WM Re B698 CorStar

WM Project 10, 11, 16
Docket No.
PDR ✓
LPDR ✓ (B, N, S)

CorSTAR

A TEKNEKRON INDUSTRIES AFFILIATE

Distribution:
PBrooks | Joan-ticket
NStill
(Return to WM, 623-SS) Sac

WM DOCKET CONTROL CENTER

'86 JAN -6 P12:24

December 30, 1985

Ms. Pauline Brooks, Project Officer
Division of Waste Management
MS 623 SS
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Contract No. NRC-02-81-026
Benchmarking of Computer Codes and Licensing Assistance
Monthly Letter Progress Report for November 1985

Dear Pauline:

This letter contains a management level summary of progress during the month of November. Also enclosed is a Technical Status Summary further describing work performed during this period.

Task 3 - Benchmark Problem Report - Waste Package Codes

There was no significant activity on this code area during the month. We are still waiting for formal receipt of NRC's comments on this report. The report has been revised using preliminary comments received from the NRC.

Tasks 4 & 5 - Siting Codes

There was no significant activity on this code area during the month.

Tasks 4 & 5 - Radiological Assessment Codes

There was no significant activity on this code area during the month.

Tasks 4 & 5 - Repository Design Codes

Due to a power outage on or about November 9 which triggered several hardware malfunctions, the Brookhaven system was out of service the entire week of November 11-15. The loss of access prevented computer use of the entire week and led to accessing difficulties and delays, due to system congestion, after service was fully restored on November 18.

An attempt was made to access COYOTECDC on the 7600 machine for use in running Problem 2.9, but the file had been lost. The NRC was informed of this problem and contacted Brookhaven to request an archived retrieval. The file

CORPORATE SYSTEMS, TECHNOLOGIES, AND RESOURCES
2121 ALLSTON WAY • BERKELEY, CALIFORNIA 94704 • (415) 548-4100

BERKELEY WASHINGTON, D.C. INCLINE VILLAGE

2687

could not be found, so it may be necessary to utilize the version of COYOTECDC at CorSTAR.

In a phone conversation with Pat Bell of NRC on December 4, 1985, we were informed that the 6600 machine at Brookhaven, designated MFA, will be taken out of service permanently on December 31, 1985. It is not known how long computer access will be restricted while a CYBER 180/830 machine, which will be designated MFC, is installed. Pat also mentioned that the user time limit on MFC may be shorter than that currently allocated on MFA. Depending upon the actual allowable user time on MFC, it may not be possible to edit our data files on MFC to the extent that we have been on MFA. If it becomes necessary, we can edit some of our files on our IBM-PC, then transfer them to Brookhaven. This, however, would increase the time required to set up and edit our files since we would have to sign off of the Brookhaven system to make changes on our PC. The significance of this consideration will become evident as further details of the MFC system are released.

A general progress meeting has been scheduled for December 10, 1985, at the NRC offices. Acres will be represented at this meeting by Bill Lamb and Bill Swanson. The NRC will be presenting a one-day training session on December 11 in Bethesda, Maryland, which will address problems associated with the change-over from MFA to MFC at Brookhaven. Acres will be represented at this session by Bill Swanson.

During the month Problem 2.9 has been set up and run with ADINAT. The comparison of ADINAT results with the analytical solution is included at the end of this report. Problem 2.9 was set up for COYOTECDC, but because the code is not on the 7600 machine, this problem has not yet been run.

Problem 3.5 was set up and attempted with the ADINA code. This problem, however, has not run successfully. Similar to the VISCOT code attempt, ADINA does not seem to properly model the Von Mises yield criteria. In addition, the use of the Drucker-Prager yield criteria also produces questionable results. The additional uncertainty of the analytical results, as discussed in previous progress reports, also hinders our progress. We are still attempting to find a viable solution for this problem.

The lengthy delay caused by the unavailability of the ADINA and ADINAT codes have caused us to fall well behind schedule in meeting the proposed Draft Task Summary Report deadline date of March 15, 1985. Estimates of anticipated schedule impacts and funding will be requirements and will be discussed during the progress meeting on December 10.

General

Our estimate of costs the end of November (December 7, 1985, for Corstar) is:

Actual costs this month:	30K
Actual costs this fiscal year:	59K
Actual costs to date:	3254K
Planned costs this fiscal year:	70K
Planned costs this month:	40K

These costs include labor, labor additive, overhead, subcontractor costs, other direct costs, G&A, and fee. These costs have not been confirmed by our accounting department.

Sincerely,

Douglas K. Vogt

Douglas K. Vogt
Project Manager

DKV/pba

Enclosures

TECHNICAL STATUS SUMMARY

TECHNICAL STATUS REPORT ATTACHMENT
TO PROGRESS REPORT FOR NOVEMBER 1985

Repository Design Codes

Task 4 - Code Procurement

All applicable codes have been procured.

Code Installation

The ADINAT code has been successfully compiled and used to run sample problems supplied by ADINA Engineering and most of our analytical problems. In addition, the ADINA-PLOT code has also been compiled successfully. This code, however, has not yet been tested. Compilation of the ADINA-IN code was attempted. However, due to FORTRAN errors, which seem to be the result of the type of computer systems used at Brookhaven and not necessarily due to computer code errors, further debugging was required. Finally, the ADINA code was successfully compiled and run. The compilation difficulties previously encountered were corrected with the help of Mr. Lee Ho of ADINA Engineering. The correction entailed decreasing the amount of memory storage space called out internally within the ADINA code. The memory storage variable, MTOT was reduced from 25000 to 20000. This solution, however, may result in storage problems in the running of the large hypothetical and field validation problems.

The lengthy installation delay of these codes has caused us to fall considerably behind schedule in meeting the proposed deadline date of March 15, 1985.

General Information

Due to a power outage on or about November 9, which triggered several hardware malfunctions, the Brookhaven system was out of service during the entire week of November 11-15. The loss of access prevented computer use for the entire week and led to accessing difficulties and delays, due to system congestion, after service was fully restored on November 18. Accessing difficulties were encountered throughout the week of November 18, as we had to "wait in line" on several occasions to gain access to the computer. Additionally, longer than normal "turnaround times" were experienced, since several users were running programs, resulting in long execution queues and subsequent delays obtaining output.

An attempt was made to access the file COYOTECDC on the 7600 machine, for use in running Problem 2.9. Since the program has not been run since September 1984, and was not found on the 7600 when the access was attempted, it was presumed that COYOTECDC had been archived. This problem was brought to the attention of Pat Bell of NRC, who contacted the Brookhaven operator and requested an archive retrieval. The file COYOTECDC, however, could not be found. No further action has been taken to install COYOTECDC on the 7600.

In a phone conversation with Pat Bell of NRC on December 4, 1985, we were informed that the 6600 machine at Brookhaven, designated MFA, will be taken out of service permanently on December 31, 1985. It is not known how long computer access will be restricted while a CYBER 180/830 machine, which will be designated MFC, is installed. Pat also mentioned that the user time limit on MFC

may be shorter than that currently allocated on MFA. Depending upon the actual allowable user time on MFC, it may not be possible to edit our data files on MFC to the extent that we have been on MFA. If it becomes necessary, we can edit some of our files on our IBM-PC, then transfer them to Brookhaven. This, however, would increase the time required to set-up and edit our files since we would have to sign-off of the Brookhaven system to make changes on our PC. The significance of this consideration will become evident as further details of the MFC system are released.

A general progress meeting has been scheduled for December 10, 1985, at the NRC offices. Acres will be represented at this meeting by Bill Lamb and Bill Swanson. The NRC will be presenting a one-day training session on December 11 in Bethesda, Maryland, which will address problems associated with the changeover from MFA to MFC at Brookhaven. Acres will be represented at this session by Bill Swanson.

Run Benchmark Problems

During the month Problem 2.9 was set-up and run with ADINAT. The analytical solution was reviewed, and the referenced source was consulted to confirm the accuracy of the curves presented in Figure 2.9-2 of the Benchmark Problems Manual (NUREG/CR-3636). Generally, the analytical and computer results compare fairly well, although ADINAT tends to underestimate the temperature decay due to a radiative sink. Temperature histories at the radiative surface (X=0) and at the insulated surface (X=L=0.25 m) are included later in this report.

Problem 2.9 was set up for COYOTECDC but because the code is not on the 7600 machine, this problem has not been run.

Problem 3.5 was set-up and attempted with the ADINA code. This problem, however, has not run successfully. Similar to the VISCOT code attempt, ADINA does not seem to properly model the Von Mises yield criteria. In addition, the use of the Drucker-Prager yield criteria also produces questionable results. The additional uncertainty of the analytical results, as discussed in previous progress reports, also hinders our progress. We are still attempting to find a viable solution for this problem.

PROJECT STATUS

TABLE 3

MATRIX OF CODE/PROBLEM COMBINATIONS*
~~(Revised 2/21/85)~~
(Revised 12/5/85)

Legend:

x Benchmark Problems by Acres.
O Benchmark Problems by Teknekron.
(1) Requires 2 runs, one for MATLOC and one for VISCOT.
(2) Two-Dimensional Analysis.
(3) Requires 3 runs, one for MATLOC and two for VISCOT.
(4) Requires 2 runs, one for Salt and one for Basalt.
S - Problems run for Salt.
B - Problems run for Basalt.

	CODES										
	ADINA - 3D	ADINAT - 3D	DOT	HEATING	MATLOC	SPECTROM 11	SPECTROM 41	VISCOT	COYOTE	SALT 4	STEALTH
2.0 THERMAL ANALYSIS CASE PROBLEMS											
2.6 Transient Temperature Analysis of an Infinite Rectangular Bar With Anisotropic Conductivity (Schneider, 1955, pp. 261)				0							0
2.8 Transient Temperature Response to the Quench of an Infinite Slab With a Temperature-Dependent Convection Coefficient (Kreith, 1958, pp. 161)				0							0
2.9 Transient Temperature Response of a Slab Exposed to a Uniform Radiative Environment (Rohsenow and Hartnett, 1973, pp. 3-49)				0					x		0
3.0 GEOMECHANICAL ANALYTICAL PROBLEMS											
3.2 Circular Tunnel (Long Cylindrical Hole in An Infinite Medium) a) Unlined in elastic medium - biaxial stress field b) Unlined in plastic medium (Tresca) von Mises											0
3.3 Thick-Walled Cylinder Subjected to Internal and/or External Pressure c) Plane strain - creep											
3.5 Plane Strain Compression of an Elastic-Plastic Material von Mises; Drucker, Prager											0
5.0 HYPOTHETICAL REPOSITORY DESIGN PROBLEMS											
5.1 Hypothetical Very Near Field Problem	x	x		0							
5.2 Hypothetical Near Field Problem											0
5.3 Hypothetical Far Field Problem	(2)	(2)									0
6.0 FIELD VALIDATION PROBLEMS											
6.1 Project Salt Vault-Thermomechanical Response Simulation Problem	(2)	(2)									0
6.3 In Situ Heater Test-Basalt Waste Isolation Project											0

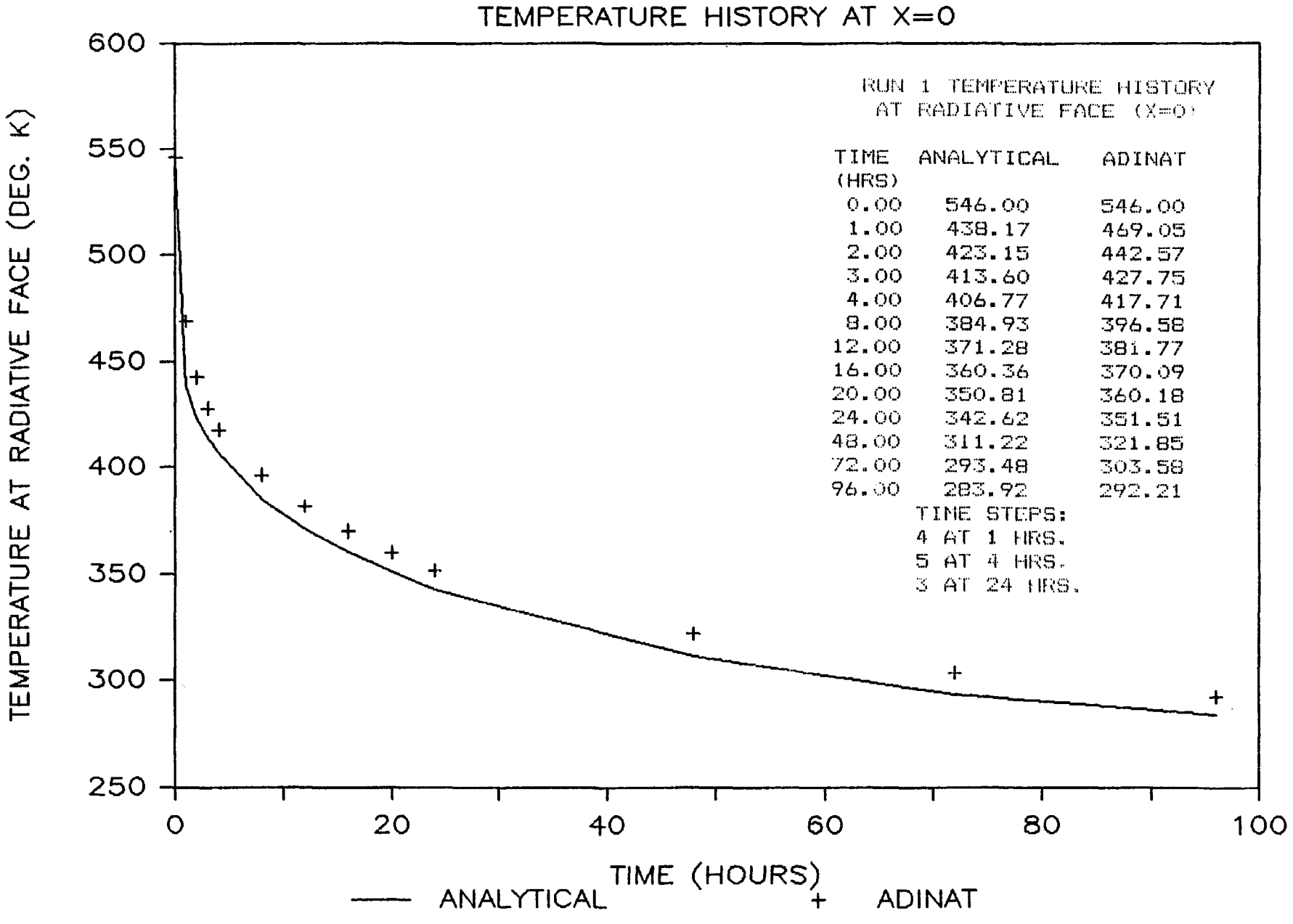
* From NUREG/CR-3636, Benchmark Problems for Repository Design Models, February 1984.

Problems completed

Problems attempted, results not analyzed

Problems attempted, difficulties encountered

ADINAT – PROBLEM 2.9 (RUN #1)

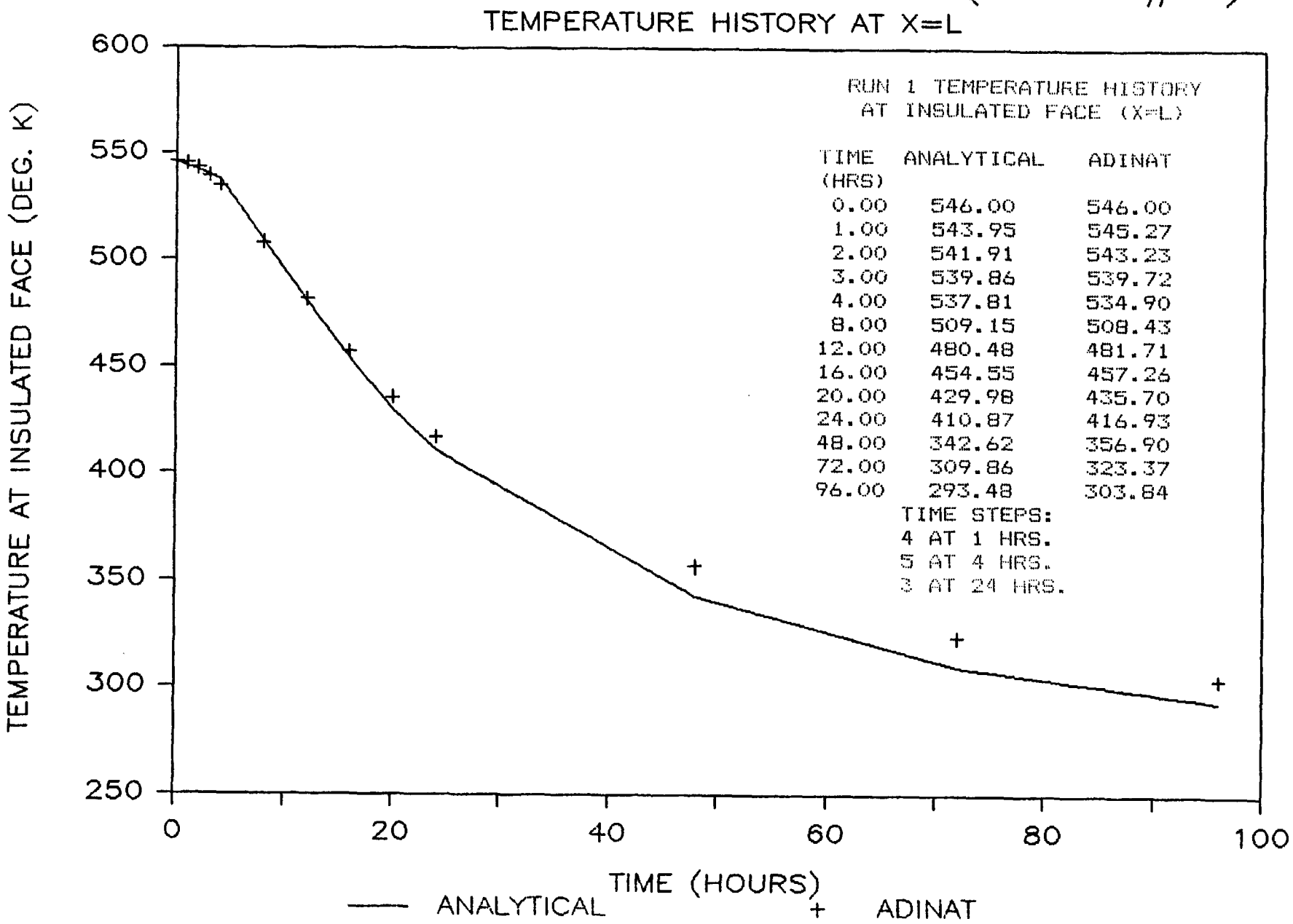


RUN 1 TEMPERATURE HISTORY
AT RADIATIVE FACE (X=0)

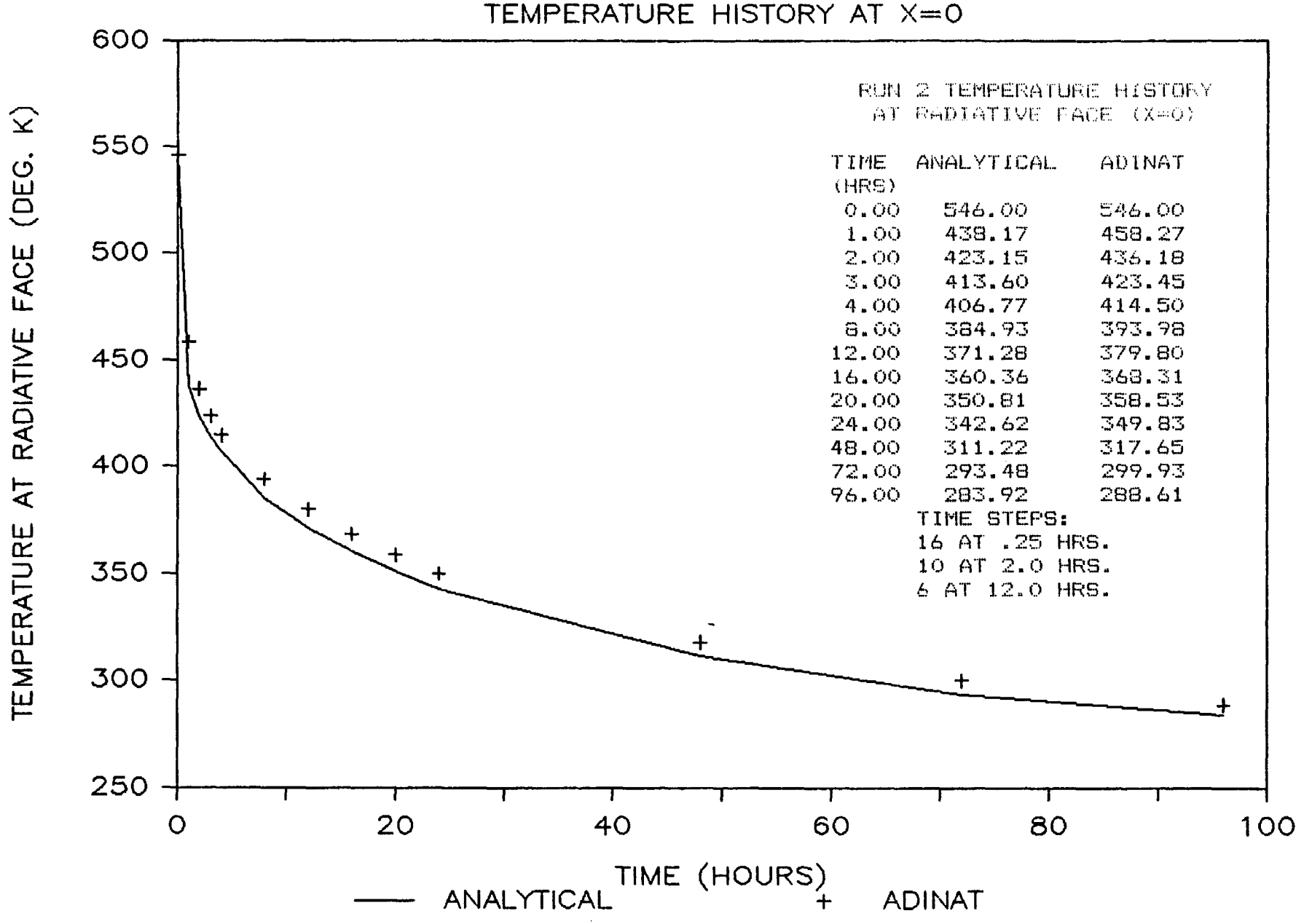
TIME (HRS)	ANALYTICAL	ADINAT
0.00	546.00	546.00
1.00	438.17	469.05
2.00	423.15	442.57
3.00	413.60	427.75
4.00	406.77	417.71
8.00	384.93	396.58
12.00	371.28	381.77
16.00	360.36	370.09
20.00	350.81	360.18
24.00	342.62	351.51
48.00	311.22	321.85
72.00	293.48	303.58
96.00	283.92	292.21

TIME STEPS:
4 AT 1 HRS.
5 AT 4 HRS.
3 AT 24 HRS.

ADINAT – PROBLEM 2.9 (RUN #1)



ADINAT — PROBLEM 2.9 (RUN #2)

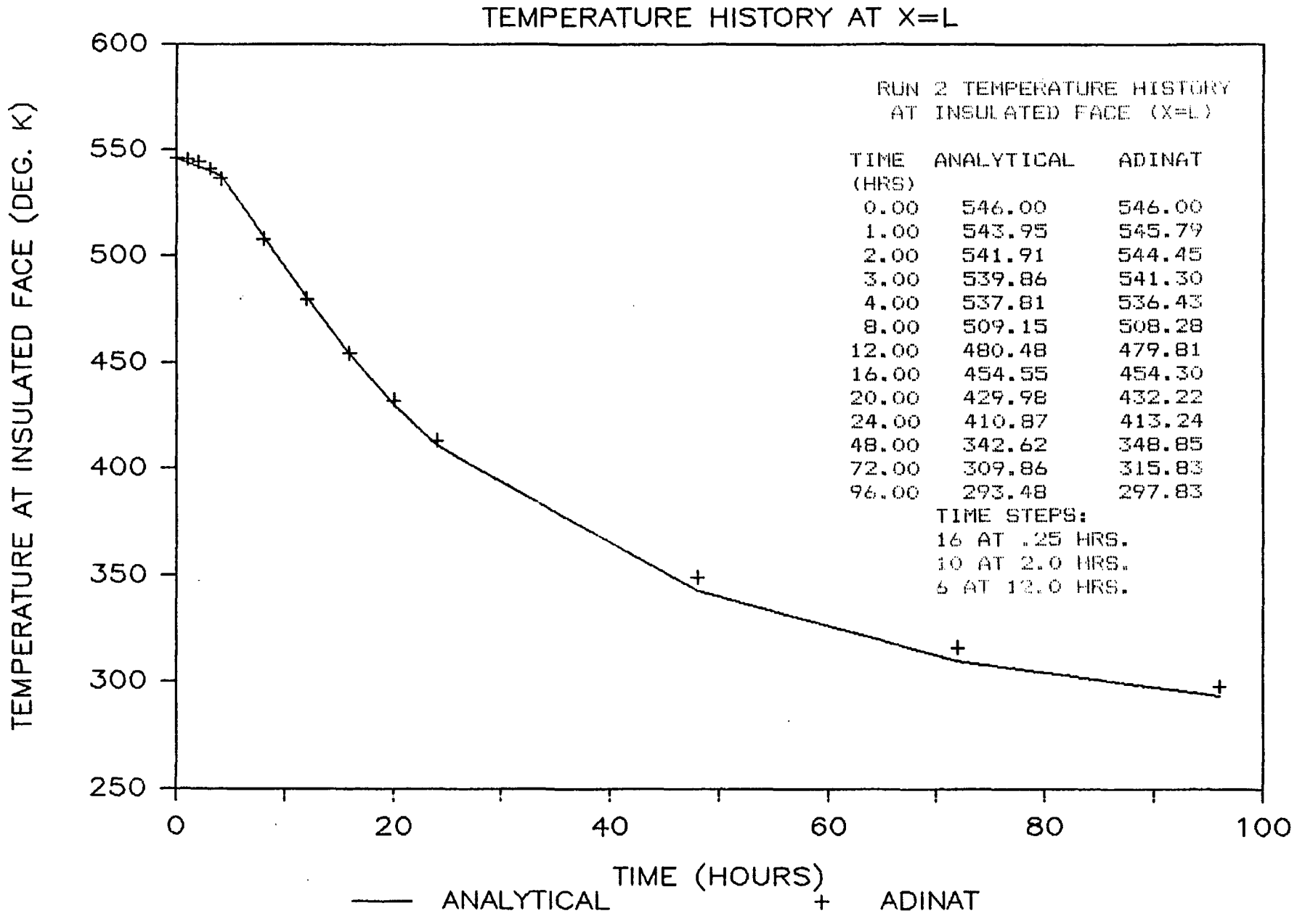


RUN 2 TEMPERATURE HISTORY
AT RADIATIVE FACE (X=0)

TIME (HRS)	ANALYTICAL	ADINAT
0.00	546.00	546.00
1.00	438.17	458.27
2.00	423.15	436.18
3.00	413.60	423.45
4.00	406.77	414.50
8.00	384.93	393.98
12.00	371.28	379.80
16.00	360.36	368.31
20.00	350.81	358.53
24.00	342.62	349.83
48.00	311.22	317.65
72.00	293.48	299.93
96.00	283.92	288.61

TIME STEPS:
16 AT .25 HRS.
10 AT 2.0 HRS.
6 AT 12.0 HRS.

ADINAT — PROBLEM 2.9 (RUN #2)



RUN 2 TEMPERATURE HISTORY
AT INSULATED FACE (X=L)

TIME (HRS)	ANALYTICAL	ADINAT
0.00	546.00	546.00
1.00	543.95	545.79
2.00	541.91	544.45
3.00	539.86	541.30
4.00	537.81	536.43
8.00	509.15	508.28
12.00	480.48	479.81
16.00	454.55	454.30
20.00	429.98	432.22
24.00	410.87	413.24
48.00	342.62	348.85
72.00	309.86	315.83
96.00	293.48	297.83

TIME STEPS:
16 AT .25 HRS.
10 AT 2.0 HRS.
6 AT 12.0 HRS.