No | 4 | excellent | EtoE | 1 | 447 | none | none | none |
| 593_FIC_40003 | 593 | - | - | | 14 | No | 4 | acceptable | FtoA | 1 | 177 | none | none | none |
| 593_FIC_40010 | 593 | - | - | | 14 | No | 4 | acceptable | EtoA | 1 | 541 | none | none | none |

Loop 593_FIC_10022 is highlighted.

Figure 87a: Loop asset display from LoopScout – part 1

Loop Scout - Sort & Filter - Windows Internet Explorer

C:\1_DTech\Research 2005_2006_2007\System Integration Work_DTECH\LoopScout\3V1\AssetDisplay.htm

| criticality | Performance | Perf. vs Last | Valve Stiction | OP Travel | Grade Tag | Grade | Rate Tag | Rate | Oscillation Period | CPI | COV | OP Mean | Loop Type | Collection Date |
|-------------|-------------|---------------|----------------|-----------|-----------|-------|----------|-------|--------------------|-------|-------|---------|-------------|-----------------|
| (All) | (All) | (All) | | | (All) | (All) | (All) | | | | | | (All) | (All) |
| openloop | ltoO | 1 | 6 | none | none | none | none | 0m 3s | 0.49 | 0.00 | 14.09 | flow | 22-Dec-2004 | |
| openloop | ltoO | 1 | 27 | none | none | none | none | 0m 3s | 0.61 | 0.20 | 56.70 | flow | 22-Dec-2004 | |
| openloop | ltoO | 1 | 5 | none | none | none | none | 0m 3s | 0.00 | 1.02 | 31.09 | flow | 22-Dec-2004 | |
| openloop | ltoO | 1 | 1 | none | none | none | none | 0m 3s | 0.45 | 0.00 | 65.51 | flow | 22-Dec-2004 | |
| inactive | Otol | 1 | 2 | none | none | none | none | 0m 3s | 0.20 | 0.00 | 62.33 | flow | 22-Dec-2004 | |
| openloop | ltoO | 1 | 0 | none | none | none | none | 0m 4s | 0.43 | 0.00 | 9.72 | flow | 22-Dec-2004 | |
| inactive | Otol | 1 | 2 | none | none | none | none | 0m 5s | 0.10 | 0.00 | 73.69 | flow | 22-Dec-2004 | |
| acceptable | AtoA | 1 | 562 | none | none | none | none | 0m 5s | 0.80 | 0.61 | 67.87 | flow | 22-Dec-2004 | |
| poor | PtoP | 31 | 1343 | none | none | none | none | 0m 5s | 0.46 | 3.01 | 50.24 | flow | 22-Dec-2004 | |
| poor | AtoP | 32 | 3291 | none | none | none | none | 0m 5s | 0.28 | 7.18 | 56.15 | flow | 22-Dec-2004 | |
| inactive | Otol | 1 | 0 | none | none | none | none | 0m 5s | 1.00 | 0.00 | 55.00 | flow | 22-Dec-2004 | |
| acceptable | FtoA | 1 | 1321 | none | none | none | none | 0m 5s | 0.96 | 0.96 | 76.21 | flow | 22-Dec-2004 | |
| poor | PtoP | 1 | 1035 | none | none | none | none | 0m 6s | 0.56 | 1.09 | 66.34 | flow | 22-Dec-2004 | |
| acceptable | AtoA | 1 | 509 | none | none | none | none | 0m 6s | 0.95 | 0.89 | 70.54 | flow | 22-Dec-2004 | |
| poor | ItoP | 2 | 834 | none | none | none | none | 0m 6s | 0.29 | 1.12 | 54.87 | flow | 22-Dec-2004 | |
| openloop | PtoO | 14 | 555 | none | none | none | none | 0m 6s | 0.53 | 30.36 | 46.48 | flow | 22-Dec-2004 | |
| excellent | ItoE | 1 | 431 | none | none | none | none | 0m 6s | 0.93 | 0.80 | 60.37 | flow | 22-Dec-2004 | |
| inactive | ltoI | 1 | 0 | none | none | none | none | 0m 6s | 0.83 | 0.00 | 64.00 | flow | 22-Dec-2004 | |
| inactive | Etol | 1 | 0 | none | none | none | none | 0m 7s | 0.58 | 0.00 | 80.00 | flow | 22-Dec-2004 | |
| acceptable | EtoA | 1 | 401 | none | none | none | none | 0m 7s | 0.85 | 0.78 | 71.10 | flow | 22-Dec-2004 | |
| excellent | EtoE | 1 | 688 | none | none | none | none | 0m 7s | 0.96 | 1.31 | 38.17 | flow | 22-Dec-2004 | |
| acceptable | EtoA | 1 | 131 | none | none | none | none | 0m 7s | 0.65 | 0.27 | 57.09 | flow | 22-Dec-2004 | |
| fair | PtoF | 3 | 412 | none | none | none | none | 0m 7s | 0.24 | 0.28 | 75.64 | flow | 22-Dec-2004 | |
| acceptable | PtoA | 1 | 428 | none | none | none | none | 0m 7s | 0.38 | 1.03 | 63.58 | flow | 22-Dec-2004 | |
| excellent | EtoE | 1 | 447 | none | none | none | none | 0m 8s | 0.99 | 0.72 | 69.30 | flow | 22-Dec-2004 | |
| acceptable | FtoA | 1 | 177 | none | none | none | none | 0m 8s | 0.73 | 0.19 | 76.78 | flow | 22-Dec-2004 | |
| acceptable | EtoA | 1 | 541 | none | none | none | none | 0m 9s | 0.85 | 0.67 | 71.49 | flow | 22-Dec-2004 | |

Loop 593_FIC_10022 is highlighted.

Figure 87b: Loop asset display from LoopScout – part 2

Additional information is provided for different plants where the data collection occurred for LoopScout. Figures 87a and 87b show another type of display, given for the different control loops used on the different plants. This information is also very useful in determining where problems are on the plant with control loops.

Examining this data can determine possible faults with control valve not properly maintained. Again, no detail from the reports will be discussed.

7.6 Shutdown Valve Signatures

With every shutdown the E/I maintenance group goes through a process where all the valves are checked with Valvelink and Valvue snap-on software, to verify the condition of the valves before they are removed for repair or overhauling.

The potential cost of valve failure is fairly high and the standard practice is to remove a valve during a shutdown period for repair. This could mean repairs before service may be necessary. By performing valve signatures it has been proven that less than one-third of the valves actually required removal from the process. Sixty four percent (64%) of the valves could be adjusted or repaired on-line, significantly reducing the total cost of repairs (Lenz 1996).

Based on the diagnostic information available, the next step is to view this information within the asset management system. Valve signature information as shown in Figure 88 is made part of the history information in the maintenance information folder in the AlertManager. This information is used for reference purposes before a shutdown takes place to ensure that the reference signatures are used to note any deviations after the signatures were done. The maintenance shutdown plan will then be updated depending on what valves required to be taken out for servicing and repairs.

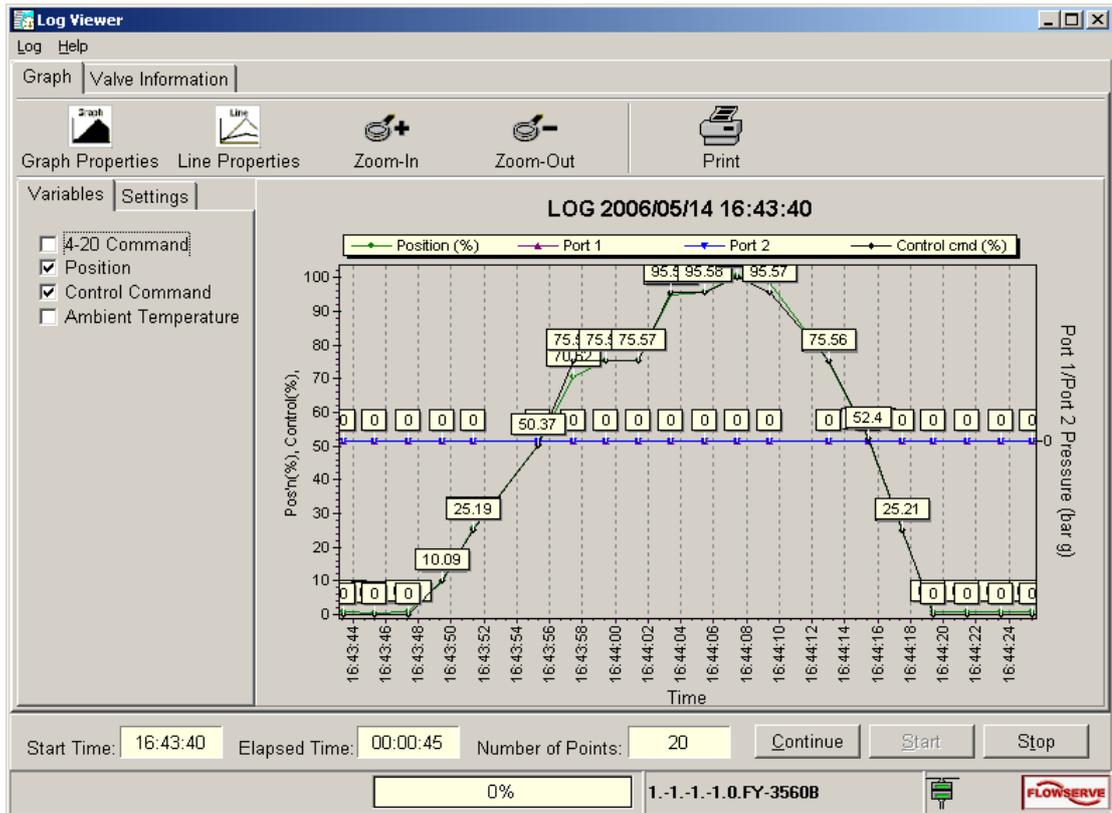


Figure 88: Stroke calibration

7.7 Conclusion

Making maintenance and process data available from one central point ensures that maintenance and process staff have access to this data from a unified platform. Using the AlertManager makes interfacing to web-based applications possible, in order to retrieve the required data for the configured assets. Data sheets and other relevant asset data are more accessible from the different equipment rooms to assist technicians and artisans to do more effective and faster maintenance. Knowledge and plant related information is freely available from the AlertManager including the shutdown valve signature information which is available for reference purposes.