Commonwealth Edison
Dresden Nuclear Power Station
R.R. #1
Morris, Illinois 60450
Telephone 815/942-2920

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Licensee Event Report #91-004-0, Docket #050237 is being submitted as required by Technical Specification 6.6, NUREG 1022 and 10 CFR 50.73(a)(2)(iv).

L. J. Gerner for

E. D. Eenigenburg
Station Manager
Dresden Nuclear Power Station

EDE/ade

Enclosure

cc: A. Bert Davis, Regional Administrator, Region III
File/NRC
File/Numerical

(ZDVR/133)

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LICENSEE EVENT REPORT (LER)

Form Rev 2.0

Facility Name (1)	Docket Number (2)	Page (3)
Dresden Nuclear Power Station, Unit 2	0 5 0 0 0 2 3 7	1 of 0 8

Title (4) Unit 2 Reactor Scram and Containment Group I Isolation Due to Main Steam Line High Radiation Caused by Resin Intrusion

Event Date (5)			LER Number (6)			Report Date (7)			Other Facilities Involved (8)	
Month	Day	Year	Year	Sequential Number	Revision Number	Month	Day	Year	Facility Names	Docket Number(s)
0 2	1 3	9 1	9 1	0 0 4	0 0	0 3	0 8	9 1	NONE	0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)					
POWER LEVEL (10)	0 6 3	___ 20.402(b)	___ 20.405(c)	X 50.73(a)(2)(iv)	___ 73.71(b)		
		___ 20.405(a)(1)(i)	___ 50.36(c)(1)	___ 50.73(a)(2)(v)	___ 73.71(c)		
		___ 20.405(a)(1)(ii)	___ 50.36(c)(2)	___ 50.73(a)(2)(vii)	___ Other (Specify		
		___ 20.405(a)(1)(iii)	___ 50.73(a)(2)(i)	___ 50.73(a)(2)(viii)(A)	in Abstract		
		___ 20.405(a)(1)(iv)	___ 50.73(a)(2)(ii)	___ 50.73(a)(2)(viii)(B)	below and in		
		___ 20.405(a)(1)(v)	___ 50.73(a)(2)(iii)	___ 50.73(a)(2)(x)	Text)		

LICENSEE CONTACT FOR THIS LER (12)

Name	TELEPHONE NUMBER AREA CODE
Kelly M. Spencer, Technical Staff System Engineer Ext. 2851	8 1 5 9 4 2 - 2 9 2 0

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
X	C E	H C V	H 0 3 7	N					
X	C E	H C V	C 6 8 4	N					

SUPPLEMENTAL REPORT EXPECTED (14)

___ Yes (If yes, complete EXPECTED SUBMISSION DATE)	X NO	Expected Submission Date (15)	Month	Day	Year

ABSTRACT (Limit to 1400 spaces, i.e, approximately fifteen single-space typewritten lines) (16)

At 0232 hours on February 13, 1991 with Unit 2 at 63% power, a Primary Containment Group I Isolation and Reactor Scram occurred due to valid Main Steam Line High Radiation signals. Operations personnel were attempting to change resins from a Reactor Water Cleanup Demineralizer (2A) while a parallel demineralizer (2C) was in service and providing cleaning of the reactor coolant. Investigation revealed that two isolation valves, normally fully closed, were not closed despite remote handwheel indications to the contrary. Later, it was found that the remote operators were broken allowing remote indications to show the valve positions without actual manipulation of the valves. Corrective action included improved administrative controls restricting resin moves only upon system isolation and flushing of the system to the Main Condenser Hotwell prior to returning it to service, to prevent resins from entering the reactor. The safety significance was minimal since the main steam line radiation monitors properly initiated the isolation/scram logic, Operators promptly responded to the event, and the short duration coolant chemistry transient had minimal effects. A previous resin intrusion occurred on December 17, 1985 on Unit 2 from the condensate demineralizers but did not result in a reactor scram.

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor -2527 MWt rated core thermal power.

Nuclear Tracking System (NTS) tracking code numbers are identified in the text as (XXX-XXX-XX-XXXXX).

EVENT IDENTIFICATION:

Unit 2 Reactor Scram and Containment Group I Isolation [JM] Due to Main Steam Line [SB] High Radiation Caused by Resin Intrusion.

A. CONDITIONS PRIOR TO EVENT:

Unit: 2 Event Date: February 13, 1991 Event Time: 0232 Hours

Reactor Mode: N Mode Name: Run Power Level: 63%

Reactor Coolant System (RCS) Pressure: 960 psig

B. DESCRIPTION OF EVENT:

At approximately 0225 hours on February 13, 1991 with Unit 2 in normal power operation at 63% rated core thermal power, Dresden Operating Procedure (DOP) 1200-5, Reactor Water Cleanup (RWCU) System [CE] Demineralizer Operation, was in progress. The 2C RWCU demineralizer was in service and aligned to process the reactor coolant while Operations personnel were attempting to transfer the 2A RWCU demineralizer resin bed, which was believed to be secured, to the Radwaste [NE] system.

At 0230 hours, service air [LF] was supplied to the 2A RWCU demineralizer bed to fluff the resins. Immediately, pressure and flow oscillations in the RWCU system were observed in the Control Room. At 0232 hours, the RWCU demineralizer recirculation pumps tripped and less than ten seconds later, a Reactor scram and Primary Containment Group I Isolation [JM] occurred due to Channel C and D Main Steam Line High Radiation signals. Automatic closure of the offgas [WF] system chimney isolation valve, the main condenser [SG] steam jet air ejector suction valves, and the offgas drain line valve also occurred upon receipt of the main steam line high radiation signals. Subsequently, Primary Containment Group II and III isolations occurred, Standby Gas Treatment (SBGT) [BH] auto-started, and the Unit 2 Reactor Building Ventilation [VA] isolated. Approximately one minute after the reactor scram, ten Area Radiation Monitors (ARM) [IL] spuriously alarmed. During the event, the conductivity of the reactor coolant reached 6.85 micro-mho per centimeter, which violated Technical Specification 3.6.C.4 limit of 5 micro-mho per centimeter when steaming rates are greater than or equal to 100,000 pounds per hour.

At 0239 hours, the RWCU system was unisolated and used to control reactor pressure, level, and temperature. The reactor was brought to stable cold shutdown conditions at 1140 hours on February 13, 1991.

C. APPARENT CAUSE OF EVENT:

This event is being reported in accordance with Title 10 of the Code of Federal Regulations Part 50 Section 73(a)(2)(iv), which states that any event that results in manual or automatic actuation of any Engineered Safety Feature, including the Reactor Protection System (RPS), must be reported.

The cause of the reactor scram was attributed to resin intrusion from the RWCU demineralizers. The increased radiation levels in the main steam lines were caused by the increased production of N-16 from the decomposition of resin in the reactor vessel. Reactor water sample analysis verified the presence of sulfates and ammonia which indicates that cation and anion resin entered the reactor vessel and broke down due to high temperature.

On February 13, 1991 at approximately 0200 hours, Operations personnel began DOP 1200-5. The 2A RWCU demineralizer was prepared for the transfer of resins to Radwaste while the 2C RWCU demineralizer remained in service to process the reactor coolant. The 2A RWCU demineralizer was isolated by closing the inlet valve (2-1201-120A) and the outlet valve (2-1201-127A) by their respective remote handwheel operators (refer to Figure 1). Both valves were verified fully closed by Operations personnel using the remote handwheel indications. Due to high radiation dose concerns, the valve positions were not locally verified while performing DOP 1200-5. After the event, valve 2-1201-120A was found to be partially open despite showing fully closed remote indication. The 2-1201-120A valve was subsequently closed another full turn manually. A maintenance history search revealed no previous similar failures of the valve operator.

Another valve, RM 2-1201-62C, was also found to be mispositioned. The valve was found to be fully open despite showing full closure by remote handwheel indication. Investigation found that the remote valve operator had previously broken allowing the remote handwheel to turn without manipulating the valve. The 2-1201-62C valve supplies the Condensate Transfer [SD] water to the 2C RWCU demineralizer vessel. The 2-1201-62C valve was then closed manually after the event. A maintenance history search revealed that Work Request (WR) 94113 had been written on July 18, 1990 to repair the broken 2-1201-62C valve remote operator reach rod.

After isolating the 2A RWCU demineralizer, Operations personnel began the resin transfer by supplying Condensate Transfer [SD] water to the reactor building. They were unaware that the 2-1201-62C valve was open, allowing condensate water to enter the 2C RWCU demineralizer beneath the underdrain. The operators then opened the 2-1201-62A valve to supply condensate water, at approximately 40 gallons per minute (gpm), to the 2A RWCU demineralizer. The 2-1201-121A valve was opened as a vent for the 2A demineralizer. The sightglass downstream of the 2-1201-121A vent valve was checked, by the operators, to verify condensate water flow from the 2A demineralizer. However, no flow was observed. Since the RWCU system pressure is 50-60 pounds per square inch (psi), the condensate water supply, which was about 80 psi, would have flowed into the RWCU system flow through the fully open 2-1201-62C valve. The partially open 2-1201-120A valve also allowed condensate water to backflow through the 2A demineralizer and over to the 2C demineralizer carrying resin fines from the 2A to the 2C demineralizer. As another means to verify the entry of water to the demineralizer, Operations personnel then opened the freeboard drain valve (2-1270-500A) for the 2A RWCU demineralizer. Flow was seen through a sightglass on the freeboard drain line. The air sparging of the 2A demineralizer bed was then begun by opening the 2-1201-63A valve. At this point, service air, which was at a higher pressure than the condensate water supply, pushed back through the 2-1201-62A valve and through the open 2-1201-62C valve, supplying air into the 2C demineralizer beneath the underdrain. Service air also would have pushed back through the 2-1201-120A and introduced air into the 2C demineralizer bed through the 2-1201-120C valve. The control room immediately noticed flow and pressure oscillations in the RWCU system.

The introduction of the air agitated the 2C demineralizer resin bed allowing resin fines to be carried through the 2C demineralizer underdrain and into the post-strainer. As the resin fines collected in the post-strainer, the differential pressure (dP) increased to the point of post-strainer degradation. Some of the fines passed through the post-strainer and into the RWCU recirculation pump suction. As more resin fines entered the post-strainer, water flow through the strainer was restricted, causing a low suction pressure transient on the RWCU recirculation pumps, which then tripped. However, the resin fines had already passed through the RWCU recirculation pumps and into the reactor vessel. The reactor then scrammed due to high radiation in the main steam lines.

The intrusion through to the 2C demineralizer underdrain was confirmed by the presence of resin fines found in a sample line [KN] that taps in between the underdrain and the post-strainer. It was noted that the post-strainer dP on the 2C demineralizer was 9 psid just following the scram. On February 12, 1991 the 2C post-strainer dP was 1.8 psid, and after backflushing the post-strainer after the scram, the dP decreased to 1.6 psid.

The conductivity of the reactor coolant reached 6.85 micro-mhos per centimeter during the event. Figure 2 shows the coolant conductivity trends after the event. Before the event, the conductivity measured 0.075 micro-mho per centimeter at 0810 hours on February 12, 1991.

The spurious ARM alarms were caused by a power supply for these units, which was experiencing difficulties in regulating the voltage output during input voltage transients. During the transfer of power from the Unit Auxiliary Transformer [EA] to the Reserve Auxiliary Transformer [EA], the momentary power interruption caused this power supply to provide an erroneous output signal and caused the monitors to spike.

D. SAFETY ANALYSIS OF EVENT:

The safety significance of the event was limited primarily to the challenge of the Primary Containment Group I isolation and scram signals. Operations personnel promptly responded to the event in accordance with procedures and training. When the irradiated resin products entered the main steam lines, the radiation monitors worked properly and initiated a Reactor Scram and Primary Containment Group I Isolation. All control rods were automatically inserted and all Primary Containment Group I Isolation valves automatically closed. The decreasing reactor water level condition, which is expected following a scram due to void collapse, initiated Primary Containment Group II and Group III isolations, auto-start of Standby Gas Treatment, and isolation of the Unit 2 Reactor Building Ventilation, as required. Review of the main chimney effluent recorders indicated no significant increase in effluent activity.

During the event, the concentration of sulfates reached 400-500 parts per billion (ppb). However, this is believed to have minimal impact on primary system Intergranular Stress Corrosion Cracking (IGSCC) due to the extremely short duration of the conductivity transient. Several other factors also mitigated the consequences of the high concentration of sulfates. After the reactor scram and Primary Containment Group I Isolation, the main steam isolation valves (MSIVs) were left closed. This kept the dissolved oxygen levels in the coolant down. The reactor was also allowed to cool down after the reactor scram. By keeping the oxygen level low and cooling the reactor, IGSCC concerns were minimized. In addition, the RWCU system was returned to service about ten minutes after the scram and resulted in a timely and controlled decrease in conductivity (see Figure 2). During startup of the reactor, power was increased in steps to ensure that coolant chemistry requirements were being met at all times. These factors decreased the potential for IGSCC. The Station also has an inservice inspection program that periodically inspects IGSCC susceptible materials and welds per Generic Letter 88-01.

Preliminary review of this event by Nuclear Fuel Services Engineers concluded that no significant effects to the fuel were involved.

E. CORRECTIVE ACTIONS:

After the reactor scram, an investigation sub-committee was promptly formed per Dresden Administrative Procedure (DAP) 7-15.

The immediate corrective action was to issue Operating Order 16-91 restricting the use of DOP 1200-5. The Operating Order required that the RWCU System be isolated in order to perform any resin transfers on the Cleanup Demineralizers. After such resin moves, the RWCU System would be blown down into the Main Condenser [SH] Hotwell for at least 15 minutes with a minimum of 150 gallons per minute flow to ensure that any resins in the system would not enter the reactor vessel. This Operating Order applies to both Unit 2 and Unit 3 and will remain in effect until DOP 1200-5 is permanently revised by Operations Department (237-200-91-02501).

The 2C RWCU demineralizer underdrain and post-strainer will be inspected before the demineralizer unit is returned to service (237-200-91-02502). The 2A RWCU demineralizer resin transfer was completed in accordance with Operating Order 16-91 and DOP 1200-5 and returned to service before startup of the reactor.

The Station is also evaluating replacement of the post-strainers on all the Unit 2 and 3 RWCU demineralizers with a model that decreases the potential of resin breakthrough (237-200-91-02503).

The remote operator for the 2-1201-62C valve will be repaired by Mechanical Maintenance under WR 94113 (237-200-91-02504).

The remote operator for the 2-1201-120A valve will be adjusted by Mechanical Maintenance under WR 99181 (237-200-91-02505).

Operations personnel will perform a review of other valves with remote operators that require repair. A prioritized list of the deficiencies will be provided to the Mechanical Maintenance Department (237-200-91-02506).

An action plan to inspect the remaining Unit 2 and the Unit 3 RWCU demineralizer underdrains will be developed (237-200-91-02507).

A review of this event will be included in an upcoming continuing Operator Training Cycle (237-200-91-02508).

The ARM power supply was replaced by Instrument Maintenance under WR 98620.

F. PREVIOUS EVENTS:

DVR Number	Title
12-2-85-171	Condensate/Demineralizer Resin Intrusion into Condensate/Feedwater Due to Underdrain Shifting

On December 17, 1985 at 0445 hours with Unit 2 operating at 99% power, a main steam line high radiation alarm was received. A high conductivity alarm was received on the RWCU inlet. The conductivity reached 5.9 micro-mho per centimeter, exceeding Technical Specification 3.6.C.4 which states that the conductivity of the reactor coolant shall not exceed 5 micro-mho per centimeter when steaming rates are equal to or exceed 100,000 pounds per hour. The cause of the event was found to be resin intrusion from the 2G condensate demineralizer due to underdrain shifting.

G. COMPONENT FAILURE DATA:

Manufacturer	Nomenclature	Model Number	Mfg. Part Number
Hancock Co.	2 inch manual globe valve (2-1201-62C)	5500W-1	N/A
Crane Valve Co.	6 inch manual gate valve (2-1201-120A)	47-1/2U	N/A

An NPRDS search revealed no remote operator failures of this component. Review of this event with Maintenance and Operations personnel found that this type of remote operator failure has occurred infrequently and involved systems not reportable to the NPRDS data base.

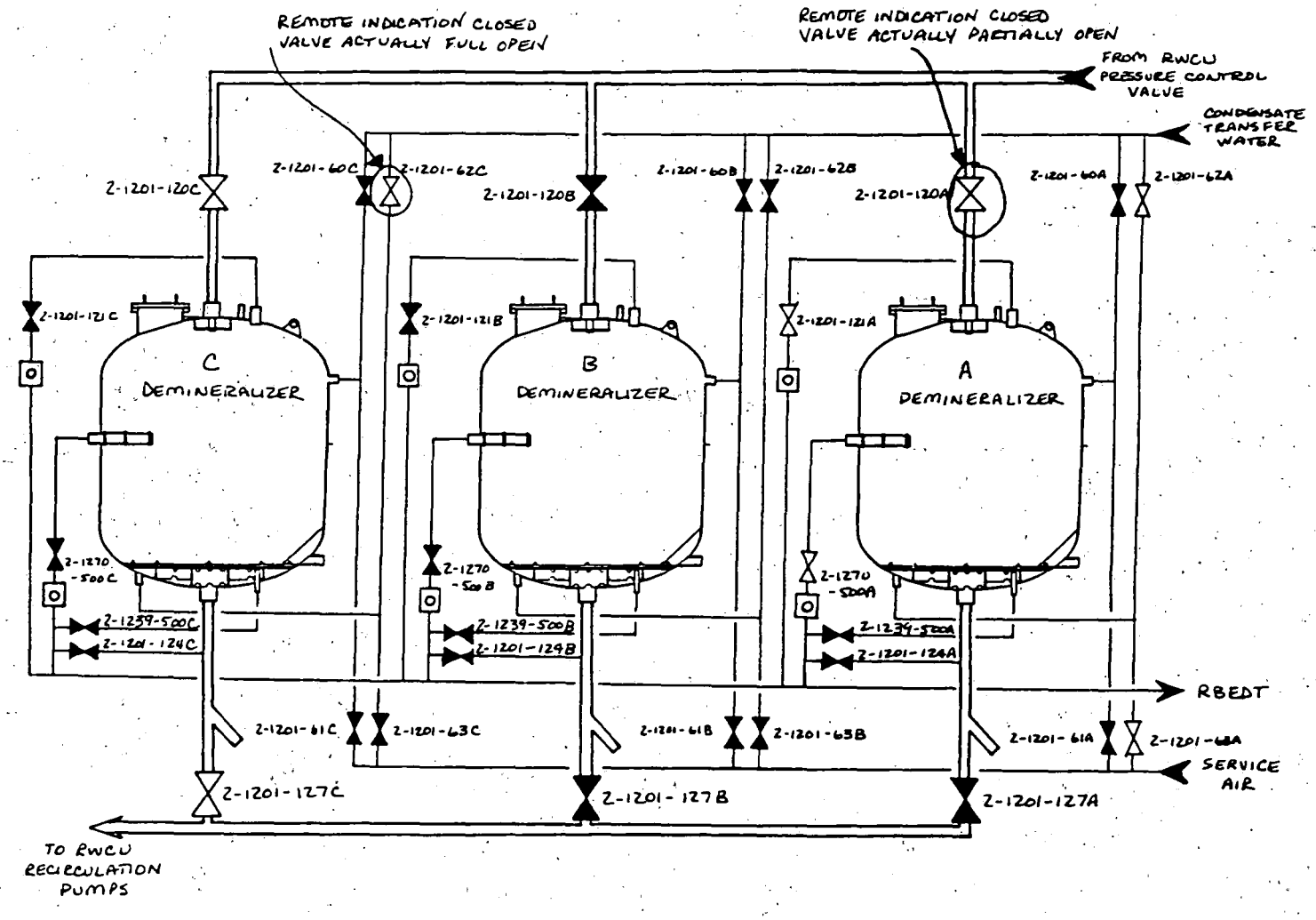

FIGURE 1
Cleanup System Demineralizer

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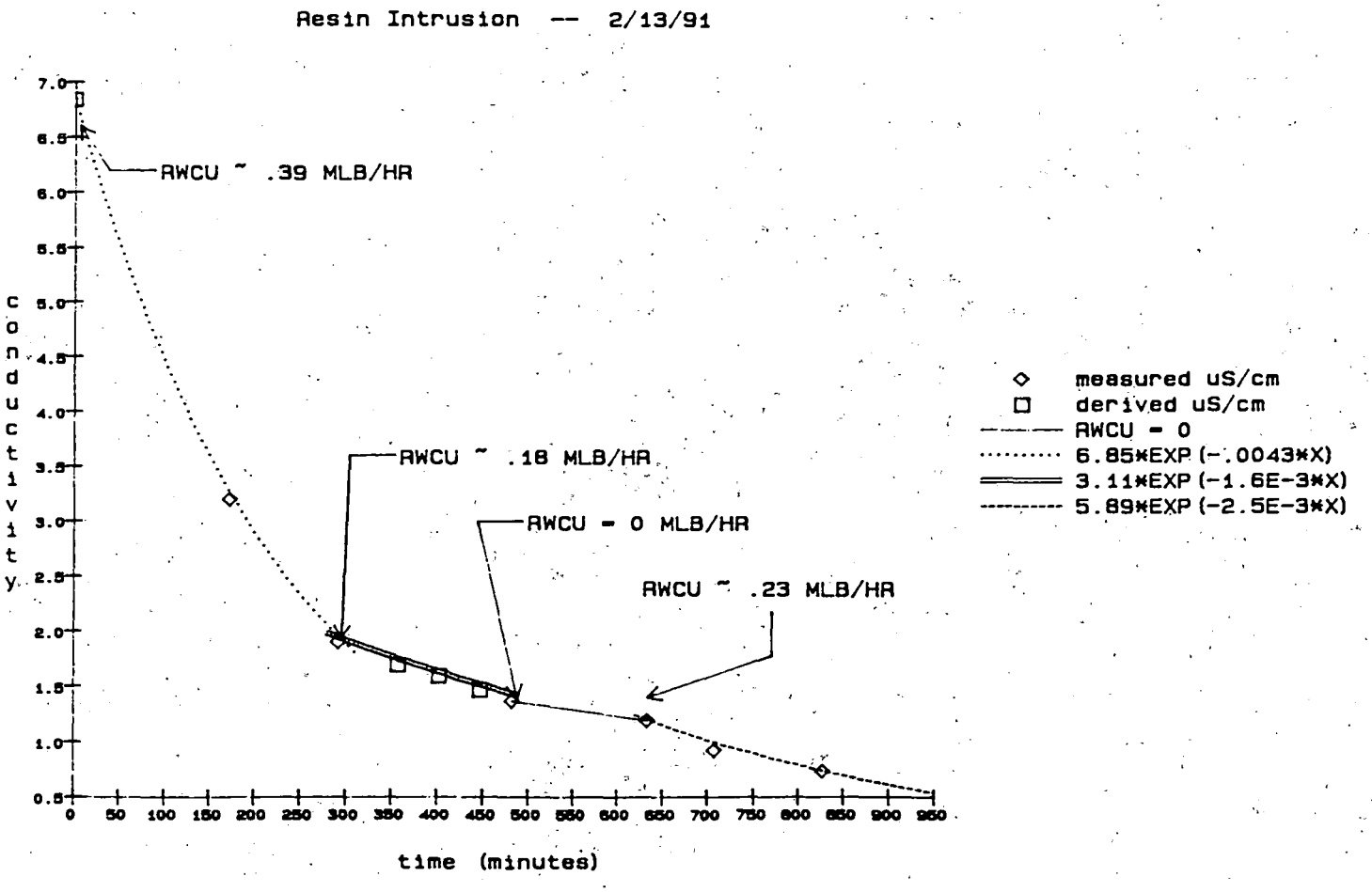

FIGURE 2
Conductivity Trend