Manufacturing Information Technology
and
Best Manufacturing Practices in the Fertilizer Industry

by

Joseph O. Perino
Manager, Industry Marketing
Biles & Associates
6161 Savoy Drive, Suite 500
Houston, Texas 77036-3386
tel: 713-789-8880
fax: 713-789-5524
e-mail: perino_j@biles.com

Abstract

The paper presents the application and benefits of manufacturing information management systems in fertilizer production with an emphasis on phosphates. Key industry trends in the information technology business are presented and their impact on production information management discussed. The concept of the integrated plant or integrated manufacturing execution system is presented along with the best manufacturing practices that take advantage of information technology to improve plant operations, productivity and profitability. The discussion applies to all types of plants in the fertilizer production chain, from ammonia and urea to multi-product phosphate fertilizer and animal feed products facilities.

Today's Challenges

The fertilizer industry is more dynamic and challenging than ever before. New worldwide construction, upgrades and debottlenecks, emerging markets, industry consolidation, geographic segmentation, multiple markets, and finally strong demand and long overdue attractive prices, all contribute to today's highly competitive business environment. Vital to improving the business is the timely and accurate accumulation of key operating data and its subsequent translation to valuable information that must be shared by operations, engineering, maintenance, laboratory, planning and scheduling, accounting, shipping and distribution, and management plus other corporate personnel.

Key Industry Trends

Several important information technology trends are beginning to impact the industry, the result of overall changes in the globally competitive chemical process industry. These trends are:

1. Worldwide supply chain integration
2. The integrated plant concept
3. The outsourcing of infrastructure systems and support services
4. The emergence of a new breed of plant engineer

Lets begin with worldwide supply chain integration. This refers to the recent trend sweeping not only the chemical industry, but all manufacturing industries. Standardization of information technology in the Windows environment and the use of large scale relational databases have allowed the development of enterprise level business systems encompassing traditional manufacturing resource planning (MRP II) plus financials, supply, logistics, and long range planning to form enterprise resource planning (ERP) systems. These systems seek to standardize the access, use, look and feel of business systems across the enterprise. Vendors such as SAP, Marcam and Oracle Datalogix are delivering multi-million dollar systems to the process industries. Some companies have committed in excess of 100 million dollars to role out these systems across their global operations. However, these systems have traditionally not been linked to the actual plant operation and as a result, a gap persists between the transaction-based business level and the real time plant control systems.

The second key trend, central to this discussion, is the concept of the integrated plant or more formally titled the integrated manufacturing execution system (IMES). The integrated plant concept refers to the linking and synchronization of plant level systems to control, manage and improve the production operation. The IMES includes control systems, computerized maintenance management systems (CMMS) and other ancillary systems, most of which have an underlying relational database, and a manufacturing information management system (MIMS) that glues all the systems together to provide uniform data access and tools across the plant. It is the MIMS, in coordination with other systems, that enables the best manufacturing practices to be followed as will be detailed later.

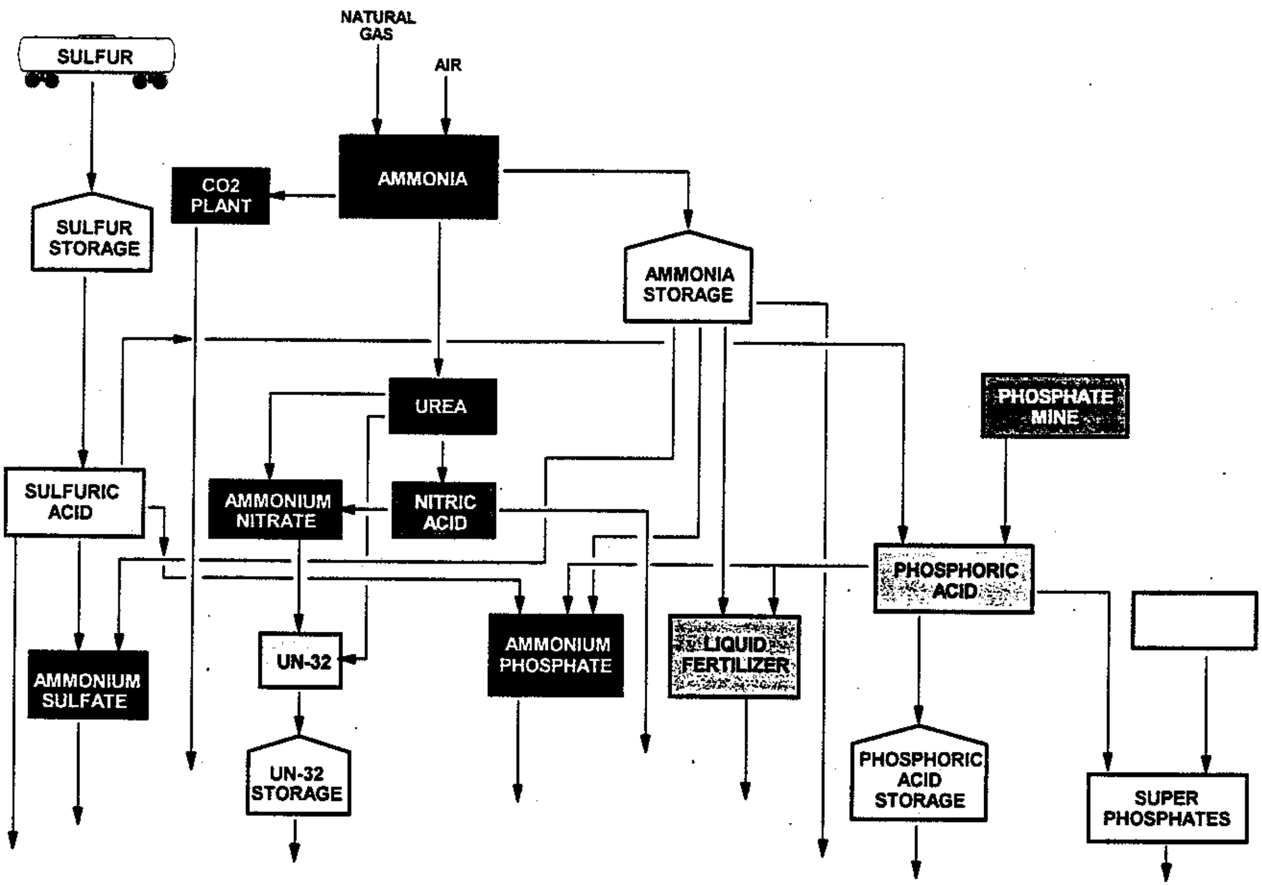


Figure 1 - Integrated Fertilizer Complex

The third trend is the outsourcing of information systems infrastructure and support services. This has resulted from corporate reorganizations and downsizings which leave few personnel in place to support legacy systems; the phase out of "homegrown" software and subsequent replacement with standard third party software; the increased ease-of-use resulting from the mass adoption of the Windows-based operating systems and graphical user interfaces, especially Windows NT; and the move toward partnering with fewer suppliers. This trend applies not only to older legacy computing systems and personal computers, but also to areas where the affected systems are part of the vital production operation. Company personnel are now so focused on the production operation and meeting business objectives that they do not have the time to spend on infrastructure support.

This ties in closely with the fourth key trend, the emergence of the new breed of plant engineer, a combination of process/process control engineer, production engineer and business manager. It is no longer sufficient to simply keep the plant operating reasonably well, but now the engineer is also responsible for production improvement, cost control and profitability. This means that to do their job well, the new breed of engineer needs to be skilled in several disciplines including the use of information technology to analyze plant operation and make better decisions.

The Integrated Plant Concept

As previously noted, the integrated plant includes the plant control and other ancillary systems. Traditionally, these systems have not been linked. This causes a number of problems which keep costs higher than they should be, lower productivity and result in working harder, not smarter.

- Questionable instrumentation and measurement values - data reliability
- Redundant and antiquated data entry methods
- Multiple non-integrated systems: control, laboratory, maintenance, business
- Excessive systems support and training costs
- Too much time spent on finding and understanding problems and not enough on though and actions

The way out of the current situation is to prepare a plan for the future that addresses process and production problems while simultaneously solving system and software problems. Involving operations and engineering is a must. Legacy systems should be integrated where appropriate and replaced where desirable. Industry and defacto standards should be utilized to simplify the integration and keep costs down. Implementing a solution in phases is often a financial reality so scalability, flexibility and a clear evolutionary path are all important in choosing the right solution.

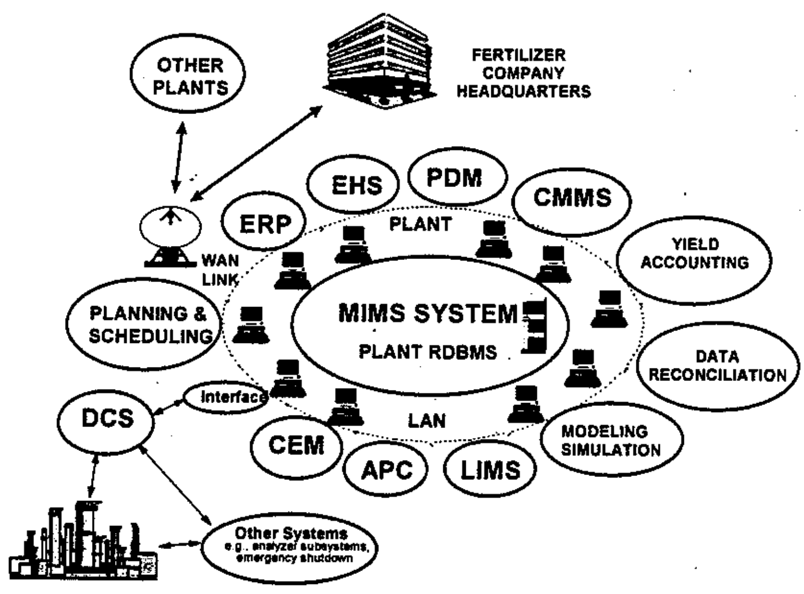


Figure 2 - MIMS Connects the Enterprise

The place to start is to first begin acquiring the plant's critical operating data so that personnel have uniform, easy access to the information when they need it, where they need it. This is the role of the manufacturing information management system. It glues the various plant systems together. What is the MIMS?

- Client/server system
- Integrates data from various plant sources e.g. DCS, PLC, SLC, lab, etc.
- Stores all of the data (process, calculated, lab manual) for very long time periods, usually 2 to 3 years on-line in a data historian

- Maintains the data to its original resolution using an advanced historian designed for time-based data storage, but links with relational databases for non-time critical data
- Provides tools to process the data into more valuable information
- Provides fast and easy access to the information for everyone - from the plant floor to the desktop and beyond

Thus the MIMS fills the "gap" between the plant control systems and the business systems and provides the tools to empower users with better information, faster and easier than ever before. And, when the business systems need production data, the MIMS responds with the key production data requested: what and how much was produced and when, and how much raw materials and energy were consumed in the process.

Empowering Your People with Best Manufacturing Practices

The MIMS provides the basis for implementing a number of functions, tools and applications that are called Best Manufacturing Practices(BMP) for two reasons: first, because these practices employ proven tools and applications that lead to improved productivity and operations; and second, because numerous chemical companies including leading fertilizer producers have employed them successfully and consider the use of the MIMS a significant operating advantage. What are these BMPs and what are their benefits? The following is a list of the leading practices.

BMP #1- The Data Historian

The data historian unifies the plant's data sources and provides the long term data repository needed to support certain advanced control applications as well as environmental, OSHA 1910 and other regulatory recordkeeping and reporting requirements. The data historian can also "playback" the data history though trends and process graphics allowing detailed analysis of long term operation, upsets and disturbances. Why is the data historian needed? Because control systems have only limited history capacities, often only a few days, and relational databases do not perform anywhere near as well as historians and also consume huge amounts of disk space to store the data - they simply are not designed for time-based data storage.

BMP #2 - Routine Process Analysis and Troubleshooting

Quick and easy access to data in the form of trends, charts, tables, tabular data, statistics, alarms, batch/lot tracking and analysis aid engineering and operations in analyzing operating trends, product variable-to-variable and lot-to-lot relationships. Figures 3 through 5 show that batches or lots of both liquid and solid fertilizers and feeds, defined by shipments of given quantities of products, can be associated with the continuous processes that produced them. In this way product problems or quality variations can be uncovered. Data is also imported directly into spreadsheets or other third party software packages for further analysis as shown in Figures 6 through 9.

BMP #3 - Performance and Supervisory Calculations

The MIMS can calculate, present and store key operating parameters such as efficiencies, conversions, catalyst aging rates, heat and material balances, environmental averages, accumulate rotating equipment run times, etc, so that the user knows how well the unit and plant are performing in real time. The calculations are easily configured as shown in Figure 10.

BMP #4 - Lifecycle Modeling

The MIMS cam move data to standard third party modeling packages like Pro II from Simulation Sciences using flat file, ODBC and DDE methods or via an intermediate spreadsheet. These packages are fine for modeling some individual unit operations like heat exchangers and evaporators. However, fertilizer unit processes such as sulfuric acid do not have published models available, not even from the process licensor. So the MIMS is necessary to collect and analyze the data to form the basis for statistical, empirical and behavioral (neural network) models. Data can then be used to verify proper operation, analyze for drift, fouling and inefficiencies; speed process design and debottlenecking efforts; and ensure process license performance is met.

BMP #5 - Implement Quality Programs

Quality programs with names like TQM, SIX Sigma and Robust Control require constant analysis of key operating variables, most often using SQC/SPC tools. Fertilizer plants offer a host of opportunities in the energy, emissions, product stream quality and equipment performance areas. Figure 11 shows a run chart with associated X-bar and R charts where the test points violations are annotated.

BMP #6 - Integrate Lab Data

As simple as this may seem, many plants are still using log reports to transfer lab data to operations and engineering for analysis along with process data. This connection can be easily automated to make the data work together seamlessly. Data can also be entered in a spreadsheet for input to the historian as shown in Figure 12.

BMP #7 - Automated Reporting

Both production and environmental reports are easily automated using built-in reporting tools or links to popular PC applications like Excel, Access and Crystal Reports. Figure 13 shows such an example.

BMP #8 - Advanced Control Support

Advanced control strategies can be implemented within the MIMS, but are more often executed in third party packages who need large amounts of data to model, predict and issue optimum setpoints to the regulatory control system. Packages like Pavilion's neural network Process Insights and Soft CEM, and Gensym's G2 expert system draw on the MIMS database, then send their results back through the MIMS to the control system. Their performance is then easily monitored by standard MIMS analysis tools. Another good example involves the integration of environmental monitoring systems on sulfuric acid plants with the regulatory control strategies so that the unit may be pushed to its "constraints" without violating permit limits.

BMP #9 - Environmental Management

MIMS purchases have been justified for environmental reasons alone. The MIMS calculates the averages and produces the desired reports like those in Figure 14. Compliance is far easier and less costly, and regulatory agencies can be provided <u>only</u> the data needed, quickly and efficiently. Third party products like EnviroMetrics PlantWare can also be linked to the MIMS for more advanced data management.

BMP #10 - Keep Management Informed

Whether its within the plant or across the Internet, management can access production information easily and quickly using simple "point and click" functions. Daily production meetings are facilitated by viewing the MIMS data live. Production reports can be viewed on-line rather than spend time "clerking" to find and assemble the data. Corporate offices can be linked to the plant across the company WAN or via the Internet. Figure 15 and 16 illustrate these concepts.

Justification and Expectations

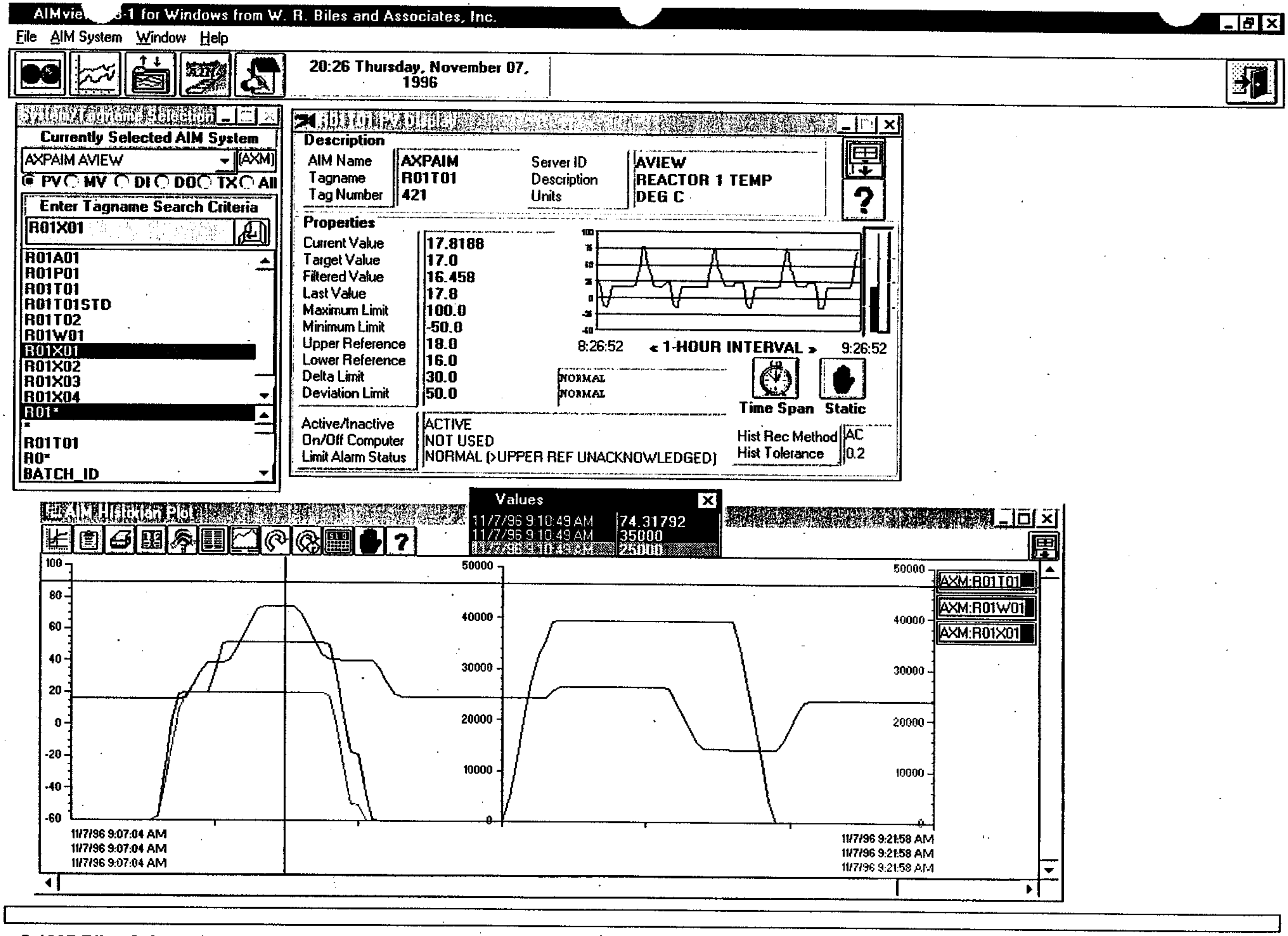
Justifying a MIMS is often a challenge because many of its benefits arise from "working smarter," problem avoidance and making better decisions faster. These benefits are not always easily quantified in advance. Three approaches have proven successful. First, a cursory analysis of the amount of time spent of excessive clerking activities can quickly reveal that if only a few hours per day are saved by operations and engineering personnel, this easily pays for the system. The second approach involves attaching the MIMS purchase to a "hard" ROI project such as an control system upgrade or an advanced control project. Third, if the company is undergoing an ERP roll-out, then the question of how the ERP systems will connect to the plant is easily answered by the MIMS. And the MIMS will cost a fraction of the ERP system.

How long will it take and what should be expected? Implementing the MIMS is a relatively quick process. Provided the DCS is ready to accept the connection and the plant network is in place, the MIMS can be installed in less than one week. Allowing for training, some application development and a period of getting used to using the system, the typical plant is using the MIMS with positive results within a three month period.

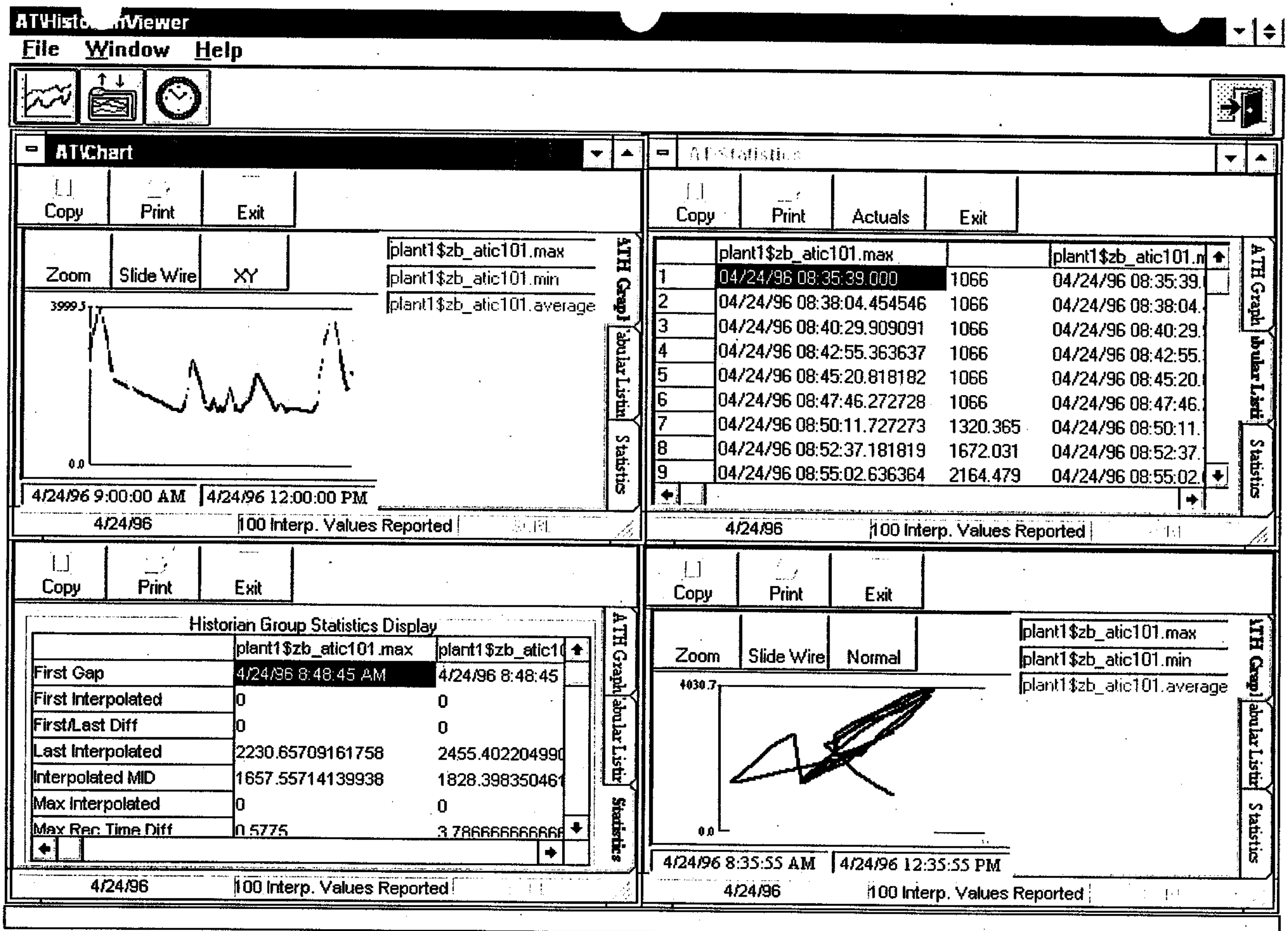
Clients report paybacks of less than one year but the most frequently heard comment is, "Why didn't we do this sooner?' As such the MIMS becomes thought of as an essential part of the plant's information technology infrastructure.

Summary

A MIMS meets the dynamic needs and challenges of the fertilizer industry by providing timely, accurate and secure information in a simple-to-access, easy-to-use pre-packaged, standard system. The range of features make it easy and cost effective to tailor the MIMS to the modern fertilizer production facility. Third party applications and enterprise connectivity allow the MIMS to fill the information and manufacturing execution gap between the business level and real time control systems. MIMS unites the plant's various systems and provides users with the tools to store, analyze and translate data into valuable information, improve throughput and yields, meet optimal product specifications, and improve operating margins - in short, to effectively carry out the Best Manufacturing Practices essential in the global, competitive marketplace. MIMS is the key to making better operating and business decisions is the access to timely, accurate and understandable information.



-1 for Windows from W. R. Biles and Associates, Inc.
File AIM System Window Help
20:26 Thursday, November 07, 1996
Currently Selected AIM System
AXPAIM AVIEW
(AXM)
PV MV DI DO TX All
Enter Tagname Search Criteria
R01X01
R01A01
R01P01
R01T01
R01T01STD
R01T02
R01W01
R01X01
R01X02
R01X03
R01X04
R01*
R01T01
R0*
BATCH_ID
Description
AIM Name AXPAIM
Tagname R01T01
Tag Number 421
Server ID AVIEW
Description REACTOR 1 TEMP
Units DEG C
Properties
Current Value 17.8188
Target Value 17.0
Filtered Value 16.458
Last Value 17.8
Maximum Limit 100.0
Minimum Limit -50.0
Upper Reference 18.0
Lower Reference 16.0
Delta Limit 30.0
Deviation Limit 50.0
NORMAL
NORMAL
8:26:52
« 1-HOUR INTERVAL »
9:26:52
Time Span
Static
Active/Inactive ACTIVE
On/Off Computer NOT USED
Limit Alarm Status NORMAL (>UPPER REF UNACKNOWLEDGED)
Hist Rec Method AC
Hist Tolerance 0.2
AIM Historian Plot
Values
11/7/96 9:10:49 AM 74.31792
11/7/96 9:10:49 AM 35000
AXM:R01T01
AXM:R01W01
AXM:R01X01
100
80
60
40
20
0
-20
-40
-60
50000
40000
30000
20000
10000
0
11/7/96 9:07:04 AM
11/7/96 9:07:04 AM
11/7/96 9:07:04 AM
11/7/96 9:21:58 AM
11/7/96 9:21:58 AM
11/7/96 9:21:58 AM



ATHistorianViewer
File
Window
Help
ATChart
Copy
Print
Exit
Zoom
Slide Wire
XY
plant1$zb_atic101.max
plant1$zb_atic101.min
plant1$zb_atic101.average
3999.5
0.0
4/24/96 9:00:00 AM
4/24/96 12:00:00 PM
4/24/96
100 Interp. Values Reported
ATH Graph
Tabular Listing
Statistics
Copy
Print
Actuals
Exit
plant1$zb_atic101.max
1 04/24/96 08:35:39.000 1066 04/24/96 08:35:39.
2 04/24/96 08:38:04.454546 1066 04/24/96 08:38:04.
3 04/24/96 08:40:29.909091 1066 04/24/96 08:40:29.
4 04/24/96 08:42:55.363637 1066 04/24/96 08:42:55.
5 04/24/96 08:45:20.818182 1066 04/24/96 08:45:20.
6 04/24/96 08:47:46.272728 1066 04/24/96 08:47:46.
7 04/24/96 08:50:11.727273 1320.365 04/24/96 08:50:11.
8 04/24/96 08:52:37.181819 1672.031 04/24/96 08:52:37.
9 04/24/96 08:55:02.636364 2164.479 04/24/96 08:55:02.
4/24/96
100 Interp. Values Reported
Copy
Print
Exit
Historian Group Statistics Display
plant1$zb_atic101.max
First Gap 4/24/96 8:48:45 AM 4/24/96 8:48:45
First Interpolated 0 0
First/Last Diff 0 0
Last Interpolated 2230.65709161758 2455.40220499
Interpolated MID 1657.55714139938 1828.39835046
Max Interpolated 0 0
Max Rec Time Diff 0.5775 3.78666666666
4/24/96
100 Interp. Values Reported
Copy
Print
Exit
Zoom
Slide Wire
Normal
plant1$zb_atic101.max
plant1$zb_atic101.min
plant1$zb_atic101.average
4030.7
0.0
4/24/96 8:35:55 AM
4/24/96 12:35:55 PM
4/24/96
100 Interp. Values Reported

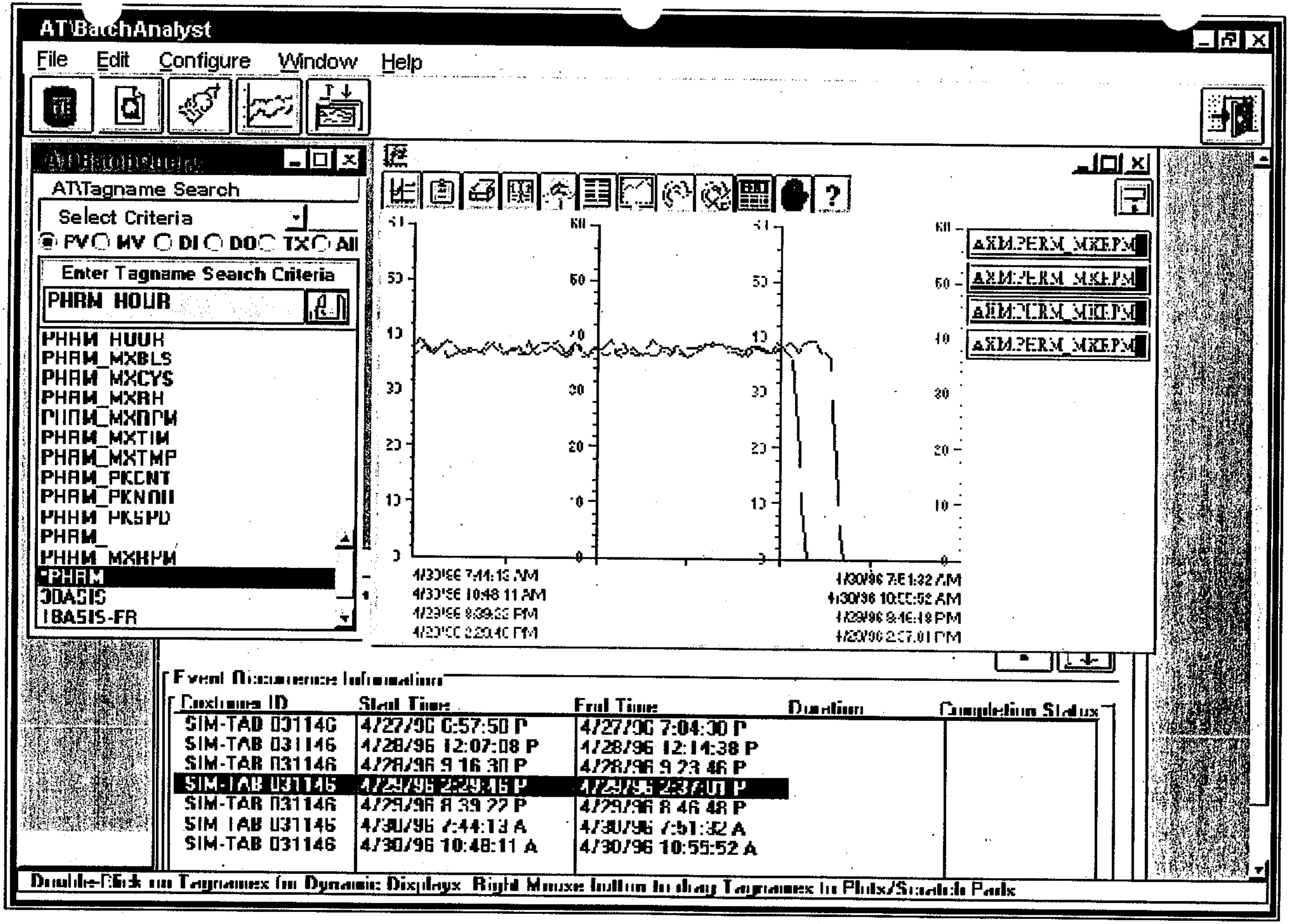
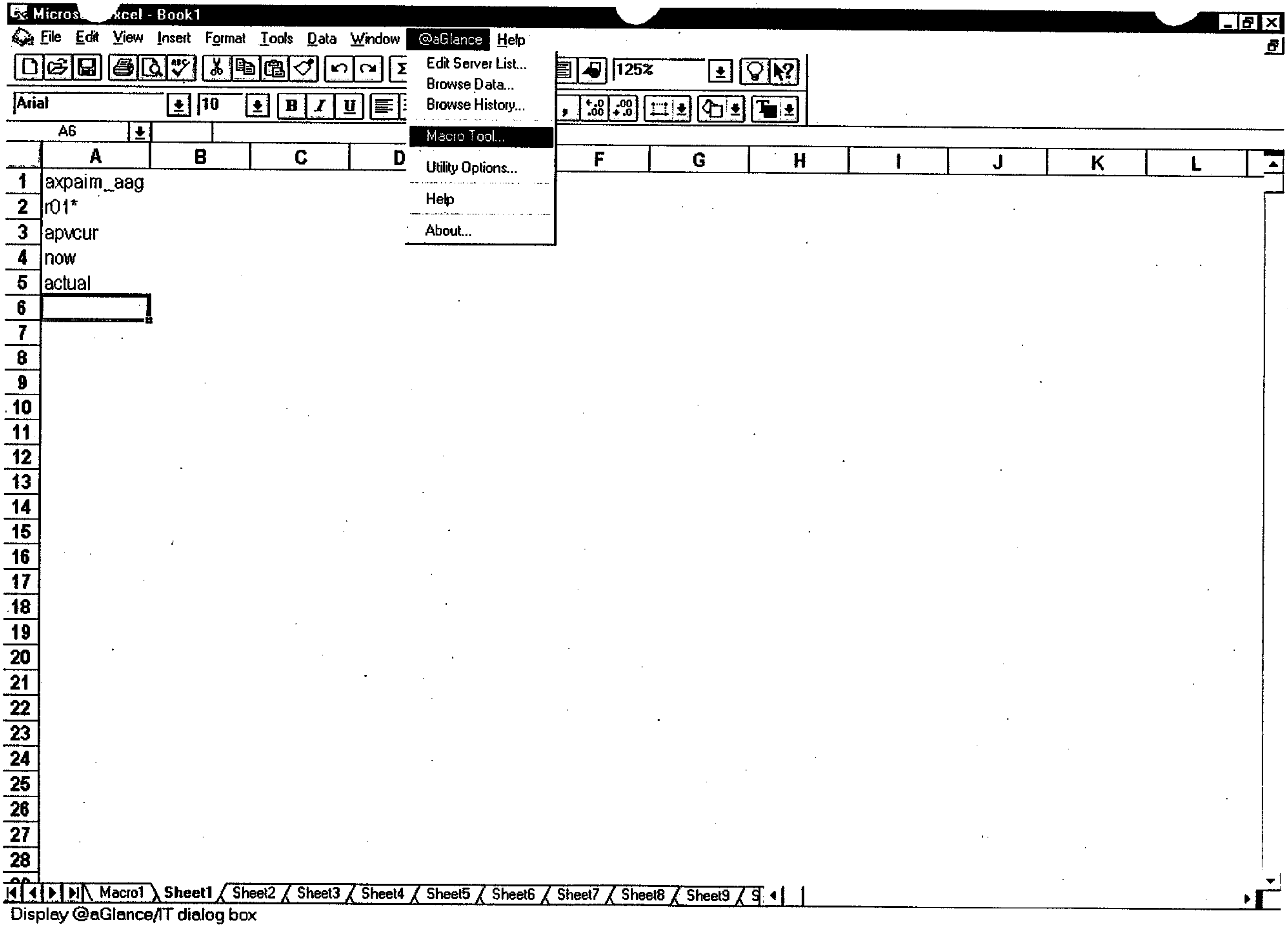

AT\BatchAnalyst
File Edit Configure Window Help
AT\Tagname Search
Select Criteria
PV MV DI DO TX All
Enter Tagname Search Criteria
PHRM HOUR
PHRM_MXBLS
PHRM_MXCYS
PHRM_MXRH
PHRM_MXTIM
PHRM_MXTMP
PHRM_PKCNT
PHRM_PKSPD
Event Occurrence Information
Start Time
End Time
Completion Status
SIM-TAB 031146
4/28/96 12:07:08 P
4/28/96 12:14:38 P
4/30/96 10:48:11 A
4/30/96 10:55:52 A

Figure 5


Micros... xcel - Book1
File Edit View Insert Format Tools Data Window @aGlance Help
Edit Server List...
Browse Data...
Browse History...
Macro Tool...
Utility Options...
Help
About...
125%
Arial
10
A6
axpaim_aag
r01*
apvcur
now
actual
Macro1
Sheet1
Sheet2
Sheet3
Sheet4
Sheet5
Sheet6
Sheet7
Sheet8
Sheet9
Display @aGlance/IT dialog box

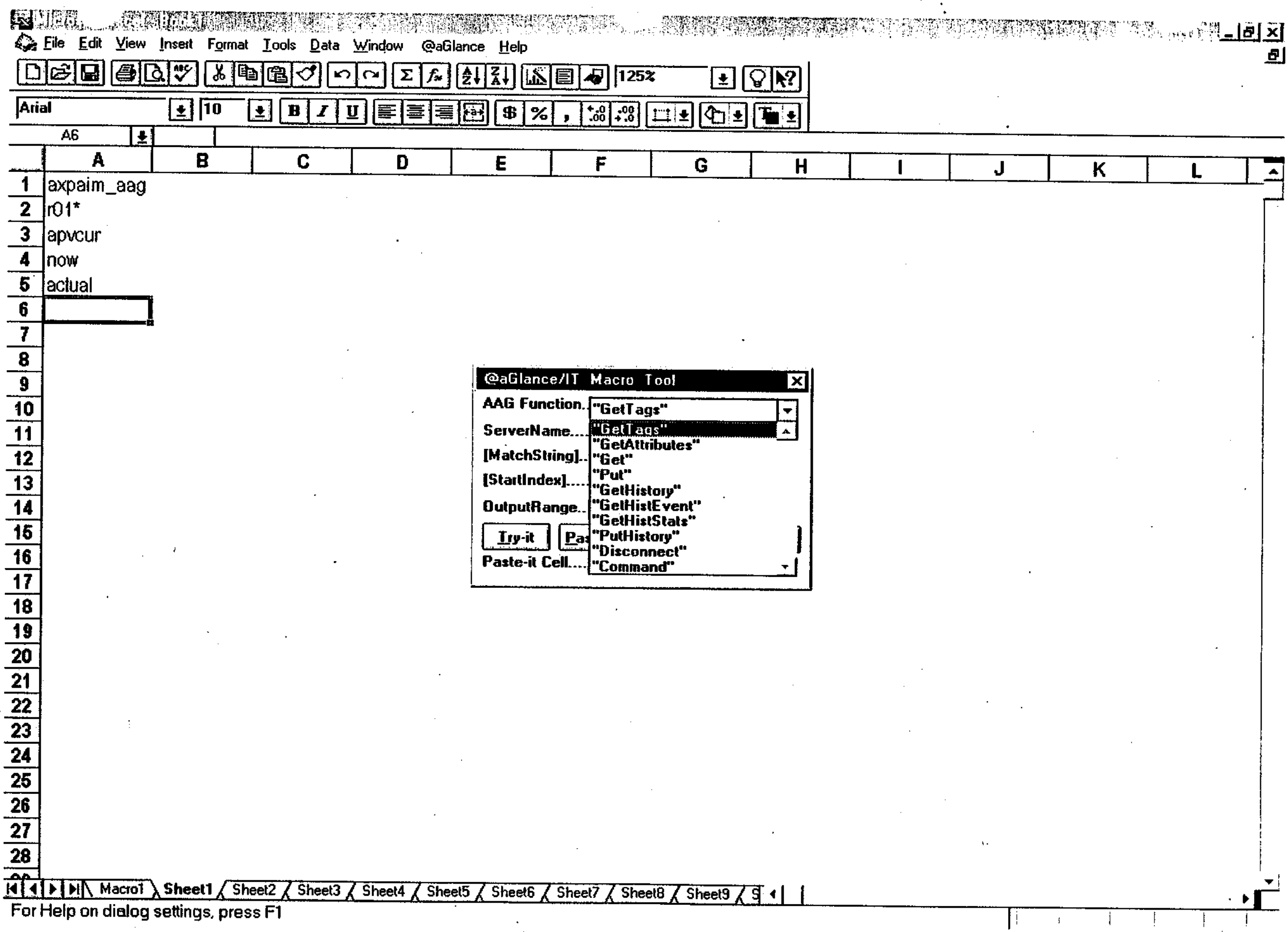

File Edit View Insert Format Tools Data Window @aGlance Help
125%
Arial
10
A6
A B C D E F G H I J K L
axpaim_aag
r01*
apvcur
now
actual
@aGlance/IT Macro Tool
AAG Function.
"GetTags"
ServerName....
[MatchString]..
[StartIndex].....
OutputRange..
Try-it
Paste-it Cell....
"GetTags"
"GetAttributes"
"Get"
"Put"
"GetHistory"
"GetHistEvent"
"GetHistStats"
"PutHistory"
"Disconnect"
"Command"
Macro1 Sheet1 Sheet2 Sheet3 Sheet4 Sheet5 Sheet6 Sheet7 Sheet8 Sheet9
For Help on dialog settings, press F1

 Figure 7

Micros cel - Book1

File Edit View Insert Format Tools Data Window @aGlance Help

Arial 10 125%

A6

	A	B	C	D	E	F	G	H	I	J	K	L
1	axpaim_aag		14.199999	7-NOV-1996	09:52:19							
2	r01*		16.200001	7-NOV-1996	09:52:24							
3	apvcur		16.200001	7-NOV-1996	09:54:24							
4	now		16.290359	7-NOV-1996	09:54:54							
5	actual		16.200001	7-NOV-1996	09:55:39							
6			16.554298	7-NOV-1996	09:57:14							
7	0		16.563427	7-NOV-1996	09:58:04							
8	R01A01$PV	6.8820343	28.200001	7-NOV-1996	09:58:14							
9	R01P01$PV	764.18982	34.199997	7-NOV-1996	09:58:19							
10	R01T01$PV	17.61298	39.199997	7-NOV-1996	09:58:24							
11	R01T01STD$PV	#N/A	39.290352	7-NOV-1996	09:58:54							
12	R01T02$PV	16.21627	69.199997	7-NOV-1996	09:59:19							
13	R01W01$PV	0	74.199997	7-NOV-1996	09:59:24							
14	R01X01$PV	0	74.317215	7-NOV-1996	10:00:09							
15	R01X02$PV	0	69.800003	7-NOV-1996	10:00:14							
16	R01X03$PV	0	45.799995	7-NOV-1996	10:00:34							
17	R01X04$PV	0	40.799995	7-NOV-1996	10:00:39							
18	R01X05$PV	0	40.817802	7-NOV-1996	10:01:29							
19			22.799999	7-NOV-1996	10:01:44							
20			17.799999	7-NOV-1996	10:01:49							
21			17.775681	7-NOV-1996	10:02:44							
22			17.559372	7-NOV-1996	10:03:39							
23			17.663254	7-NOV-1996	10:04:34							
24			22.200001	7-NOV-1996	10:04:39							
25			24.200001	7-NOV-1996	10:04:44							
26			24.305744	7-NOV-1996	10:06:34							
27			24.483608	7-NOV-1996	10:07:14							
28			19.799999	7-NOV-1996	10:07:19							

Macro1 Sheet1 Sheet2 Sheet3 Sheet4 Sheet5 Sheet6 Sheet7 Sheet8 Sheet9

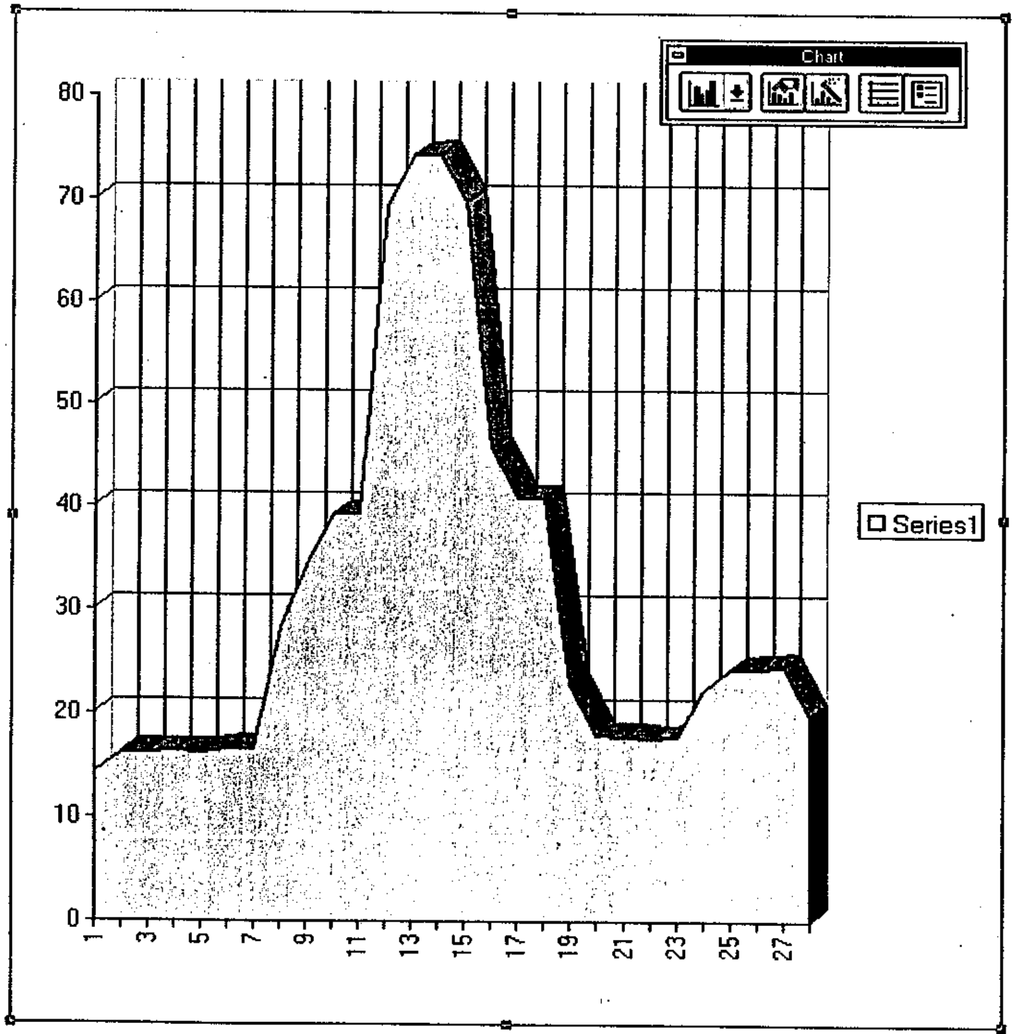
Ready

Microsoft Excel - Book1

File Edit View Insert Format Tools Data Window @aGlance Help

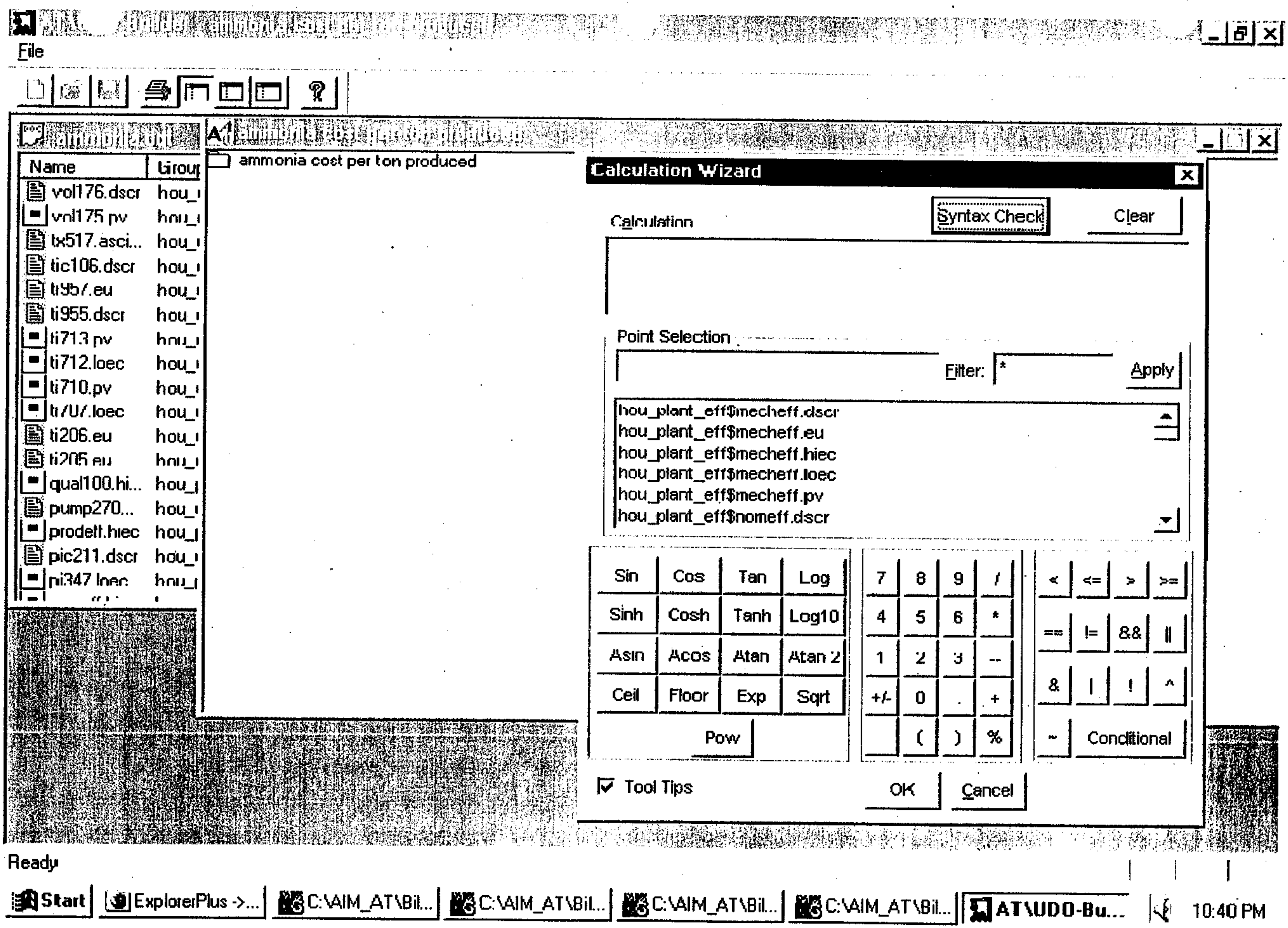
Chart 1

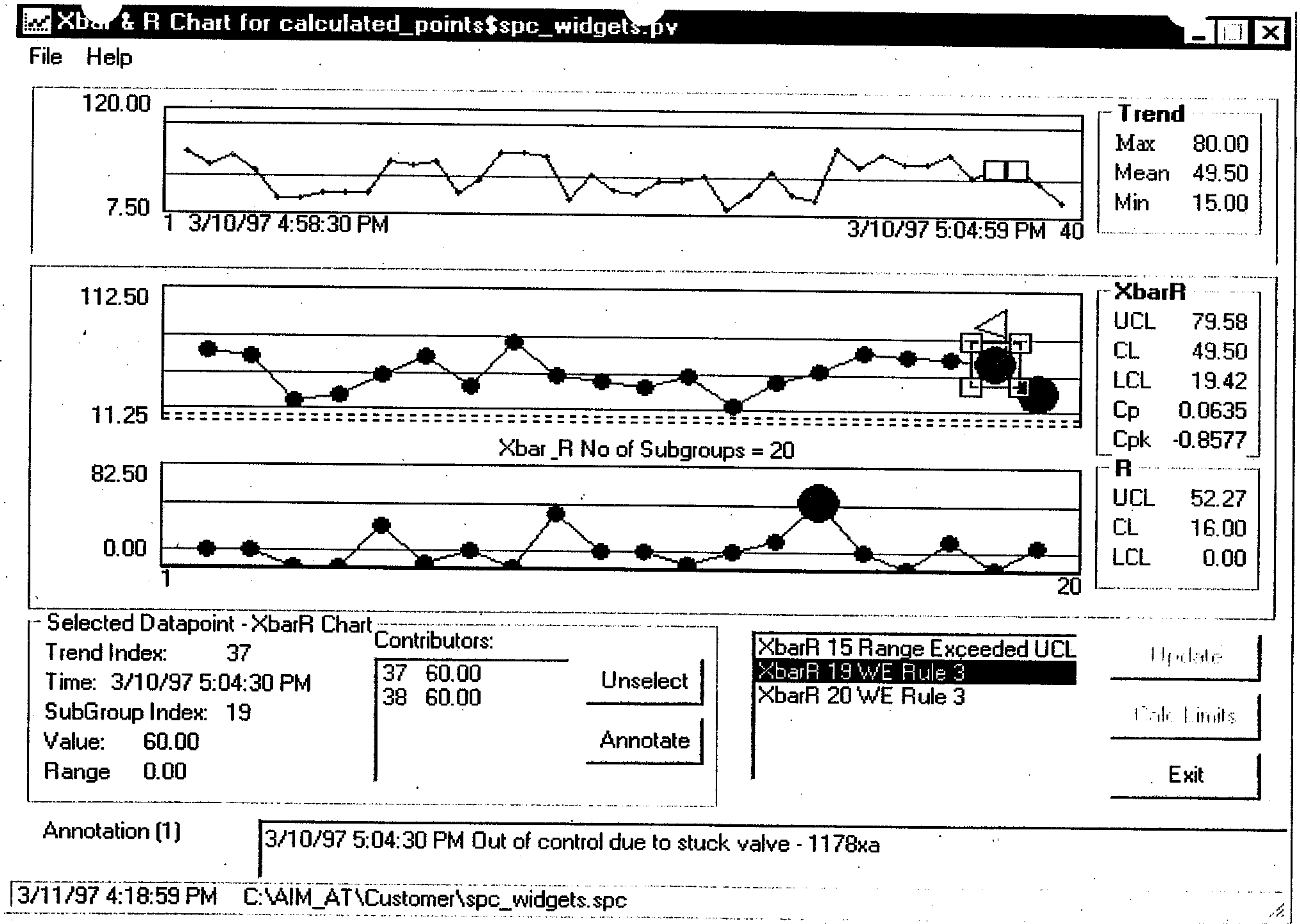
	A	B	C	D	E
1	axpaim_aag		14.199999	7-NOV-1996	09:52:19
2	r01*		16.200001	7-NOV-1996	09:52:24
3	apvcur		16.200001	7-NOV-1996	09:54:24
4	now		16.290359	7-NOV-1996	09:54:54
5	actual		16.200001	7-NOV-1996	09:55:39
6			16.554298	7-NOV-1996	09:57:14
7	0		16.563427	7-NOV-1996	09:58:04
8	R01A01$PV	6.8820343	28.200001	7-NOV-1996	09:58:14
9	R01P01$PV	764.18982	34.199997	7-NOV-1996	09:58:19
10	R01T01$PV	17.61298	39.199997	7-NOV-1996	09:58:24
11	R01T01STD$PV	#N/A	39.290352	7-NOV-1996	09:58:54
12	R01T02$PV	16.21627	69.199997	7-NOV-1996	09:59:19
13	R01W01$PV	0	74.199997	7-NOV-1996	09:59:24
14	R01X01$PV	0	74.317215	7-NOV-1996	10:00:09
15	R01X02$PV	0	69.800003	7-NOV-1996	10:00:14
16	R01X03$PV	0	45.799995	7-NOV-1996	10:00:34
17	R01X04$PV	0	40.799995	7-NOV-1996	10:00:39
18	R01X05$PV	0	40.817802	7-NOV-1996	10:01:29
19			22.799999	7-NOV-1996	10:01:44
20			17.799999	7-NOV-1996	10:01:49
21			17.775681	7-NOV-1996	10:02:44
22			17.559372	7-NOV-1996	10:03:39
23			17.663254	7-NOV-1996	10:04:34
24			22.200001	7-NOV-1996	10:04:39
25			24.200001	7-NOV-1996	10:04:44
26			24.305744	7-NOV-1996	10:06:34
27			24.483608	7-NOV-1996	10:07:14
28			19.799999	7-NOV-1996	10:07:19

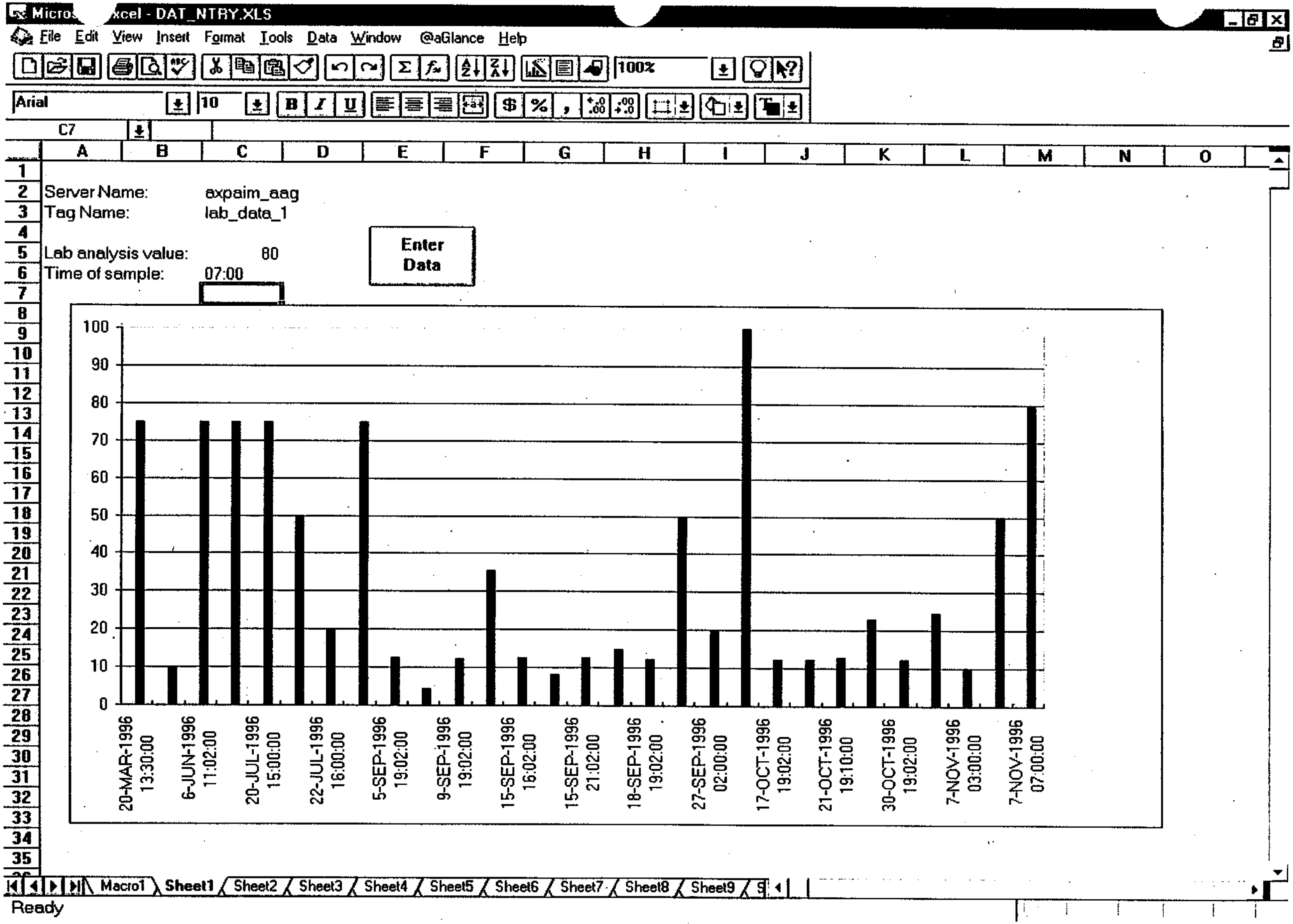


Macro1 / Sheet1 / Sheet2 / Sheet3 / Sheet4 / Sheet5 / Sheet6 / Sheet7 / Sheet8 / Sheet9

Double-click chart to edit


File
Name
Group
vol176.dscr
vol175.pv
tx517.asci...
tic106.dscr
ti955.dscr
ti713.pv
ti712.loec
ti710.pv
ti206.eu
ti205.eu
qual100.hi...
pump270...
prodeff.hiec
pic211.dscr
ammonia cost per ton produced
Calculation Wizard
Calculation
Syntax Check
Clear
Point Selection
Filter: *
Apply
hou_plant_eff$mecheff.dscr
hou_plant_eff$mecheff.eu
hou_plant_eff$mecheff.hiec
hou_plant_eff$mecheff.loec
hou_plant_eff$mecheff.pv
hou_plant_eff$nomeff.dscr
Sin Cos Tan Log
Sinh Cosh Tanh Log10
Asin Acos Atan Atan 2
Ceil Floor Exp Sqrt
Pow
7 8 9 /
4 5 6 *
1 2 3 --
+/- 0 . +
( ) %
< <= > >=
== != && ||
& | ! ^
~ Conditional
Tool Tips
OK
Cancel
Ready
Start
ExplorerPlus ->...
C:\AIM_AT\Bil...
C:\AIM_AT\Bil...
C:\AIM_AT\Bil...
C:\AIM_AT\Bil...
AT\UDO-Bu...
10:40 PM


Xbar & R Chart for calculated_points$spc_widgets.pv
File Help
120.00
7.50
1 3/10/97 4:58:30 PM
3/10/97 5:04:59 PM 40
Trend
Max 80.00
Mean 49.50
Min 15.00
112.50
11.25
Xbar_R No of Subgroups = 20
82.50
0.00
1
20
XbarR
UCL 79.58
CL 49.50
LCL 19.42
Cp 0.0635
Cpk -0.8577
R
UCL 52.27
CL 16.00
LCL 0.00
Selected Datapoint - XbarR Chart
Trend Index: 37
Time: 3/10/97 5:04:30 PM
SubGroup Index: 19
Value: 60.00
Range 0.00
Contributors:
37 60.00
38 60.00
Unselect
Annotate
XbarR 15 Range Exceeded UCL
XbarR 19 WE Rule 3
XbarR 20 WE Rule 3
Exit
Annotation (1)
3/10/97 5:04:30 PM Out of control due to stuck valve - 1178xa
3/11/97 4:18:59 PM C:\AIM_AT\Customer\spc_widgets.spc


Micros... xcel - DAT_NTRY.XLS
File Edit View Insert Format Tools Data Window @aGlance Help
100%
Arial
10
C7
Server Name: axpaim_aag
Tag Name: lab_data_1
Lab analysis value: 80
Time of sample: 07:00
Enter Data
100
90
80
70
60
50
40
30
20
10
0
20-MAR-1996 13:30:00
6-JUN-1996 11:02:00
20-JUL-1996 15:00:00
22-JUL-1996 16:00:00
5-SEP-1996 19:02:00
9-SEP-1996 19:02:00
15-SEP-1996 16:02:00
15-SEP-1996 21:02:00
18-SEP-1996 19:02:00
27-SEP-1996 02:00:00
17-OCT-1996 19:02:00
21-OCT-1996 19:10:00
30-OCT-1996 19:02:00
7-NOV-1996 03:00:00
7-NOV-1996 07:00:00
Macro1 Sheet1 Sheet2 Sheet3 Sheet4 Sheet5 Sheet6 Sheet7 Sheet8 Sheet9
Ready

AT essCommander

File Summary Analysis Reports Graphics Window Help

Emission Report

NOx Excess Emission Report

Company Name: XYZ AMMONIA Company

Reporting Period: 1996

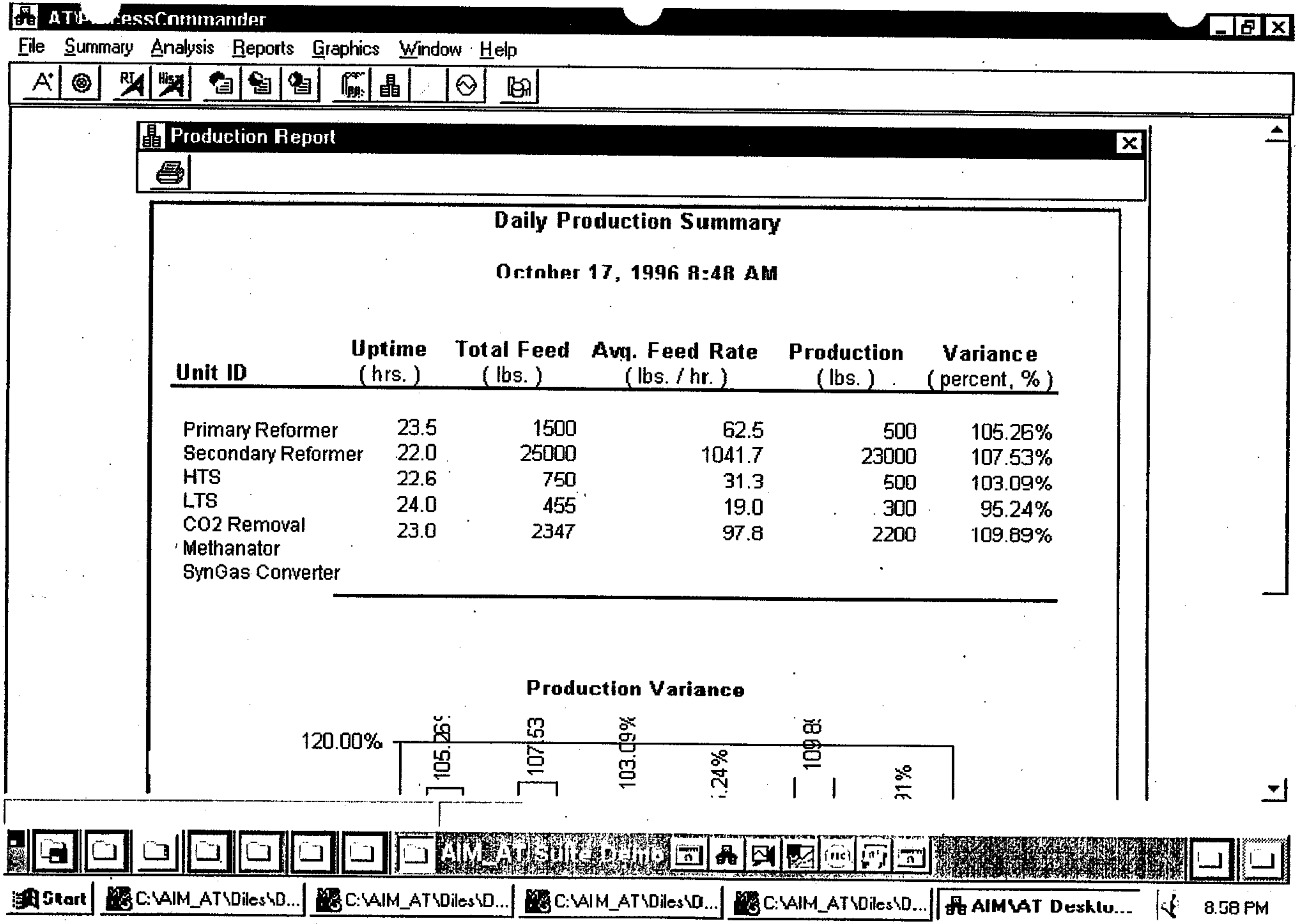
Unit Description: Natural Gas Fired Turbine
Emission Limit: 83.9 lb/hr

Texas Permit No.

Excess Begin Date Time	Excess Ended Date Time	Magnitude of Excess Emissions, lb/hr	Turbine Load MW (average)	Fuel Usage, mmbtu/hr	Problem Description	Action Taken
6/24/96 10:00	6/24/96 13:00	121	1321		Routine S/U	None
7/21/96 5:00	7/21/96 7:00	88	1450		Cycle Gas Interrupt.	Red. RPM
0/3/96 12:00	0/3/96 16:00	5	1400		Mon. Detector Fail.	Replaced Det.

Start | C:\AIM_AT\Diles\D... | C:\AIM_AT\Diles\D... | C:\AIM_AT\Diles\D... | C:\AIM_AT\Diles\D... | AIM\AT Desktu... | 10:03 PM

Figure 13



Daily Production Summary

October 17, 1996 8:48 AM

Unit ID	Uptime (hrs.)	Total Feed (lbs.)	Avg. Feed Rate (lbs. / hr.)	Production (lbs.)	Variance (percent, %)
Primary Reformer	23.5	1500	62.5	500	105.26%
Secondary Reformer	22.0	25000	1041.7	23000	107.53%
HTS	22.6	750	31.3	500	103.09%
LTS	24.0	455	19.0	300	95.24%
CO2 Removal	23.0	2347	97.8	2200	109.89%
Methanator					
SynGas Converter					

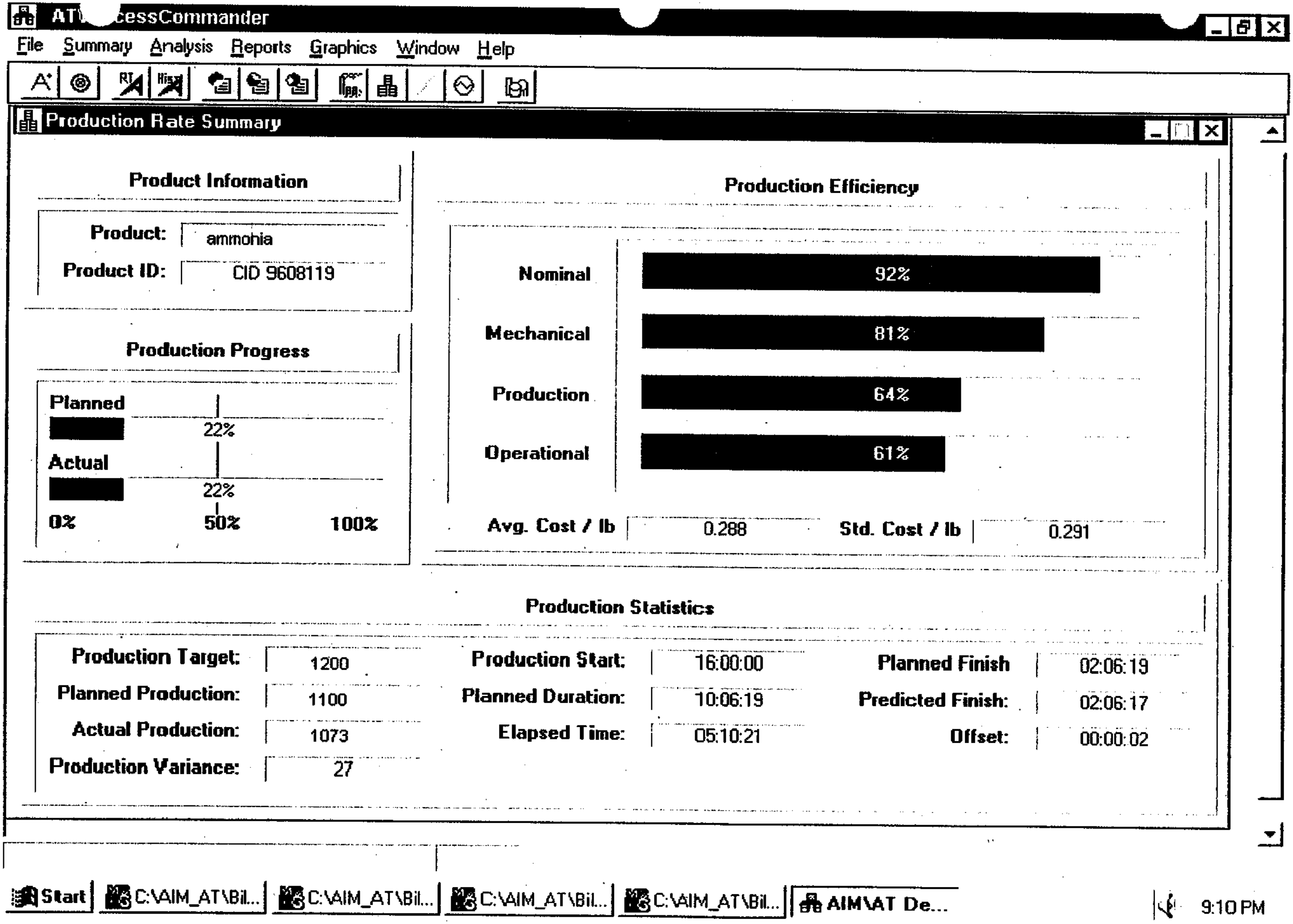

AT cessCommander
File Summary Analysis Reports Graphics Window Help
Production Rate Summary
Product Information
Product: ammohia
Product ID: CID 9608119
Production Progress
Planned
22%
Actual
22%
0% 50% 100%
Production Efficiency
Nominal 92%
Mechanical 81%
Production 64%
Operational 61%
Avg. Cost / lb 0.288
Std. Cost / lb 0.291
Production Statistics
Production Target: 1200
Planned Production: 1100
Actual Production: 1073
Production Variance: 27
Production Start: 16:00:00
Planned Duration: 10:06:19
Elapsed Time: 05:10:21
Planned Finish 02:06:19
Predicted Finish: 02:06:17
Offset: 00:00:02
Start
C:\AIM_AT\Bil...
C:\AIM_AT\Bil...
C:\AIM_AT\Bil...
C:\AIM_AT\Bil...
AIM\AT De...
9:10 PM

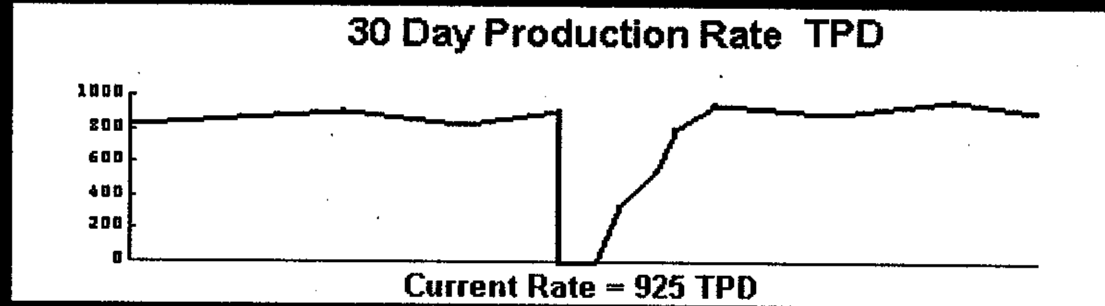
Figure 15

Biles & Associates ActiveX Technology - Microsoft Internet Explorer

File Edit View Go Favorites Help

Address http://wrb.biles.com/InternalProjects/ActiveX/AIMactx2.htm Links

XYZ AMMONIA Company - Baton Rouge Plant



arizona$point4.pv	600	conneticut$point9.pv1	1
florida$point12.pv	1	conneticut$point9.pv2	0
hawaii$point14.pv	62	conneticut$point9.pv3	0
kentucky$fic-290$pv	0	conneticut$point9.pv4	0
louisiana$mic-290$pv	0	maryland$ttic-201.pv	82.5
mississippi$pic016-425.pv	33	missouri$mic016-425.pv	461
nebraska$tic016-383.pv	280	new_york$point54.pv	1287.5

More - >

Shortcut to ATPic.htm