Chapter 5
System Control and Data Recording - Data Acquisition and Handling Systems

A data acquisition and handling system (DAHS) is a combination of hardware and software that is used to record data and generate reports for submission to the regulatory agency. A properly designed DAHS also can provide warnings of CEM system fault conditions and excess emissions so that adjustments and repairs can be made in a timely manner. The DAHS is considered an integral part of the CEM system and must be included as part of the CEM certification and audit procedures. Because CEM data are a key enforcement tool used by EPA and local agencies, emissions reports must be prepared in a manner that accurately reflects the quality of the data and any anomalies that occurred during the reporting period (McCoy, 1986).

Although not generally considered part of the DAHS, control of CEM system functions such as calibration, probe blowback, and probe switching (for time sharing systems) is often performed by the same hardware and software that performs some data acquisition functions. For example, the same programmable logic controller (PLC) may be used to calculate emission rates and to control calibration cycles. Decisions about the CEM control hardware and software must be made with a consideration of how it will affect the ability of the user to change DAHS vendors in the future (see Commercial PLCs section). This chapter contains discussions of CEM system control and data acquisition functions.

The complexity of the DAHS required for a given application depends on the number of emission parameters being monitored and the applicable report-ing requirements. Three basic options for handling emissions data are described in this chapter: a simple data recording device (stripchart or data-logger), a plant mainframe computer (often used to implement a distributed control system (DCS)), and a commercially available DAHS. The design elements of commercial DAHSs are described in detail.

5.1 Option 1: Simple Data Recording Device

In the case of very limited data reporting requirements, a simple stripchart recorder or data logger may be adequate. Digital stripchart systems will average data, calculate emission rates, and display the data either graphically or in tabular form (Figure 5-1). Often they have some data storage capability so that data can be downloaded periodically to a personal computer. The simple recording device may be the preferred option if the facility is required to monitor and certify compliance, but is not required to submit summaries of emission data or CEM system quality assurance data to the regulatory agency. A PLC or other device may be necessary to control calibrations and sampling, but in some cases these functions can be controlled by the gas analyzer itself.

Figure 5-1. Odessa paperless stripchart.

To quantify negative zero drift during calibrations, the recorder scale must be capable of providing concentration results well below zero. For example, 40 CFR, Part 60, Appendix F CEM quality assurance procedures require that a CEM system be declared "out of control" if the calibration drift exceeds four times the drift limit in the applicable performance specification.

For example, if a CEM system with a range of 0-1000 ppm was subject to a drift limit of 2.5% of span during the Performance Specification Test, the DAHS would have to be capable of displaying a reading at least as low as -100 ppm (-0.025 x 4 x 1000 = -100).

Some regulatory agencies no longer accept stripchart data for reporting purposes (even as a backup system) or they place restrictions on the resolution of the recorder. Therefore, consultation with the regulatory agency must occur before deciding to use this option.

Choosing a simple data recorder will reduce the initial capital investment in the CEM system, but it may be more costly in the long run. If the CEM system does not have a method of recording fault conditions or process operating status, interpreting the emissions data retroactively for CEM system or process upset conditions may be difficult and time-consuming. Thus, the validity of the data for extended periods of time could be questionable. Without a DAHS, the user will be required to keep up with the calibration and other quality assurance data manually, making implementation of a CEM system quality assurance plan more difficult. Also, a backup recorder should be used to prevent failures in the data recording device from causing violations of CEM system downtime provisions.

5.2 Option 2: Plant Mainframe Computer System

A limited number of facilities have opted to develop their own DAHS using the plant mainframe computer system. Plant process control systems typically are equipped with excess data recording and storage capability. The plant internal programming option is attractive because the CEM data can be integrated easily with the other plant data display and backup systems. The programming also can be tailored to meet the specific needs of the plant operators. The downside to this approach is that the extra programming required to keep up with CEM emission rate calculations, alarm conditions, calibration data, emission data validation, and report generation can be underestimated. An internally programmed system may not be as flexible as a commercial product and may need periodic reprogramming to keep up with changing regulations or operator needs. When choosing between internal programming and a commercial DAHS, the user should examine carefully all of the functions offered by commercial systems and make an honest appraisal of the cost and delivery schedule issues associated with developing the programming in-house. Commercial DAHS provided either by the CEM vendor or by an independent DAHS provider have been found to be more cost effective by most CEM system users.

5.3 Option 3: Commercial DAHS

A DAHS is a stand-alone system that is used to display data in units of the emission standard, provide alarms, and prepare reports for submission to regulatory agencies. It can be used by the operator to produce edited emission summaries, excess emission reports, alarm reports, and CEM system downtime and corrective action reports. A typical system (Figure 5-2) consists of a personal computer, a data interface (typically a PLC or datalogger), a backup data storage device, and a printer. The DAHS computer may be connected to a local area network (LAN) and/or it may be equipped with a modem for remote access.

Since the implementation of the new source performance standards (40 CFR, Part 60) and the Acid Rain Program (40 CFR, Part 75), CEM system and DAHS vendors have made great strides in the reliability, flexibility, and utility of personal computer-based DAHSs. Recent additions to DAHS software packages include reporting requirements for 56 CFR 7134 (BIF Rule), 40 CFR 63 (MACT standards), 40 CFR 503 (sewage sludge incinerators), and the revised standards for hazardous waste incinerators. Early DAHS software was written specifically for each installation, but most vendors now have standard software products that can be configured by the user for each regulatory application.

If the user has special data reporting requirements from an unusual permit condition or a state rule, the software provider may need to perform custom programming. Such custom programming can be costly for the user and can lead to software "bugs." If possible, the user may propose a more standardized reporting format to the regulatory agency to avoid custom programming.

DAHS functions and some typical hardware com-ponents are described in the following sections.

5.3.1 Emission Data Recording

Some gas analyzers and sensors send digital signals directly to the DAHS and others send analog signals (usually 4-20 mA) that must be converted to a digital value and scaled to the appropriate units (concentration, flow rate, temperature, etc.). Concentration and flow rate data are used to calculate emission rates in units of the emission standard. The units of the emission standard vary according to the type of facility, the applicable regulation, or the permit

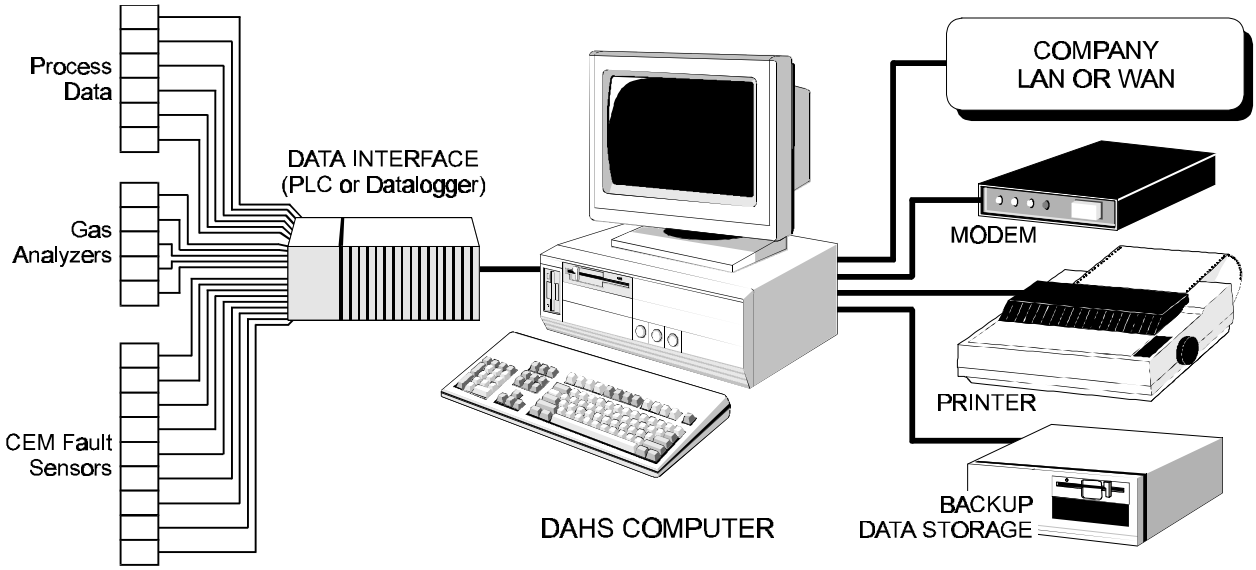

Figure 5-2. Typical DAHS system.

conditions. Some common units for emission standards are:

- ppm_v of pollutant
- ppm_v of pollutant corrected to a standard O_2 dilution basis (e.g., ppm_v at 7% O_2)
- ppm_v of pollutant corrected to a standard CO_2 dilution basis (e.g., ppm_v at 12% CO_2)
- lb of pollutant/MMBtu of fuel combusted
- lb of pollutant/hour
- lb of pollutant/lb of product

A more comprehensive discussion of the units of the standard are found in Appendix E.

Because analyzer measurement ranges and the parameters used to calculate emission rates can change over time, most DAHSs include a menu system to allow the user to scale the analyzer channels and edit the emission rate calculations. Emission rate calculation errors are not uncommon, therefore the emission rates should be verified with hand calculations when the DAHS is first installed and after each change of the calculation parameters.

The applicable monitoring regulation or permit conditions should state the minimum frequency of data collection and recording for each parameter; if not, it should be discussed with the regulatory agency before the DAHS is chosen. Minimum data collection frequencies can be from once per 10 seconds to once per 15 minutes, depending on the variability of the emission parameter and the response time of the CEM system. If the sampling frequency is high, use of a PLC or data logger may be necessary to preserve processor time on the DAHS PC. The minimum frequency of data collection may be different from the minimum frequency of data recording. For example, BIF regulations for monitoring of total hydrocarbons require that data be collected at least once each 15 seconds, but average data values need to be recorded as one-minute averages. For sources subject to 40 CFR, Part 60 monitoring requirements, the minimum data collection frequencies can be found in section 60.13.

The averaging periods should be flexible to allow easy data collection during quality assurance testing. Having the ability to print real-time one-minute averages simplifies conducting and documentation of cylinder gas audits and relative accuracy tests.

5.3.2 Emission Data Display

The main viewing screen of the DAHS should have a real-time data display that is easy for operators to read. The screen should show emissions data, CEM system status (on-line, off-line, calibrating, etc.) and the status of alarms. If the DAHS computer is not located near the CEM system hardware, a second display terminal should be located near the gas analyzers for quality assurance checks and troubleshooting. Often the reading on the front panel of an analyzer does not match the reading on the DAHS screen due to small signal conversion errors or automated calibration corrections. Therefore, the analyzers should be tuned to provide accurate results using results from the DAHS. A PLC or data logger located

near the analyzers often can be used as a display device for troubleshooting.

Most DAHS vendors include software that allows the user to look at historical trends in the data (Figure 5-3) for user-selectable intervals and aver-aging periods. Trending of different combinations of emission and operating parameters can be used to determine whether changes in emissions data are linked to plant operation or to CEM system operation. Key plant operating parameters such as production rate, temperatures, or control device parameters can be trended with emissions data for troubleshooting. The trending software also may be helpful in determining the nature of emission exceedances when preparing emission reports for the regulatory agency. If the plant computer control system has ample capacity, some users may prefer to send CEM system data from the DAHS to the plant computer so that plant operators can use display and trending software that is familiar to them and already available at their workstations.

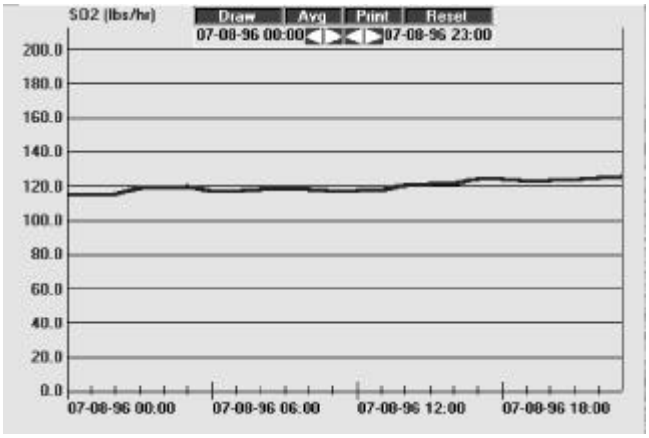

Figure 5-3. Example historical trend screen.

5.3.3 Sampling System Control

The DAHS software and/or computer may be used to control routine sampling system control functions or it may simply monitor control functions that are conducted by a PLC. If the CEM system uses an extractive sampling system, periodic purging of the sample probe with compressed air to remove particulate matter from the probe tip filter may be necessary. The duration and frequency of air purges depend on the particular type of emission source and on the source operation. After the CEM system installation, it may require several months of operation to determine the optimum purge duration and frequency settings. These settings should be configurable by the user on the DAHS computer, PLC, or datalogger. Likewise, CEM systems that perform time-sharing of sample probes (i.e., using the same analyzers for more than one emission point) should include a method for adjusting the frequency of probe switching. For both time-sharing and air purges, the emissions data will be invalidated for short periods. Some DAHS systems use "sample and hold" circuits to keep the analyzer response constant during purges, while other DAHSs label the data as "invalid" and do not include it in averages. Also, the time required for the sampling system to be completely purged can change over time due to filter plugging or changing sample pump performance. The CEM system user periodically should verify that the purge times used by the DAHS are adequate to ensure that only representative sample data are being recorded.

5.3.4 Calibration Control and Recording

Automatic daily zero and span calibrations of the CEM system may be controlled by the DAHS or the DAHS may monitor the activity of a PLC. For calibration using cylinder gases, the DAHS should have a feature that easily allows the user to edit the initiation time, concentration values, and the duration of each calibration gas injection. For each calibration standard, the following information should be recorded:

- time and date
- value of the calibration standard
- instrument response to the calibration standard
- amount of calibration error (as a percent of instrument span)

An example calibration cycle configuration screen is shown in Figure 5-4.

The DAHS also should allow the user to initiate an automatic calibration cycle at any time. This feature is especially useful when CEM system data are in doubt or after any recalibration or repair.

Rather than adjusting the zero and span of an analyzer at the instrument itself, some users prefer to make zero and span adjustments by automatically applying correction factors using the DAHS after each calibration check. When such adjustments are made, the calibration report must include the values used for the calibration adjustment. Automatic calibration adjustments apply only to data collected <u>after</u> a given calibration and before the next calibration adjustment. Retroactive calibration adjustments generally are not allowed. The accumulated amount of calibration adjustment made by the software should be limited so that degradation in CEM system performance can be detected. An excessive software correction is a sign that the CEM system hardware

should be inspected. Typically, a DAHS will generate an alarm when the zero or span software correction exceeds 5 or 10 percent of span.

	Parameter	Control		
		Min	Value	Max
1	DAILY CALIBRATION HOUR	0	17	23
2	DAILY CALIBRATION MINUTE	0	51	59
3	CAL TYPE (0-DAILY;1-MULTIPLE)	0	0	1
4	MULTIPLE CALIBRATION MINUTE	0	25	59
5	MULTIPLE CAL FREQUENCY (HR)	0	2	24
6	AUTO CAL INHIBIT (1-INHIBIT)	0	0	1
7	PROCESS STABLE (SEC)	0	1	1800
8	CALIBRATION STABLE (SEC)	0	15	1900
9	BLOWBACK FREQUENCY (MIN)	1	60	1440
10	BLOWBACK DURATION (SEC)	5	10	1800
11	CGA CALIBRATION STABLE (SEC)	0	0	1800
12	DRIFT CORRECTION (0-ON)	0	1	1
13	SO2 UP-RANGE (ppm)	0.0	200.0	500.0
14	SO2 DOWN-RANGE (ppm)	0.0	100.0	500.0
15	NOx UP-RANGE (ppm)	0.0	180.0	400.0
16	NOx DOWN-RANGE (ppm)	0.0	150.0	400.0

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Figure 5-4. Example calibration cycle configuration screen.

5.3.5 Alarms

All commercial DAHSs can be configured to provide alarms for excess emissions and CEM system fault conditions. Depending on the design of the DAHS, the alarms may be triggered at the DAHS computer, PLC, datalogger, or at the analyzer itself. The DAHS is equipped with alarm acknowledgments that allow the user to enter the reasons and corrective actions for alarm conditions. The alarms, reasons, and corrective actions can be reviewed periodically to identify recurring problems with the process or CEM system operation. Triggers for excess emission alarms can be set at lower setpoints or at shorter averaging periods than the emission standard so that corrective action can be taken before an actual emission exceedance occurs. Some excess emission indications during conditions such as unit startup/ shutdown or equipment malfunctions may be exempted by the applicable regulations. CEM system operators have found that when data are examined only during the preparation of quarterly emission reports, incomplete records often lead to the inability to determine the reason and corrective action for each exceedance. For this reason, commercial DAHSs contain lists of numbered reason codes that are entered by the operator as part of the alarm acknowledgment procedure. The operator also may opt to enter a reason code for "unknown" or manually enter a reason that is not on the list. The list of reason codes for a given facility should be reviewed periodically to make sure that the list is complete and that the reasons are adequately descriptive. Some regulatory agencies can offer guidance on which reasons constitute "excused" exceedances. Some example excess emission reasons are provided below:

- bag leak
- baghouse blowback
- air damper malfunction
- plugged spray nozzles
- start-up
- shut down

The use of CEM system fault alarms can reduce the time required for diagnosis and repair as well as reducing the CEM system downtime. Fault alarms also can be used to invalidate questionable emissions data automatically, simplifying report production. Some common CEM system fault conditions are listed below:

- analyzer flame-out
- sample flow low
- sample vacuum high
- calibration gas pressure low
- sample line temperature low
- condenser temperature high
- water in sample line - pump shut off
- dilution air pressure low

5.3.6 Plant Computer Interface

As discussed in Option 2: Plant Mainframe Computer System, the plant computer control system can be used to display CEM data in a manner that is useful to the process operators. Likewise, plant operational data should become part of the DAHS. The most useful application of plant data is for determining when the process is on-line, off-line, or in a startup or shutdown condition. Threshold levels for such parameters as steam flow, fan speed, or stack temperature can be used by the DAHS to automatically mark the data as valid or invalid for emission reporting purposes. In addition, EPA guidelines for open market trading programs require correlation of emissions data with the activity level (percent capacity) of the emission source. Having production unit and control device operational data in the data-base while preparing periodic emission reports also can be useful in explaining anomalies in the emissions data or "unknown" reason codes for excess emissions.

5.3.7 Report Generation

Commercial DAHSs are designed primarily for sources subject to monitoring provisions of 40 CFR Parts 60 and 75. These monitoring requirements include detailed reporting requirements for emissions summaries, excess emissions, CEM system downtime, and CEM system data quality assurance test data. Even if the applicable reporting requirements do not specify detailed reporting, the reporting software that already has been developed for other applications can be very useful for internal quality assurance programs. DAHS systems include editing functions that allow the user to review questionable data and mark it as "valid" or "invalid" based on what was known about the CEM system and plant operation at the time the data were collected. In all cases, the raw unedited data files are retained separately for later reference.

5.3.7.1 Data Flags

During data collection, the DAHS labels each discrete emission data average according to the quality of the data or the status of the CEM system at the time that the data were collected. When emission reports are prepared, the flags allow the editor to sort data by its designation. DAHS vendors use different systems for labeling, but a typical list of data flag designations might be:

- valid data
- invalid data due to an alarm condition
- questionable data due to alarm condition
- process unit off-line
- process unit in startup or shutdown condition
- calibration in progress
- analyzer logged off-line for maintenance or other QA activity
- substituted backup reference method data during extended CEM system downtime

The data flags allow the DAHS software to calculate percent data availability, process unit on-line hours, and emission averages. The data can be sorted to compile summaries of excess emissions, CEM system downtime, and process status summaries.

5.3.7.2 Emission Summary Reports

To prepare a summary of emissions data the user must first review all of the data for the reporting period and resolve all issues of questionable data quality. Preparation of this summary may involve reviewing the plant or CEM system operation and maintenance logs. When all data have been sorted correctly, the DAHS automatically recalculates averages and produces data summaries based on the data that have been through the review process. The editing function is particularly useful when calculating long-term or rolling averages such as 24-hour block averages or 30-day rolling averages from one-hour average values.

5.3.7.3 Excess Emission Reports

Most monitoring regulations require the CEM system operator to report the time, date, magnitude, reason, and corrective action for each exceedance of the emission standard. A common feature of almost all DAHSs is the ability to produce automatically reports summarizing excess emissions for a given reporting period. The reason and corrective action codes entered by the operator are provided for each exceedance. During the review process, the user can edit the reasons and corrective actions based on new information. EPA has produced a guidance document which describes how enforcement agencies use excess emission reports (Paley, 1984).

5.3.7.4 CEM System and Unit Downtime Reports

For each reporting period, the CEM system operator generally is required to report the total hours of unit operation and the percent availability of CEM system data. By monitoring process parameters, the DAHS can easily keep track of when the source is on-line or off-line and in most cases can be used to produce a summary report showing the time, date, and duration of each outage. Using CEM system alarms, analyzer on-line/off-line indicators, and information entered during the emission summary editing process, the DAHS can calculate the percent data availability for each emission parameter and also can produce a report indicating the time, date, duration, reason, and corrective action for each CEM system downtime incident.

5.3.7.5 Alarm Reports

The DAHS can be used to produce a list of all alarms that occurred during a given period, including CEM system faults and excess emissions. This summary list can be used during the emission data review process to ensure that all periods of questionable data are resolved. It also can be used to identify the most common CEM system fault conditions that may require an equipment or procedure modification.

5.3.7.6 Calibration Drift Reports

The DAHS can be used to generate a summary of all zero and span calibration data for the reporting period. This report documents the time of each daily calibration and whether the results are within the applicable performance specifications. Even if the drift results are within specifications, the summary may

indicate a long-term degradation in instrument performance.

5.3.7.7 Data Assessment Reports

For those sources which are subject to the ongoing CEM quality assurance procedures in 40 CFR, Part 60, Appendix F, a requirement exists to prepare a data assessment report (DAR) for each calendar quarter. The DAR contains a summary of all quality assurance activities, including daily calibrations, cylinder gas audits, and relative accuracy tests. The DAR may be reviewed by the enforcement agency to evaluate the status of a CEM system (Von Lehmden, 1989).

5.3.8 Multitasking

The DAHS often is required to perform several functions simultaneously. Some of the competing demands placed on the software are illustrated in Figure 5-5. The DAHS must have a resilient multitasking capability to resolve the competing demands without generating errors or "locking up" (Baranowski, 1995). A procedure called "kernelling" is used by the operating system to prioritize tasks and prevent conflicts. In recent years, many DAHS vendors have moved their software to operating systems such as UNIX or OS/2 which are designed specifically for multitasking and multi-user applications. Other systems that use MS DOS or Windows operating systems rely on PLCs or dataloggers to handle most of the routine tasks such as calibrations, data averaging, and emission rate calculations. Multitasking conflicts often are inconsistent and difficult to trace. Only by interviewing other DAHS software users or by conducting extensive acceptance testing can the purchaser be assured that a vendor's software is free from such conflicts.

5.3.9 Expansion

Early providers programmed DAHSs specifically for each application and any changes in the number of inputs being monitored often required an expensive software modification. Most DAHS vendors now provide software that will allow the user to add gas analyzers, emission rate calculations, alarms, and even additional production units using a series of menus within the software. Each vendor offers a different level of flexibility. Before purchasing a DAHS the user must determine the degree to which the system can be expanded without reprogramming by the vendor. Purchasing extra hardware capacity to accommodate additional analog and digital signals is prudent. After operating the CEM system through the break-in period, many users find adding more input signals from the plant distributed control system (DCS) or providing more fault alarms for the CEM system is helpful in the data review process.

5.3.10 Hardware

5.3.10.1 DAHS Computer

Most DAHS vendors use a stand-alone IBM-compatible personal computer for data storage, display, and the generation of reports. However, vendors who use the UNIX operating system occasionally will install the DAHS software on the plant mainframe computer system. Most DAHS vendors will provide the computer with the DAHS but may allow the user to select or purchase their own computer if the company has a preferred manufacturer. The DAHS computer most often is located in the plant control room so that plant operators can have easy access to the data. This also provides a clean environment, a well-regulated power source, and backup for emergency power.

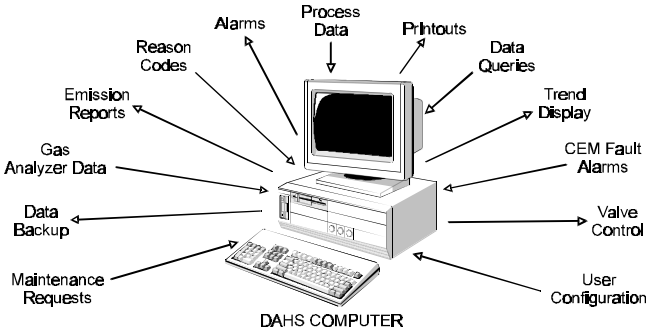

Figure 5-5. Competing demands for processor time.

5.3.10.2 Signal I/O Boards

The least expensive hardware option for processing signals from analyzers and alarms is to use multifunction boards that fit directly into the expansion slots of the DAHS PC or into a chassis that is attached to the PC. Multifunction boards accept multiple analog input signals (from analyzers or other sensors) as well as digital input and output signals (e.g., alarms). Processing the signals places a heavy burden on the PC processor to perform such real-time functions as analog-to-digital conversion, signal scaling, emission rate calculations, and averaging. In addition, the PC may be required to control such functions as calibration and blowback. With the increased burden on the processor, multitasking becomes more difficult. Vendors using multifunction boards may require the user to conduct data review and report generation on a separate computer. Another drawback to this system is that if the PC stops running for any reason, emission data are not collected or stored.

5.3.10.3 Commercial PLCs

Many DAHS vendors use standard PLCs to gather analyzer and alarm signals, calculate data averages

and emission rates, and control calibrations and blowback. CEM data are downloaded periodically to the DAHS computer where the data are displayed and stored for report generation. In some cases the PLCs are equipped with memory modules so that data can be stored for days at a time in case of a failure in the DAHS computer. When the computer is restored, the stored data are down-loaded and no data loss occurs. Often plant instrument technicians are already familiar with programming PLCs and may even have backup hardware available in case of a failure. The DAHS vendor should be familiar with the PLC that is chosen for a given application. Often DAHS vendors offer a choice of PLCs, based on the preference of the plant operators. Some common PLC manufacturers that are supported are:

- General Electric
- Allen Bradley
- Siemens
- Modicon
- controllers using the Modbus communications protocol

Since PLCs use different communication protocols, the DAHS vendor should be asked if they have installed other systems using the PLC that is chosen.

A significant advantage to using a commercial PLC is that it may be compatible with DAHS computers from several different vendors. This flexibility makes a change of software vendors possible without purchasing additional hardware. Previous experience by DAHS users in the acid rain program has shown that keeping all options open can be valuable in case the chosen software does not perform adequately (Huberland, 1995).

5.3.10.4 Custom CEM System Dataloggers

Instead of PLCs, some DAHS vendors provide their own custom data loggers that are designed specifically for DAHS systems (Figure 5-6). Some of these systems were developed originally for use at ambient air monitoring stations. The dataloggers perform all of the same functions of a PLC, but often have added features such as real-time data display, enhanced data storage, and battery backup. In the event of a DAHS PC failure, the datalogger will continue to collect data until the PC comes back on-line. The datalogger can be programmed from the front panel or from the DAHS PC using menu-driven software. Because of the added functionality, DAHS vendors can operate several dataloggers (and CEM systems) using one DAHS computer.

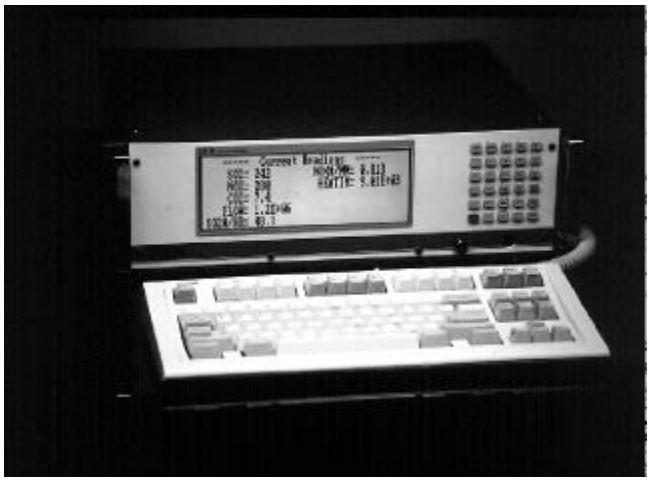

Figure 5-6. Custom CEM system datalogger.

5.3.10.5 Backup Data Storage

The DAHS computer should be equipped with a backup data storage device to prevent data loss in the event of a hard disk failure. Many hardware options are available including magnetic tape, removable hard disks, and optical disks. The backup routine should be automatic and should include a procedure for verifying the integrity of the backup copy.

5.3.10.6 Component Failure Analysis

DAHS failure is among the most common causes of CEM system downtime. Often when a component fails, excessive time is spent finding a replacement and then making the software function properly again. As part of the development of the CEM system quality assurance program, a set of procedures should be established in the event of a DAHS component failure. Determine how long obtaining replacement hardware (I/O card, PLC, datalogger, or computer) takes. If the lead time necessary for shipping could lead to a violation of CEM system downtime limits spare components should be kept on-hand. If a failure of a programmable component (e.g., the PLC, datalogger, or computer) occurs, the software and programming instructions should be kept up-to-date and in a secure location. The operators should practice reprogramming the components to make sure that the procedure is adequate.

5.3.10.7 Remote Access Within the Plant or Company

Many DAHSs now are integrated into the plant local area network (LAN) or company's wide area network (WAN). For example, the plant environmental coordinator may find monitoring the CEM system and preparing emission reports easier from his or her office. Networking of the DAHS should be discussed with

the DAHS vendor at the time of purchase so that communication issues can be resolved. Some functions, such as initiating calibrations, editing data summaries, and entering reason codes, should be restricted with password protection. Often the DAHS provider will install a modem so that diagnostics and software upgrades can be accomplished remotely.

A company may find integration of CEM data from all remote locations into a central location for review and planning purposes advantageous. To integrate results from several locations, the emissions data must be stored in a format that can be converted easily or directly downloaded into a central database (Long, 1995).

5.3.10.8 Remote Access by the Regulatory Agency
Increasingly, state and local agencies are requiring the installation of remote terminal units (RTUs) that allow the agency to monitor CEM system status, source status, and emission data remotely on a real-time basis or to download emissions data via modem periodically (Friedlander, 1992). Remote access usually is accomplished using a separate datalogger that receives concentration and emission rate data from the CEM system. Remote reporting allows the agency to have access to raw data for auditing and monitoring, but the source still is required to submit emissions data according to the regular reporting requirements. Remote terminal units are being used on a limited number of sources by regulatory agencies in Pennsylvania and New Jersey as well as several local districts in California.

5.4 Summary

The ideal DAHS for a given application depends on the complexity of the applicable reporting requirements. A simple stripchart recorder or datalogger may be sufficient for cases where the source is not required to submit detailed emission monitoring reports to regulatory agencies and the monitoring requirements are simple and straightforward. A computer-based DAHS can be an indispensable tool when emission reporting requirements include calculations of CEM data availability, complex data averaging, and generation of reports for CEM downtime and excess emission reasons/corrective actions. A computer-based DAHS can be programmed using the plant mainframe computer or it can be purchased from the CEM vendor or a DAHS vendor.

The best DAHS is one that allows the user to be sure of the status of the emission source, control equipment, and CEM system for the entire reporting period. The first part of preparing emission reports is to answer basic questions such as:

- During what periods was the emission source operating or in a startup/shutdown condition?
- During what periods was the CEM system off-line due to equipment failure or quality assurance and maintenance activities?
- Do any of the reported emission averages need to be recalculated based on new CEM or plant operational data?
- What was the reason and corrective action for each period of CEM downtime or excess emissions?

If the DAHS incorporates sufficient plant operational data and CEM status indicators, these questions can be answered more easily and many labor hours can be saved. Also, the DAHS should include an editor that allows the user to input new information and recalculate emission averages while maintaining the original unedited data in a separate location.

The selection of a particular DAHS can affect the flexibility that the user will have in the future. Some software changes may require reprogramming by the vendor, but many vendors provide software that allows the user to add analyzers, averaging periods, alarms, and even additional emission sources without reprogramming by the vendor. The user also should be cautious about integrating CEM control functions (calibration valve switching, probe blowback, etc.) with the software on the DAHS computer. Combining the control and data acquisition functions in the same software may make the ability to switch DAHS vendors at a later time more difficult and costly. Often CEM system control functions can be performed by a PLC or by the analyzers themselves while the DAHS computer monitors the status of the sampling system and records data.

Finally, determining whether a given DAHS software package will work properly can often be difficult at the time of purchase. Many DAHS users have been forced to switch DAHS vendors shortly after purchase due to poor software performance. The purchaser should interview previous users of the candidate software packages to evaluate the long-term reliability and utility of the software.

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