Sheldon, Lee H NWP

From: Miska, Edward P NWP
Sent: Monday, September 12, 2005 3:30 PM
To: Wittinger, Rodney J NWP; Sheldon, Lee H NWP
Subject: field notes 090905b.doc

My notes. Please review and let me know if I should change anything.

I divided items into a section to send to ATEC (the first items) and additional in-house elements (see divider line). Please consider if any elements should be moved from one section to the other.

Field trip notes

McNary Unit 5 ITB testing

9/6-9/05
Ed Miska
Lee Sheldon
Rod Wittinger
Greg Luna ATEC

1. One of the main difficulties during the field trip was the lack of good documentation on how to use the software.
2. Source code for the tested software was not provided as previously agreed.
3. A run time error that shut down the program occurred during some mouse clicks around the "flow" value raw data label. It did not seem to be repeatable. The program was restarted.
4. We went through an "ATE-150 Quick Start Guide" Doug Albright sent to Roy Richardson on 9/6/05. The guide has significant problems in ease of use and missing steps, and is an overly complex device for the purpose needed. The use of the ATE150, that adds significant complexity and cost, could have been avoided completely with the proper transducer choice.
5. We went through a calibration setup that is part of the above "Quick Start" guide that Doug sent 9/6/05 (He was supposed to have this ready earlier). The process is grueling and at times does not seem to make any sense. The part that does not make sense is the part that relates to the ATE150. We spent about 2.5 hours x 4 people (~$1200 cost to the gov.) going through the calibration that should have been about a half hour. [Extra costs for the garage shop box keep adding up!]
6. Rod went through the correction list made up from the last field trip. Some of the following items relate to that effort.
7. On the raw points graph for flow there is an approximate sine wave on top of the flow value. Disconnecting the transducer eliminates it. We did not have an opportunity to see the result if the unit were shut down. Once disconnected there are a few very small magnitude spikes seen every few seconds, presumably random electrical noise. Too small to be worth investigating at this time.
8. The Raw points graph was not showing any quantities other than flow. Flow was scaled in the volts input to the A/D board, which is twice the volts produced by the transducer. Going through a multiplier circuit is poor design since it is complicates the equipment and introduces calibration difficulties and additional error into the signal, especially between different run dates.
9. There appears to be no way to determine the actual sample frequency. Per Greg it changes with

different ITB settings. A way to know the frequency is basic to good data sampling and analysis. It should be added if reasonable.

10. The OPC quantities were updating very fast a number of times over about ½ second and then would then hold for about ½ second before repeating the update sequence again. Not a serious issue but what is really going on?
11. For the "Limits" screen, a manual entry of 0.9 or 0.99 into power and forebay causes the values to always be red, thus no data would ever be recorded. This same problem was on the prior test last month. A follow on test showed that entering 0.8 seemed to work. Some software quirk seems likely.
12. Limits screen – Several values show a "volts" quantity that does not physically exist in the ITB, however the values change and the filter uses it. This does not make any sense to us. We need a description of what is going on in order to use it. If not needed please remove. This was also included in results from the last field trip. Also, each of the filter elements and their use should be explained in the users manual.
13. The "Autolimits" function seems to work well for an initial setting but using it presented the following observation. Autolimits would potentially allow more MW and Flow data through than desired if it was allowed to go to a point that generally did not filter other quantities. Possibly, MW and Flow should have their own auto-filter functions separate from the other quantities.
14. Autolimits "RST" button did not work. Rebooting the computer did not help.
15. The filter was frequently blocking sample recording due to small amounts of noise on the forebay and tailwater levels. In essence the Autolimits settings can't be used for both the flow and the other data on a single on-off basis.
16. The Second Pass filter seems to reset about every 5 minutes. Data is then not recorded properly until it "fills" up again. What is going on? It doesn't seem to make any sense. Greg had no answer for this. (When this occurs and the steady state filter resets, the quantities turn red, which means no data is collected in SS mode, but is should be.)
17. There are numerous screen elements that we have no explanation for. Either the element should be documented in the operations manual or removed. An example was a chart function Greg turned on that produced a set of file outputs. Greg said it was to mimic a chart recorder type function.
18. There were numerous user interface comments mentioned to Greg so he could take them back for Doug's consideration. Correcting these is considered to be outside of the current contract due to time and priority of our current needs. Examples: 1) The general need is to put data that changes like MW and WK quantities where they can be seen best and place low priority on elements that do not change much like forebay and tailwater. 2) Head needs to have a label identifying it. 3) Numerous buttons give no user feedback that they have been clicked. 4) Focus is taken away from entry points for seemingly no reason. 5) Focus it taken away from Windows functions in mid process, like dragging windows, making them near impossible to use. 6) Screen layout and fixed locations forces covering needed info with other needed info.
19. Constant values should be in the header, not printed in its own column.
20. Headers should be put in each .prn data file. Adding the file name is also recommended.
21. A file named like "5KAvg 09-08-2005 50.dat" is being created about every three seconds. What are these files for and what data is in them?
22. A strip chart function is creating files: BladeStat.prn, FlowStat.prn, GateStat.prn, GateStat.prn, HeadStat.prn, PowerStat.prn, and TailStat.prn. The files have no heading or labels. Provide an explanation of what is in the files.
23. The source of the data for each column in the stored data needs to be documented. This includes the following:

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names          Forebay        Tailwater      GrossHead      Gate
IdealBlade     PertOn/Off     BladeOffset    Blade          FlowVolts
InchesWC       FtWC           Exponent       KFactor        Flow
          SpecHead       CorrFlow       Power          CorrPower      RelEfficiency
Forebay1       Forebay2       Forebay3       Tailwater1     Tailwater2
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Tailwater3    NetHeadToPM   PlantHead     NetHead       Date          Time
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24. For the above data, any quantity that is simply calculated from others above should not be included in the file. We assume FtWC and InchesWC are an example of this. Keep FtWC only.
25. The data files have several quantities that don't change much. They should be put at or near the right end of the data.
26. Some values seem to be constants that would more appropriately be in a header section. (Exponent, KFactor)
27. Several "0"s appear in the first line of each file. What are they?
28. Why isn't there more resolution on the three Forebay and the three Tailwater levels? They are in whole feet. Also, they don't match up at all with the forebay and tailwater in the second and third columns, so where do they come from?
29. This version did not have the requested two additional WKCal calibration points for the WK transducer. In addition the concept of being able to get to full scale to set the calibration end point is not possible. Lee had a long discussion with Greg about this and Greg stated he now understands the need.
30. Any additional Winter-Kennedy piping manifolds should be made with a male hose connection on the drain lines.

---------- In-House field notes follow ----------

31. Greg measured 200 mV AC on the DC pressure transducer signal. This shows that there is a lot of noise on the base signal.
32. Low winter K pressure was found, about 50% low. 0.9 feet when it should have been about 2 feet. Some investigation resulted but no visible cause was seen. The current working theory is that it is due to a leak on the higher pressure piping side of the W-K taps. This is expected to skew the data results but we should still be able to get relative efficiency improvement data from the perturbations. The next test could be done on unit 9. However the unit 9 PLC would require updating in order to do perturbations.
33. A significant amount of time is required to attain each MW setting within about 0.2 MW. First the governor took about 8 minutes to settle out each time control action occurred. And it tool about 20 minutes to get to a predetermined MW setting. The speed setting adjustment was done directly on the governor cabinet using the smallest of control movements possible.
34. Scatter on flow data was very large. There appeared to be two or three fundamental frequencies in the signal. One of the frequencies is very low and another frequency is probably in the range of 60 Hz. Per Greg the ATEC tech, the actual frequency is apparently impossible to determine via the ATEC setup since the sample rate varies with the number of samples and no function to tell us time in relation to the high speed samples is available. However, the filtered samples do have a time stamp in terms of seconds. [To try next time: Set the filter sample numbers to 1 for both first and second filter and then set it to record all samples. This will collect a great deal of data rapidly so be careful about using us memory. Only do it for a short time.]
35. MW value scatter was the next most significant quantity with some difficulty in obtaining a stable value.
36. The smallest MW control resolution seemed to be about 0.3MW using the governor speed level dial on the Actuator cabinet. It was barely moved.
37. At MW loadings of 59MW and above the governor gate position was observed to reverse after a raise control was initiated. It would slowly drift back.
38. The unit was still on the variable part of the Gate-Blade while operating at 80MW, and about 75 feet of head.
39. Data was collected at numerous MW levels for later analysis. Blade perturbations were set to +/- 0.5 degrees. An initial point with not perturbation was recorded then a +0.5 degree perturbation, back to 0, then a -0.5 perturbation. Later a few points with 0.6 degree perturbation were taken.
40. The unit was running very rough for MW and flow when the load was a bout 40 MW. At about

54 MW the values were much smoother.

Given: McNary Unit 5 with a mechanical Woodward governor.