Appendix K

Remote Monitoring

REMOTE MONITORING OF PROCESS
DATA ACQUISITION, TRANSFER, AND CONVERSION

Data Acquisition
The Milliken Station plant data is collected by a Westinghouse WDPF Data Acquisition System. This system includes three PCH/PC data collection personal computers (PCs). Separate PCH/PC units are interconnected to Unit 1, Unit 2, and FGD Unit. Each PCH/PC runs OS/2 2.1 and WDPF version 1 software. On each PCH/PC, the file named HSRCONFG.SC defines which process variables are collected on that PCH/PC. A section of an HSRCONFG.SC file is:

```
SELECTIVE DATA COLLECTION CONFIGURATION FILE
00564 AI150     60 0.010000 N
00567 AI4726    60 0.001000 N
06232 AT4709    60 1.000000 N
00587 AT4726    60 1.000000 N
06236 AT4728    60 1.000000 N
00588 AT4729    60 0.010000 N
00618 FI151     60 1.000000 N
00622 FI170     60 1.000000 N
01396 FT113A1   60 0.100000 N
```

The columns are:
1) System ID -   A 5-digit number unique to each process variable.
2) Name -   The name of the process variable.
3) Frequency -   The frequency, in seconds (1, 10, or 60), to examine the value of the process variable.
4) Deadband -   The amount by which the current value of the process variable must exceed the previous value in order to be saved.

When the PCH/PC begins recording data, the value of every variable is stored on the first recording cycle. Thereafter, if the Frequency time period has passed and the difference between the current value and the previously recorded value differs by more than the Deadband, a new value is recorded for that variable.

Data is stored in a format proprietary to the WDPF system. Each day's data is stored in a separate file. The file name format is @hhmmddM.ysc, where:

hh -   Two digit hour specifying when data recording began. (Usually 00)
mm -   Two digit minute specifying when data recording began. (Usually 00)
dd -   Two digit date specifying when data recording began
M -   One digit month specifying when data recording began (0 - 9, N, D)
y -   One digit year specifying when data recording began

An example data file name is "@0000114.8sc", which contains data for 4/11/98. While the data is being collected, the data file is located on the E: or F: drive. At the start of a new day, the previous day's data file is transferred to the G:\HSRFILES directory.

Data Transfer

Each of the three PCH/PC units is equipped with a modem and pcAnywhere software. The modems are SupraFAX modems running at 9600 baud. With data compression, the modem transfer rate is 19.2 Kbps. The pcAnywhere software allows another (remote) computer to control the PCH/PC through a telephone connection.

Twice a week, a PC at CONSOL R&D with a modem and pcAnywhere software calls a PCH/PC and initiates a remote control session. WDPF data files stored in G:\HSRFILES are copied from the PCH/PC to the PC at CONSOL in Library, PA. Data files older than 1 month are removed from the PCH/PC to insure adequate disk space for continued operation. The PC at CONSOL then terminates the remote control sessions. During the session, data collection continues on the PCH/PC. Data from each of the three PCH/PCS are transferred separately in this way.

Data Conversion

On a PC at CONSOL running OS/2 2.1 and WDPF version 1 software, the proprietary WDPF data files are converted to ASCII data files through the use of the WDPF Convert program. This program uses a configuration file called HSRASCII.SC to determine which process variables to convert. A section of an HSRASCII.SC file is:

```
WDPF HSR CONVERT CONFIGURATION FILE
00564 AI150      60 0.010000 N
00567 AI4726     60 0.001000 N
06232 AT4709     60 1.000000 N
00587 AT4726     60 1.000000 N
06236 AT4728     60 1.000000 N
00588 AT4729     60 0.010000 N
00618 FI151      60 1.000000 N
00622 FI170      60 1.000000 N
01396 FT113A1    60 0.100000 N
```

(Note that this is the HSRCONFG.SC file with a different header line.)

The WDPF Convert program creates an ASCII data file with two sections. The first section lists the signal type (measured, calculated, etc.), point name, system ID number, description, engineering units, deadband, collection frequency, and under the value column the value of every process point at midnight:

```
SELECTIVE DATA OUTPUT FILE: @0000014.8SC
RT PNT_NAME SYSID ENGLISH_DESCRIPTION......... ENGR_U DEADBAND FQ VALUE...  STATUS
AL AI150    00564 SELECTED OXYGEN               PCT    0.010000 60 2.898562  0000h
AL AI4726   00567 BOILER 1 NOX                  LB/MBT 0.001000 60 0.325195  0000h
AI AT4726   00587 NOX EMISSIONS                 PPM    1.000000 60 -12.4999  038Ch
AI AT4729   00588 UNIT 1 BYPASS NOX EMISSIONS   PCNT   0.010000 60 1.840088  0000h
AL FI151    00618 TOTAL AIR FLOW                KPPH   1.000000 60 835.3493  0000h
```

The format of the second section is:

column 1 -   current time stamp
column 2 -   time stamp of previous value for this process variable
column 3 -   process variable name
column 4 -   current value
column 5 -   status

```
18:32:21 18:31:36 PT4404   1956.298 0000h
18:32:22 18:30:52 PT4504   449.8533 0000h
18:32:25 18:31:40 SI110    53.47762 0000h
18:32:25 18:30:12 TI170    1007.535 0000h
18:32:26 18:31:40 PI170    1844.358 0020h
18:32:27 18:31:40 AI4726   0.356934 0000h
18:32:29 18:31:44 FI151    936.9088 0000h
18:32:29 18:31:44 FI170    1058.416 0000h
18:32:30 18:31:44 FT151A1  486.3280 0000h
```

To make the data more conducive to analysis by CONSOL engineers, two programs were developed that use the ASCII data file as input. The first program creates a spreadsheet summary of the data file. A section of summary is:

PNT_NAME	ENGLISH_DESCRIPTION..	TTL COUNT	BAD COUNT	AVG	MIN	MAX	DEADBAND	FQ
AIT18753	SO2 FLUE GAS ANALYZER	412	0	1270	897.119	1462	10	60
AIT18766	UNIT 1 SO2 OUTLET	1258	0	219.224	49.3408	356.042	0.5	60
AIT28753	SO2 FLUE GAS ANALYZER	359	0	1674.22	1437.28	1838.28	10	60
AIT28766	UNIT 2 ABS OUTLET SO2	1266	0	265.233	48.4253	404.565	0.5	60

For a given day, the count, average, minimum, and maximum recorded values are calculated for each process point in the summary. The "BAD COUNT" column indicates the number of recorded values with a problem status code. A problem status code is one in which bits 9, 11, or 15 is a binary 1. The deadband and frequency for each process point is included on the summary.

The second program developed to assist CONSOL engineers calculates hourly instantaneous and average values for each process point. These values are also stored in spreadsheet format. A section of one is:

	00:00:00	01:00:00	02:00:00	03:00:00	04:00:00	05:00:00	06:00:00	07:00:00
AIT18753 HA	1320.092	1268.857	1270.691	1345.045	1361.999	1251.039	1239.834	1333.431
AIT18753 HI	1320.092	1042.687	1299.035	1392.419	1342.065	1266.076	1309.106	1360.375
AIT18766 HA	133.5693	104.9364	128.744	232.8588	310.1236	222.6796	172.1941	235.9044
AIT18766 HI	133.5693	49.34082	136.3159	303.8574	319.4213	167.4438	249.8413	236.1083

HA indicates an hourly average and HI indicates an hourly instantaneous value. At midnight, the first column, these values are identical. For each other hour, the hourly average value is the average of the recorded values during that hour. For example, the hourly average at 3 AM is the average of values between 2:00:01 and 3:00:00. The hourly instantaneous value is the value at the top of the hour. For example the hourly instantaneous value at 3 AM is the value of the process variable at 3:00:00. In both the hourly and instantaneous calculations, values recorded with a problem status are discarded.

The two CONSOL programs were developed in Microsoft FORTRAN and can be run on a DOS or Windows PC.

Data Maintenance
All WDPF data files transferred from plant PCH/PC units are maintained on a network server at CONSOL, where they are regularly backed to tape. Also, the CONSOL programs and other WDPF configuration files are stored on the network server. The backup prevents data loss in case of a server failure. The data files, programs, and configuration files are maintained on a separate tape for archival. Because the ASCII data files and spreadsheets can be recalculated from the WDPF data files, they are not maintained on the archive tape.

Plant Data Acquisition Option
The WDPF automatic control system is also interfaced to a VAX-4300 scientific digital computer running the PI data acquisition programs of Oil Systems, Inc. Upon special request to plant technical personnel, PI system data are downloaded in Lotus 1-2-3 spreadsheet format, then transferred to CONSOL for further processing. Essentially all of the plant operating variables are collected and stored by the PI program for subsequent storage by NYSEG. Only selected variable data values for limited time periods, not available from the PCH/PC system, have been obtained by CONSOL from the PI system.

PI system data is easily transferred from Milliken Station at Lansing, NY, to CONSOL at Library, PA. Such data files are placed on the fixed drive of a PCH/PC at the power plant, then accessed for remote transfer via the modem/telephone line system.