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Department of Energy

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Richland Operations Office
P.O. Box 550
Richland, Washington 99352

FEB 02 1995



PMDA-95-018

President
Westinghouse Hanford Company
Richland, Washington

Dear Sir:

PROJECT C-018, 242-A EVAPORATOR/PUREX PLANT CONDENSATE TREATMENT FACILITY,
INDEPENDENT ASSESSMENT OF THE MONITORING AND CONTROL SYSTEM.

An Independent Assessment by a consultant evaluated the workability of the Monitor and Control System (MCS) as installed in the field. The completed assessment was shared with WHC December 20, 1994. The assessment left several items open to be reviewed at a later date. Enclosed is a follow up report discussing the items relative to the MCS. The report is specific to point out several potential discrepancies between the Functional Design Criteria WHC-SD-C018-FDC-001, Rev. 1, the Performance Specification V-C018HC1-001, and the ADTECHS/Micon MCS as configured in the facility. Particular examples of the discrepancies discussed in the report are:

- 1) Barrier termination types are not provided in the Local Control Unit (LCU) for all input/output (I/O) points.
- 2) The MCS performance parameters not verified, i.e. measurement of the LCU to LCU response time, Operating Control System (OCS) to LCU response time, graphic time update, and control time update.
- 3) Graphics are not verified fail safe relative to Air operated valves.
- 4) Graphic density is excessive, over 500 tags on displays and is too dense for normal operator control.

WHC is requested to review the primary items A1, A2, A3, B1, & B2 listed in the report as a minimum and provide a response to the potential discrepancies relative to the Performance Specification and the Functional Requirements of the MCS.

Further, the report throughout recommends conducting an MCS Acceptance Test Procedure (ATP) to ensure completeness. A review conducted by PMD of the Performance Specification, Section 01650 presents several potential discrepancies relative to ATP testing of the software. The Performance Specification, 01650, ATP Scope Section 3.2.4 provides for insurance that all software, equipment, and modules function correctly as a system and verifies



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that all software, equipment and systems operate as intended by the design. It appears that the existing ATP configuration may not provide for a software functionality, verification of software design, and system operations for the integrated plant.

This is critical in that the operating philosophy is for full automation, and failure to test such a key element may have cost and schedule impacts. Thus, WHC is secondly requested to review the Performance Specification 01650 ATP relative to ADTECHS MCS ATP configuration, and provide a response to address all potential discrepancies relative to the Performance Specification 01650, Section 3.2.4.

The need to resolve these potential items is critical and WHC responses are required prior to February 10, 1995. If you have any questions, feel free to contact Mr. George Dragseth at 372-0750.

Sincerely,



Wu Chin, Acting Director
Project Management Division

PMD: GD

Enclosure

cc w/encl:
G. W. Jackson, WHC/PSS
J. R. Kelly, WHC/TWP

9513336.0657

DON'T SAY IT --- Write It!

DATE: January 26, 1995

TO: George Dragseth B1-42FROM: H.S. Robbers B1-42Telephone: 946-3705

cc:

SUBJECT: ITA problem Item Review

Attached to this cover sheet is the summary report of the review of the Independent Technical Assessment (ITA) of the Monitoring and Control System (MCS) items. This report completes the work scope tasks for evaluation of the ITA technical issues relating to the MCS capabilities and items to be addressed before Hot Operations.

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1.0 SCOPE

This document provides an analysis and recommendations for resolving the problem items discovered during the Independent Technical Assessment (ITA) of the Project C-018H, Effluent Treatment Facility (ETF), Monitoring and Control System (MCS).

The ITA reviewed the Performance Specification requirements for the MCS and compared the requirements to the present as-built design provided by ADTECHS, the design-build contractor. This evaluation included an overview of the design criteria specified, an identification of the current as-built design, and an analysis of the differences based upon direct observation, and discussions and documentation provided by the Department of Energy, Richland Operations Office (RL), Westinghouse Hanford Company (WHC), ICF-Kaiser Hanford (ICF-KH), ADTECHS, and MICON.

2.0 SCOPE OF WORK

The objective of this assessment is to review the problems identified in the ITA and develop a plan to minimize the impact of the perceived problems on the Plant start-up and operations.

2.1 REVIEW ITA OPEN ITEMS

Review and expand the details of the recommendations and open items discovered during the Independent Technical Review (ITR) Work Scope Items 1 - 4 in the areas identified below:

- A. Retrieve and itemize problems and recommendations specifically defined in the ITR. (1/20/94)
- B. Retrieve MCS items from ATP review and quantify into identifiable items. (1/20/94)
- C. Retrieve MCS concerns from operations and quantify concerns into identifiable items (1/27/94).
- D. Retrieve open items from MCS testing and quantify into identifiable items (1/27/94).

2.2 PROVIDE A REPORT FOR RESOLUTION OF PROBLEMS FOUND

Provide a report detailing the following for each item of task 5 identified. (preliminary by 2/15/95, draft: 2/20/95, final: 2/24/95)

- A. Description of the open item.
- B. Description of the item's impact on the project completion. This description shall include concerns on impact related to operability, ATP/OTP functions, hot operations, schedule, and functional need.

- C. Recommendation for resolution of the item
- D. Classification and prioritization of the items recommended for implementation.

2.3 ATP REVIEW

Review a sample of completed ATPs to determine if any MCS related control functions may have potential and include those items with the items from section 2.1 items. Review the Primary and Secondary Train ATPs for performance measurements and potential MCS impact. A review of OTPs is not possible due to none have been available before Jan 20,1995.

3.0 METHODOLOGY

This section describes the approach used to determine what items to review and the importance of that item in the report. Each task and sub-task identified in section 2.0 required some processes to make an evaluation. Each process used is identified here for clarification.

3.1 RETRIEVE ITA ITEMS

Retrieve and itemize problems and recommendations specifically defined in the ITR. The ITA document (primarily sections 5, 4,3.2 and 3.3) was reviewed for identification of initial items to be added to the database. The database consists of the contents defined in the Database Definition section.

3.2 RETRIEVE WHC ATP REVIEW ITEMS

Retrieve MCS items from ATP review and quantify into identifiable items. These items are documented in the form of information requests. These information requests are added only when the content is needed to determine a specific MCS need or requirement.

3.3 RETRIEVE OPERATIONS CONCERNS

Retrieve MCS concerns from operations and quantify concerns into identifiable items. A number of comments and questions have been documented in Operations relating to the MCS System performance and the capability of the MCS to provide the control functions necessary for proper operation. Discussions with COG engineers and operation personnel will be held to identify these items and classify them. The intent is to get a heads up review of the need before Hot operations turn over and thus reduce the impact of transition.

3.4 RETRIEVE TEST ITEMS

Retrieve open items from MCS testing and quantify into identifiable items. Some key test problems are identified in the ATP status report provided weekly by

ADTECHS. Some of these items will affect test criteria and impact system functional performance measurement. These items and notes from the testing interviews will be added to the item list.

3.5 OPEN ITEM DATABASE DEVELOPMENT

The report for the identification and classification of open items will be stored in a database until the final report is generated. The database standard chosen is Paradox ver 4.02 which is presumed to be a Hanford Site standard (recommended by Liz Bibb and Mike Coates). Outputs of this database will be maintained in dBASE III and Lotus 123 formats for manipulation in various documents. The fields of the database are defined from the report requirements and selection functions required to produce the desired outputs. The database will go through three planned expansions:

- Initial setup
- Classification modifications
- Final report restructuring.

The modifications and final database structure are documented in Appendix C "Database Definition"

4.0 ANALYSIS

The resolution of the items identified will allow the MCS to perform the functional requirements specified and support the ETF operations. The complete list of items is contained in the Paradox data file MCSITM.DB and a table of the contents is attached as Appendix A. This analysis details the items associated with getting the Plant through the OTP effort and ready for Hot Operations. The Classification codes are defined in Appendix C. Those items classified as A1, A2, A3, or B1 (action required before ATP completion "An" or before OTP completion "Bn") are reviewed in this section.

The description of the Item as it appears in the database is provided at the beginning of the discussion for information only. The contents of the data file may be slightly altered due to field size limits, or reporting functions.

4.1 ITA4.3.1

Item Id.	Classification	Description
ITA4.3.1	A1	1 LCU I/O termination -not barrier type terminals
		Impact: Maintenance, repair and modification time
		Recommended Action: enforce spec (see 3.2.9) or determine authorization
		References: ITA 4.3.1 & 3.2.9

The Project Construction Specification (V-C018HC1-001 section 13460) specifies the Local Control Unit (LCU) termination be barrier type terminations for all I/O. This is interpreted to require a termination point for each I/O connection in the LCU (including spares). Generally, some sort of barrier termination is mounted in an area away from the backplane which allows the termination of field cables without adding additional wires to the backplane.

This requirement should be implemented. It has been implemented on the remote I/O used for one of the skids who purchased the equipment as a part of their control equipment supplied with the skid. The reason why this requirement has not been implemented before this time is unknown.

If the terminations are accepted as is, the equipment will work but the effort to modify the I/O will be significant when the proposed changes in this program are implemented.

4.2 ATP002

Item Id.	Classification	Description
ATP002	A1	10 MCS performance parameters not verified
		Impact: System limits unknown spec not measured
		Recommended Action: ADTECHS provide test or calc proof Div 13 spec met
		References: C018H 13460 (all) ITA 3.2.4 IR 95-01-002

The overall performance parameters specified in V-C018HC1-001 section 13460 paragraphs 1.3.3 (and others) are not proven by the content of the ATPs as presently written. These tests need to be done when the whole system is operating and the maximum data load is being applied within the limits specified. Most of the requirements will require calculations from measured data. Final acceptance of the MCS must require the proof of operation at the limits specified.

Specific items for which measurements are needed include:

- LCU to LCU response
- LCU to OCS response
- OCS to LCU response
- EWS to LCU, OCS response
- Graphic update time
- Control update time
- Printout response times (for both loggers and color printer)

It is recommended that the information be provided by ADTECHS prior to closeout of the ATPs. ADTECHS may wish to perform an additional ATP to backup the proof but if ADTECHS has another way that is acceptable as long as the measurements required are provided.

4.3 ITA4.3.3A

Item Id.---- Classification- Description-----
 ITA4.3.3a A1 15 Tags - ATP test of maximum/min performance
 criteria

Impact: Performance Failure, OTP test failure & added delay

Recommended Action: review w/ ADTECHS to determine test measurements

References: ITA 4.3.3, 3.2.5 IR 95-01-002

The System capacity requirements for TAGs in the V-C018HC1-001 sections 13460, 1010, and 1040) specification require the capabilities of the system to include 200 trend points, storage requirements for these trend points and logging of tag data for alarms, trend data, etc. No measurement or proof of performance has been established for the ability of the system to support these items. The proof must be supplied by ADTECHS.

4.4 ITA4.4.2c

Item Id.---- Classification- Description-----
 ITA4.4.2c A1 20 Open Micon Items - U-32 availability

Impact: Schedule delays, operations delays

Recommended Action: Setup test program and qualification of spares

References: ITA 4.4.2& ATP Status - Micon Problem

The U-32 problem as identified in the ATP Status report requires special testing of units supplied by MICON in order to get units that will work in the existing system. The additional test is not confirmed by MICON as being required but the number of failures reported by ADTECHS makes this a concern. The existing spares purchased by Operations have not been tested in this "environment" and no method for guaranteeing the spares will work when needed has been established. It is recommended that the procedures now being used by ADTECHS be documented and developed for qualifying all U-32 spares to be associated with this project. An approach would be to test replacement cards at the next shutdown after receipt and placing the older module removed for the test in the spares inventory. This insures the newer boards get tested before their warranty runs out and that a "good" spare is available when a failure occurs.

4.5 ITA4.4.2D

Item Id. --- Classification- Description-----
 ITA4.4.2d A1 30 LOI interface requirement except operator usability
 Impact: failure to perform will affect operator performance
 Recommended Action: establish LOI interface standard
 References: ITA 3.2.1,4.4.2

The Local Operator Interface (LOI) as provided by MICON was intended to be used in the event the Operator Control Station (OCS) failed and control must be performed at the Local Control Unit (LCU). The LOI requirements per the specification state the LOI must not require programming experience to operate and all functions controlled by the LCU must be able to be controlled by an operator at the LOI.

No information has been available on the ATP testing of the LOI. In addition, observations of the LOI operation has developed a concern that the LOI will require detailed knowledge of the MCS in order to control the associated processes. An interface standard (operating procedure and rules for operating the LOI is needed to assure the ADTECHS design meets the intent of the specification.

4.6 ATP001

Item Id.---- Classification- Description-----
 ATP001 A1 50 Graphics not verified fail safe
 Impact: Flow lines & valves show partial open as closed
 Recommended Action: Change logic to use valve closed position switch
 References: Section 1010 1.5.8.3
 Notes: example H2-89915 sht 2 (AOV-60A054)

The Logic diagrams provided in the Control Manual show all AOV (Air Operated Valves) having the graphics associated with the "Open" position switch. In the event of a valve control failure and/or the valve remains partially open, this would provide a closed indication at the OCS. This is not acceptable per V-C018HC1-001 section 1010 paragraph 1.5.8.3. The fail-safe nature of the control should use, at minimum, the "Closed" position switch to indicate closed. Standard practice would be to use a color scheme to support "Open", "Partially open", "Signal loss", and "Closed". The multi-color requirement is not specified in the specification directly and may not be required of ADTECHS. The requirement not met only requires that the equipment display shows the fail-safe condition. This is also true of the MCC equipment (Pumps, motors, etc) and other valves with control interfaces.

Recommended action is to direct ADTECHS to provide Proof through verification or test of the Graphic displays have the proper operation. In our interviews we were given the impression that Graphic operation problems have been noted separately by ADTECHS and not considered as a limiting item for proper ATP operation and acceptance by the AI and COG witnesses. This makes the tests performed before 27 Jan, 1995, invalid for proof of proper graphic operation per V-C018HC1-001 Section 01650 paragraph 3.2.4.

A change in procedure as far as the ATP witness function is required if any ATP tests are to be acceptable for confirming MCS operation. Confirmation of Graphic Displays reviewed and identification of anomalies in these screens must be included in the test report. If only a portion of a screen is involved in the test, the portion must be identified. Then before the ATP program is accepted, this information must be reviewed and a determination made for whether all of the screen portions have operated as required and display the equipment in a fail-safe manner.

4.7 ITA4.4.2B

Item Id.---- Classification- Description-----

ITA4.4.2b A1 99 Open Micon Prob - gen

(Completed)

Impact: schedule time lost

Recommended Action: check items for impact- add items needed

References: ITA 4.4.2

The item has been performed by the ITA team and is now completed. This item was an interim item from the ITA to provide identification of other problems controlled by ADTECHS. ADTECHS provides a weekly status report and punch list of open items they are resolving as the testing proceeds. Some of these items have impact on the MCS operability and identify potential areas of concern relating to Micon operation. Discussions with ADTECHS and MICON have confirmed the problem areas and additional items were added. Each of these items use the Item ID prefix ATP.

4.8 ITA5.2.2B

Item Id.---- Classification- Description-----

ITA5.2.2b A1 99 Logic Changes Review Engineering list

(completed)

Impact: system performance and operator response

Recommended Action: break out items and add to list

References: ITA 5.2.2, 5.2.3, 5.2.4

The item has been performed by the ITA team and is now completed. This item was an interim item from the ITA to provide identification of other problems found by Operations during the design review processes which were not transferred as concerns for the system functional operation from Kaiser to ADTECHS. Notes from meeting minutes, mail messages, reports and interviews were collected and summarized during this task. Some of these items have impact on the MCS operability and identify potential areas of concern relating to Micon operation. The items developed from the summarization were added to the list based on the review and summarization effort. These items use the Item ID prefix ATP or in some cases are already included in other ITA prefixed items.

4.9 ITA3.2.7

Item Id.	Classification	Description
ITA3.2.7	A2	Control Logic Philosophy change
		Impact: reduce RAM usage U-32s&RCM by using MICON modules
		Recommended Action: revise Control Spec and make changes in logic
		References: ITA3.2.7, 3.3.1

The current logic structure of the MCS is based upon a centralized control philosophy applied to a decentralized control system. This approach caused the logic software and the hardware to be configured in a manner which increases the logic overhead required to control devices in the systems. The first step in correcting this problem is to develop a plan on how to change the control philosophy. The remaining steps would then be to implement the changes in hardware and software on a selected basis as needed.

This item is identified as a need since it is not required for the ATP completion. The effort is needed in order to support another item that may be needed prior to the OTP completion.

The Control Logic plan must address the following:

Identification of the generic changes required for each logic structure in the areas identified below:

- Valve Control
- Motor Control Center (MCC) Control
- System Interlocking Logic and permissive

Use of MICON constructs and control blocks in place of current structures.

Hardware modifications required, broken into system, area, and location (both functional and physical) to support control optimization.

Graphic Logic changes required to support control logic.

The recommendation is to proceed with development of the plan in order to be able to support potential startup problems in system operations. Note this does not reflect a change in the ITA conclusion that the ADTECHS version of the system will be able to perform its function. The ADTECHS System will perform the control functions but only when everything is working perfectly. Anomalies which impact a system interlock, will cause the system to shutdown.

4.10 ITA4.4.2A

Item Id. --- Classification- Description-----
 ITA4.4.2a A3 ATP completion measurement
 Impact: ATP status unknown affects schedule measurement
 Recommended Action: Weighted percent complete
 References: ITA 4.4.2

The current ATP status report provided by ADTECHS does not provide a consistent percent complete measurement. The reason is that the various ATPs are of different sizes and importance in the goal to complete the whole ATP process. A weighted percent complete spreadsheet has been developed and recommended for use in evaluating the real ATP closure effort based upon the status supplied by ADTECHS. The spreadsheet is currently in LOTUS 1-2-3 version 2.1 but can be controlled or processed using LOTUS, EXCEL, or other spreadsheets which can import LOTUS 1-2-3 ver 2.1 data files. This spreadsheet is detailed in Appendix B.

4.11 ATP006

Item Id. --- Classification- Description-----
 ATP006 B1 Main Train permissions (auto/Man) complex
 Impact: limit automatic/manual operations, excessive trips
 Recommended Action: review/restructure to support operations

A review of the main treatment train permissions for Auto/Manual operation showed the system interlocks were so fail-safe that manual operation of some systems like the 1st RO or the 2nd RO to compensate for equipment problems could not be done.

This item is recommending a review of this problem which is a continuation of the A2 item (ITA3.2.7) and a decision be made on what is needed to complete the startup process. Some limited modification of the logic is expected but the decision must be made first. recommend change item for startup.

4.12 ATP004

Item Id.--- Classification- Description-----
 ATP004 B1 UV Ox TI-545 Modbus Interface
 Impact: Current mode loads buffers, limits Micon
 Recommended Action: Evaluate changing interface to bi-directional handshake

The MODBUS interface of the UV-Ox system is setup in such a way as that the U-32 modules cannot support uploads, downloads, compile or other non-control functions without physical disconnect of the MODBUS connection. This problem was identified by ADTECHS who determined that when the system is running, the need for this function is minimized and therefore it is an anomaly not a problem. The Problem in my experience will affect operations at the worst time, when something needs to be fixed in a hurry to support system operation. At this time, an evaluation (testing) would be needed to determine the impact of this item and decide whether changing to a MICON based controller or modifying the handshake functions or control logic actions would be appropriate.

4.13 ITA5.2.1D

Item Id.---- Classification- Description-----
 ITA5.2.1d B2 Graphic I/O Graphic density
 Impact: Operator ability to read display
 Recommended Action: modify selected displays
 References: ITA 4.2.4.3

The 1st RO graphic display has over 500 tags on the display and is too dense for normal operator control. This screen must be split and additional screens developed to support startup operation. If the existing screen is used, the operator will have problems determining control actions, and performing controlled startup or shutdown operations. This would have no impact on Automatic functions only manual operations. Other displays are also dense and may benefit from the same simplification. These screens would be a desire. see item ITA5.2.1b.

The only displays needing review at this time are the 1st RO and the Polisher screens. Modification of the 1st RO is recommended for the reasons stated above.

4.14 ITA4.3.2A

Item Id.---- Classification- Description-----
 ITA4.3.2a B2 Expansion Capabilities-U-32
 Impact: unable to use spare I/O
 Recommended Action: review U-32 storage and RAM usage on each LCU
 References: ITA 4.3.2.3.2.6.& 3.3.2

Memory Usage reduction is needed to support utilization of spare I/O and additional logic. This item is a continuation of item ITA3.2.7. One of the items in that plan is to simplify the control logic. This has the potential of reducing the valve control logic alone to 70% of the current usage for the same logic functions.

The recommendation is to evaluate all of the U-32 modules and implement the logic reduction where memory usage exceeds 60K.

4.15 THE REMAINING ITEMS

The Item data file contains 35 items. The A1, A2, A3, and B1 classified items have been described in detail in the proceeding portion of this section. The other items identified have a classification of B2, B3, C1, C2, C3, D1, D2, or D3. This makes these items not important to the completion and turnover of the plant. The classification of the items in Appendix A is defined in Appendix C and further refined for this analysis as follows:

- A1 Action/decision required before completion of ATPs
- A2 A need exists which should be decided before ATP completion
- A3 This item is for information relating to the ATP process.

- B1 Action/ decision required before completion of OTPs
- B2 A need exists or a potential problem may occur which should be decided before OTP completion
- B3 These items are needed not for operation of the plant but may make the plant operate "better" and a decision should be made before completing the OTPs have completed.

- C1 Action required but it may delayed until operations have started.
- C2 A need exists or a potential problem may occur which can be implemented during plant operations.
- C3 These items are not needed for operation of the plant but may make the plant operate "better" and they can be implemented during plant operations.

- D1 Action may be performed during any shutdown period
- D2 A potential problem may occur which should be resolved during a shutdown.
- D3 These items are not needed for operation of the plant but may make the operation of the plant "better" but they must be implemented during a shutdown.

Other than identifying the items and providing a reference for justification, these items have not been analyzed.

5.0 SUMMARY

This analysis reviewed the anomalies identified in the Independent Technical Assessment (ITA) and developed a list of 35 individual and related items which need to be evaluated. These items were then classified on the basis of need and when a decision would be required. There were 12 items requiring a decision either before the ATPs or OTPs are completed. These items were further analyzed and the resultant recommendations provided in the analysis section of this report.

APPENDICES

C01811 MCS ITA Item Review

APPENDIX A - ITEM REPORT

The following table is a description of the item file reporting the items reviewed from the ITA review which required further action.

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Itemid	Item description	Class	Priority	Impact	Recommended Action	References	Notes
ITA4.3.1	LCU I/O termination -not barrier type terminals	A1	1	Maintenance, repair and modification time	enforce spec (see 3.2.9) or determine authorization	ITA 4.3.1 & 3.2.9 IR950103	RI: Section 13460 para 1.3.8.3c
ATP002	MCS performance parameters not verified	A1	10	System limits unknown spec not measured	ADTECHS provide test or calc proof Div 13 spec met	C01811 13460 IR 95-01-002	
ITA4.3.3a	Tags - ATP test of maximum/min performance criteri	A1	15	Performance Failure, ATP test failure & added delay	review w/ ADTECHS to determine test measurements	ITA 4.3.3, 3.2.4 IR950102	
ITA4.4.2c	Open Micon Items - U-32 availability	A1	20	Schedule delays, operations delays	Setup test program and qualification of spares	ITA 4.4.2 & ATP Micon Prob	
ITA4.4.2d	LOI interface requirement except oper. usability	A1	30	failure to perform will affect operator performance	establish LOI interface standard	ITA 3.2.1, 1010-1.6.11	1010-1.6.11 & 1.1.9.1, also ITA 4.2.2
ATP001	Graphics not verified fail safe	A1	60	Flow lines & valves show partial open as closed	Change logic to use valve closed position switch	1010 para 1.5.7.1	example H2-89915 slit 2 (AOV-60A054)
ITA4.4.2b	Open Micon Prob - gen	A1 (Completed)	99	schedule time lost	check items for impact-add items needed	ITA 4.4.2	
ITA5.2.2b	Logic Changes Review Engineering list	A1 (completed)	99	system performance and operator response	break out items and add to list	ITA 5.2.2, 5.2.3, 5.2.1	
ITA3.2.7	Control Philosophy change	A2		reduce RAM usage U-32s & RCM by using MICON modules	revise Control Spec and make changes in logic	ITA3.2.7, 3.3.1	
ITA4.4.2a	ATP completion measurement	A3		ATP status unknown affects schedule measurement	Weighted percent complete	ITA 4.4.2	
ATP006	Main Train permissions (auto/Man) complex	B1		limit automatic/manual operations, excessive trips	restructure to support operations		

C01811 MCS IFA Item Review

ATT004	UV Ox TI-545 Modbus Interface	H1		Data in broadcast mode loads buffers, limits Micon	change interface to bi-directional handshake		
IFA5.2.4	Auto/Manual System Operation in mixed mode	H2		system operation limited to full automatic	change interlocks between systems	IFA 5.2.4 & 3.2.2	
IFA4.3.2a	Expansion Capabilities-U-32	H2		unable to use spare I/O	review U-32 storage and RAM usage on each I.CU	IFA 4.3.2, 3.2.6, & 3.3.2	
IFA5.2.1d	Graphic I/O Graphic density	H2		Operator ability to read display	Identify key displays to modify	IFA 4.2.4.3	
IFA5.2.2a	Logic Changes change control blocks to Micon form	H2		I/O response time and function performance	use RCM and U-32 control blocks supplied by MICON	IFA 5.2.2 & 4.2.3, 4.2.2	
ATT005	MCC Logic complex & not using Micon modules	H2		Expansion limited and response time limited	develop standard logic optimized for MCC		
ATT010	Valve logic complex & not using MICON blocks	H2		Expansion limited & communications response time	change logic		
IFA5.2.3d	Hardware Changes - UV Ox	H3		Failure to provide alarm controls & signal data	review Modbus interface and change if needed	IFA 5.2.3, 4.2.3, 4.4.3	
ATT008	System troubleshooting complex due to programming	H3		COG cannot maintain or diagnose problems	Provide training on non-standard MICON logic		
ATT009	Alarm Graphics - need additional displays	C2		current approach hard to resolve alarm conditions	reduce density and add displays		
ATT007	Wiring not optimized for communications	C2		I/O handling tying up data busses	develop plan to reconfigure hardware		
IFA5.2.3e	Hardware Changes - 1st RO	C3		Communications Loaded	Restructure I/O to reduce control logic	IFA 5.2.3 & 4.2.2	
IFA5.2.3g	Hardware Changes RCM I/O	C3		Improve communications by reducing logic	Develop approach to modification and logic changes	IFA 5.2.3, 4.2.3, 4.4.3	
IFA4.3.2b	Expansion Capab. - U-32 Memory	H3		unable to expand control functions	review U-32 & RCM interfaces move I/O ctrl to RCMs	IFA 4.3.2 & 3.3.1	

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C01811 MCS FTA Item Review

FTA5.2.1c	Graphic I/O Process Links	D3		requires operator use menu selection(added time)	Add links (goto buttons) to process graphics	FTA 5.2.1& 4.2.4.4	
FTA5.2.1b	Graphic I/O Process Graphics flow	D3		Hard to use and impact operator response	standardize flow graphics & revise software	FTA 5.2.1 & 4.2.4.1	
FTA5.2.1A	Graphic I/O device controls	D3		Hard to use and support plant salley functions	Restructure Logic to improve control logic	FTA 5.2.1 & 4.2.4.2	
FTA5.2.3g	Hardware Changes - Degasser	D3		Communications loaded	Restructure I/O to reduce control Logic	FTA 5.2.3 & 4.2.2	
FTA5.2.3c	Hardware Changes - I.CU 6	D3					
FTA5.2.3f	Hardware Changes - Polisher	D3		Communications loaded	Restructure I/O to reduce Control Logic	FTA 5.2.3 & 4.2.2	
FTA5.2.3h	Hardware Changes II 32 Configuration	D1		Improve Communications			
FTA5.2.3a	Hardware Changes- I.CU 2a	D3					
FTA5.2.3b	Hardware Changes- I.CU 2b	D3					
ATT003	Replace HV Ox TI-545	D3		control interface disables system when programming	Replace w/ MICON controller (if allowed)		

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APPENDIX B - ATP WEIGHTED COMPLETION CALCULATION

B-1 Spreadsheet Inputs

Key fields of the spreadsheet are as follows:

Cycle times (team days) are calculated by using the cycle times (in days) provided by ADTECHS and adding the assignments made by team from the ADTECHS ATP schedule. If the forecast number of teams change or the cycle time for specific teams changes on a specific ATP, then the associated Team days needs to be adjusted. Once the ATP has been started, this information is irrelevant.

ATP Percent Complete is the ADTECHS reported percent complete for each ATP. The percent complete is used to determine how much of the cycle time has been completed and affects the estimated finish dates and the weighted percent complete status.

Status Date is the date the percent complete reflects in its measurement of the percent complete. This date is used to calculate the estimated finish dates, the projected weighted complete values

Teams is the number of teams used in the process. This number is divided into the team-cycle days to determine the number of cycle days which is used to estimate the estimated completion dates.

Days/wk is the number of days in the week the teams are working. 7 indicates the ATP process is continuing through the weekend and holidays.

Scheduled finish date is the date the schedule is proposed to be finished by ADTECHS.

B-2 Spreadsheet Outputs

The following measurements are provided on the spreadsheet:

Weighted Per unit value of each ATP

Adjusted Percent Complete is the total ATP percent complete using the weighted % complete values.

Early Finish is calculated from the remaining cycle days.

Late Finish is calculated from the remaining cycle days and adding time for lags between finishing one ATP and starting another.

Projected percent complete (to meet desired finish date)

Projected percent complete (to meet early finish date)

ATPs Completed is the total count of all ATPs that have been started or are completed (have a percent complete greater than .01%).

ATPs remaining are the total number of ATPs that need to be started.

B-3 Spread sheet table

Two versions of the spreadsheet are provided showing the report generated for a Status date of Jan 7, 1995 and the second is a status date of Jan 16, 1995.

See the following sheets

Status date Jan 7, 1995

ATP weighted schedule calculation			date			
			20-Jan-95	17:58		
	Team-days		% of	Weighted		
ATP	Cycle	Title	total	value	%	Complete
		Completed ATPs as of	07-Jan-95			50
401	17	HVAC	0.0425	2.125		0.000
402	17	HVAC	0.0425	2.125		0.000
403	5	Chilled Water	0.0125	0.625		0.000
421	7	VOG	0.0175	0.875		0.000
425	6	Surge Tank pH Cleaning	0.0150	0.750		0.000
433	13	UV Flow	0.0325	1.625		0.000
435	13	H2O2 Feed	0.0325	1.625		0.000
446	10	RO flow	0.0250	1.250		0.000
447	10	RO 2nd feed	0.0250	1.250		0.000
448	5	RO Dosing pump	0.0125	0.625		0.000
449	5	RO cleaning	0.0125	0.625		0.000
451	7	Polisher Regeneration	0.0175	0.875		0.000
			0.0000	0.000		0.000
453	5	Resin Discharge	0.0125	0.625		0.000
455	7	Eff pH Chem Feed	0.0175	0.875		0.000
456	7	Eff pH flow	0.0175	0.875		0.000
458	46	MTT Integration	0.1150	5.750		0.000
460	7	SWRT Chem Feed	0.0175	0.875		0.000
463a	33	Evaporator	0.0825	4.125	5%	0.206
463b	36	Evaporator 24 Hr run	0.0900	4.500		0.000
466	7	CWRT Chem Feed	0.0175	0.875		0.000
469	24	Dryer	0.0600	3.000		0.000
470	5	Resin Dewatering	0.0125	0.625		0.000
471	14	Drum Handling	0.0350	1.750		0.000
472	5	H2O2 fill	0.0125	0.625		0.000
473	5	NAOH fill	0.0125	0.625		0.000

ATP weighted schedule calculation				date			
				20-Jan-95	17:58		
	Team-days			% of	Weighted		
ATP	Cycle	Title		total	value	%	Complete
475	10	RO 1st Feed		0.0250	1.250		0.000
476	2	H2O2 Fill		0.0050	0.250		0.000
501	24	MTT		0.0600	3.000		0.000
502	48	STT		0.1200	6.000		0.000
	—			—	—		—
Totals	400			1.0000	50.00	1	50.21
					Adjusted % complete		
6	Teams		Status date	07-Jan-95			
75.67	Cycle days		Sched Finish	03-Mar-95			
6	Days/wk			23-Mar-95	Early finish		
29	ATPs to be tested			20-Apr-95	Late Finish		
36	ATPs Completed		% complete to meet Sched finish date				50.00%
28	ATPs remaining		% complete to meet Early Finish date				50.00%

Status Date Jan 16, 1995

ATP weighted schedule calculation				date			
				24-Jan-95	18:21		
	Team-days			% of	Weighted		
ATP	Cycle	Title		total	value	%	Complete
	35	Completed ATPs as of		07-Jan-95			50
401	17	HVAC		0.0425	2.125		0.000
402	17	HVAC		0.0425	2.125		0.000
403	5	Chilled Water		0.0125	0.625		0.000
421	7	VOG		0.0175	0.875		0.000
425	6	Surge Tank pH Cleaning		0.0150	0.750	100%	0.750
433	13	UV Flow		0.0325	1.625		0.000
435	13	H2O2 Feed		0.0325	1.625		0.000
446	10	RO flow		0.0250	1.250		0.000
447	10	RO 2nd feed		0.0250	1.250		0.000
448	5	RO Dosing pump		0.0125	0.625		0.000
449	5	RO cleaning		0.0125	0.625		0.000
451	7	Polisher Regeneration		0.0175	0.875	25%	0.219
453	5	Resin Discharge		0.0125	0.625		0.000
455	7	Eff pH Chem Feed		0.0175	0.875	100%	0.875
456	7	Eff pH flow		0.0175	0.875		0.000
458	46	MTT Integration		0.1150	5.750		0.000
460	7	SWRT Chem Feed		0.0175	0.875	100%	0.875
463a	33	Evaporator		0.0825	4.125	8%	0.350
463b	36	Evaporator 24 Hr run		0.0900	4.500		0.000
466	7	CWRT Chem Feed		0.0175	0.875	100%	0.875
469	24	Dryer		0.0600	3.000		0.000
470	5	Resin Dewatering		0.0125	0.625		0.000
471	14	Drum Handling		0.0350	1.750		0.000
472	5	H2O2 fill		0.0125	0.625		0.000
473	5	NAOH Fill		0.0125	0.625		0.000
475	10	RO 1st Feed		0.0250	1.250		0.000

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ATP weighted schedule calculation				date			
				24-Jan-95	18:21		
	Team-days			% of	Weighted		
ATP	Cycle	Title		total	value	%	Complete
476	2	H2O2 Fill		0.0050	0.250		0.000
501	24	MTT		0.0600	3.000		0.000
502	48	STT		0.1200	6.000		0.000
	—			—	—		—
Totals	400			1.0000	50.00	6	53.94
					Adjusted % complete		
6	Teams		Status date	16-Jan-95			
66.67	Cycle days		Sched Finish	05-Mar-95			
7	Days/wk			23-Mar-95	Early finish		
29	ATPs to be tested			15-Apr-95	Late Finish		
41	ATPs Completed		% complete to meet Sched Finish date				58.18%
23	ATPs remaining		% complete to meet Early Finish date				55.95%
cycle days calculation							
ATP	Days per Doc	Title	Team #	Days	Total Days		
401	17	HVAC	IV	17	17		
402	17	HVAC	IV	17	17		
403	5	Chilled Water	IV	5	5		
421	7	VOG	I	7	7		
425	6	Surge Tank pH Cleaning	II	6	6		

ATP weighted schedule calculation				date			
				24-Jan-95	18:21		
	Team-days			% of	Weighted		
ATP	Cycle	Title		total	value	%	Complete
433	13	UV Flow	III	13	13		
435	13	H2O2 Feed	III	13	13		
446	10	RO flow	VI	10	10		
447	10	RO 2nd feed	VI	10	10		
448	5	RO Dosing pump	VI	5	5		
449	5	RO cleaning	VI	5	5		
451	7	Polisher Regeneration	III	7	7		
453	5	Resin Discharge	II	5	5		
455	7	Eff pH Chem Feed	IV	7	7		
456	7	Eff pH flow	IV	7	7		
458	23	MTT Integration	III	23	46		
			VI	23			
460	7	SWRT Chem Feed	IV	7	7		
463a	23	Evaporator	I	23	33		
			II	10			
463b	12	Evaporator 24 Hr run	Team I	12	36		
			II	12			
			IV	12			
466	7	CWRT Chem Feed	IV	7	7		
469	24	Dryer	V	24	24		
470	5	Resin Dewatering	II	5	5		
471	14	Drum Handling	V	14	14		
472	5	H2O2 fill	I	5	5		
473	5	NAOH Fill	IV	5	5		
475	10	RO 1st Feed	VI	10	10		

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ATP weighted schedule calculation				date			
				24-Jan-95	18:21		
	Team-days			% of	Weighted		
ATP	Cycle	Title		total	value	%	Complete
476	2	H2O2 Fill	III	2	2		
501	12	MTT	III	12	24		
			VI	12			
502	12	STT	I	12	48		
			II	12			
			IV	12			
			V	12			
				TOTAL DAYS	400		

APPENDIX C - DATABASE DEFINITION

C-1 The Database

The Database consists of a collection of computer files which are used as a set to store information. This Independent Technical Assessment and Recovery plan use IBM Personal Computer Disk Operating System based (DOS) hardware and software to support the tasks to be performed.

C-2 DOS Applications used

The main application programs used by this project are:

<u>Application</u>	<u>Extensions</u>
Word Perfect version 5.1	WP, WP5, DSI, CVR, + others
Lotus 1-2-3 version 3.0	WKS, WK1, WK2, WK3
Paradox version 4.02	DB, F, R,
dBASE version III (file format only)	DBF, NDX
DOS 6.22 - Command programs	BAT, EXE, COM
DOS - ASCII Data storage	TXT, RPT, LPT, PRN

Each of these application programs store data in special formats which can be identified by the DOS extension of the filename. All data used in this project are stored on 3.5" 1.44M formatted data diskettes. The application software is stored and maintained on the Hanford Network.

C-3 Paradox Item Database

The Item database includes the Item Datafile, the input screens, the indexes, and report formats used to generate documentation and track the review process. The files in the paradox Item database use the MCSITM prefix to the filename. The extensions .Fxx, .DB, .Rxx, .Yxx, and .TXT are all associated with the database and contain report forms, file structures and the report layout. Extensions .WKx(LOTUS), .XLx (Excel), .DBF (dBASE) and .DIF (SuperCalc) are translated copies of the datafile for use in other applications. Other file naming conventions are as follows:

MCSITM.xxx	Main Paradox database
MCSITEMS.xxx	Backup version of portions of the database
MCSITMC.xxx	Version used for classification effort.

C-3.1 MCSITM File Description

The Item Datafile includes the following fields:

<u>Name</u>	<u>Size</u>	<u>Description</u>
Item ID	A25	Unique Identification Number in ASCII alphanumeric format.
Class	A15	Classification of the item - relating to when needed and level of need.
Priority	N05	Priority of item within the classification
Item Description	A50	Description of the problem to be solved
Impact	A60	Description of the impact of the problem if the problem is not resolved.
Recommended Action	A75	Description of the action to be taken to resolve the problem defined.
References	A25	Identification of the documentation were problem identified.
Notes	A50	Notes - any information which may be needed to understand the item entry.

C-3.2 Item ID Field Description

A unique Identification Number in ASCII alphanumeric format. ITA based items use the format

C-3.2.1 ITAx.x.xa Are ITA associated items where the ITA identifies the ITA report, the "x.x.x" identifies the paragraph number, and the "a" is a sequential identifier (usually alpha numeric) for more than one item relating from that paragraph number.

C-3.2.2 ATPxxxx Are the items developed from the secondary review of ATP, Engineering comments, and Interview Notes. "xxxx" is a four digit sequential number.

C-3.3 Classification Field Description

Classification of the item - relating to when needed and level of need. The first two digits of this field identify the time frame of the resolution and the relative need for the system to operate.

C-3.3.1 Digit 1 - Due by

A=Before the ATP tests are completed

B=Before OTP completion

C=After startup (may be fixed during operations)

D=During a shutdown (should have system down to fix)

C-3.3.2 Digit 2 - Necessity of item

1=Essential

2=Need

3=Desire

Essential is defined as required in order to support functional requirements specified in the Project Specification or System operations.

Need is defined as not required but may have potential impact on the system meeting functional requirements.

Desire is defined as not needed for functional performance criteria but would be beneficial if completed.

C-3.4 Priority Field Description

The Priority of the item is specified numerically to allow sorting of the items within a classification. The number varies from 1 to 99.

99 indicates the item is completed and no longer important.

C-3.5 Item Description Field Description

Description of the problem to be solved. This field is a free format ASCII text field. The contents are based on the input.

C-3.6 Impact Field Description

Description of the impact of the problem if the problem is not resolved. This field is a free format ASCII text field. The contents are based on the input.

C-3.7 Resolution Field Description

Description of the action to be taken to resolve the problem defined. This field is a free format ASCII text field. The contents are based on the input.

C-3.8 References Field Description

Identification of the documentation were problem identified. This field is a free format ASCII text field. The contents are based on the input.

C-3.9 Notes Field Description

Notes - any information which may be needed to understand the item entry. This field is a free format ASCII text field. The contents are based on the input.

C-4 Initial Setup

The initial setup will provide the base fields required to identify and insert the contents of the information required.

<u>Name</u>	<u>Size</u>	<u>Description</u>
Item ID	A15	Unique Identification Number in ASCII alphanumeric format.
Class	A10	Classification of the item - relating to when needed and level of need.
Priority	A15	Priority of item within the classification
Item Description	A50	Description of the problem to be solved
Impact	A50	Description of the impact of the problem if the problem is not resolved.
Resolution	A50	Description of the action to be taken to resolve the problem defined.
References	A15	Identification of the documentation were problem identified.
Notes	A50	Notes - any information which may be needed to understand the item entry.

Notes: The size is a paradox code, A = Alphanumeric, N = numeric and the number identifies the maximum number of characters that can be stored in the field.

C-5 **Item Classification Modifications**

Changes to the data field contents and the intent of the fields were made during the data collection and classification process. The changes are identified in this section.

Resolution field changed to Recommend Action

The contents were revised to relate to a recommended action instead of identifying a solution to the problem.

Item ID is not based on source document for secondary items.

The ATP prefix does not identify an ATP as the source of the change. The ATP prefix was used to identify items added due to the ATP and Engineering item review process. These items were a result of collection and summarization and all association with specific ATP tests were ignored.

Priority Numbering system established

As specified, the priority is based on the order in the classification. Items were sorted by the problem description and priorities given in increments of

10 to each of the items in the A1 classification. The numbers were then changed to arrange the order of presentation during the analysis of the items. The number 99 was assigned to completed items requiring no additional action.

Item Classification Report, Item Classification edit screen, and Standard form editing screen established.

The additional reports and screens were used to simplify editing and review efforts by reducing the contents displayed or available for edit.

Field sizes were changed to fit a need for additional comment space.

