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Making Title V Compliance Simpler
The PI System's Role in Environmental Compliance

Title V of the 1990 Clean Air Act creates a new ***regulatory environmental compliance world and is a watershed event.*** Title V operating permits (now being implemented) require owners of facilities to certify environmental compliance. The burden of compliance monitoring is no longer on the regulatory agencies; it is now on the owner/operator. Companies must have records that prove compliance and must issue exception reports.

In this new world, consistent and reliable monitoring data becomes paramount to both companies and individuals. Title V demands management awareness and attention.

Most chemical plant owners/operators recognize Title V requires a major new effort in environmental management and compliance. Chemical plant owner/operators are now struggling to define exactly what the new effort needs to be and **get it done.**

The OSI PI system can provide invaluable assistance in achieving compliance with environmental requirements on process variables. In the presentation Charlie will show how this is done with specific, real-world examples.

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[START HERE - Example PI Title V Reports.htm]

Examples of The PI System's Role in Environmental Compliance

This document is a companion to a White Paper on PI's Role in Title V Compliance (See It).

Here is a picture of how the OSI PI system assists in environmental compliance (Overview Pictorial).

This document provides a description of how the PI system helps with environmental compliance. It is a compliment to a set of example Title V compliance reports. The reports correspond to Title V requirements for an Olefins plant.

Olefins Plant Title V Requirements

Regulations and permits, especially Title V Permits, are very difficult to understand. It is very helpful for a plant to create a summary of the environmental requirements that apply to a unit. The summary provides a concise list of the requirements for the unit. Here is an example for the Olefin Plant (Example Title V Requirements).

Compliance Plans

After creating the summary of requirements in operating language, the next step in developing the compliance program is to develop a description of the plan for managing and verifying compliance to each requirement. Here is an example (Compliance Plan Description).

PI can be used to help the plant cope with these requirements and achieve a high level of compliance. Here's how.

Create Compliance Verification Reports

A set of compliance reports can be created using PI. With PI the reports are HTML pages and can be displayed on Intranet pages to make them available to people who need the information.

The list of requirements also serves as a list of Compliance Reports needed.

For example the first requirement is that records of the Olefin Plant production be keep for five years. Here is a report that shows the production for January 2003 (Olefins Title V Reports - Production - January 2003). This report would be generated from PI and posted on the PI ICE Intranet site for the Olefin Plant. Clearly reports that cover the five years provide compliance with the Production Report requirement.

This report has a link to the respective requirement from the list of requirements. The requirement is yellow highlighted. The link provides easy cross-reference. A link could be put on the requirements summary that brings up the five years of production reports.

During January the Olefin Plant had an unscheduled shutdown as shown by the zero production rates on January 10 and 11. The production data and the hours of production report (Olefins Title V Reports - Operating Hours - January 2003) need to be consistent. The hours of production report corresponds to the second requirement as the citation link shows. This could be created manually by one of the operations personnel but it is better generated from a PI report on the basis of a process variable that would indicate whether the unit is running or shutdown. The criteria suggested in the example is the unit is running when the flow through the Pyrolysis Compressor exceed s 100,000 SCF/Hr.. This objective criteria and the data from PI rather than memory or nominal start and stop times increases the consistency between the production report and the hours of production report.

The 3rd through 8th requirements relate to sulfur emission from the furnaces and boilers in the plant.

The 3rd report (Olefins Title V Reports - Fuel Type - January 2003) shows the type of fuel burned in each furnace or boiler each day in January 2003. The indication of fuel type can be determined from process conditions recorded in PI. The indicator of burning fuel gas would be a significant pressure downstream of the fuel gas isolation value but in front of the gas burner. Again use of a physical measure and process values stored in PI provides objectivity and credibility, improves consistency among reports, avoids creating reports that are contradictory to other operating data, and decrease resource required to generate the reports. Again a link is provided to the summary of requirements with the specific requirement highlighted.

The 4th report (Olefins Title V Reports - Sulfur Content - January 2003) satisfies requirements 4, 5, 6, 7 & 8. In addition to the link to the highlighted requirements, the report also includes a link to a schematic of the fuel gas treater and fuel oil system. The schematics provide information that is useful in understanding the report for example identifying the sample point for the analysis.

The data for the sulfur content of the gas reflects a situation where the plant is able to adjust amine flow in the three-stage treater to control sulfur content of the blended gas below the required level. This decreases energy while still meeting the environmental requirement. In the example shown the average sulfur content of the gas is five standard deviations below the maximum limit this makes it extremely unlikely for the process to “drift” above the limit – as long as the variability of the sulfur content does not increase. The plant technical support staff could track the standard deviation of the sulfur content of the treated gas as part of a pro-active compliance assurance program. The PI reports to track treated fuel gas sulfur content standard deviation would be easy to create.

The sulfur content of the fuel oil is from daily laboratory analysis of the fuel oil. The analysis results from the laboratory need to be brought into PI for this report. If there is a Laboratory

Information System (LIMS) it is likely that data links are already available to more the data to PI. If a LIMS provides for data export in any of the common standards it is most likely easy to make the LIMS to PI connection. If the LIMS has an SQL database the connectivity is easy.

The laboratory analyses most likely have considerable variability. The analyses could be supplemented by a calculation of the sulfur content of the Heavy Gas Oil and Pyrolysis Pitch. The sulfur content of each would be strongly correlated with the amount of each heavy feed to the unit. Once a correlation was developed the correlation could be put into ACE to perform a prediction of Gas Oil and Pitch sulfur contents. The laboratory results would then be compared with the predicted values to flag suspect analyses. This is another place where the technical staff can use PI to provide proactive compliance improvement.

Here are some final Observations and Conclusions.

Rob Eisele, Chemical Industry Manager

Making Title V Compliance Simpler
The PI System's Role in Environmental Compliance

Title V of the 1990 Clean Air Act creates a new ***regulatory environmental compliance world and is a watershed event.*** Title V operating permits (now being implemented) require owners of facilities to certify environmental compliance. The burden of compliance monitoring is no longer on the regulatory agencies; it is now on the owner/operator. Companies <u>must</u> have records that prove compliance and <u>must</u> issue exception reports.

In this new world, consistent and reliable monitoring data becomes paramount to both companies and individuals. Title V demands management awareness and attention.

Most chemical plant owners/operators recognize Title V requires a major new effort in environmental management and compliance. Chemical plant owner/operators are now struggling to define exactly what the new effort needs to be and **get it done.**

Complexity and Cost Containment

Environmental integrity is a top priority of chemical and petrochemical facilities, as it has been for some years. However, environmental compliance has been a challenge for a variety of reasons: the operations are large and complex, the regulations are complicated, and there are a large number of regulations. Just mastering the environmental acronyms can be daunting—CWA, CAA, Title V, CEMS, NPDES, BIF, PSD, RECLAIM, MACT, NESHAP, 40 CFR Part 70, 21CFR Part 11 and ISO 14000.

Chemical, petrochemical, and others such as refining, energy, pulp/paper, and metals companies have spent billions of dollars in training, equipment and other facility upgrades to reduce pollution. Companies have established environmental policies, environmental goals and objectives, tracked and publicized environmental performance, and involved employees to reduce pollution and improve regulatory compliance.

Despite these efforts environmental compliance continues to require increasing resources as the emission limits tighten and regulations become more stringent. Title V marks a major step in this continuing process of stricter environmental compliance requirements. Furthermore, Title V presents unique challenges because of the number of requirements imposed and the increase in monitoring and reporting required.

For example, a typical world-class chemical or petrochemical plant must deal with approximately 20,000 applicable Title V requirements (1). Examples are shown in Exhibit 1. The number of activities to meet these requirements makes monitoring compliance a formidable task. Even non-compliance with a small fraction of the requirements results in a long Title V exception (or "deviation") report and a massive program of "corrective action". Compounding the compliance problem are operational upsets, incidents, and a zero-tolerance policy on recordkeeping gaps and omissions.

Additionally, industry faces intense cost pressures from globalization and the economic business cycle. Company resources in today's ultra-competitive world and poor economic climate are carefully controlled. Staff levels cannot be increased, or are only very reluctantly increased, to deal with the new requirements.

Corporate and Personal Liability Demand Best Practices/World-Class Solutions

Title V and other environmental regulations put not only a company's reputation and liability at risk, but also create personal liability, via fines and jail time. A systematic, comprehensive engineered approach to compliance, employing Best Practices and World-Class products, is demanded. Solutions, products and practices, which were once considered "good enough", are no longer satisfactory.

For example, current best practices demand that your Environmental Management System be fully integrated with systems monitoring your manufacturing operations.

The PI System Addresses Important Environmental Compliance Business Needs

OSIsoft provides performance-driven business intelligence software fully capable of meeting your Title V compliance requirements as well as monitoring your manufacturing operations. OSIsoft's Enterprise Performance Management Platform, the PI System is a world-class software product employed at more than 10,000 manufacturing sites, a number of which already use it to satisfy Title V requirements and as a core component of their Environmental Management System.

The PI System can solve many of the most vexing problems associated with building an effective facility-wide or enterprise-wide Environmental Management System. As an Enterprise Performance Management Platform, the PI System assists users and organizations climb the information value pyramid shown in Figure 1 below:

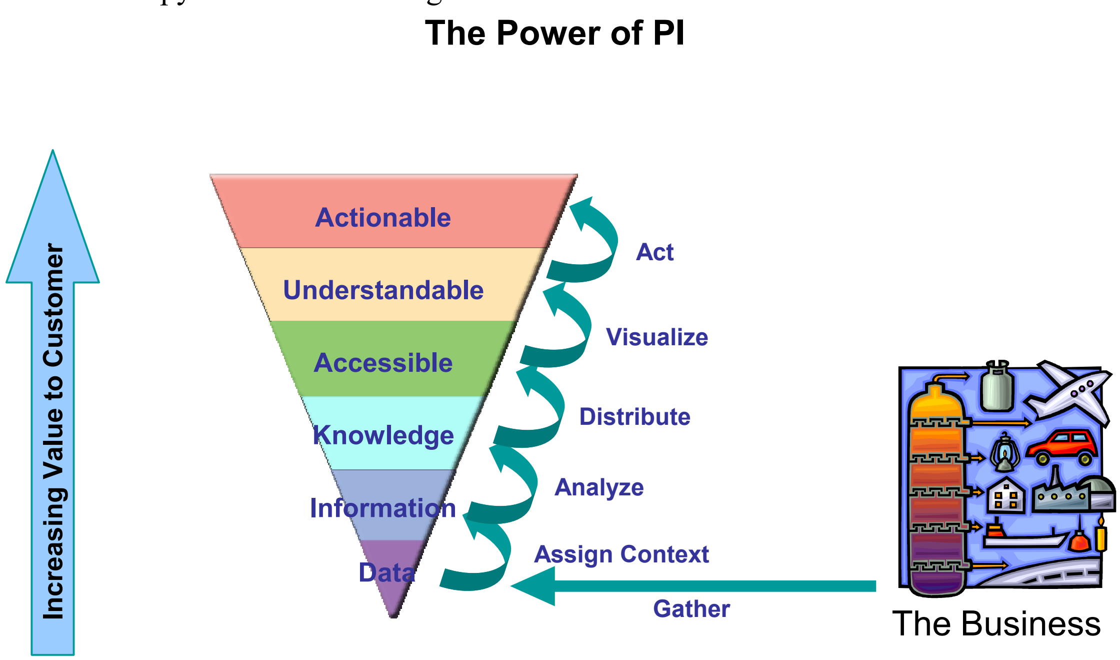

Figure 1

Implementing OSIsoft's flexible PI System platform provides users at every level in your company with the right environmental information at the right time, easily bridging the often difficult gap between data and actionable information by performing such tasks as:

- **Gathering and storing data simply by configuring OSIsoft Software products**
  - Examples include DCS, SCADA, PLC, other Historians, LIMS, ERP, Batch, relational data, web-based, manual entry.
  - PI handles time-series data efficiently.
  - PI is built on the knowledge and techniques developed collectively through years of effort by process control engineers to assure data integrity of process information, such as the complexities of analyzer calibrations, analyzer failures, saturated flows, and calibration failures.
  - Data is stored in its original resolution covering long periods of time as the Title V record retentions of 5 years require.
  - Meets the rigorous demands imposed by federal regulations for security, audits (21CFR, Part 11), data integrity and longevity, etc.
  - The PI system handles all kinds of operations: continuous processes, semi-continuous processes, cyclic operations, batch operations, and discrete manufacturing.
  - If multiple environmental data repositories are used, the software, installation and operational costs of monitoring and data management can be as much as five times more than a PI System.
  - If multiple environmental data systems are used, employees can be overwhelmed and compliance compromised.
- **Assigning a business or technical context**
  - PI supports environmental performance reporting by site, by business unit, and by product line.
  - Examples include equipment, product, process, market, regulatory, customer, supplier, GMP, locale, organization, and financial.
- **Analyzing the problem**
  - Examples include numerical methods, ad-hoc, search/drill-down, interactive, model-based, structured, unstructured, heuristics, data shaping.
  - Built-in functionality to perform: (a) the viewing of time slices of environmental data; (b)server-based calculations, such as totalizations; (c) ad-hoc calculations, such as averages, minimums, maximums, ranges, means, etc; as well as (d) the capability to perform sophisticated advanced calculations and scheduling such as: a rolling twelve month average for a list of RCRA hazardous metals.
  - The PI database is easily mined to meet conditional environmental requirements if certain conditions are present.
- **Distributing the results**
  - Examples: LAN, Intranet, WAN, graphical, text, spreadsheet, programmable API/SDK, XML, transactional, Web Services, reports, ODBC/OLE DB/MDX, server-side events, client-side events.
  - The PI system offers scalability. It is capable of collecting, storing and presenting an entire enterprise's environmental data with tools for easy and consistent deployment and management of calculations across the enterprise.
  - Source for the entire enterprise's environmental information (i.e. both environmental department and operations needs) handling multi-locations, multi-product manufacturing, and multi-business unit.

- **Visualizing the results**
  - PI allows for viewing data across web portals, dashboards, reports, and graphical user interfaces.
  - PI environmental monitoring can be installed as a layer above the operational monitoring layer to ensure environmental monitoring and reporting do not interfere with the monitoring of real time operations.

PI supports environmental performance reporting by site, by business unit, and by product line.

- The database design ensures emissions are not double counted and that inconsistencies are not introduced when several reporting perspectives are required.
- PI provides monitoring for all of the aspects of your business: business performance, product quality, operational effectiveness, process safety, and environmental.

- **Assist in taking of intelligent action**
  - Accurate information
    - PI's Advanced Computing Engine (ACE) allows standard calculation methods to be developed and used throughout the enterprise.
  - Timely information – data is available in real-time and within seconds
  - Data at right granularity – PI data is stored in its original resolution so you can see exactly what your process was doing at any point in time.
  - Drill-down capabilities
    - PI can be used to do "what if" studies.
      - Studies may be needed to determine the root cause of changes to emissions or environmental performance.
      - As part of a Prevention of Significant Deterioration (PSD) analysis, studies may be needed to determine whether a proposed operating change would result in a change in emission levels.

How PI Reduces the Cost of an Environmental Management System

A PI System can decrease the cost of implementing an Environmental Management System (EMS) for companies no matter whether the company is installing its first EMS, using a legacy EMS, or upgrading to a newer more comprehensive EMS.

The installed cost of an EMS typically runs five to seven times the purchase cost of the environmental software. The "indirect costs" include such items as:

- The cost of internal or external consultants for configuration and population of the system
- Integration with other software systems such as the LIMS, ERP, and Process Historian
- Data migration
- Data "scrubbing"
- User training

Here are some examples of ways in which the PI System's can minimize the total EMS costs:

- **Leveraging an Existing PI System Investment** - The PI System is a world-class software product, already used by more than 10,000 sites to collect and monitor their operations and technical data. If a company already has a PI System, the existing PI investment can be leveraged over both operations and environmental data needs.

- **Rapid Installation via Configuration of Standard Products** - The PI System installs easily and rapidly in 3-5 days, requiring only configuration of standard products and interfaces, not the writing of custom code.

- **Connecting Disparate Systems** - PI's open design and over 300+ standard "off-the shelf" interfaces means data from LIMS, ERP, PLCs and CEMS is easily connected to the PI System database, eliminating the expensive need to build a custom interfaces.

- **Reduced Data Scrubbing** - Less data "scrubbing" is needed because there is only one database for operations and environmental.

- **World-Class Data Analysis Tools** - Integrated and flexible client tools to visualize data, such as trends (PI ProcessBook). Also a client tool (PI DataLink) to perform ad-hoc data analysis or to build routine reports in an Excel spreadsheet.

- **Reporting** – Easily configurable server-based dynamic report generation capabilities, called Flex Reports, to address the audit tracking concerns inherent with Excel report files. Excel Add-in to address ad-hoc analysis.

- **Audit Tracker** – Built-in audit tracking capabilities to comply with 21CFR Part 11 or other similar EPA mandated requirements.

- **Reduced Training** - Because of its wide acceptance as an industry standard many technical and operations staff are already trained on PI and its use. Also, the PI System's use of Microsoft's platform gives it a standard look and feel, making it quick and easy to gain proficiency.

- **Specialized Software Tools**
    - Integrated management alarming functionality
    - An integrated control loop monitoring subsystem (PI Control Monitor) to ensure a properly functioning environmental control system.
    - An integrated Statistical Quality Control Subsystem (PI SQC) to monitor quality control of various plant operations

In addition, the PI System complements many of the existing pre-configured EMS software packages currently in use to generate specific required reports, such as:

- State environmental reports (most states have devised their own emissions reporting forms)

- Federal reports such as the SARA 313 Form R Electronic Report, SARA 312 Tier I and Tier II reports, and Federal Hazardous Waste Biennial Reports, and Discharge Monitoring (DMR) Reports
- Incident reports
- Waste reports, including waste profiles and shipment details
- Leak detection and repair (LDAR) reports

Case Study: **The PI System is the EMS of Choice in the Los Angeles Basin**

One example of the PI System Platform working with a pre-configured EMS software package is Exele Information Systems, Inc.'s (Rochester, NY) RECLAIM software package for CEMS reporting to the South Coast Air Quality Management District. RECLAIM is an acronym for Regional Clean Air Incentive Market and is used for nitrous oxide (NOx) and sulfur oxides (SOx) reporting. The PI System and Exele's RECLAIM software are used to provide a total solution for collecting, storing, processing and reporting NOx and SOx emissions from approximately 200 point sources generated at major industrial facilities in the strictest environmental air compliance area in the country, the Los Angeles basin.

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Date: February 12, 2003

References

(1). Beath, John M., "Rightsize" Your Environmental Management Information System", Chemical Engineering Progress, May 2001.

Exhibit 1
Typical Title V Requirements

1). Maintain records of production for the last two or five years.
Note: Any inconsistencies between environmental records of production need to be consistent with business records of production need to be reconciled. Ideally they are both the same data set.
2). Maintain records of operating hours for the last two or five years.
3). Maintain records of fuel gas type for the last two or five years.
4). Maintain records of fuel gas sulfur content for the last two or five years.
5). All pollution emission capture equipment and abatement equipment must be in good working order and operating properly during normal facility operations.
The PI System makes it easy to put environmental monitoring information into a plant's Intranet site along with information on operational efficiency and effectiveness, yields, product quality, energy utilization, and capacity utilization.
6). Maximum allowed production rate from a process unit measured in tons per day, pounds per day, etc. against a twelve-month rolling average.
7). Emissions from a process unit of a specific pollutant (for example SOx) of less than a given number of pounds per unit of production at the unit on a calendar day basis.
8). Fuel gas combusted in the pre-heaters and furnaces shall not exceed 1.0 part per million volume of total sulfur content.
9). The caustic scrubbing systems shall maintain a minimal efficiency of 92.5%.
Note: This requirement requires use of an engineering model of the scrubber to calculate the removal efficiency.
10). Continuous Emission Monitoring for a stack must be performed by monitoring the SO2 concentrations an the outlet as follows:

a. The calibration drift of the CEMS must be checked daily with a zero and span check with:
   - *(i)* The component for the drift test specified must be SO_2,
   - *(ii)* Span is a level between 500 and 1000 ppm.
   - (iii) The zero and span must be adjusted whenever the 24- hour zero drift or 24-hour span drift exceeds 50 ppm.
   - (iv) The 24-hour span and drift measurements must be recorded and maintained for at least two years.

b. Each monitor must be quality-assured by a cylinder gas audit at least quarterly.

c. The CEMS must make at least four measurements every hour.

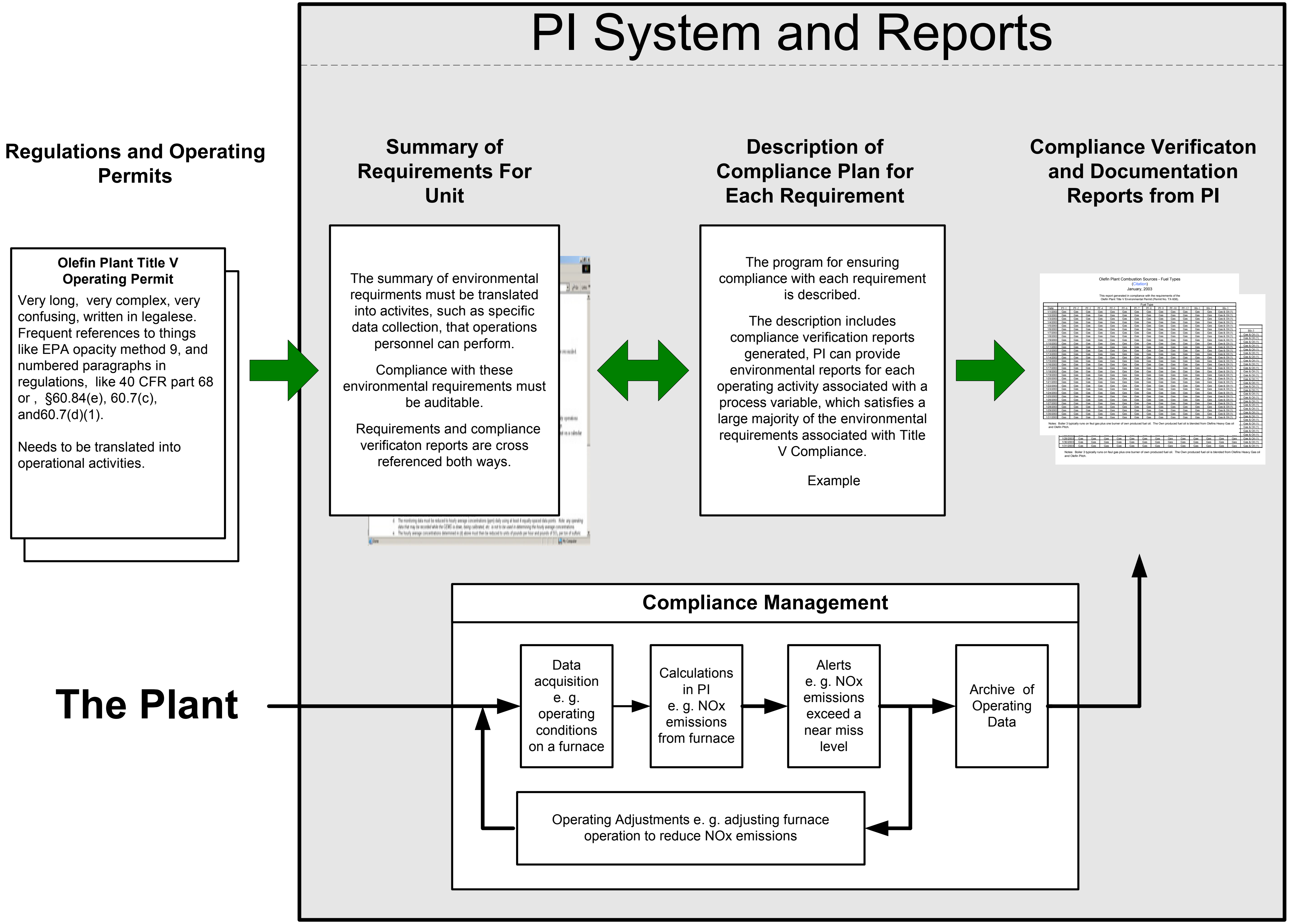
d. The monitoring data must be reduced to hourly average concentrations (ppm) daily using at least 4 equally-spaced data points. *Note: any operating data that may be recorded while the CEMS is down, being calibrated, etc. is not to be used in determining the hourly average concentrations.*

e. The hourly average concentrations determined in (d) above must then be reduced to units of pounds per hour and pounds of SO_2 per ton of sulfuric acid produced. This data must be calculated at least once a week.

11). Continuous Emission Monitoring Data must be recorded and maintained on file for at least two years to demonstrate compliance with permit emission limits.
12. All CEMS measurements, calibration checks, performance evaluations, testing measurements, adjustments, maintenance records.
13). All CEMS downtime must be recorded and reported.

14). Pound per hour limit on each furnace for NO_X, SO_X, CO, PM10, and VOC.
15). Occurrences and duration's of all startups, shutdowns, and malfunctions.
16). The date, time, and duration of any period of excess emissions.
17). The total amount of process operating time during the semiannual reporting period.
18). Specific identification of each period of excess emissions that occurs during startups, shutdowns or malfunctions.
19). The nature and cause of any malfunction that causes excess emissions.
20). The corrective action taken or preventative measures adopted in response to any malfunction that causes excess emissions.

OSIsoft PI System Assists In Title V Compliance



Olefin Plant
Typical Title V Requirements

1). Maintain records of production for the last two or five years (Compliance Description) (Report).
Note: Any inconsistencies between environmental records of production need to be consistent with business records of production need to be reconciled. Ideally they are both the same data set.
2). Maintain records of operating hours for the last two or five years (Compliance Description).
3). Maintain records of fuel type for each combustion device for the last five years (Compliance Description).
4). Maximum sulfur content of fuel gas based on the average of 24 calendar day hour average readings of 20 ppm(w) (Compliance Description).
5). Maximum sulfur content of fuel gas based on the highest of 24 calendar day hour averages of 22 ppm(w).
6). Maintain records of fuel gas sulfur content for the last five years.
7). Maximum sulfur content of fuel oil of 1.00 %(w) based on daily laboratory analysis.
8). Maintain records of fuel oil sulfur content for the last five years.
9). All pollution emission capture equipment and abatement equipment must be in good working order and operating properly during normal facility operations.
10). Maximum allowed production rate from a process unit measured in tons per day, pounds per day, etc. against a twelve-month rolling average.
11). Emissions from a process unit of a specific pollutant (for example SOx) of less than a given number of pounds per unit of production at the unit on a calendar day basis.
12). The caustic scrubbing systems shall maintain a minimal efficiency of 92.5%.
Note: This requirement requires use of an engineering model of the scrubber to calculate the removal efficiency.
13). Continuous Emission Monitoring for a stack must be performed by monitoring the SO2 concentrations an the outlet as follows:
   a. The calibration drift of the CEMS must be checked daily with a zero and span check with:
      (i) The component for the drift test specified must be SO_2,
      (ii) Span is a level between 500 and 1000 ppm.
      (iii) The zero and span must be adjusted whenever the 24- hour zero drift or 24-hour span drift exceeds 50 ppm.
      (iv) The 24-hour span and drift measurements must be recorded and maintained for at least two years.
   b. Each monitor must be quality-assured by a cylinder gas audit at least quarterly.
   c. The CEMS must make at least four measurements every hour.
   d. The monitoring data must be reduced to hourly average concentrations (ppm) daily using at least 4 equally spaced data points. *Note: any operating data that may be recorded while the CEMS is down, being calibrated, etc. is not to be used in determining the hourly average concentrations.*

e. The hourly average concentrations determined in (d) above must then be reduced to units of pounds per hour and pounds of SO_2 per ton of sulfuric acid produced. This data must be calculated at least once a week.

14). Continuous Emission Monitoring Data must be recorded and maintained on file for at least two years to demonstrate compliance with permit emission limits.

15. All CEMS measurements, calibration checks, performance evaluations, testing measurements, adjustments, maintenance records.

16). All CEMS downtime must be recorded and reported.

17). Pound per hour limit on each furnace for NOX, SOX, CO, PM10, and VOC.

18). Occurrences and duration's of all startups, shutdowns, and malfunctions.

19). The date, time, and duration of any period of excess emissions.

20). The total amount of process operating time during the semiannual reporting period.

21). Specific identification of each period of excess emissions that occurs during startups, shutdowns or malfunctions.

22). The nature and cause of any malfunction that causes excess emissions.

23). The corrective action taken or preventative measures adopted in response to any malfunction that causes excess emissions.

Olefin Plant Production Report
(Citation)
Last Five Years - Ending January, 2003

This report generated in compliance with the requirements of the Olefin Plant Title V Environmental Permit (Permit No. TX-938).

Year	Month
2003	
	January, 2003
2002	
	December
	November
	October
	September
	August
	July
	June
	May
	April
	March
	February
	January
2001	
	December
	November
	October
	September
	August
	July
	June
	May
	April
	March

February
January
2000
December
November
October
September
August
July
June
May
April
March
February
January
1999
December
November
October
September
August
July
June
May
April
March
February
January
1998
December
November
October
September
August
July
June
May
April

March
February
January

Olefin Plant Production Report (Citation)
January, 2003

This report generated in compliance with the requirements of the
Olefin Plant Title V Environmental Permit (Permit No. TX-938).

	Daily Production, mlbs (1)												
Date	Fuel Gas	$C_2^=$	C_3^o	$C_3^=$	iC4	nC4	C5	Lt. Gasoline	Hvy. Gasoline	Lt. Gas Oil	Hvy. Gas Oil	Pitch	Total
1/1/2003	272,149	5,579,060	1,224,672	1,784,846	1,043,239	725,731	1,542,179	1,632,896	1,201,993	1,043,239	635,015	408,224	17,093,243
1/2/2003	296,837	6,085,148	1,335,764	1,946,753	1,137,873	791,564	1,682,074	1,781,019	1,311,028	1,137,873	692,619	445,255	18,643,806
1/3/2003	273,071	5,597,951	1,228,818	1,790,889	1,046,771	728,189	1,547,401	1,638,425	1,206,063	1,046,771	637,165	409,606	17,151,119
1/4/2003	309,195	6,338,489	1,391,376	2,027,801	1,185,246	824,519	1,752,103	1,855,168	1,365,609	1,185,246	721,454	463,792	19,419,997
1/5/2003	272,205	5,580,201	1,224,922	1,785,211	1,043,452	725,880	1,542,494	1,633,229	1,202,238	1,043,452	635,145	408,307	17,096,737
1/6/2003	288,960	5,923,688	1,300,322	1,895,098	1,107,681	770,561	1,637,442	1,733,762	1,276,242	1,107,681	674,241	433,441	18,149,119
1/7/2003	295,876	6,065,461	1,331,443	1,940,454	1,134,192	789,003	1,676,632	1,775,257	1,306,786	1,134,192	690,378	443,814	18,583,488
1/8/2003	293,794	6,022,784	1,322,074	1,926,801	1,126,212	783,452	1,664,835	1,762,766	1,297,592	1,126,212	685,520	440,691	18,452,732
1/9/2003	68,626	1,406,842	308,819	450,075	263,068	183,004	388,883	411,759	303,100	263,068	160,128	102,940	4,310,313
1/10/2003	0	0	0	0	0	0	0	0	0	0	0	0	0
1/11/2003	0	0	0	0	0	0	0	0	0	0	0	0	0
1/12/2003	68,626	1,406,842	308,819	450,075	263,068	183,004	388,883	411,759	303,100	263,068	160,128	102,940	4,310,313
1/13/2003	139,740	2,864,663	628,828	916,459	535,669	372,639	791,858	838,438	617,183	535,669	326,059	209,609	8,776,814
1/14/2003	279,336	5,726,378	1,257,010	1,831,975	1,070,786	744,895	1,582,901	1,676,013	1,233,732	1,070,786	651,783	419,003	17,544,598
1/15/2003	296,953	6,087,543	1,336,290	1,947,519	1,138,321	791,876	1,682,735	1,781,720	1,311,544	1,138,321	692,891	445,430	18,651,143
1/16/2003	288,571	5,915,703	1,298,569	1,892,544	1,106,188	769,522	1,635,235	1,731,425	1,274,521	1,106,188	673,332	432,856	18,124,657
1/17/2003	291,988	5,985,751	1,313,945	1,914,954	1,119,287	778,634	1,654,598	1,751,927	1,289,613	1,119,287	681,305	437,982	18,339,269
1/18/2003	283,351	5,808,702	1,275,081	1,858,312	1,086,180	755,604	1,605,657	1,700,108	1,251,468	1,086,180	661,153	425,027	17,796,824
1/19/2003	290,907	5,963,593	1,309,081	1,907,865	1,115,143	775,752	1,648,473	1,745,442	1,284,839	1,115,143	678,783	436,360	18,271,381
1/20/2003	299,980	6,149,585	1,349,909	1,967,367	1,149,922	799,946	1,699,885	1,799,879	1,324,911	1,149,922	699,953	449,970	18,841,229
1/21/2003	297,239	6,093,407	1,337,577	1,949,395	1,139,418	792,638	1,684,356	1,783,436	1,312,807	1,139,418	693,559	445,859	18,669,110
1/22/2003	264,351	5,419,200	1,189,581	1,733,703	1,013,346	704,937	1,497,990	1,586,107	1,167,551	1,013,346	616,820	396,527	16,603,460
1/23/2003	290,496	5,955,167	1,307,232	1,905,169	1,113,568	774,656	1,646,144	1,742,976	1,283,024	1,113,568	677,824	435,744	18,245,567
1/24/2003	275,067	5,638,864	1,237,799	1,803,978	1,054,422	733,511	1,558,710	1,650,399	1,214,877	1,054,422	641,822	412,600	17,276,471
1/25/2003	296,330	6,074,769	1,333,486	1,943,432	1,135,932	790,214	1,679,204	1,777,981	1,308,792	1,135,932	691,437	444,495	18,612,005
1/26/2003	286,834	5,880,095	1,290,752	1,881,152	1,099,530	764,890	1,625,392	1,721,003	1,266,850	1,099,530	669,279	430,251	18,015,558
1/27/2003	300,525	6,160,769	1,352,364	1,970,945	1,152,014	801,401	1,702,977	1,803,152	1,327,320	1,152,014	701,226	450,788	18,875,495
1/28/2003	274,810	5,633,605	1,236,645	1,802,296	1,053,438	732,827	1,557,257	1,648,860	1,213,744	1,053,438	641,223	412,215	17,260,359
1/29/2003	274,416	5,625,526	1,234,872	1,799,711	1,051,928	731,776	1,555,023	1,646,495	1,212,004	1,051,928	640,304	411,624	17,235,605
1/30/2003	286,752	5,878,422	1,290,385	1,880,617	1,099,217	764,673	1,624,930	1,720,514	1,266,489	1,099,217	669,089	430,128	18,010,435
1/31/2003	295,561	6,058,993	1,330,023	1,938,385	1,132,982	788,162	1,674,843	1,773,364	1,305,393	1,132,982	689,641	443,341	18,563,670
Total	7,752,546	158,927,201	34,886,459	50,843,783	29,718,094	20,673,457	43,931,096	46,515,278	34,240,413	29,718,094	18,089,275	11,628,820	486,924,517

Notes:

(1). Unless otherwise noted all daily productions are from 12:00 PM (MN) to 11:59:59 of the respective date.

Olefin Plant
Typical Title V Requirements

1). Maintain records of production for the last two or five years.

Note: Any inconsistencies between environmental records of production need to be consistent with business records of production need to be reconciled. Ideally they are both the same data set.

2). Maintain records of operating hours for the last two or five years.

3). Maintain records of fuel type for each combustion device for the last five years.

4). Maximum sulfur content of fuel gas based on the average of 24 calendar day hour average readings of 20 ppm(w).

5). Maximum sulfur content of fuel gas based on the highest of 24 calendar day hour averages of 22 ppm(w).

6). Maintain records of fuel gas sulfur content for the last five years.

7). Maximum sulfur content of fuel oil of 1.00 %(w) based on daily laboratory analysis.

8). Maintain records of fuel oil sulfur content for the last five years.

9). All pollution emission capture equipment and abatement equipment must be in good working order and operating properly during normal facility operations.

10). Maximum allowed production rate from a process unit measured in tons per day, pounds per day, etc. against a twelve-month rolling average.

11). Emissions from a process unit of a specific pollutant (for example SOx) of less than a given number of pounds per unit of production at the unit on a calendar day basis.

12). The caustic scrubbing systems shall maintain a minimal efficiency of 92.5%.

Note: This requirement requires use of an engineering model of the scrubber to calculate the removal efficiency.

13). Continuous Emission Monitoring for a stack must be performed by monitoring the SO2 concentrations an the outlet as follows:

a. The calibration drift of the CEMS must be checked daily with a zero and span check with:

(i) The component for the drift test specified must be SO_2,

(ii) Span is a level between 500 and 1000 ppm.

(iii) The zero and span must be adjusted whenever the 24-hour zero drift or 24-hour span drift exceeds 50 ppm.

(iv) The 24-hour span and drift measurements must be recorded and maintained for at least two years.

b. Each monitor must be quality-assured by a cylinder gas audit at least quarterly.

c. The CEMS must make at least four measurements every hour.

d. The monitoring data must be reduced to hourly average concentrations (ppm) daily using at least 4 equally-spaced data points. *Note: any operating data that may be recorded while the CEMS is down, being calibrated, etc. is not to be used in determining the hourly average concentrations.*

e. The hourly average concentrations determined in (d) above must then be reduced to units of pounds per hour and pounds of SO_2 per ton of sulfuric acid produced. This data must be calculated at least once a week.

14). Continuous Emission Monitoring Data must be recorded and maintained on file for at least two years to demonstrate compliance with permit emission limits.

15. All CEMS measurements, calibration checks, performance evaluations, testing measurements, adjustments, maintenance records.

16). All CEMS downtime must be recorded and reported.

17). Pound per hour limit on each furnace for NO_X, SO_X, CO, PM10, and VOC.

18). Occurrences and duration's of all startups, shutdowns, and malfunctions.

19). The date, time, and duration of any period of excess emissions.

20). The total amount of process operating time during the semiannual reporting period.

21). Specific identification of each period of excess emissions that occurs during startups, shutdowns or malfunctions.

22). The nature and cause of any malfunction that causes excess emissions.

23). The corrective action taken or preventative measures adopted in response to any malfunction that causes excess emissions.

Olefin Plant
Typical Title V Compliance Assurance Program Description

1). Maintain records of production for the last two or five years.

Reports of production on each of the products are produced from the OSIsoft PI system. The same meters and production rate values are used for financial and business analyses. The meters are proved monthly to ensure accuracy.

The production rates are from the PI flow integrator algorithm.

2). Maintain records of operating hours for the last two or five years.

The hours of operations are determined from physical conditions in the plant rather than memory or notes of plant start and stop times which are inaccurate and subject to error.

The process variable that indicates whether the unit is running the flow through the Pyrolysis Gas Compressor exceeding he example is the unit is running when the flow through the Pyrolysis Compressor exceeding 100,000 SCF/Hr. OSIsoft PI Advanced Computing Engine (ACE) functions are used to produce concise reports of the start and stop times. This “running” criteria is approximately 0.7% of the compressor capacity. It is impossible for the compressor to operate at that rate.

The Pyrolysis Process Control engineer reviews the reports weekly for accuracy and reconciles any discrepancies or irregularities. Notes from any such reconciliation are retained in the OSIsoft PI system and included with any reports using this data. This protocol is as proscribed in the FDA’s 21 CFR Part 11 which sets the standard for data integrity. The OSIsoft PI system has successfully been part of the scope of an FDA audit dozens of times.

3). Maintain records of fuel type for each combustion device for the last five years.

The indication of fuel type is determined from process conditions recorded in PI. The indicator of burning fuel gas is a significant pressure downstream of the fuel gas isolation value but in front of the gas burner. A similar measurement is used to indicate fuel oil burning. Using a physical measure and process values stored in PI gives more accurate and precise values.

4). Maximum sulfur content of fuel gas based on the average of 24 calendar day hour average readings of 20 ppm(w).

As shown in the schematic of the fuel gas system (Schematic), own-produced fuel gas is treated for removal of sulfur in a three-stage amine treater. Total fuel gas consumption substantially exceeds own-produced. Natural gas is added to make provide the additional gas. The gasses are mixed and pressure surge is provided by the fuel gas blend drum.

Sulfur content of the blended fuel gas is measured with the on-line blended fuel gas sulfur analyzer. Sulfur content of the treated own-produced fuel gas is monitored with the on-line analyzer on the gas treated fuel gas. Lean amine flow is varied to control the sulfur content of the own-produced fuel gas. This decreases energy while still meeting the environmental requirement.

The sulfur content of the blended fuel gas is maintained at five standard deviations of the blended gas sulfur content below the maximum limit this makes it extremely unlikely for the process to "drift" above the limit – as long as the variability of the sulfur content does not increase. The Pyrolysis control engineer tracks the sulfur content standard deviation of both the blended fuel gas and the treated fuel gas, via PI reports, for pro-active compliance assurance.

5). Maximum sulfur content of fuel gas based on the highest of 24 calendar day hour averages of 22 ppm(w).

The data in the sulfur report are from PI database queries.

6). Maintain records of fuel gas sulfur content for the last five years.

The data in the sulfur report are from PI database queries.

7). Maximum sulfur content of fuel oil of 1.00 %(w) based on daily laboratory analysis.

The sulfur content of the fuel oil is from daily laboratory analysis of the fuel oil. The analysis results from the laboratory are imported into the OSIsoft PI database from the laboratory information system (LIMS). Quality assurance on the laboratory analysis is performed by Quality assurance using LIMS.

The laboratory analyses have considerable variability. The analyses are supplemented by a calculation of the sulfur content of the Heavy Gas Oil and Pyrolysis Pitch. The sulfur content of each is strongly correlated with the amount of each heavy feed to the unit. The correlation of Pyrolysis Pitch and Gas Oil sulfur content was developed and used in OSIsoft PI ACE to a prediction of Gas Oil and Pitch sulfur contents. The laboratory results are compared with the predicted values to flag suspect analyses. Whenever the values differ by more than 20% (high or low) the analysis is repeated and new duplicate samples are taken and analyzed.

8). Maintain records of fuel oil sulfur content for the last five years.

9). All pollution emission capture equipment and abatement equipment must be in good working order and operating properly during normal facility operations.

10). Maximum allowed production rate from a process unit measured in tons per day, pounds per day, etc. against a twelve-month rolling average.

11). Emissions from a process unit of a specific pollutant (for example SOx) of less than a given number of pounds per unit of production at the unit on a calendar day basis.

12). The caustic scrubbing systems shall maintain a minimal efficiency of 92.5%.

Note: This requirement requires use of an engineering model of the scrubber to calculate the removal efficiency.

13). Continuous Emission Monitoring for a stack must be performed by monitoring the SO2 concentrations an the outlet as follows:

a. The calibration drift of the CEMS must be checked daily with a zero and span check with:

(i) The component for the drift test specified must be SO2,

(ii) Span is a level between 500 and 1000 ppm.

(iii) The zero and span must be adjusted whenever the 24- hour zero drift or 24-hour span drift exceeds 50 ppm.

(iv) The 24-hour span and drift measurements must be recorded and maintained for at least two years.

b. Each monitor must be quality-assured by a cylinder gas audit at least quarterly.

c. The CEMS must make at least four measurements every hour.

d. The monitoring data must be reduced to hourly average concentrations (ppm) daily using at least 4 equally-spaced data points. Note: any operating data that may be recorded while the CEMS is down, being calibrated, etc. is not to be used in determining the hourly average concentrations.

e. The hourly average concentrations determined in (d) above must then be reduced to units of pounds per hour and pounds of SO2 per ton of sulfuric acid produced. This data must be calculated at least once a week.

14). Continuous Emission Monitoring Data must be recorded and maintained on file for at least two years to demonstrate compliance with permit emission limits.

15). All CEMS measurements, calibration checks, performance evaluations, testing measurements, adjustments, maintenance records.

16). All CEMS downtime must be recorded and reported.

17). Pound per hour limit on each furnace for NOX, SOX, CO, PM10, and VOC.

18). Occurrences and duration's of all startups, shutdowns, and malfunctions.

19). The date, time, and duration of any period of excess emissions.

20). The total amount of process operating time during the semiannual reporting period.

21). Specific identification of each period of excess emissions that occurs during startups, shutdowns or malfunctions.

22). The nature and cause of any malfunction that causes excess emissions.

23). The corrective action taken or preventative measures adopted in response to any malfunction that causes excess emissions.

Olefin Plant Operating Hours Report (Citation)
January, 2003

This report generated in compliance with the requirements of the Olefin Plant Title V Environmental Permit (Permit No. TX-938).

Continuous Operation From	1/1/03 12:00 AM	to	1/9/03 6:23 AM
Continuous Operation From	1/11/03 7:43 PM	to	1/31/03 11:59 PM

Notes:

(1). Operating hours as indicated in OSI PI by flow through Pyrolysis Gas Compressor greater than 100,000 SCF/Hr.

Olefin Plant Combustion Sources - Fuel Types (Citation)
January, 2003

This report generated in compliance with the requirements of the
Olefin Plant Title V Environmental Permit (Permit No. TX-938).

	Fuel Type												
Date	PF-1	PF-2	PF-3	PF-4	PF-5	PF-6	PF-7	PF-8	PF-9	PF-10	PF-12	Blr-1	Blr-2	Blr-3
1/1/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/2/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/3/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/4/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/5/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/6/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/7/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/8/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/9/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/10/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/11/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/12/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/13/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/14/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/15/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/16/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/17/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/18/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/19/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/20/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/21/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/22/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/23/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/24/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/25/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/26/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/27/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/28/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/29/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/30/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)
1/31/2003	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas	Fuel Gas & Oil (1)

Notes:

(1). Boiler 3 typically runs on feul gas plus one burner of own produced fuel oil. The Own produced fuel oil is blended from Olefins Heavy Gas oil and Olefin Pitch.

Olefin Plant Combustion Sources - Fuel Gas Sulfur Content
January, 2003 (Citation)

This report generated in compliance with the requirements of the Olefin Plant Title V Environmental Permit (Permit No. TX-938).

	Fuel Sulfur Content		
Date	Fuel Gas Sulfur Content, ppm(w) (1) (Schematic)		Fuel Oil Sulfur Content, %(w) (Schematic)
	24-hour Average max. 20 ppm(w)	Highest Hour Average max. 25 ppm(w)	Sample Point "C" max. 1.00 %(w)
1/1/2003	15.3	17.8	0.614
1/2/2003	15.0	16.4	0.606
1/3/2003	15.1	17.1	0.611
1/4/2003	14.9	15.5	0.600
1/5/2003	15.2	15.5	0.586
1/6/2003	14.8	17.2	0.584
1/7/2003	15.1	17.2	0.585
1/8/2003	14.9	15.5	0.582
1/9/2003	14.7	16.2	0.570
1/10/2003	14.9	15.4	0.559
1/11/2003	15.3	16.9	0.551
1/12/2003	14.6	16.9	0.555
1/13/2003	14.8	16.4	0.557
1/14/2003	14.7	16.7	0.553
1/15/2003	15.5	17.0	0.555
1/16/2003	15.2	17.4	0.551
1/17/2003	14.5	16.5	0.528
1/18/2003	15.3	16.8	0.510
1/19/2003	15.1	17.2	0.491
1/20/2003	14.9	16.8	0.472
1/21/2003	15.1	17.0	0.450
1/22/2003	14.7	18.2	0.614
1/23/2003	15.1	17.3	0.606
1/24/2003	15.2	17.1	0.611
1/25/2003	15.2	16.9	0.600
1/26/2003	14.9	16.8	0.586
1/27/2003	14.9	17.5	0.584

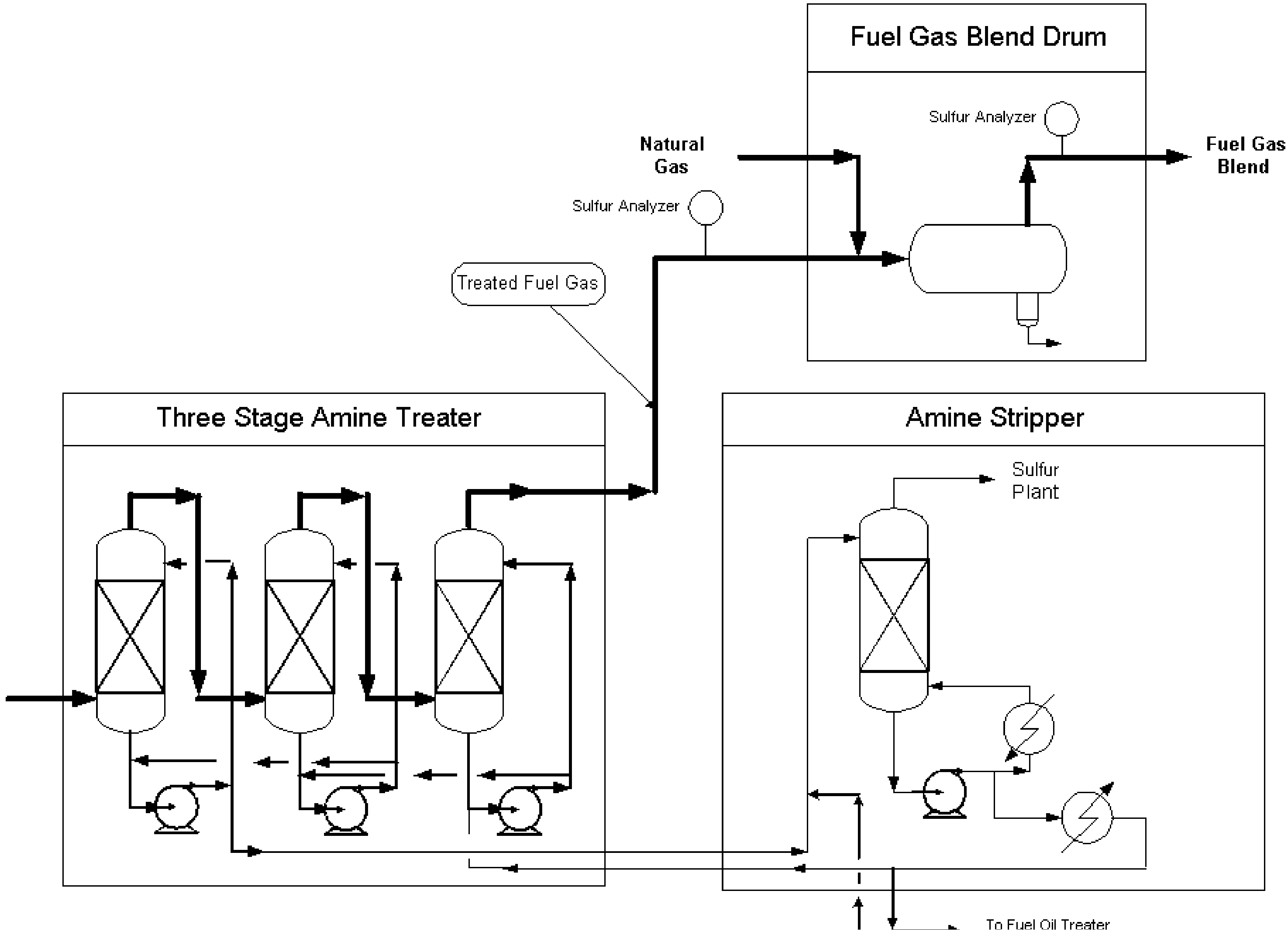
1/28/2003	15.3	17.2	0.585
1/29/2003	14.7	17.1	0.582
1/30/2003	15.2	17.4	0.570
1/31/2003	15.1	17.2	0.559

Notes:

(1). Boiler 3 typically runs on feul gas plus one burner of own produced fuel oil. The Own produced fuel oil is blended from Olefins Heavy Gas oil and Olefin Pitch.

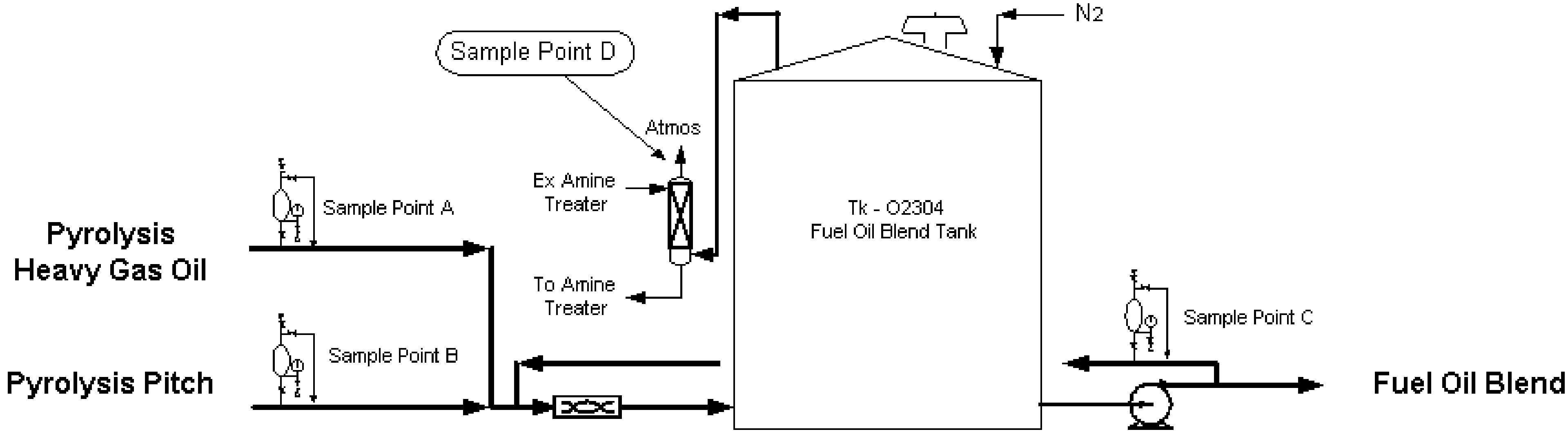
(2). More Notes

FUEL GAS SYSTEM SCHEMATIC




From Fuel Oil Treater

Fuel Oil Blending System



Conclusions and Observations

1. Design to Fit Organization

It is important to design a compliance assurance system so that it fits with the organization. For example the list of environmental requirements provides an effective way for Environmental to "hand off" to operations. The responsibility for analyzing all of the regulations and permits is on Environmental. It puts responsibility for meeting the requirements on Operations. Operations can give the list of requirements to Process and Control Engineering asking for an Implementation Plan design. After review and agreement with the Implementation Plan Operations ask for Environmental's concurrence with the plan. Once the plan have been agreed upon by all parties Operations can have Process and Control Engineering create the reports and other items to support implementation. Once these are complete Operations executes the plan.

Making the responsibilities and workflow clear makes setting up a time schedule for the whole effort easier. It also improves compliance.

2. Establish Standard Calculations Methods

Where ever possible develop and use standard methods for calculations. For example a standard method can be developed for furnace heat and material balance and calculation of NOx. The calculation method can be reviewed and "blessed" by corporate Environmental and Engineering.

Using standard methods will decrease cost and staff required and also improves compliance.

3. Establish Standard Implementation Plans

The same requirement can apply to many equipment items. Obviously the Implementation Plans should be similar if not identical.

Standard Implementation Plans can be developed, thoroughly reviewed, and then applied multiple times. Implementation tools can also be reused.

4. Cookie Cutter

Items 1, 2, and 3 above are obviously the first steps in building "cookie cutter" approach. Take this as far as possible. It will decrease effort required and improve compliance. In addition, when there are "deviations", the standard method can be revised. That provides prevention of deviations where the problem was just waiting to occur. The agency will also be "positively disposed" toward this approach.

5. Use Robust Tools

Given the importance of the compliance data this should **not** be done with personal productivity applications like Excel. This is mission critical data and should be treated that way.

6. Start Early

Get an early start. You may find problems that have to be fixed and that will take time.

7. Physical Measurements

Wherever possible use physical measurements to "drive" reports rather than manual entries. In the examples the fuel gas pressure downstream of the control valve is used as an indicator of whether gas is being burned in the furnace. This give a more precise report and fewer errors and inconsistencies than a manual log in a notebook.