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Heading
Strainer Test with Fiber Insulation and Reactor Tank Insulation. Results form the Small Model.

Summary:
This report provides an account of the experiences from the covering and pressure loss test that is being carried out in the small circulation model with parallel flow against a small filter surface. Results from the initial coverage and back rinsing test that were carried out on a scale of 1:2 for a complete filter system are provided in a separate report. The test is part of the total program which is being carried out jointly with the nuclear power plants at Ringhals, Barsebäck, and Oskarshamn.

LIST OF CONTENTS /2

LIST OF APPENDICES

1 INTRODUCTION

/3

This report provides an account of the experiences from the covering and pressure loss test which is being carried out in the small circulation model with parallel flow against a small filter surface. The results from the introductory covering and back rinsing test that were carried out on a scale of 1:2 for a comp e filter system are provided in a separate report. The test is part of the total program that is being carried out jointly between the nuclear power plants at Ringhals, Barsebäck, and Oskarshamn.

2 TEST EQUIPMENT

2.1 The Test Rig

The circulation loop contains a pump, a magnetic flow meter and a small cylindrical tank with a propeller type agitator and a heating cartridge. A schematic diagram is given in Appendix 1. The circuit is manufactured of stainless steel, and water from the municipal water line is used to fill the system up.

The volume of the system is about 180 liters, 150 liters of which is made up by the tank. The detention time which is calculated as the flow/volume is thus 15 to 20 minutes for a surface load of 2 centimeters per second.

The test section is 100 mm in diameter, and the strainer surface is placed in a vertical pipe with an inlet funnel just above the strainer. The pressure release is located before and after the strainer to measure the pressure loss via the strainer plus the fiber cake. The differential pressure indicators and flow meters are connected to a metering computer to register the course of the test. In addition, the thickness of the fiber cake is measured at the end of the test with a flow against the cake as well as without a flow. The fiber cake is dried and weighed.

3. PARAMETERS AND TEST METHODOLOGY

3.2 Strainer Surface

Stainless perforated plating with 3 mm round holes, 33% hole area, has been primarily used in these tests. In some tests, a

tighter net over the hole plating has been used to obtain a homogeneous filter cake without holes (see comments on results). This applies to tests with a high portion of reactor tank insulation (Caposil, Newtherm) where the filter cake becomes very thin.

3.5 Preliminary Treatment of the Material /4

The two factors that were previously taken into consideration apply to aging and breaking apart.

Aged asbestos reinforced Caposil HT1 (reactor tank insulation) is available in small amounts from blast tests with steam (later also from water/steam mixture); the Karlshamn Test). Tests with this material have still not been carried out. In some tests, Caposil HT1, which had been brushed in the wet state, has been used.

Freshly steam blasted cellulose reinforced Newtherm 1000 has been used in the initial test. This Newtherm 1000 was strained to eliminate the large clumps. One sample was dried and the concentration of Newtherm solution was calculated. Due to sedimentation of the material and the difficulty in getting a representative amount of the material, uncertainty in the dosage arose. This Newtherm 1000 was not adequate for all tests, and later freshly steel-brushed Newtherm 1000 had been used. Comparison tests between these materials have been conducted to determine if they have essentially different properties (Test Numbers 37 and 8 as well as 40 and 12).

Aged mineral wool from the nuclear power plant which was ground in a dry state in a modified meat mincer has been used for all tests with mineral wool. The breaking up method was selected to be able to weigh units accurately and was based on the preliminary test with just the fiber insulation.

In the test with Transco, material ground in the meat mincer was primarily used. Comparison tests with steam blasted Transco have also been carried out. In these tests, Transco that was steam blasted in Karlshamn was used. A sample was dried and the concentration in the sample was calculated. Since the material

consisted largely of clumps, difficulties arose in weighing representative samples. There were differences in the amount of the dosage and the cake weight.

3.6 Feeding of the Material

The dosage supplied to the tank (150 liters) with the agitators was gradually carried out in small units with operation up until there was clear water or stable pressure loss. The objective has been to carry out the dosage supply until about 2 meters of pressure loss was reached. This was difficult to achieve in many cases (see the comments).

4. TESTS

/5

4.2 Main Test According to Overlapping Program

The test has been conducted according to the test plan that was developed after the initial test (Reference 1). Table 1 shows the original test plan.

In addition it is recommended that a series of 17 tests with repeated tests for a speed of 2 cm/s for clean mineral wool, clean fiberglass wool, and steam blasted fiberglass wool (or alternatively mineral wool) should be carried out. Since four of the tests are already included in Table 1, the total number of tests should be about 34 according to Table 2.

TABLE 1 Test Designed for Regression Analyses According to the PLS-Method

Number	Name	Speed cm/s	Caposil %	Mineral/ Glass
1 1)	N1	1	0	Mineral Wool
2 1)	N2	4	0	Mineral Wool
3 1)	N3	1	0	Fiber Glass
4 1)	N4	4	0	Fiber Glass
5	N5	1	15	Mineral Wool
6	N6	4	15	Mineral Wool
7	N7	1	15	Fiber Glass
8	N8	4	15	Fiber Glass
9	N9	1	50	Mineral Wool
10	N10	4	50	Mineral Wool
11	N11	1	50	Fiber Glass
12	N12	4	50	Fiber Glass
13	N13	1	85	Mineral Wool
14	N14	4	85	Mineral Wool
15	N15	1	85	Fiber Glass
16	N16	4	85	Fiber Glass
17	N17	1	100	
18	N18	4	100	

1) Included in Series that Includes Tests R, T, TS

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/6

TABLE 2 Test Matrix. The Total Number of Tests /7

Series	Type of Test	Number of Tests at v=1	2	4 cm/s
R	Mineral Wool 100%	1	3	1
T	Transco 10%	1	3	3
TS	Transco 100% Steam Blasted	1	3	1
R85/SC15	Mineral Wool 85% Steam Blasted Newtherm 15%	1		1
T85/SC15	Fiber Glass 85% Steam Blasted Newtherm 15%	1		1
R50/SC50	Mineral Wool 50% Steam Blasted Newtherm 50%	1		1
T50/SC50	Fiber Glass 50% Steam Blasted Newtherm 50%	1		1
R15/SC85	Fiber Glass 15% Steam Blasted Newtherm 85%	1		1
T15/SC85	Fiber Glass 15% Steam Blasted Newtherm 85%	1		1
SC100	Steam Blasted Newtherm 100%	1		1
	Control Test, 3 Each (Is Indicated Later)		3	

5. COMMENTS TO TESTS CARRIED OUT

A table with a summary of results from all tests carried out up until now is shown in Appendix 1. The test number agrees with the number that was assigned in the original test plan (Table 1). The separate test protocols with pressure loss curves that were developed for each test are reported in Appendix 3. In the commentary on the tests it is generally stated whether holes occurred in the filter cake, if the pressure loss resulted in the pump bottoming out, and if residue of the material settled or remained in the water after the end of the test. The /8 test protocol for test number 114 that was carried out after the other tests is contained in Appendix 4.

Due to a lack of time, tests were often interrupted because a stagnating pressure loss could be observed even if the water was

not entirely clear. In all tests with just fiber, a stable pressure fall was achieved. In tests with Newtherm and Capocil, the majority of tests were interrupted due to a quick rise in the pressure loss and the pump could not produce the proper flow. In the test with fiber/Newtherm-mixtures it can be seen that a condition with clear water and stable pressure loss is difficult to achieve. The following three cases occur most frequently in these tests:

- The pressure loss is stable but small particles continue to circulate though the cake.
- The pressure loss is stable due to a hole in the cake
- The water is clear but the pressure loss is so great (>4 mvp) that the pump circuit cannot produce a flow through the strainer.

5.1 Fiber Tests

The original test plan has been followed exactly in the test that was only dosed with fiber material. This test has a very slow course and can be dosed with a relatively large amount of material. In most tests a certain amount of material became sediment at the bottom of the basin. This problem was especially obvious with the mineral wool where a sand-like sedimentation fraction sedimented directly. With Transco the sediment was primarily wads of fiber. Since the cake was always dried and weighed, this is not a problem for tests with just fiber. In a number of tests (numbered >100) no sedimentation was allowed to occur, but the material was stirred up manually instead.

The tests that were repeated show relatively little spreading if consideration is given to the cake weight. Tests number 28 and 29 which are repetitions of number 4 are still not carried out. Test number 33 which is a repetition of 103 and 104 is also still not carried out.

Comparative tests with "meat mincer ground" Transco and steam blasted Transco show that the steam blasted Transco has not been finely distributed as much as the ground Transco. The ground Transco yields a higher pressure loss with lower doses which

indicates that the portion of small particles is greater in the ground Transco. The steam blasted Transco is not as homogeneous as the ground Transco bu consists primarily of clumps. This means that the cake does n remain as homogeneous as in the case with ground Transco.

5.2 Caposil in Fiber-Tests /9

The intent of the test was to measure the pressure loss via a homogeneous bed on the strainer plate. In the filtering of the fiber/Caposil-mixture it showed that this was difficult to do depending on two factors:

- The cake yields a high pressure fall even when it is very thin: this results in the development of holes in the cake so that a homogeneous bed cannot be maintained.
- If a bed without holes develops (with high dosages), a rapid pressure increase occurs where a stable pressure loss is not achieved until the pump in the circuit cannot produce a flow.

The first tests that were carried out with Newtherm 1000 were numbers 17 and 18 where no fiber dosage was used. Test number 17 produced a very high pressure loss. Later test number 17 was repeated with brushed Newtherm 1000 in test number 105, and even this test produced a very high pressure loss but with a slower course as the dosage was considerably lower.

A number of tests where a fine meshed steel net was used to prevent holes from developing in the cake have been carried out with 50% Newtherm 1000 and 50 fiber insulation. In these tests, a 0.5 mm net was used in test number 106, and a 0.1 mm net was used in tests number 107-109. The purpose of these tests is to obtain a measurement of the pressure loss via a homogeneous filter cake. In all tests, the pump has not managed to produce a flow when the cake began to form. The course of events is slow in the beginning but the pressure does not plane out but climbs till the cake is solid. Even small amounts of material in the end produce a solid cake. The thickness of the cake in these tests is <1 mm and could only be measured approximately above the water.

In the tests with brushed Caposil HT1 (Tests 111 and 110) the

same dosage was used as for test 108 and with a 0.1 mm net to compare whether Newtherm 1000 and Caposil HT1 have different properties. The course of the pressure loss was very fast here compared to brushed Newtherm 1000. Even test number 114 (Appendix 4) where Newtherm 1000 was treated with "wet brushing" in exactly the same manner as for tests 110 and 111, it showed that Newtherm 1000 has a slower pressure increase than Caposil HT1.

The tests 5-8, 19, 37, 38, and 39 were all carried out with 15% Newtherm mixture. This test was carried out with hole plating as a filter (but often with holes in the cake). In test number 19, brushed Newtherm 1000 was used. In this test a certain amount of fiber had sedimented so that the distribution of fiber/Newtherm 1000 in the cake is not 15% but should be recalculated according to the cake weight and the Newtherm 1000 dosage amount. In all tests, the water was nearly clear so that it can be assumed that most of the Newtherm 1000 was filtered away and is found in /10 the cake. The portion of Newtherm 1000 that is not filtered away is probably the smallest particles. This fact can be misleading since the small particles are probably the most effective stoppages in the cake when they fasten.

In the first tests with 50% Newtherm mixture (Numbers 10-12), hole plating was used as a filter surface. In all tests the water became very cloudy from Newtherm 1000, and made the visibility depth in the tank non-existent. This resulted in the thickness of the cake not being measured under water in two cases. Only in test number 12 was a relatively stable pressure loss achieved without the pump bottoming out; in other cases, the pressure loss was too high. In tests number 35 and 38, the pump bottomed out. In test number 40, number 12 was repeated and in test number 37, number 8 was repeated but with brushed Newtherm 1000 for comparison. There is little difference in the results between steel brushed and steam blasted Newtherm 1000 if consideration is given to the weight of the cake.

In all these tests Newtherm 100 remnants and fiber have been found in water at the end of the test which means that the exact

distribution of the material in the cake could not be determined. Only one test (number 15) has been carried out with 85% Newtherm 1000. Even in this case a large amount of material was found in the water when the test was interrupted. A large amount of Newtherm 1000 was sedimented in the test.

6. COMMENTS ON THE RESULTS OBTAINED

Due to a lack of time the tests were often interrupted before the water cleared if a stable pressure loss was achieved. The tests that were carried out last with a net over the hole plating (numbers 106-111) show that in the filtering of the material that contains reactor insulation, the course of the pressure loss is slow in the beginning, but it does not plane out. It can be assumed that as long as small particles circulate through the cake, the pressure loss is relatively low but, as the pores in the cake become smaller and smaller, the pressure loss increases so that in the end it is so great that the test must be stopped. The tests that were carried out with the hole plating where a leveling out of the pressure fall is achieved have probably not filtered out the smallest particles but the equalized pressure loss is due to holes in the cake opening and closing one after the other.

A measurement of the pressure loss via a homogeneous /11
reactor tank insulation/fiber bed has not been possible with hole plating. The only conclusion that can be drawn is that a very thin cake (<1 mm) and a net on the hole plating reaches over 4500 mmvp in pressure loss at 1 cm/s. Tests with lower dosages have been determined to be meaningless since the cake becomes so thin that a breakthrough in the cake is even risked with the netting. In tests number 110 and 111, Caposil HT1 reinforced with asbestos is used under the same conditions as in test number 108 where brushed Newtherm 1000 was used. It can be seen that the Caposil HT1 reinforced with asbestos has a much steeper pressure loss course than Newtherm 1000. Even test 114 (Appendix 4) with wet brushed Newtherm 1000 confirms this.

It can be feared that even in the case with hole plating where a

cake is formed the pressure loss will increase very slowly as small particles are bound in the cake. A stable pressure loss can be achieved if a balance between the open holes in the cake and the pressure loss develops. If the solidity of the cake increases with the number of small particles in the cake, the number of open holes will decrease and finally the cake will be compact whereby the pressure loss will increase quickly.

7. SOURCES OF ERRORS AND UNCERTAINTIES

In these test the following parameters were studied:

- The dosage rate effects the build-up of the cake in layers
- Non-homogeneous cakes cause ruptures and holes in the cake that result in large pressure loss variations
- Sediment of material and residue from Caposil in the water results in an inability to calculate the exact composition of the cakes.
- Clumps in the fiber material (steam blasted Transco) and low concentration in a solution results in the development of uncertainties in the dosage amount.
- The temperature in the water increases due to the effect from the pump which results in an inability to maintain the exact water temperature.

It can also be assumed that other parameters which were not studied probably affect the course of the filtering, for example:

- the agitation/flow condition in the tank /12
- the interaction of the properties of the water and the other materials.

8. EVALUATION AND CONCLUSIONS

8.1 PLS-Analysis

In the evaluation with PLS (Projection of Latent Structures) it was confirmed as already seen in the tests. In the test with Newtherm or Caposil mixed with fiber, no statistical relationship can be found based on three factors:

- A stable pressure loss is not achieved with a homogeneous cake
- There are parameters that affect the mode that are not measured
- Other sources of errors

To get a good picture of the course of the filtration, a different measurement than final pressure loss must be used. In the evaluation of tests with just fiber, a better model is achieved but a large error still exists here. Only 75% of the variations in the final pressure loss can be explained with the parameters that were studied. This means that a reasonable regression analysis of the load, speed, and pressure loss conditions could not be made. Some tests, for example, have a lower pressure loss with higher load at the same speed.

It can be assumed that the following parameters that were not studied affect the results:

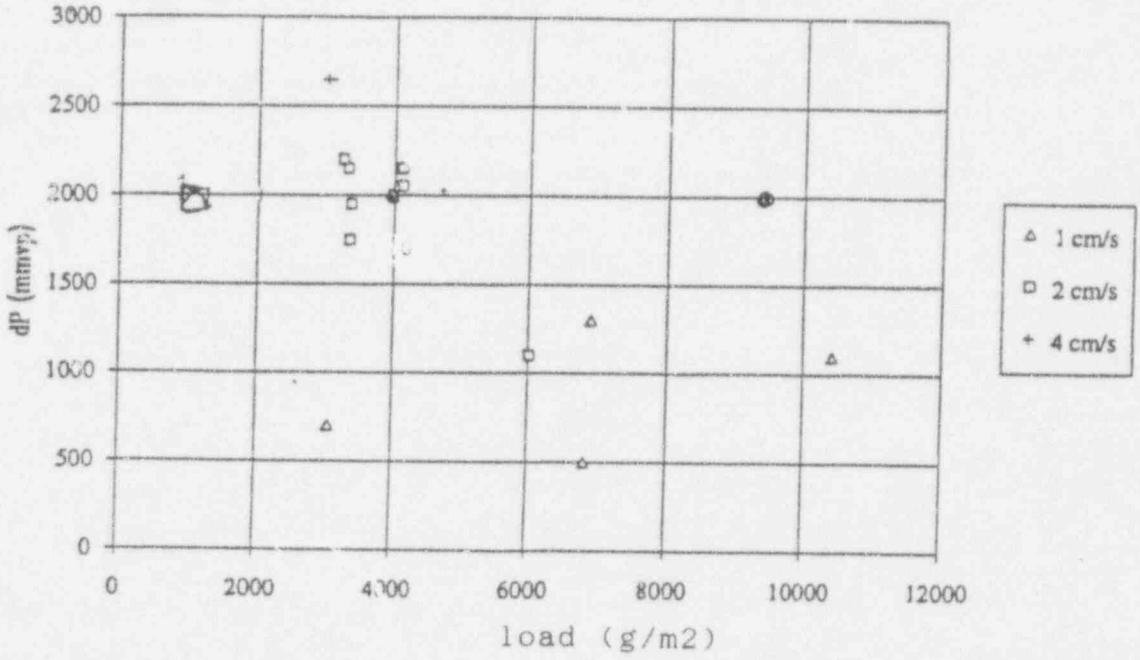
- The rate of the dosage, both number of doses and time between doses
- The interactive properties of the water and the other materials
- The flow properties in the container, degree of agitation.

8.2 General Conclusions

Since the tests contain a number of sources of error and problems with sedimentation and exact dosages in the execution, it is difficult to draw reliable conclusions. However, the results can be summarized as follows:

In the filtering of just fiber, the course of the pressure loss is slow and heavily dependent on the load on the strainer. No great differences could be shown with mineral wool and Transco.Steam blasted Transco differs from the Transco /13 that was ground in a meat mincer. The steam blasted fibers are not equally finely distributed as the ground fibers which means that the steam blasted fibers result in a longer pressure loss than the ground fibers. Figure 1 provides a diagram of the distribution in the tests:

Figure 1 Summary Fiber Tests



In the filtering of a mixture of fiber and Caposil HT1 or fiber and Newtherm 1000, the combination of stable pressure loss and clear water is not possible to achieve without holes developing in the cake. The following situations seem to occur:

- The cake stops up entirely and the pressure drop increases sharply.
- The amount of fiber in the cake makes the cake so porous that small particles can circulate through.
- Holes develop in the cake whereby the pressure loss stagnates for the periods examined in the tests.

It is not possible to state clearly under what conditions these cases will occur without studying several parameters under controlled conditions.

It is also difficult to say if these conditions are constant or if, for example, an apparent equilibrium between the holes in the cake and the pressure loss will change after a while to a compact cake whereby a quick pressure drop increase is obtained.

In the comparison between Newtherm and Caposil HT1, four /14 comparative tests for the controlled variables were carried out. Numbers 108 and 114 were with Newtherm, and numbers 110 and 111 were with Caposil HT1. In all of these tests the speed was 1

cm/s, doses of 0.5 grams of fiber (ground Transco) and 0.5 grams of Caposil or Newtherm were added at the start of the test. A 0.1 mm net was used over the hole plating. Tests 110, 111, and 114 had wet brushed Caposil and Newtherm, test 108 dry brushed Newtherm.

With these conditions Caposil HT1 produces a much quicker pressure increase than Newtherm 1000. Newtherm 1000 produces a nearly linear pressure increase while Caposil HT1 produces a very small pressure increase (about 200 mmvp) for about 1800 seconds and then increases to 4000 mmvp for 1000 seconds (see the test protocol Appendix 3 and 4).

REFERENCES:

1. Overlapping program Strainer Test with Fiber Insulation and Caposil , Mats Henriksson, Vattenfall Development Company, May 5, 1993.

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SUMMARY OF TESTS CARRIED OUT IN THE SMALL STRAINER MODEL

No.	Vel. cm/s	Caposil %	Fiber Minull=Mineral Wool	Added g	Final dP mmvp	Cake thickness 1* mm	Cake Weight g(dry)	Load g/m2
1	1	0	Minull	10+10+20+20+20	700	18	24.06	3063.4
2	4	0	Minull	20+10+10+10	2650	14	23.78	3027.8
3	1	0	Transco	20+20+20+20+20	1300	38	54.31	6914.9
4	4	0	Transco	10+10+10	2650	14	23.48	2989.6
5	1	15	Minull	2+5+10+5	2900	3	5.45	693.9
6	4	15	Minull	5+5	4100	2	3.78	481.3
7	1	15	Transco	5+5+5+5	3300	8	10.95	1394.2
8	4	15	Transco	4+2+2	3800	4	5.93	755.0
9	1	50	Minull					0.0
10	4	50	Minull	20+20+20+40+40+40	4100	2.5 not loaded	6.43	818.7
11	1	50	Transco	10+10+2+4+8	4300	7 in air	3.22	410.0
12	4	50	Transco	5+5+10+10	2250	2	3.54	450.7
13	1	85	Minull					0.0
14	4	85	Minull					0.0
15	1	85	Transco	30+30+30+30+30	600	3	4.79	609.9
16	4	85	Transco					0.0
17	1	100	-	10+10	4500	0.5 not loaded	1.12	142.6
18	4	100	-	2+2+2	3200	0.5 not loaded	0.41	52.2
19	2	15	Transco	5+5+5	3500	7	8.95	1139.5
20								0.0
21								0.0
22	2	0	Minull	20+10+10+20+20	1750	16	26.25	3342.2
23	2	0	Minull	20+10+10+20+20	2150	22	32.34	4117.6
24	2	0	Minull	20+10+10+20+20	2050	21	32.36	4120.2
25	2	0	Transco	20+10+10	2150	15	25.92	3300.2
26	2	0	Transco	20+10+10	1950	16.5	26.35	3355.0
27	2	0	Transco	20+10+10	2200	14	25.34	3226.4
28	4	0	Transco					0.0
29	4	0	Transco					0.0
30	1	0	Transco**	4+4+4+8+70	500	69	53.72	6839.8
102	1	0	Transco**	20+20+20+20	1100	84-119	81.91	10429.1
103	2	0	Transco**	10+10+10+10	1700	40	32.91	4190.2
104	2	0	Transco**	10+10+10+10	1100	46-61	47.30	6022.4
33	2	0	Transco**					0.0
101	4	0	Transco**	5+5+5+5+5	2000	15	15.96	2032.1
35	4	50	Transco**	2+2	2750	5	3.35	426.5
36	1	15	Transco	5+5+5+5	1550	15	8.90	1133.2
37	4	15	Transco	5+2	4350	1	3.81	485.1
38	1	50	Minull	60+60+60+60+60	2500	5 in air	7.65	974.0
39	1	15	Minull	10+10+5	2700	6	15.03	1913.7
40	4	50	Transco	4+8+4+4+2	3600	4.5	7.18	914.2
105	1	100		5	3600	<1 (in air)	1.77	225.4
106	1	50	Transco	2+2+2	4650	1 (in air)	2.64	336.1
107	1	50	Transco	2	2500	<1 (in air)	0.91	115.9

Vattenfall Development Company Appendix 1/2/16

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SUMMARY OF TESTS CARRIED OUT IN THE SMALL STRAINER MODEL

No.	Vel. cm/s	Caposil %	Fiber Minull=Mineral Wool	Added g	Final dP mmvp	Cake thickness l* mm	Cake Weight g(dry)	Load g/m2
108	1	50	Transco	1	4500	<1(in air)	0.68	86.6
109	1	50	Transco	1	2500	<1(in air)	0.60	76.4
110	1	50***	Transco	1	4100	0.5(in air)	0.42	53.5
111	1	50***	Transco	1	4350	0.5(in air)	0.26	33.1

* measurement with flow through the cake

** steam blasted Transco

*** Brushed Caposil HT 1

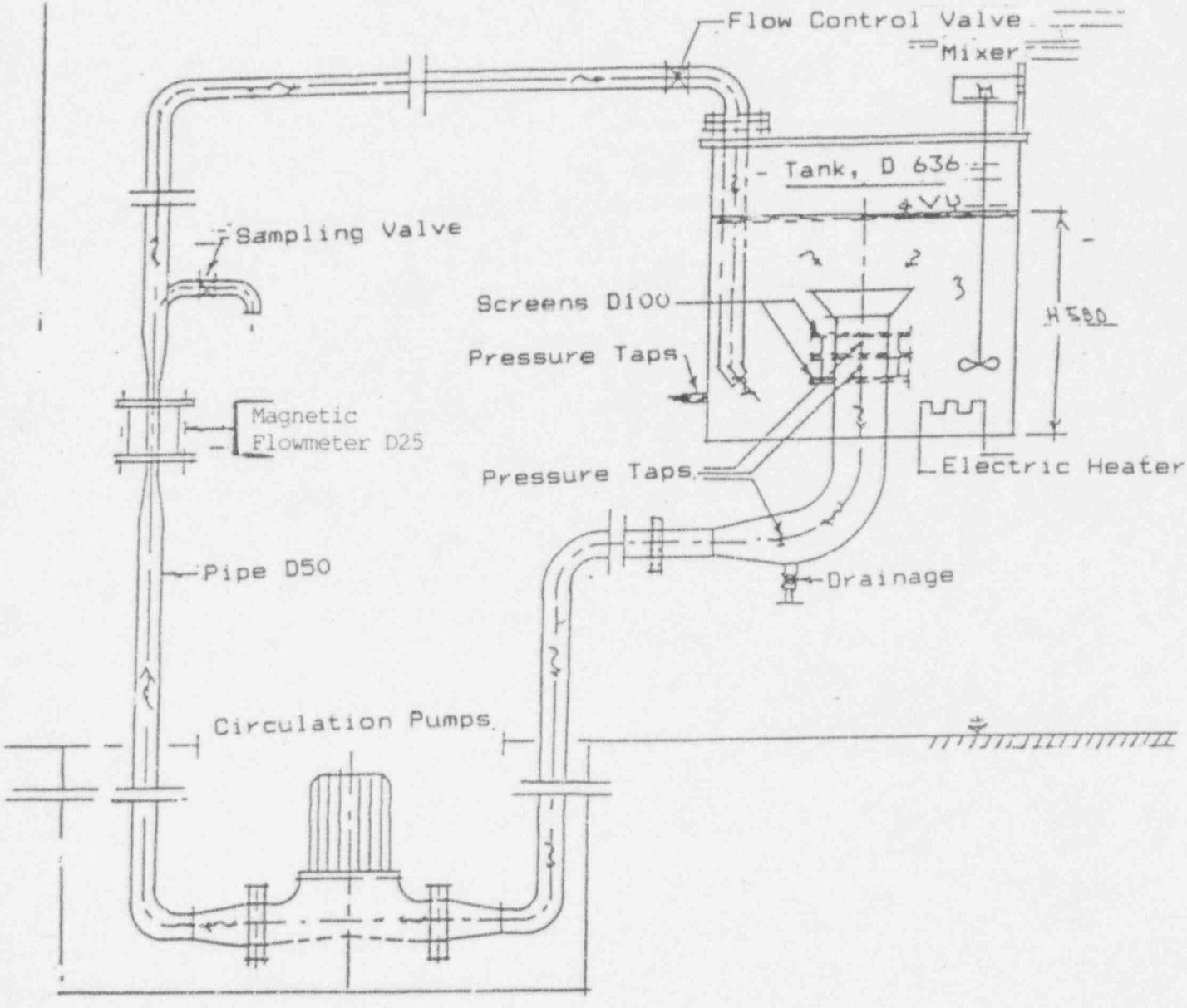
SUMMARY OF TESTS CARRIED OUT IN THE SMALL STRAINER MODEL

Number	Comments
1	Sediment of mineral wool
2	Sediment of mineral wool
3	Sediment of Transco
4	Very small sediment on bottom, one hole in the strainer at the end
5	Sediment of mineral wool, water slightly milky
6	Sediment of mineral wool
7	Sediment of Transco
8	Small sediment of Transco, 4 holes in the cake at the end
9	Test failed
10	Residue of both Newtherm and Mineral Wool
11	Brushed Newtherm, sediment of Newtherm, pump only produced 0.6 cm/s at the end
12	Residue of both Newtherm and fiberglass at the end, uncertain measuring of the thickness of the cake
13	Not done
14	Not done
15	Brushed Newtherm, residue of both Newtherm and fiberglass, 3 holes in the cake at the end
16	Not done
17	0.5 mm net was used over the hole plating, the pump produced 0.5 cm/s at the end
18	0.5 mm net was used over the hole plating
19	Brushed Newtherm
20	20,21 are verification tests
21	For regression modelling
22	Sediment of mineral wool
23	Sediment of mineral wool
24	Sediment of mineral wool
25	Sediment of Transco

26	Sediment of Transco
27	Sediment of Transco
28	
29	
30	Sediment of Transco, erroneous dosage in first 4 units
102	Manual agitation, only wads in the water at the end
103	Manual agitation
104	Manual agitation
33	
101	Manual agitation
35	Residue of Newtherm in the water at the end
36	Brushed Newtherm, repetition of number 7, residue of Newtherm in the water at the end
37	Brushed Newtherm , the pump only produced 2.2 cm/s at the end . 3 holes in the cake, see number 8
38	Repetition of number 9, residue of Newtherm, the pump only produced 0.64 cm/s at the end
39	Brushed Newtherm, repetition of 5, sediment on mineral wool at the end
40	Brushed Newtherm, repetition of 12, residue of Newtherm, 5 holes in the cake
105	Brushed Newtherm, repetition of 17, the pump only produced 0.9 cm/s at the end
106	Brushed Newtherm, net 0.5 mm was used, the pump only produced 0.26 cm/s after 6120 seconds
107	Brushed Newtherm, net 0.1 mm was used, the pump did not produce a full flow after 1260 seconds.
108	Brushed Newtherm, net 0.1 mm was used, the pump did not produce a full flow after 1050 seconds
109	Repetition of 108, flow was not adjusted up at the end; thus the difference in the final dP
110	Repetition of 108 but with Caposil HT1 reinforced with asbestos, see dP-curves
111	Repetition of 110

Figure 1

Ringhals 1 - Diagram of Flow Loop Used for 1-D Head Loss Test



Ringhals 1 - Schematic of flow loop used for 1-D head loss tests

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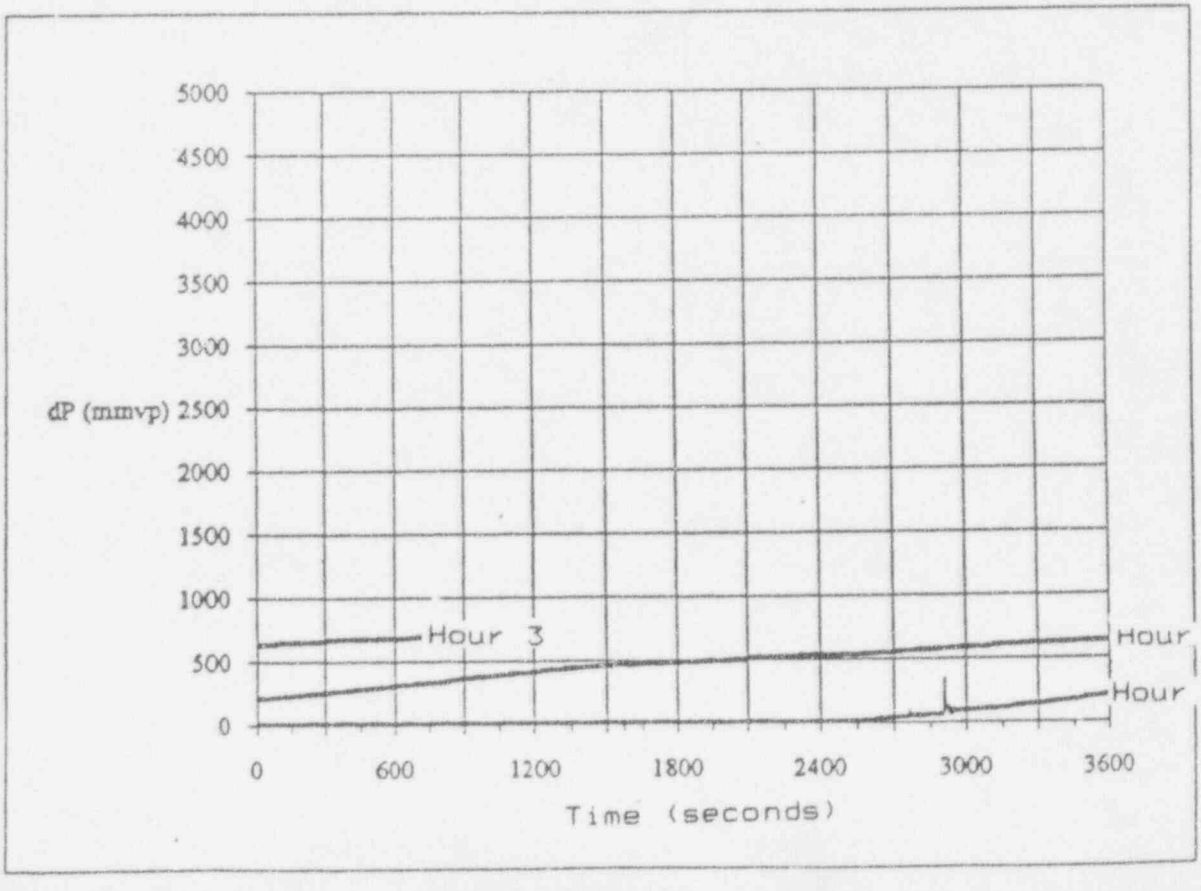
Test Number:	1
Date:	5/13/93
Average Temperature:	22.6 Degrees Celsius
Average Speed:	1.00 cm/s
Cake Thickness loaded:	18 mm
Cake Thickness not loaded:	24 mm
Cake Weight dry	24.06 g
Cake Weight/surface:	3063.41 g/m2

Comments: The mineral wool settles as sediment. Sediment remains at the end.

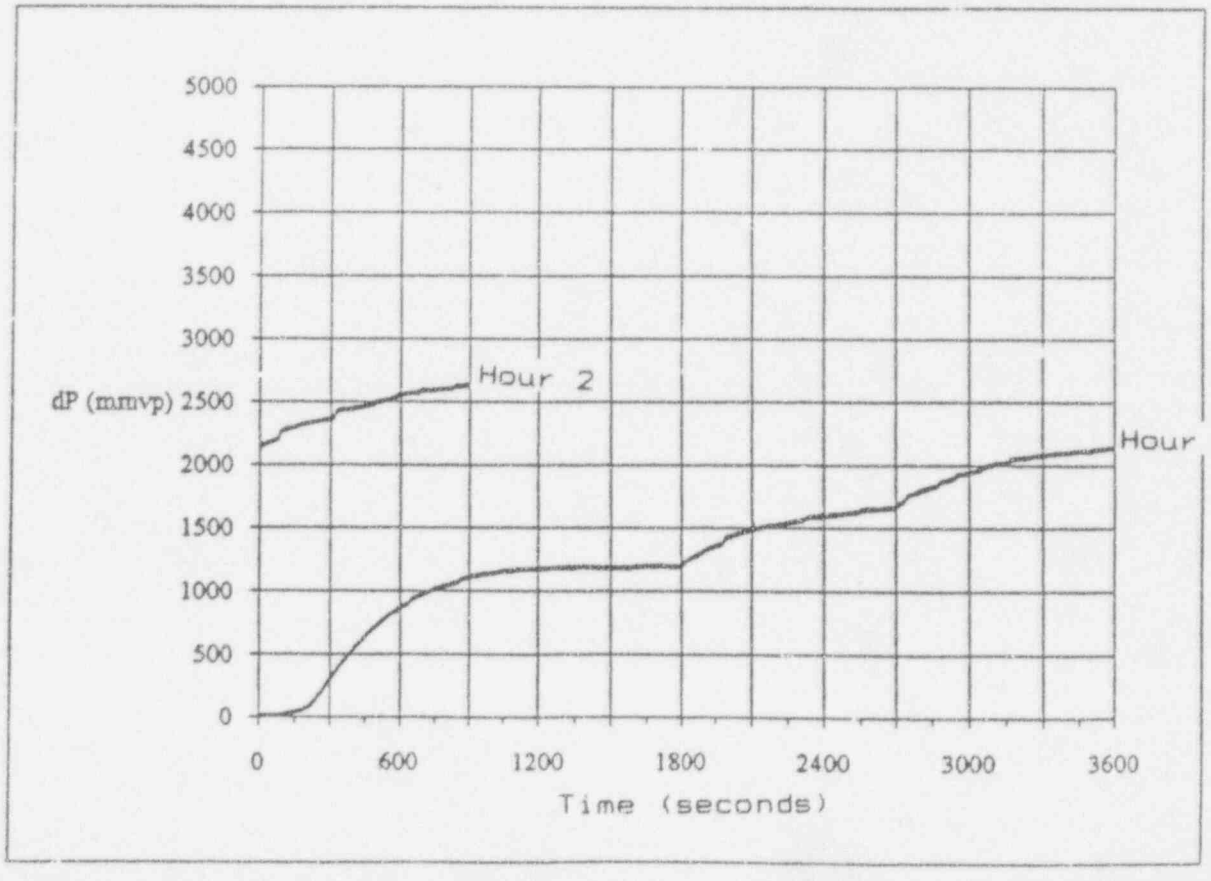
Additions Number	Time (s)	Amount (g)	Added Material
1	0	10	Mineral Wool
2	1800	10	Mineral Wool
3	2580	20	Mineral Wool
4	4380	20	Mineral Wool
5	6180	20	Mineral Wool
Final	7920		



Test Number:	2
Date:	5/13/93
Average Temperature:	20.7 Degrees Celsius
Average Speed:	4.00 cm/s
Cake Thickness loaded:	14 mm
Cake Thickness not loaded:	24 mm
Cake Weight dry	23.78 g
Cake Weight/surface:	3027.76 g/m2

Comments: Sediment of mineral wool at the end.

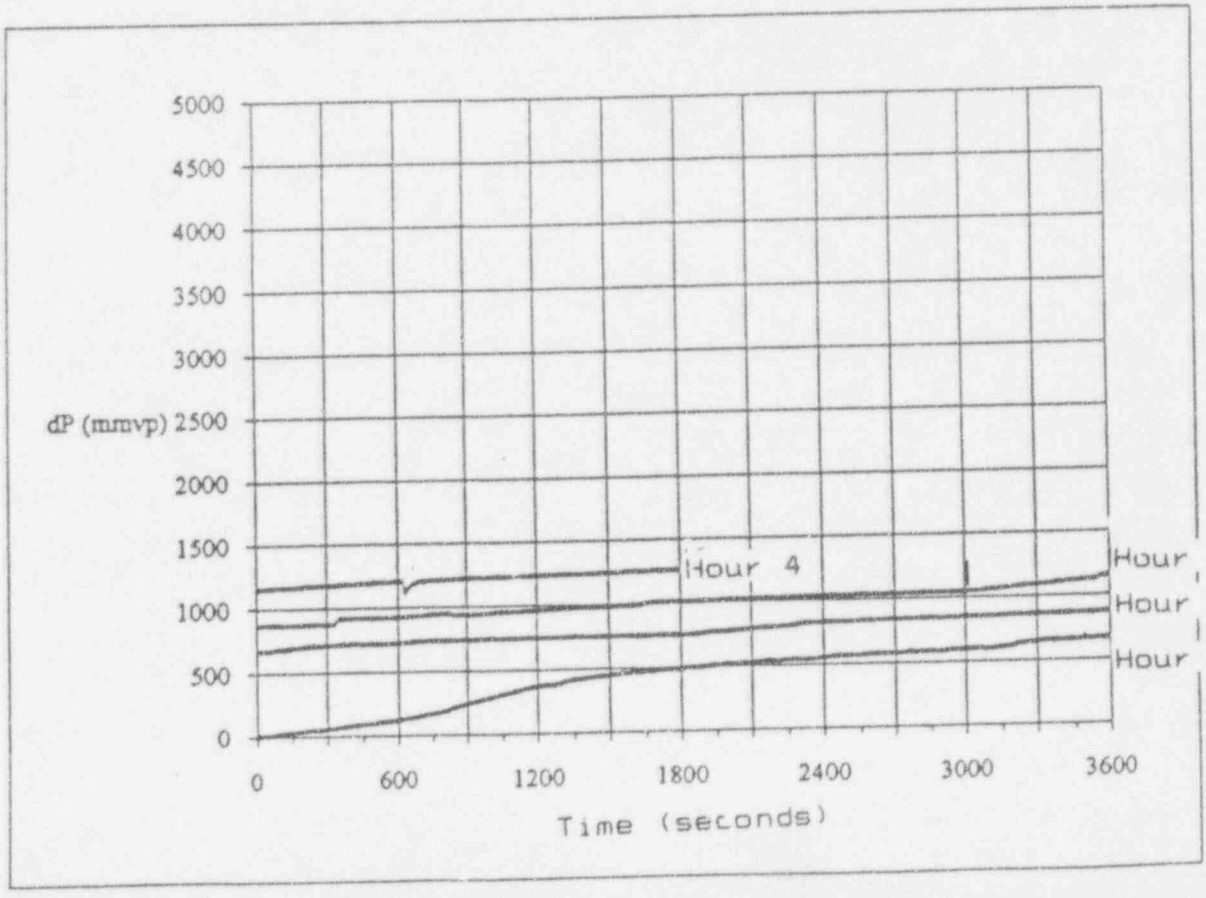
Additions Number	Time (s)	Amount (g)	Added Material
1	0	20	Mineral Wool
2	1800	10	Mineral Wool
3	2700	10	Mineral Wool
4	3600	10	Mineral Wool
5			
Final	4500		



Test Number:	3
Date:	5/13/93
Average Temperature:	22.4 Degrees Celsius
Average Speed:	1.00 cm/s
Cake Thickness loaded:	38 mm
Cake Thickness not loaded:	Not measured mm
Cake Weight dry	54.31 g
Cake Weight/surface:	6914.95 g/m2

Comments: The water was somewhat colored at the end of the test. Various sedimented materials at the bottom of the tank.

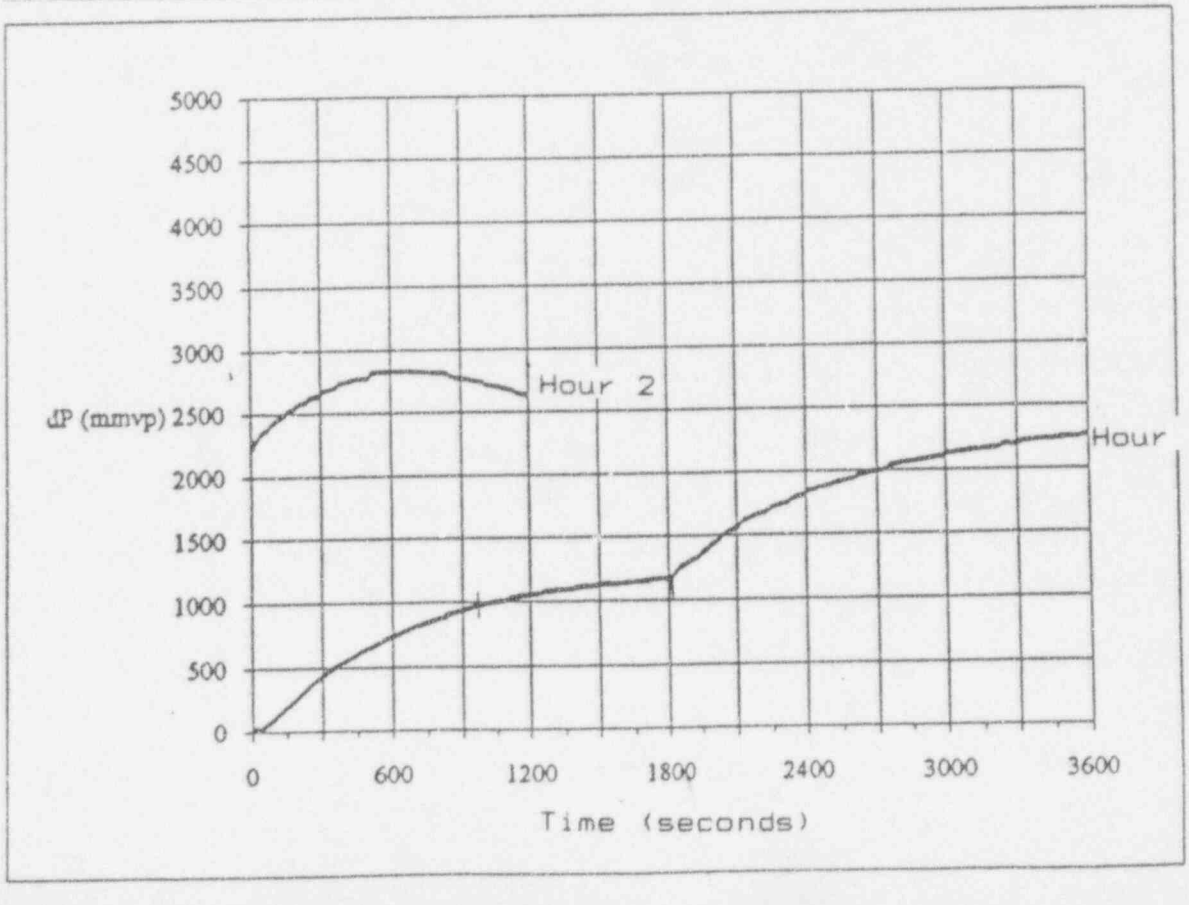
Additions Number	Time (s)	Amount (g)	Added Material
1	0	20	Transco
2	3060	20	Transco
3	5400	20	Transco
4	7800	20	Transco
5	10200	20	Transco
Final	12500		



Test Number:	4
Date:	5/13/93
Average Temperature:	20.7 Degrees Celsius
Average Speed:	3.99 cm/s
Cake Thickness loaded:	14 mm
Cake Thickness not loaded:	17 mm
Cake Weight dry	23.48 g
Cake Weight/surface:	2989.56 g/m2

Comments: Insignificant sediment at the bottom at the end. The water was clear

Additions Number	Time (s)	Amount (g)	Added Material
1	0	10	Transco
2	1800	10	Transco
3	3600	10	Transco
4			
5			
Final	48000		



Test Number: 5
Date: 5/13/93
Average Temperature: 21.3 Degrees Celsius
Average Speed: 1.00 cm/s
Cake Thickness loaded: 3 mm
Cake Thickness not loaded: 4 mm
Cake Weight dry 5.45 g
Cake Weight/surface: 693.91 g/m2

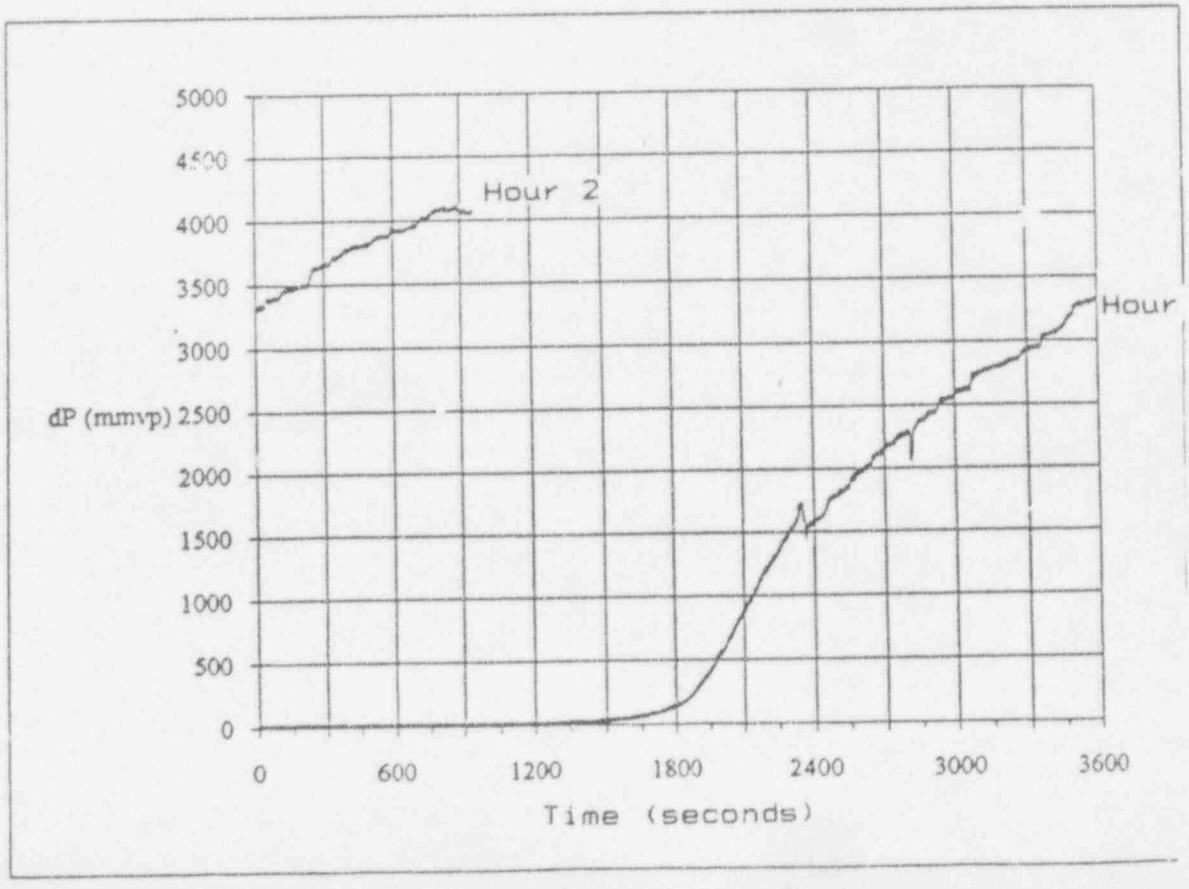
Comments: Sediment on the bottom. One hole opened in the strainer. The water was somewhat milky at the end of the test.

Additions Number	Time (s)	Amount (g)	Added Material
1	0	2	15% Steam Blasted Newtherm, 85% Mineral Wool
2	1200	5	15% Steam Blasted Newtherm, 85% Mineral Wool
3	2400	10	15% Steam Blasted Newtherm,85% Mineral Wool
4	4800	5	15% Steam Blasted Newtherm, 85% Mineral Wool
5			
Final	6900		

Test Number:	6
Date:	5/14/93
Average Temperature:	20.4 Degrees Celsius
Average Speed:	4.00 cm/s
Cake Thickness loaded:	2 mm
Cake Thickness not loaded:	5 mm
Cake Weight dry	3.78 g
Cake Weight/surface:	481.28 g/m2

Comments: Sediment of mineral wool on the bottom at the end. The was clear. No holes at the end.

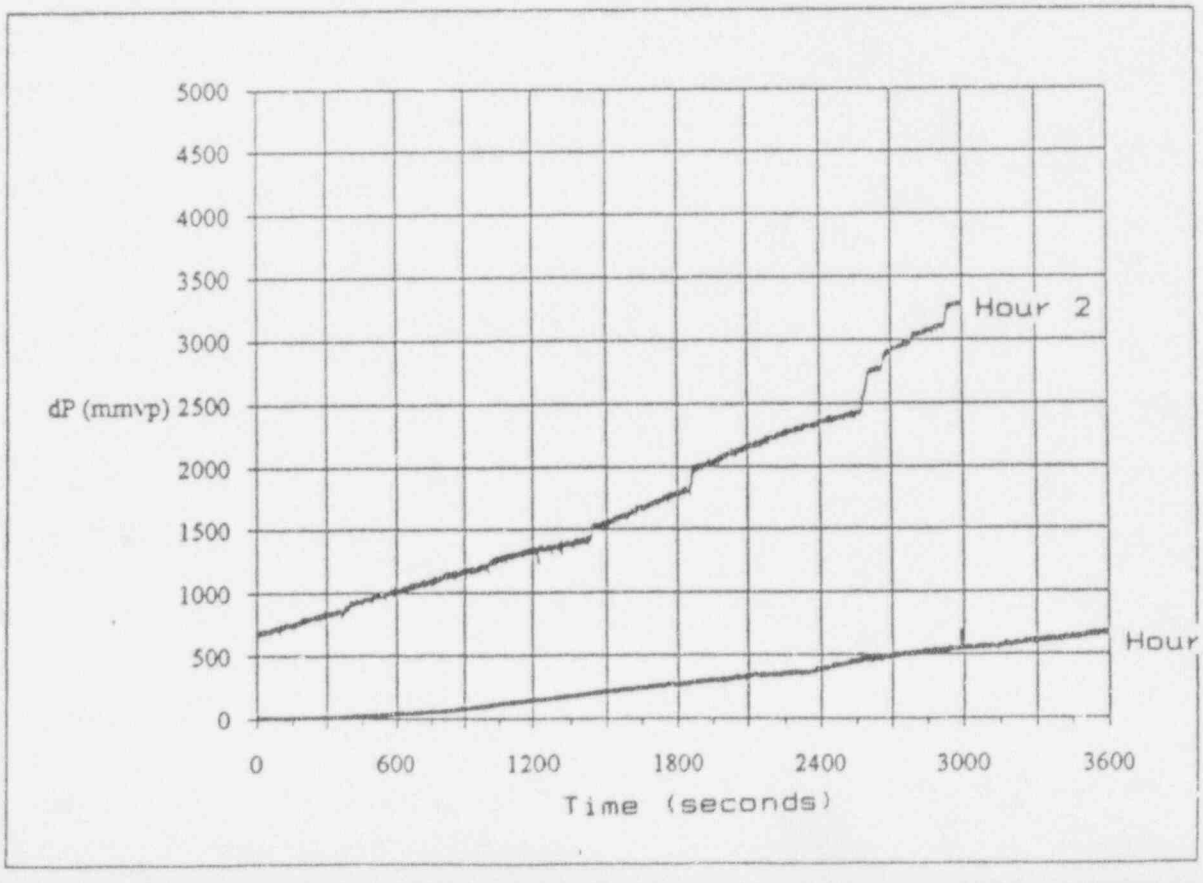
Additions Number	Time (s)	Amount (g)	Added Material
1	0	5	15% Steam Blasted Newtherm, 85% Mineral Wool
2	1200	5	15% Steam Blasted Newtherm, 85% Mineral Wool
3			
4			
5			
Final	4560		



Test Number: 7
Date: 5/14/93
Average Temperature: 21.9 Degrees Celsius
Average Speed: 1.01 cm/s
Cake Thickness loaded: 8 mm
Cake Thickness not loaded: 10 mm
Cake Weight dry 10.95 g
Cake Weight/surface: 1394.19 g/m2

Comments: Certain sediment of fiber on the bottom at the end. No holes in the cake.

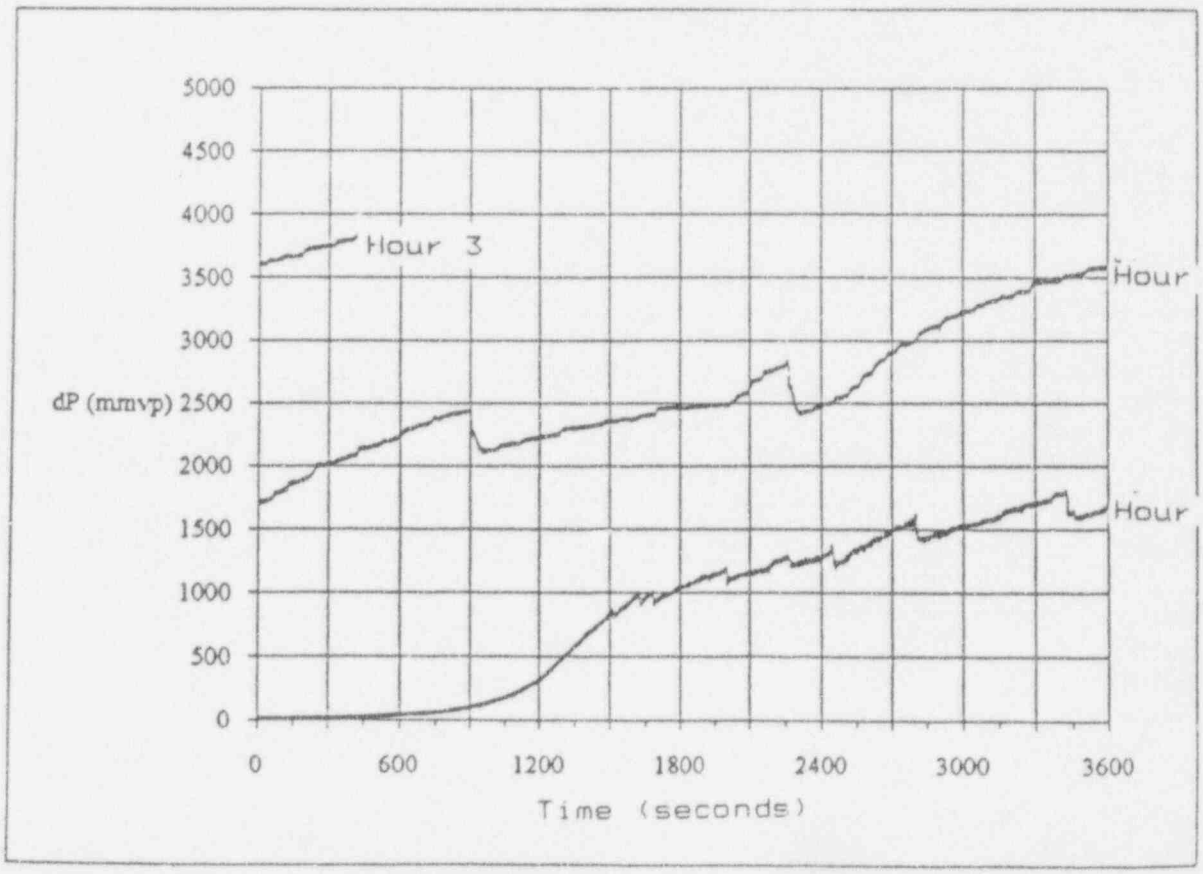
Additions Number	Time (s)	Amount (g)	Added Material
1	0	5	15% Steam Blasted Newtherm, 85% Transco
2	2400	5	15% Steam Blasted Newtherm, 85% Transco
3	3600	5	15% Steam Blasted Newtherm,85% Transco
4	5100	5	15% Steam Blasted Newtherm, 85% Transco
5			
Final	6600		



Test Number: 8
Date: 5/14/93
Average Temperature: 21.8 Degrees Celsius
Average Speed: 4.00 cm/s
Cake Thickness loaded: 4 mm
Cake Thickness not loaded: 5 mm
Cake Weight dry 5.93 g
Cake Weight/surface: 755.03 g/m2

Comments: Some sediment of fiber at the end. 4 holes in the cake at the end. The water was clear at the end.

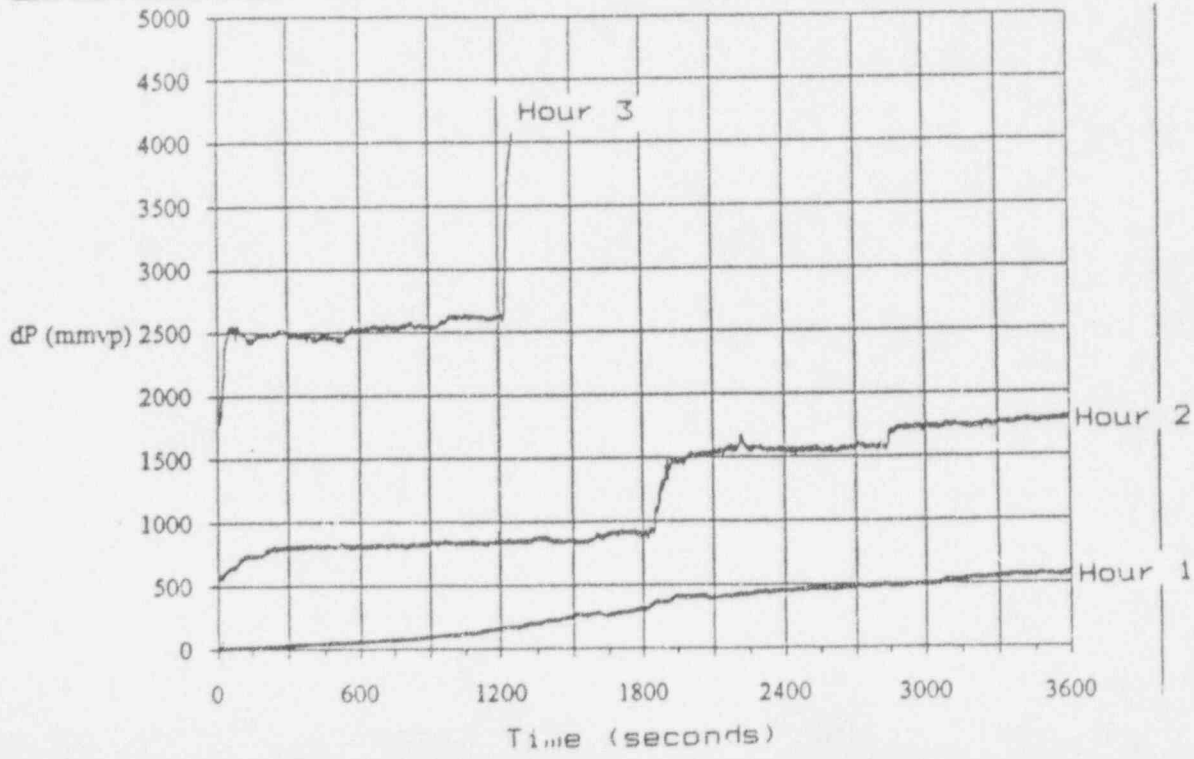
Additions Number	Time (s)	Amount (g)	Added Material
1	0	4	15% Steam Blasted Newtherm, 85% Transco
2	2400	20	15% Steam Blasted Newtherm, 85% Transco
3	5640	20	15% Steam Blasted Newtherm, 85% Transco
4			
5			
Final	7620		



Test Number: 10
Date: 5/19/3
Average Temperature: 21.6 Degrees Celsius
Average Speed: 3.99 cm/s
Cake Thickness loaded: not measured mm
Cake Thickness not loaded: 2.5 mm
Cake Weight dry 6.43 g
Cake Weight/surface: 818.69 g/m2

Comments: 2 holes in the cake at the end. Residue of Newtherm in the water at the end. Pump did not function after 8400 seconds, but only produced 3.4 cm/s at the end.

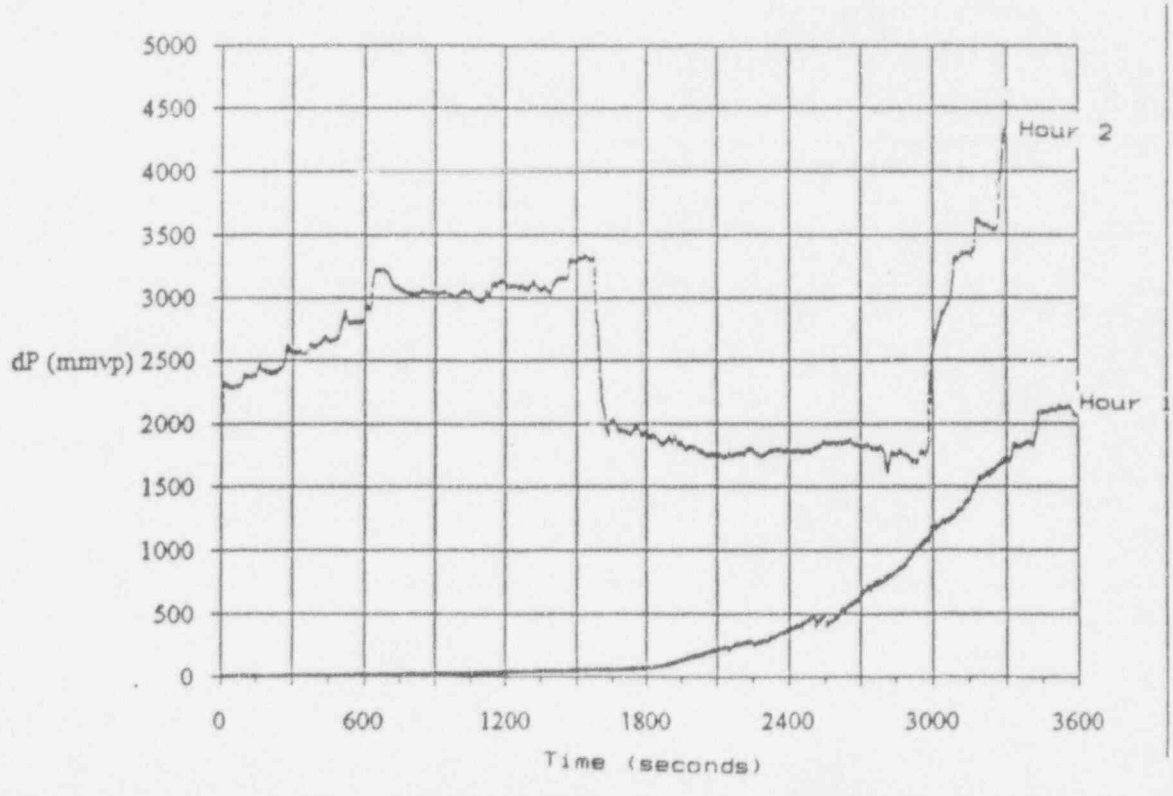
Additions Number	Time (s)	Amount (g)	Added Material
1	0	20	50% Mineral Wool, 50% Steam Blasted Newtherm
2	1800	20	50% Mineral Wool, 50% Steam Blasted Newtherm
3	3600	20	50% Mineral Wool 50% Steam Blasted Newtherm
4	5400	40	50% Mineral Wool, 50% Steam Blasted Newtherm
5	7200	40	50% Mineral Wool, 50% Steam Blasted Newtherm
6	8400	40	50% Mineral Wool, 50% Steam Blasted Newtherm
Final	84606900		



Test Number: 11
Date: 5/21/93
Average Temperature: 21.2 Degrees Celsius
Average Speed: 1.00 cm/s
Cake Thickness loaded: not measured mm
Cake Thickness not loaded: 7 (measured in air) mm
Cake Weight dry 3.22 g
Cake Weight/surface: 409.98 g/m2

Comments: Sediment primarily of Newtherm at the end. After 6840 seconds, the pump did not produce a flow, at the end about 0.6 cm/s

Additions Number	Time (s)	Amount (g)	Added Material
1	0	10	50% Transco, 50% Brushed Newtherm
2	1800	10	50% Transco, 50% Brushed Newtherm
3	3600	2	50% Transco, 50% Brushed Newtherm
4	5400	4	50% Transco, 50% Brushed Newtherm
5	6300	8	50% Transco, 50% Brushed Newtherm
Final	6900		



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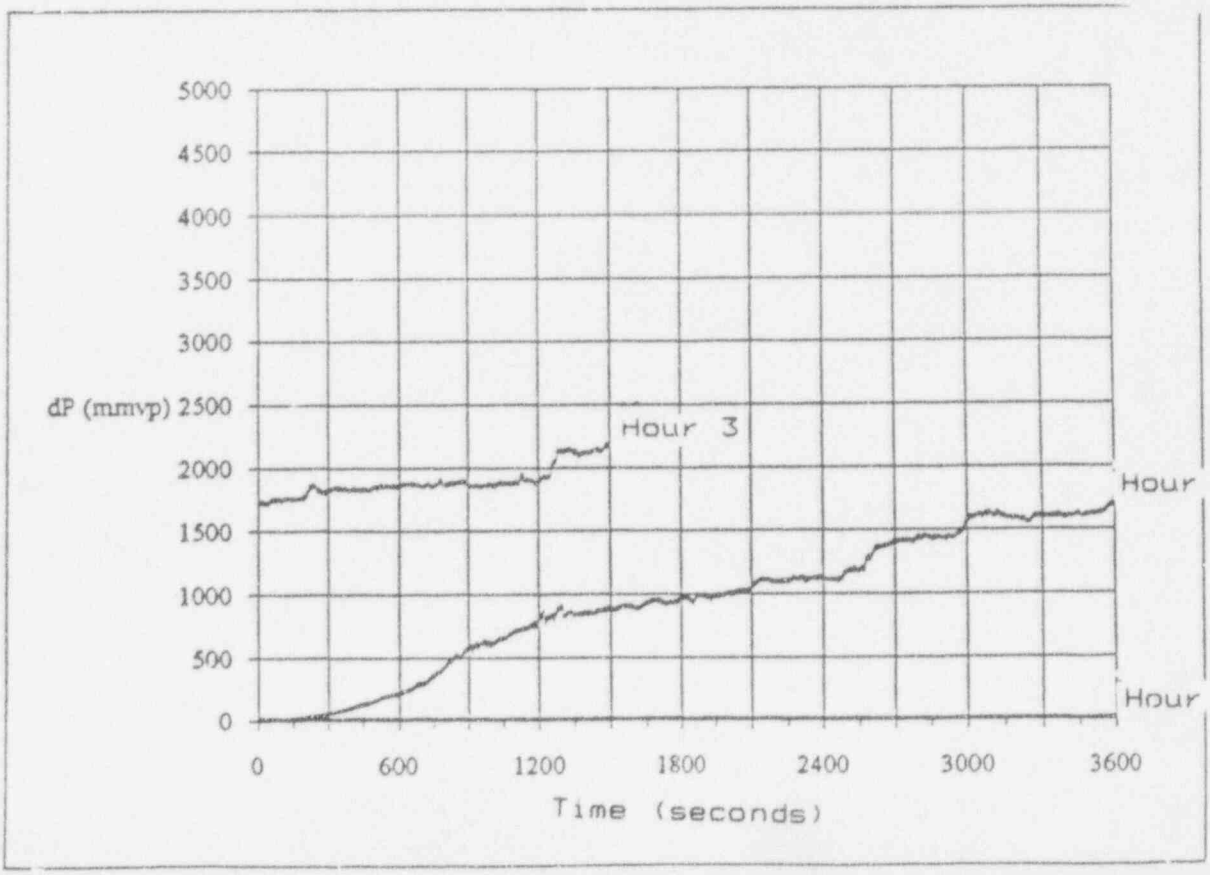
Test Number:	12
Date:	5/18/93
Average Temperature:	22.4 Degrees Celsius
Average Speed:	4.00 cm/s
Cake Thickness loaded:	2 mm
Cake Thickness not loaded:	4 mm
Cake Weight dry	3.54
Cake Weight/surface:	450.73 g/m2

Comments: Uncertain measurement of the cake thickness when the water was milky. Residue of Newtherm and a little sedimented Transco at the end.

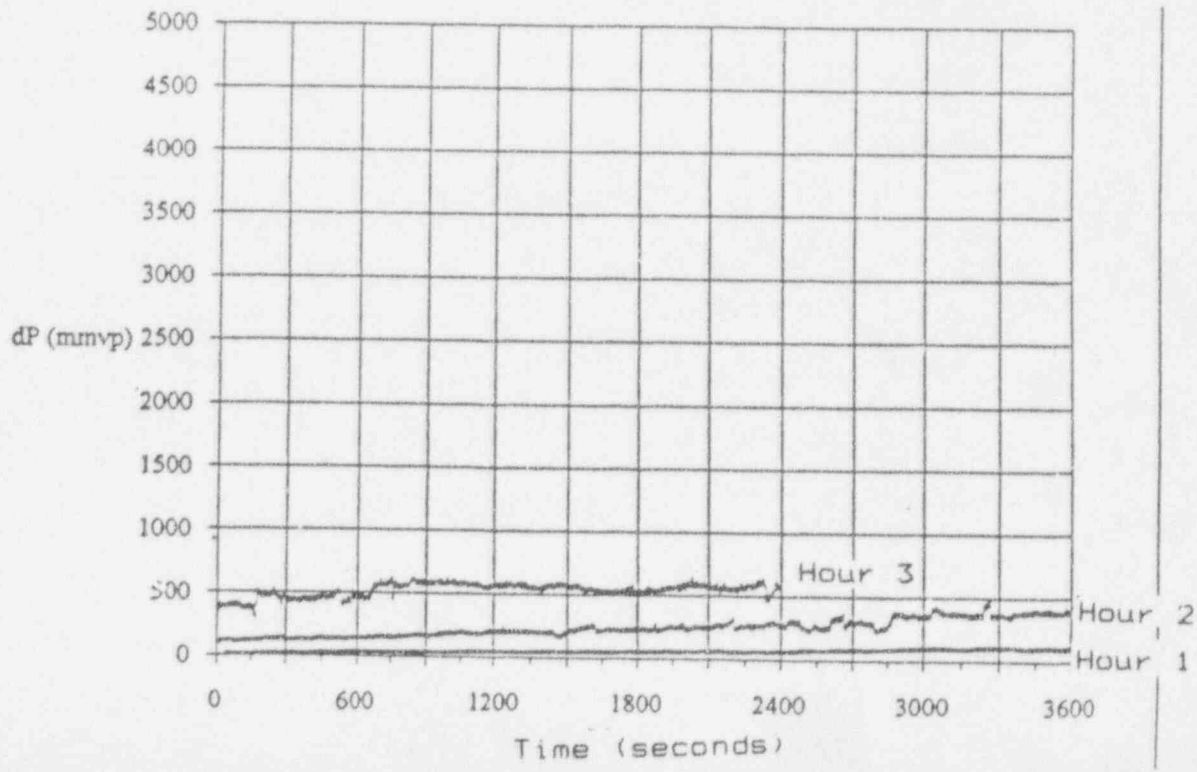
Additions Number	Time (s)	Amount (g)	Added Material
1	0	5	50% Transco, 50% Steam Blasted Newtherm
2	1800	5	50% Transco, 50% Steam Blasted Newtherm
3	3600	10	50% Transco, 50% Steam Blasted Newtherm
4	5400	10	50% Transco, 50% Steam Blasted Newtherm
5			
Final	8700		



Test Number: 15
Date: 5/21/93
Average Temperature: 21.2 Degrees Celsius
Average Speed: 1.00 cm/s
Cake Thickness loaded: 3 mm
Cake Thickness not loaded: not measured mm
Cake Weight dry 4.79 g
Cake Weight/surface: 609.88 g/m2

Comments: Depth of visibility about 0-5 cm. Cake thickness measured by placing the measurement stick in the cake. Three holes in the cake at the end. Sediment of Newtherm at the bottom at the end.

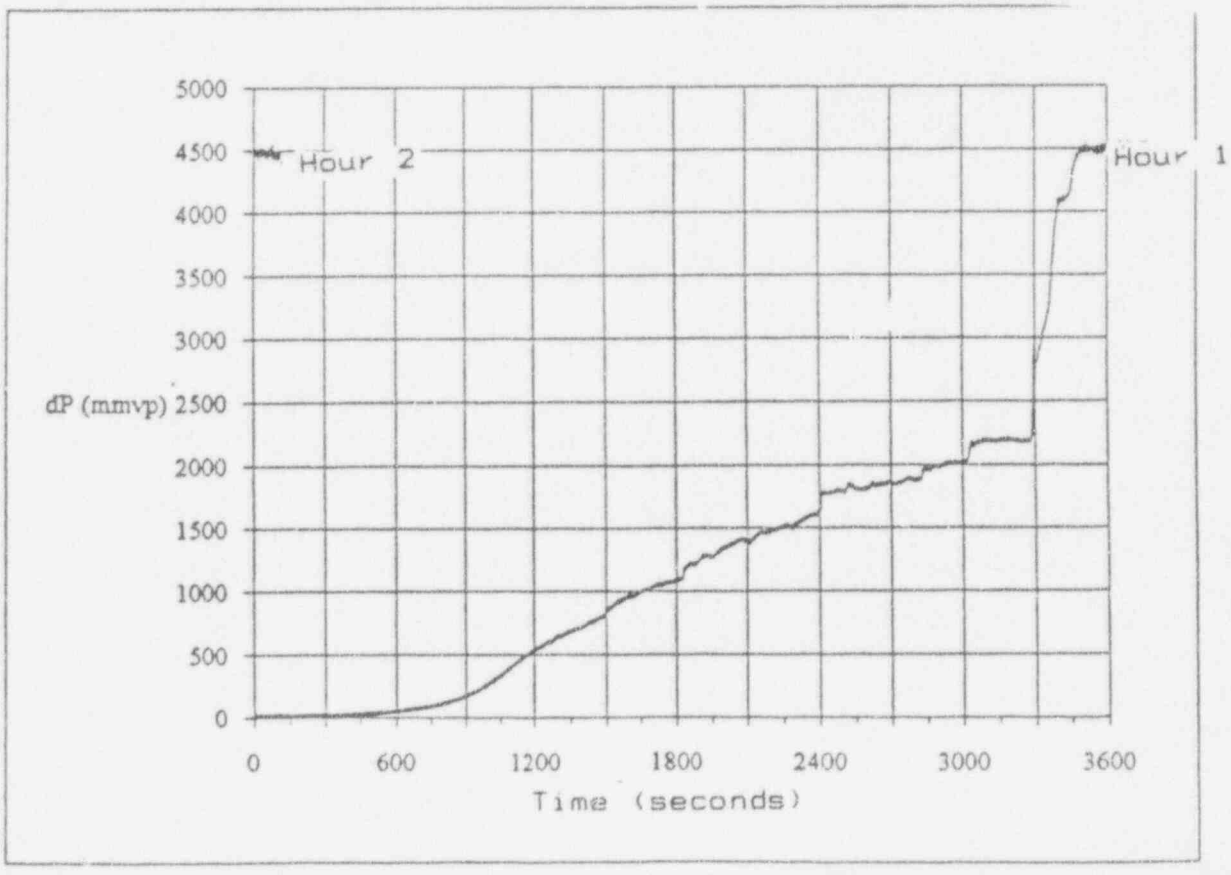
Additions Number	Time (s)	Amount (g)	Added Material
1	0		15% Transco, 85 % Brushed Newtherm
2	2400		15% Transco, 85% Brushed Newtherm
3	4200		15% Transco, 85% Brushed Newtherm
4	6000		15% Transco, 85% Brushed Newtherm
5	7800		15% Transco, 85% Brushed Newtherm
Final	9600		



Test Number:	17
Date:	5/12/93
Average Temperature:	19.8 Degrees Celsius
Average Speed:	1.01 cm/s
Cake Thickness loaded:	- mm
Cake Thickness not loaded:	0.5 mm
Cake Weight dry	1.12 g
Cake Weight/surface:	281.97 g/m2

Comments: Cake thickness with load not measurable since the water is milky. 0.5 mm net was used over the hole plate. With dP over 4000 mmvp the pump did not produce 1 cm/s but sank to 0.5 cm/s at the end of the test.

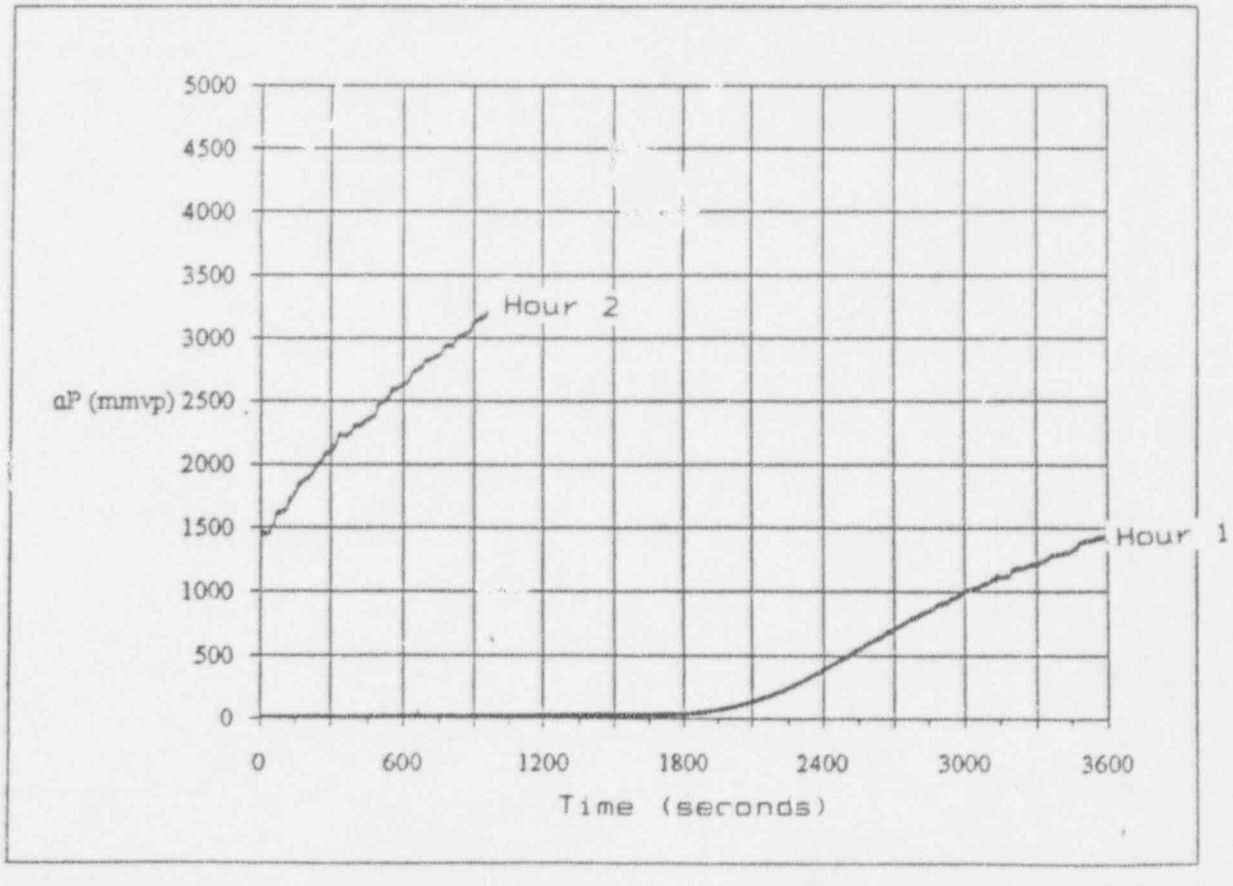
Additions Number	Time (s)	Amount (g)	Added Material
1	0	10	Steam Blasted Newtherm
2	3240	10	Steam Blasted Newtherm
3			
4			
5			
Final	3720		



Test Number:	18
Date:	5/12/93
Average Temperature:	21.1 Degrees Celsius
Average Speed:	4.00 cm/s
Cake Thickness loaded:	- mm
Cake Thickness not loaded:	0.5 mm
Cake Weight dry	0.41 g
Cake Weight/surface:	52.20 g/m2

Comments: Cake thickness with load not measurable since the water is milky. 0.5 mm net was used over the hole plate. The water was also not entirely clear at the end, probably small particles that were circulating.

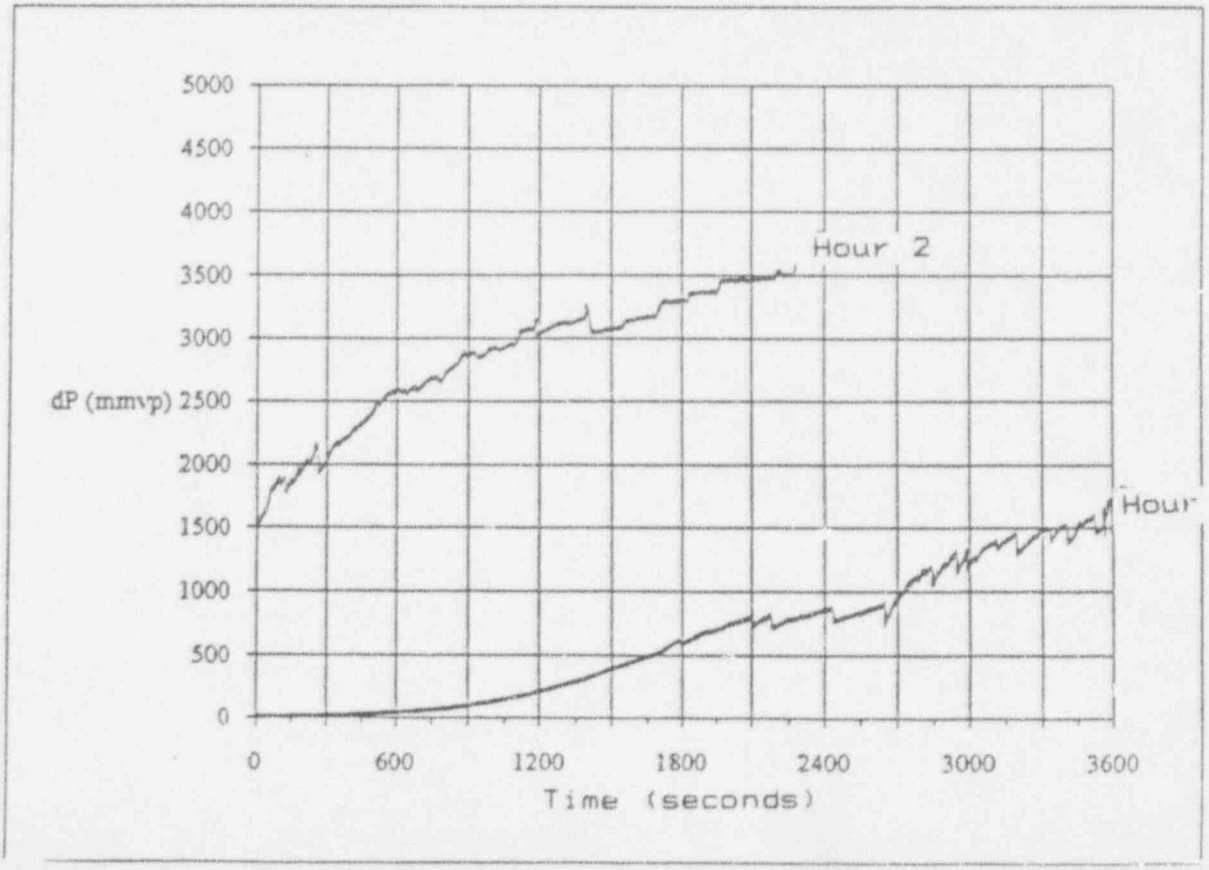
Additions Number	Time (s)	Amount (g)	Added Material
1	0	2	Steam Blasted Newtherm
2	1800	2	Steam Blaste Newtherm
3	3600	2	Steam Blasted Newtherm
4			
5			
Final	4560		



Test Number: 19
Date: 5/21/93
Average Temperature: 21.0 Degrees Celsius
Average Speed: 2.01 cm/s
Cake Thickness loaded: 7 mm
Cake Thickness not loaded: 9 mm
Cake Weight dry 8.65 g
Cake Weight/surface: 1101.35 g/m2

Comments: No holes in the cake at the end.

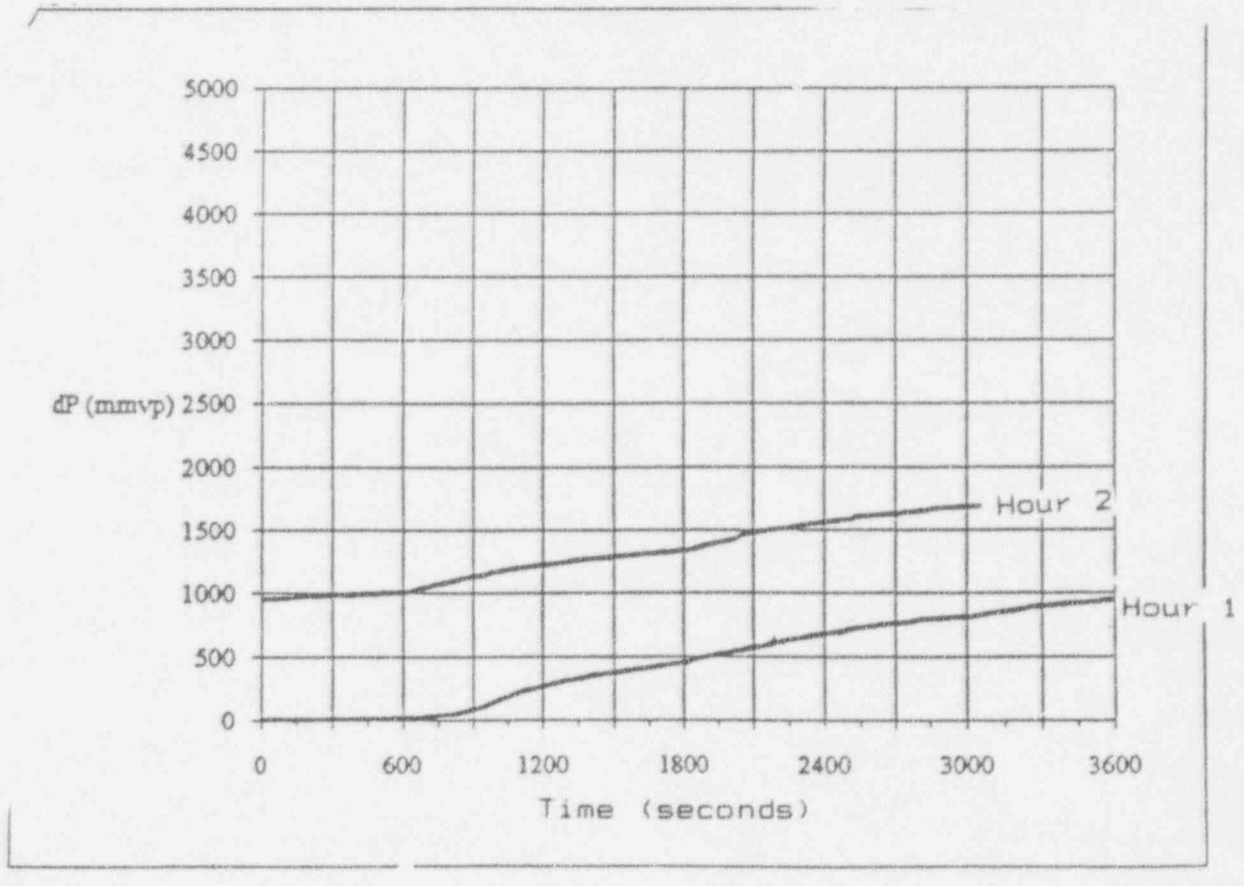
Additions Number	Time (s)	Amount (g)	Added Material
1	0	5	15% Transco, 15% Brushed Newtherm
2	2640	5	15% Transco, 15% Brushed Newtherm
3	3540	5	15% Transco, 15% Brushed Newtherm
4			15% Transco, 85% Brushed Newtherm
5			15% Transco, 85% Brushed Newtherm
Final	5880		



Test Number: 22
Date: 5/17/93
Average Temperature: 20.9 Degrees Celsius
Average Speed: 2.00 cm/s
Cake Thickness loaded: 16 mm
Cake Thickness not loaded: 18 mm
Cake Weight dry 26.25 g
Cake Weight/surface: 3342.25 g/m2

Comments: Sediment on the bottom at the end.

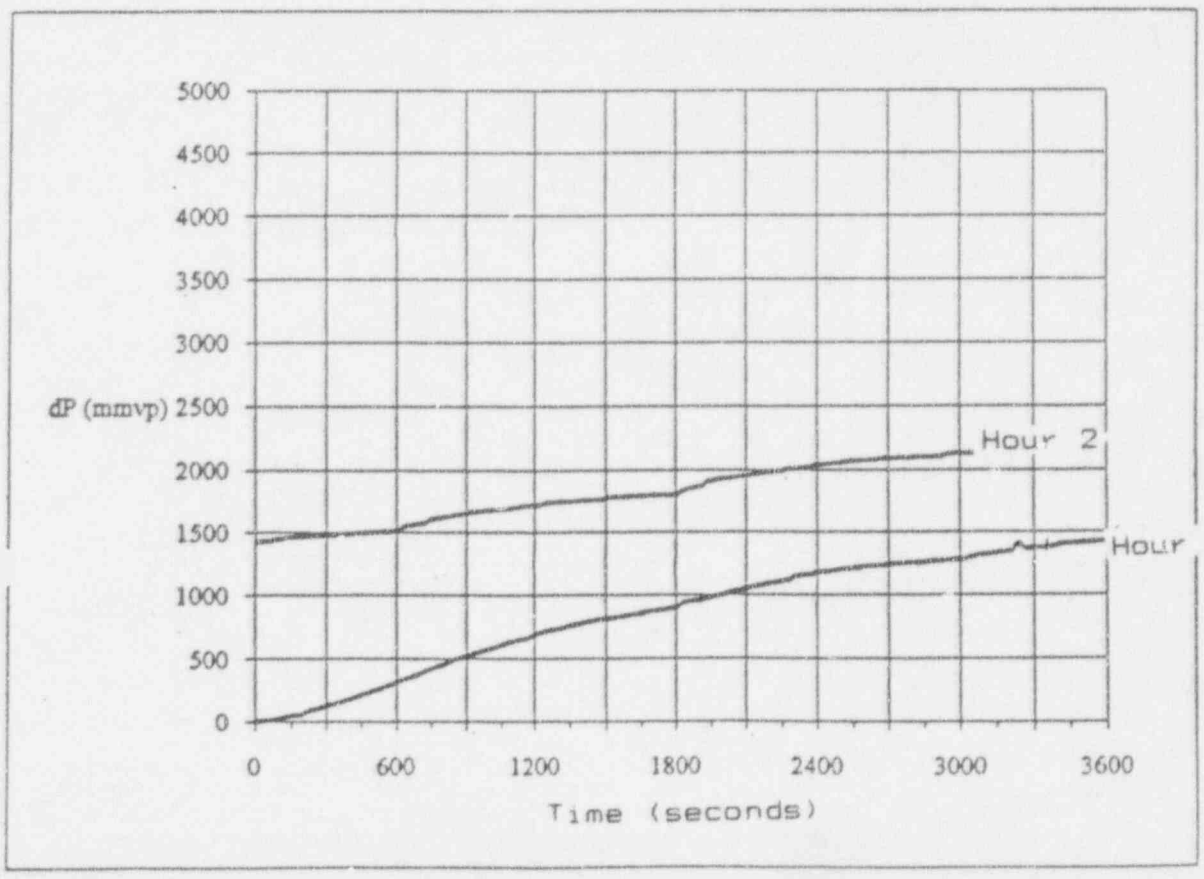
Additions Number	Time (s)	Amount (g)	Added Material
1	0	20	Mineral Wool
2	1800	10	Mineral Wool
3	3000	10	Mineral Wool
4	4200	20	Mineral Wool
5	5400	20	Mineral Wool
Final	6660		



Test Number:	23
Date:	5/17/93
Average Temperature:	21.4 Degrees Celsius
Average Speed:	2.00 cm/s
Cake Thickness loaded:	22 mm
Cake Thickness not loaded:	32 mm
Cake Weight dry	32.34 g
Cake Weight/surface:	4117.65 g/m2

Comments: Sediment on the bottom at the end.

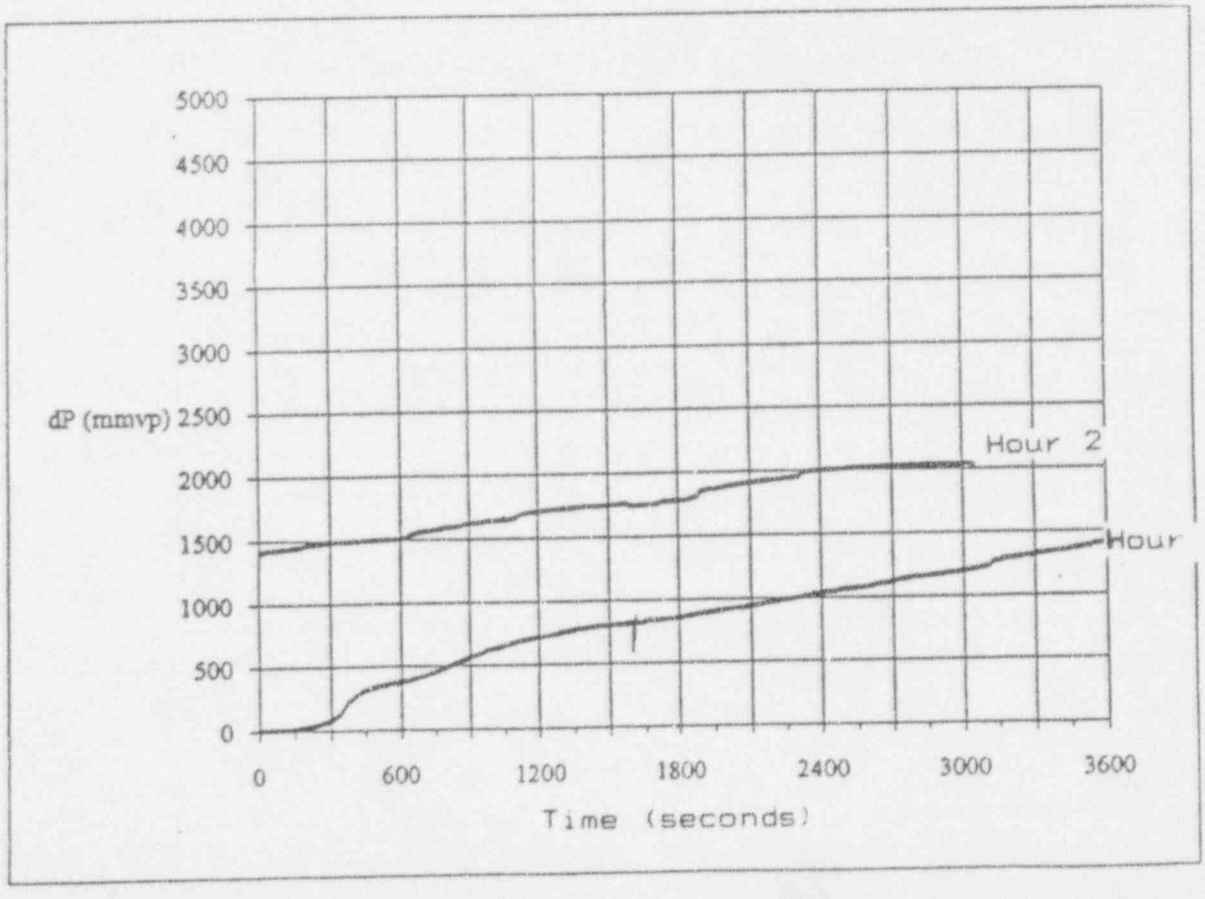
Additions Number	Time (s)	Amount (g)	Added Material
1	0	20	Mineral Wool
2	1800	10	Mineral Wool
3	3000	10	Mineral Wool
4	4200	20	Mineral Wool
5	5400	20	Mineral Wool
Final	6660		



Test Number: 24
Date: 5/17/93
Average Temperature: 23.1 Degrees Celsius
Average Speed: 2.01 cm/s
Cake Thickness loaded: 21 mm
Cake Thickness not loaded: 34 mm
Cake Weight dry 32.36 g
Cake Weight/surface: 4120.19 g/m2

Comments: Sediment on the bottom at the end.

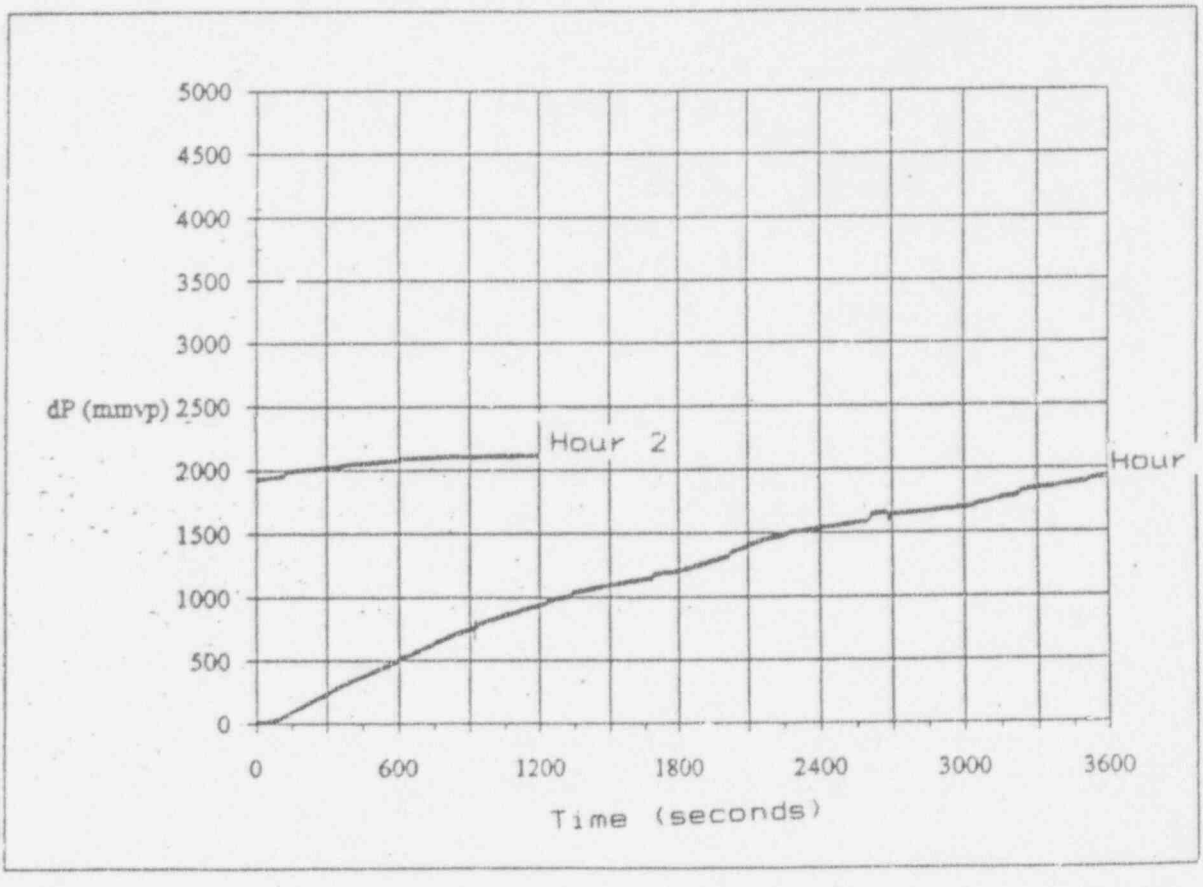
Additions Number	Time (s)	Amount (g)	Added Material
1	0	20	Mineral Wool
2	1800	10	Mineral Wool
3	3000	10	Mineral Wool
4	4200	20	Mineral Wool
5	5400	20	Mineral Wool
Final	6660		



Test Number: 25
Date: 5/18/93
Average Temperature: 21.0 Degrees Celsius
Average Speed: 2.01 cm/s
Cake Thickness loaded: 15 mm
Cake Thickness not loaded: 28 mm
Cake Weight dry 25.92 g
Cake Weight/surface: 3300.23 g/m2

Comments: Sediment on the bottom at the end.

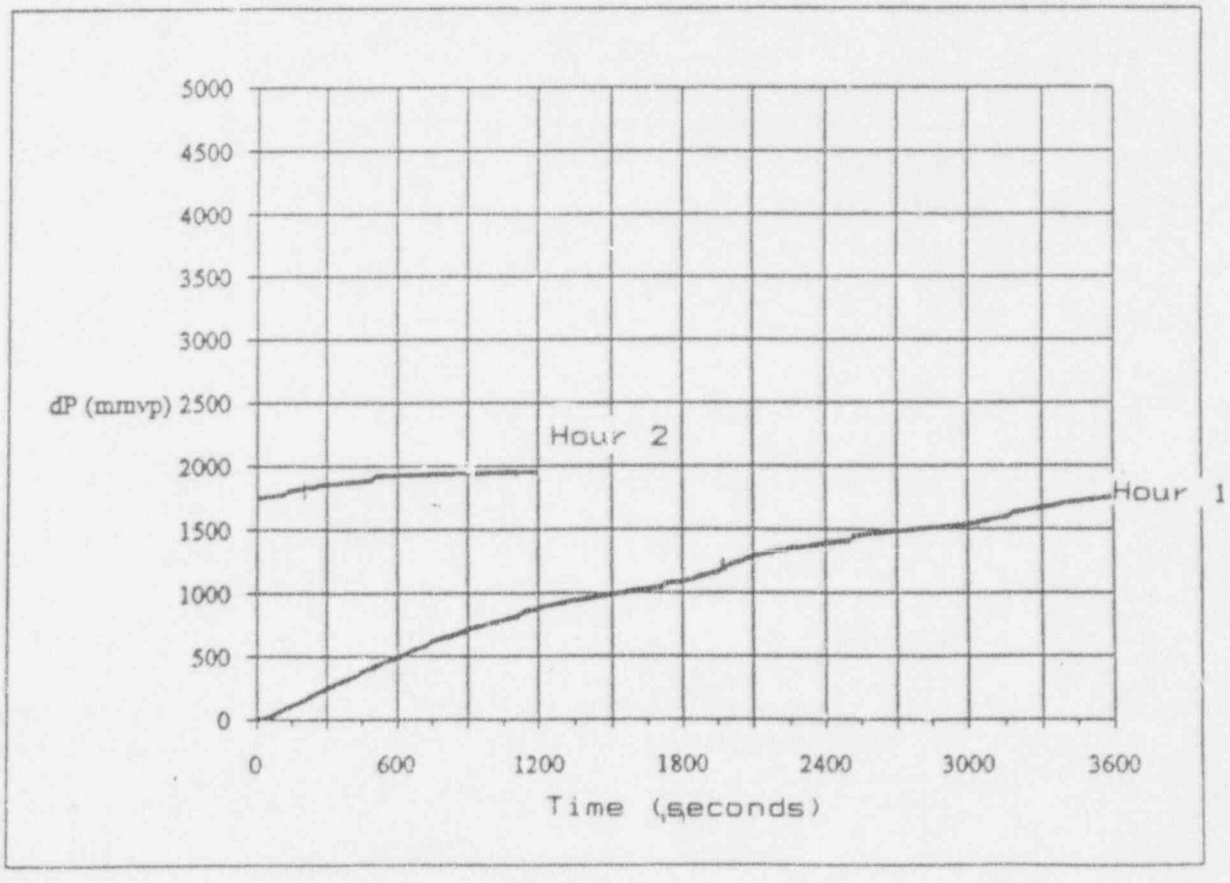
Additions Number	Time (s)	Amount (g)	Added Material
1	0	20	Transco
2	1800	10	Transco
3	3000	10	Transco
4			
5			
Final	4800		



Test Number: 26
Date: 5/18/93
Average Temperature: 21.0 Degrees Celsius
Average Speed: 2.01 cm/s
Cake Thickness loaded: 16.5 mm
Cake Thickness not loaded: 30 mm
Cake Weight dry 26.35 g
Cake Weight/surface: 3354.98 g/m2

Comments: Sediment at the end.

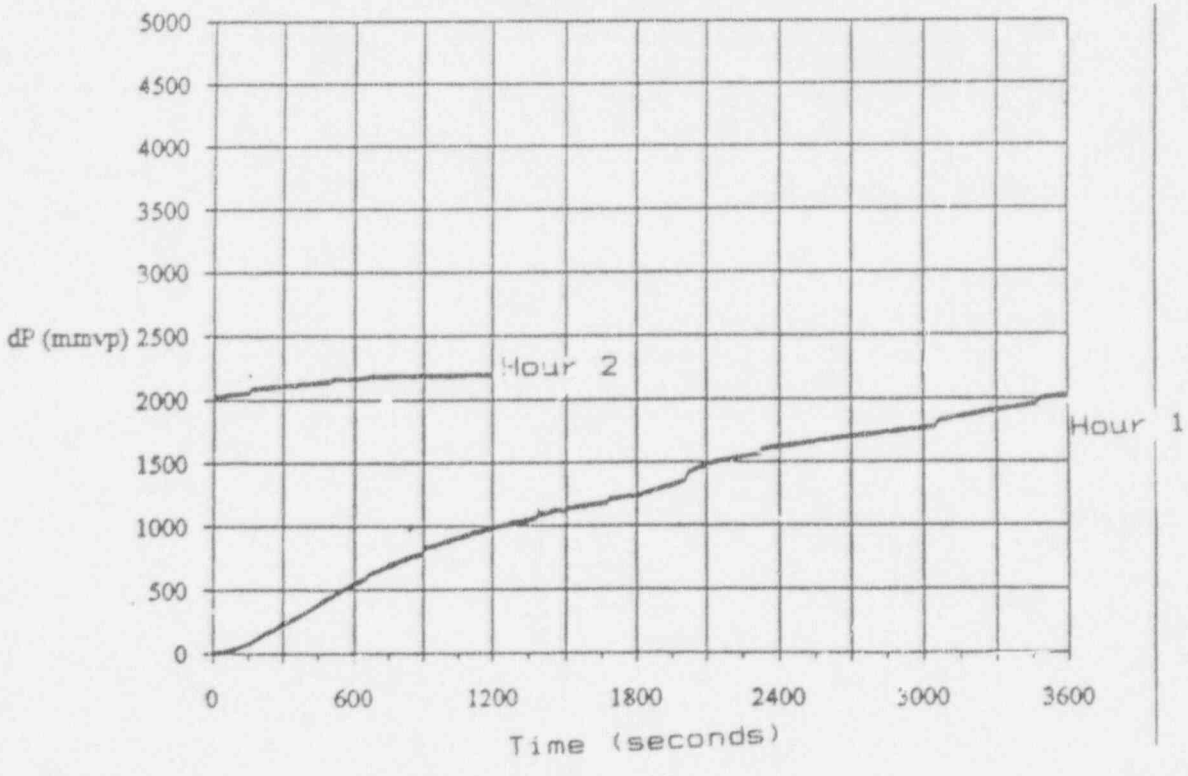
Additions Number	Time (s)	Amount (g)	Added Material
1	0	20	Transco
2	1800	10	Transco
3	3000	10	Transco
4			
5			
Final	4800		



Test Number:	27
Date:	5/18/93
Average Temperature:	20.8 Degrees Celsius
Average Speed:	2.00 cm/s
Cake Thickness loaded:	14 mm
Cake Thickness not loaded:	23.5 mm
Cake Weight dry	25.34 g
Cake Weight/surface:	3226/38 g/m2

Comments: Sediment at the end. Log missing for the first 13 seconds.

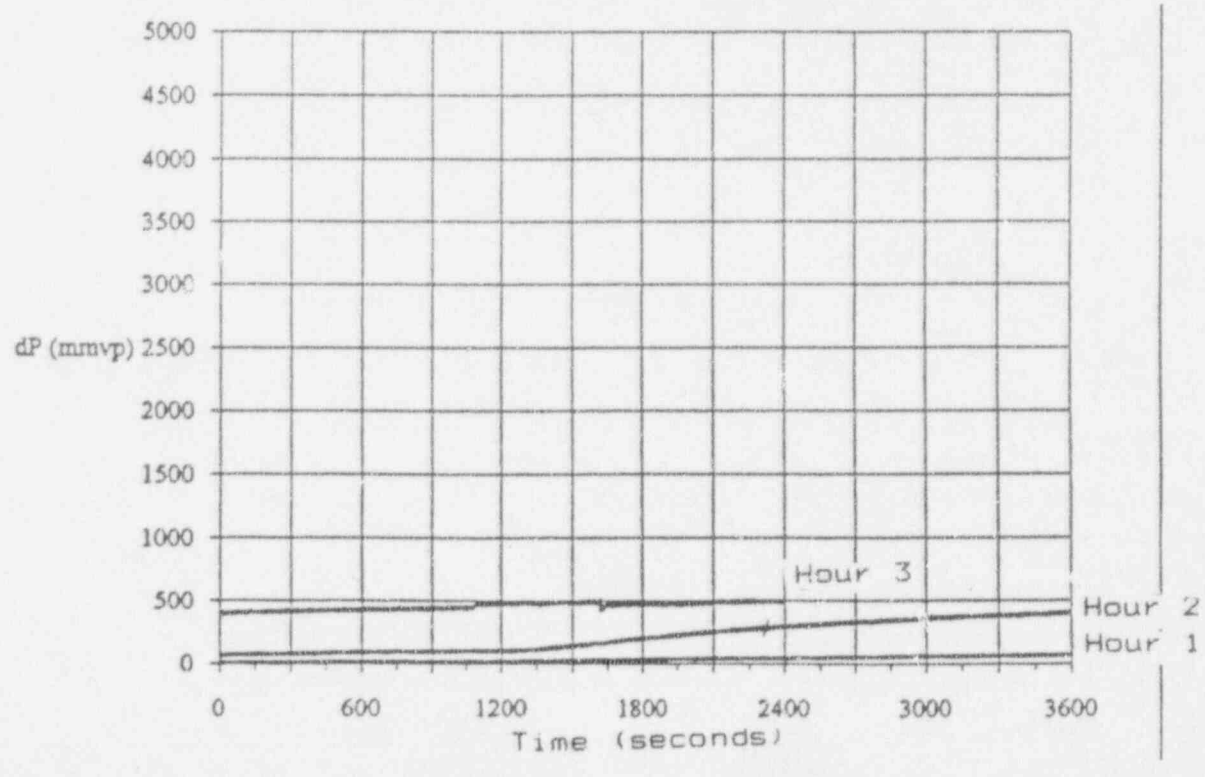
Additions Number	Time (s)	Amount (g)	Added Material
1	0	20	Transco
2	1800	10	Transco
3	3000	10	Transco
4			
5			
Final	4800		



Test Number:	30
Date:	5/19/93
Average Temperature:	22.7 Degrees Celsius
Average Speed:	1.01 cm/s
Cake Thickness loaded:	69 mm
Cake Thickness not loaded:	81 mm
Cake Weight dry	53.72 g
Cake Weight/surface:	6839.83 g/m2

Comments: Field dosage in 4 first dosages. In the last one, the rest was directly added. The test can be used for comparison with others to see the effect of the rate of the dosage. Sediment of Transco remaining at the end.

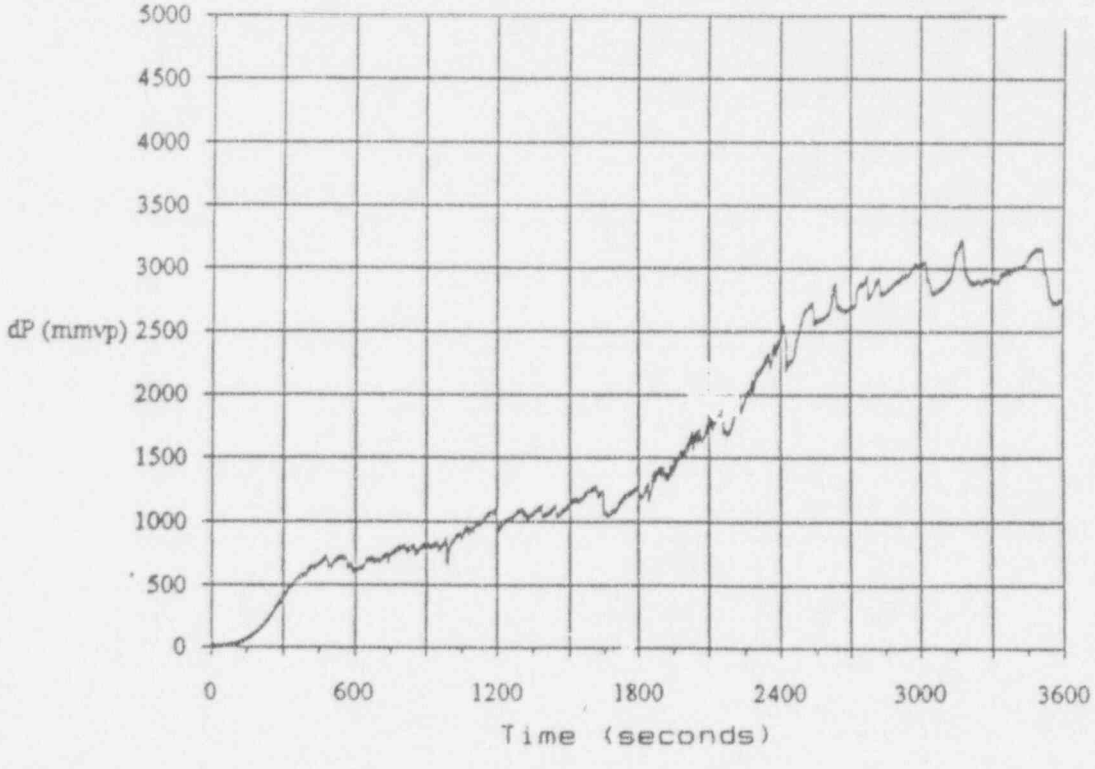
Additions Number	Time (s)	Amount (g)	Added Material
1	0	4	Stem Blasted Transco
2	1200	4	Steam Blasted Transco
3	2400	4	Steam Blasted Transco
4	3600	8	Steam Blasted Transco
5	4800	70	Steam Blasted Transco
Final	9600		



Test Number: 35
Date: 5/18/93
Average Temperature: 20.4 Degrees Celsius
Average Speed: 3.99 cm/s
Cake Thickness loaded: 3.5 mm
Cake Thickness not loaded: 5 mm
Cake Weight dry 3.35 g
Cake Weight/surface: 426.53 g/m2

Comments: Very little sediment. Difficult to control the flow. Residue of Newtherm in the water at the end. No holes in the cake.

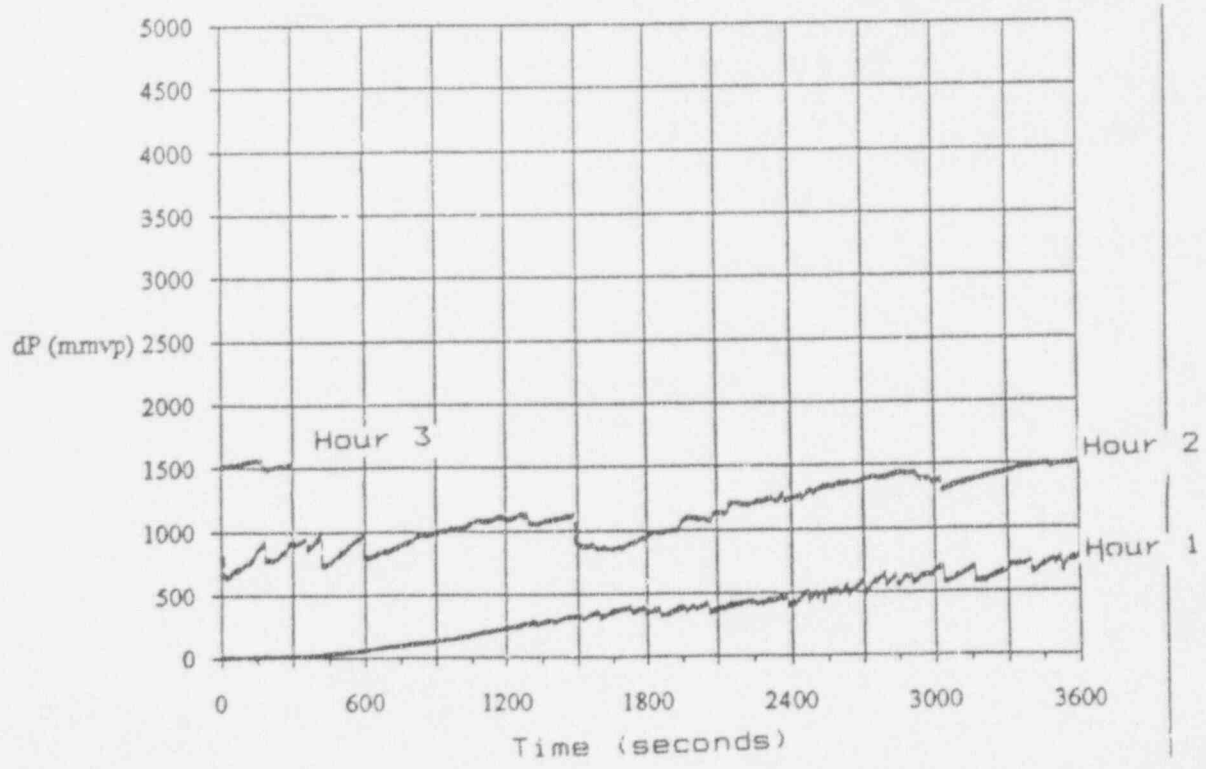
Additions Number	Time (s)	Amount (g)	Added Material
1	0	2	50% Steam Blasted Transco, 50% Steam Blasted Newtherm
2	1800	2	50% Steam Blasted Transco, 50% Steam Blasted Newtherm
3			
4			
5			
Final	3600		



Test Number: 36
Date: 5/19/93
Average Temperature: 21.7 Degrees Celsius
Average Speed: 1.00 cm/s
Cake Thickness loaded: 15 mm
Cake Thickness not loaded: 18 mm
Cake Weight dry 8.9 g
Cake Weight/surface: 1133.18 g/m2

Comments: A little sediment of Transco at the end. Residue of Newtherm in the water at the end; the waster was a little milky.

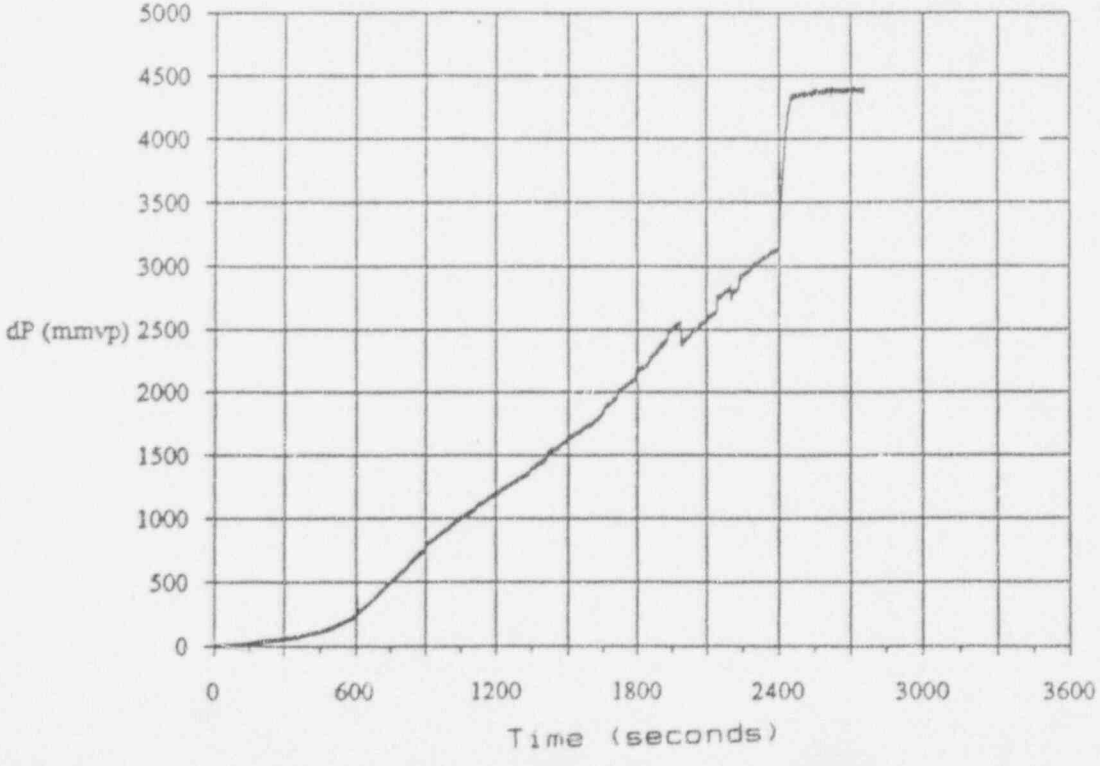
Additions Number	Time (s)	Amount (g)	Added Material
1	0	5	15% Brushed Newtherm, 85% Transco
2	2400	5	15% Brushed Newtherm, 85% Transco
3	3600	5	15% Brushed Newtherm, 85% Transco
4	5100	5	15% Brushed Newtherm, 85% Transco
5			
Final	7500		



Test Number:	37
Date:	5/24/93
Average Temperature:	20.3 Degrees Celsius
Average Speed:	3.99 cm/s
Cake Thickness loaded:	1 mm
Cake Thickness not loaded:	3 mm
Cake Weight dry	3.81 g
Cake Weight/surface:	485.10 g/m2

Comments: The test should correspond to test number 8 but with brushed Newtherm. The test was interrupted when the pump did not produce 4 cm/s. The speed began to drop after about 2280 seconds and at the end was 2.2 cm/s. Three holes in the cake and the water was almost clear at the end.

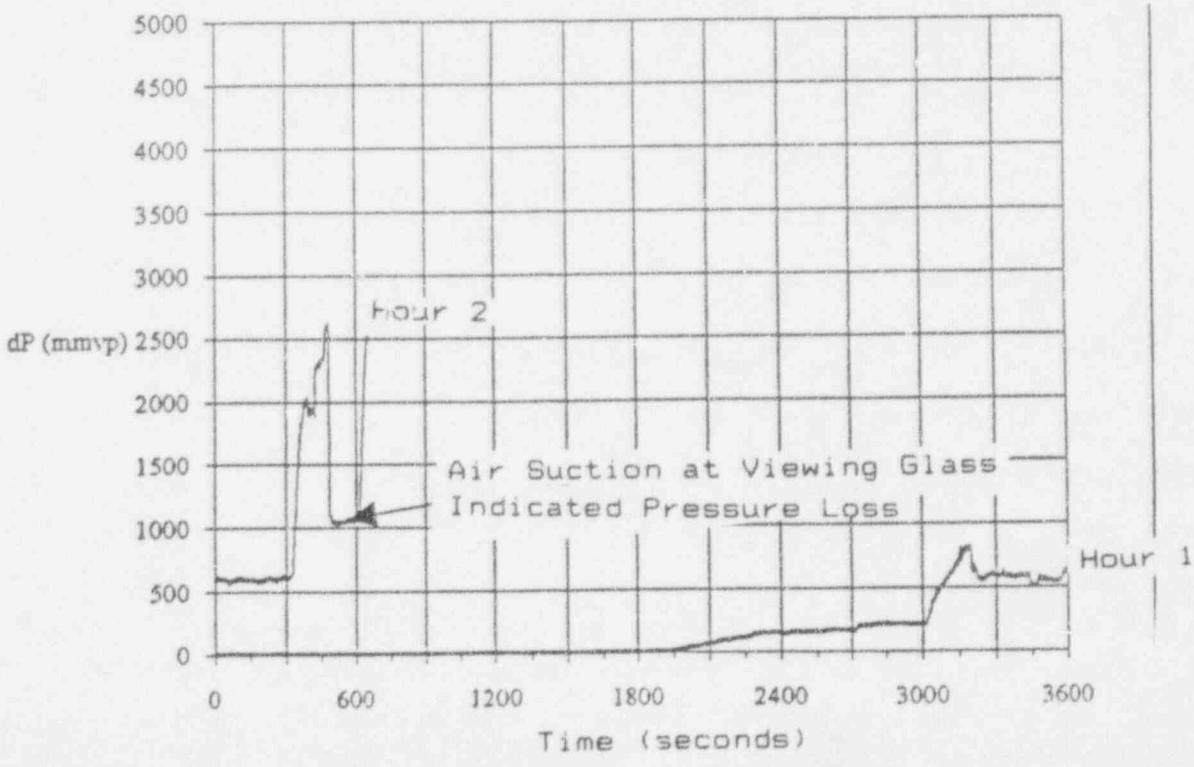
Additions Number	Time (s)	Amount (g)	Added Material
1	0	5	85% Transco, 15% Brushed Newtherm
2	2400	2	85% Transco, 15% Brushed Newtherm
3			
4			
5			
Final	2760		



Test Number: 38
Date: 5/19/93
Average Temperature: 20.0 Degrees Celsius
Average Speed: 1.00 cm/s
Cake Thickness loaded: not measurable mm
Cake Thickness not loaded: 5 (in the air) mm
Cake Weight dry 7.65 g
Cake Weight/surface: 974.03 g/m2

Comments: Sediment of mineral wool at the end and residue of Newtherm in the water. No hole in the cake. After 4200 seconds the pump could no longer produce 1 cm/s but sank to 0.64 cm/s at the end.

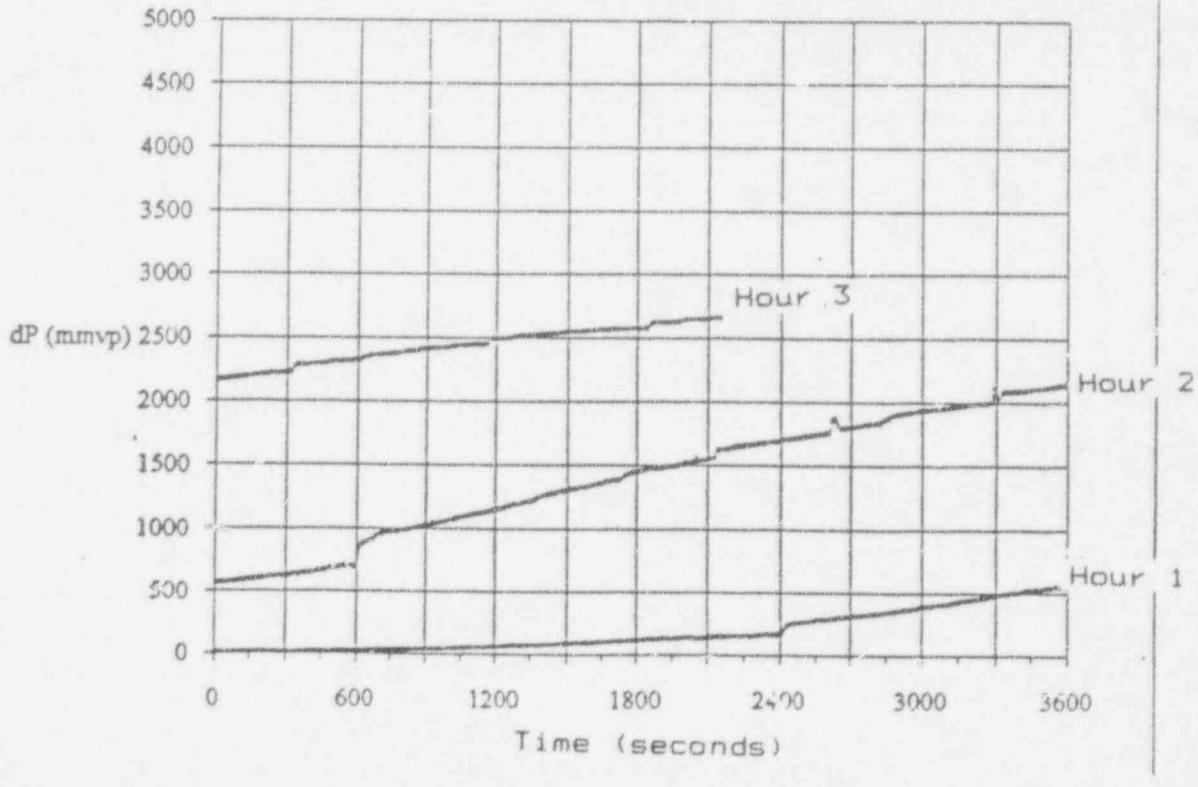
Additions Number	Time (s)	Amount (g)	Added Material
1	0	60	50% Mineral Wool, 50% Steam Blasted Newtherm
2	900	60	50% Mineral Wool, 50% Steam Blasted Newtherm
3	1800	60	50% Mineral Wool, 50% Steam Blasted Newtherm
4	3000	60	50% Mineral Wool, 50% Steam Blasted Newtherm
5	3900	60	50% Mineral Wool, 50% Steam Blasted Newtherm
Final	4260		



Test Number: 39
Date: 5/23/93
Average Temperature: 22.0 Degrees Celsius
Average Speed: 1.00 cm/s
Cake Thickness loaded: 6 mm
Cake Thickness not loaded: 7 mm
Cake Weight dry 15.03 g
Cake Weight/surface: 1913.67 g/m2

Comments: Repetition of test number 5 but with brushed Newtherm. Some sediment and no holes in the cake at the end.

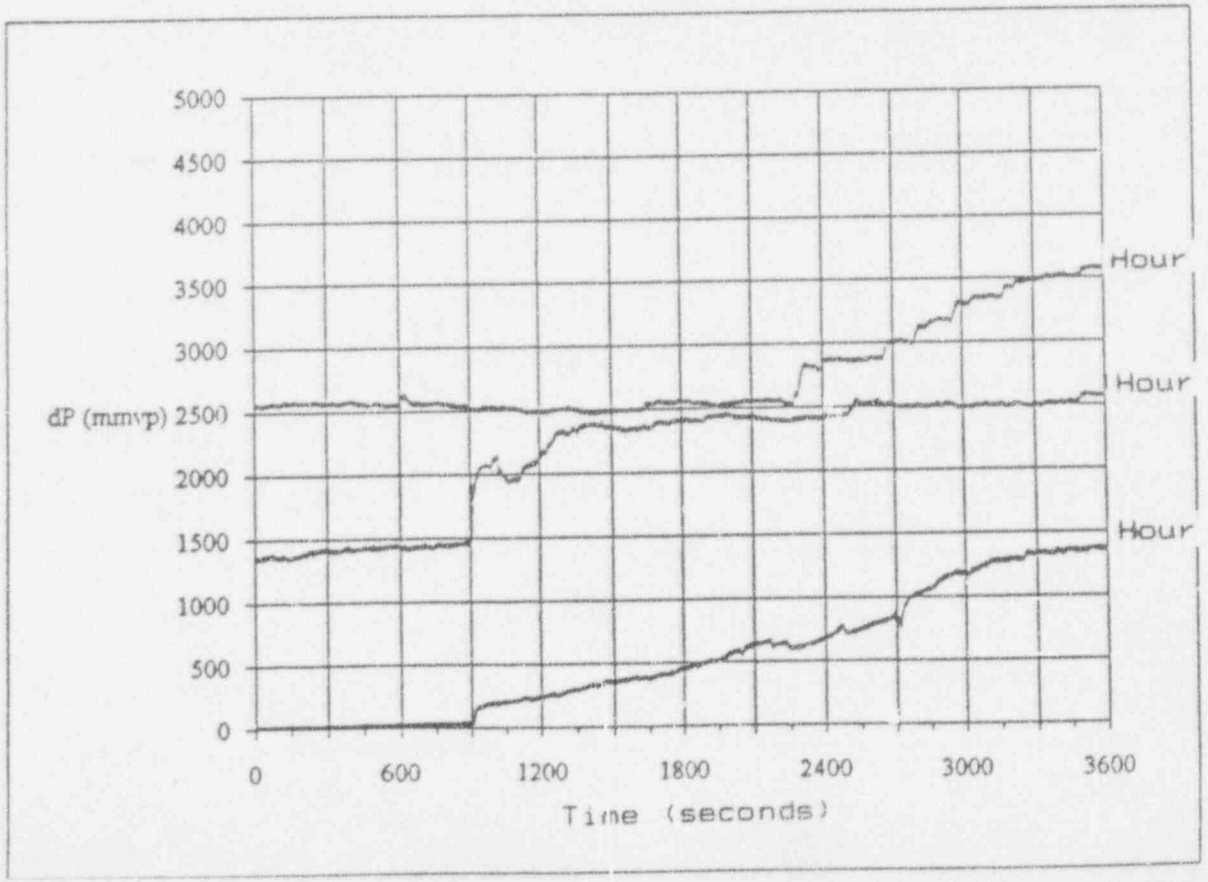
Additions Number	Time (s)	Amount (g)	Added Material
1	0	10	15% Brushed Newtherm 85% Mineral Wool
2	2400	10	15% Brushed Newtherm, 85% Mineral Wool
3	4200	50	15% Brushed Newtherm, 85% Mineral Wool
5			
Final	9360		



Test Number:	40
Date:	5/24/93
Average Temperature:	21.8 Degrees Celsius
Average Speed:	4.00 cm/s
Cake Thickness loaded:	4.5 mm
Cake Thickness not loaded:	not measured mm
Cake Weight dry	7.18 g
Cake Weight/surface:	914.18 g/m2

Commencs: Residue of Newtherm in the water and some sediment at the end. Depth of visibility at the end about 30 cm. 5 holes in the cake at the end.

Additions Number	Time (s)	Amount (g)	Added Material
1	0	4	50% Transco, 50% Brushed Newtherm
2	900	8	50% Transco, 50% Brushed Newtherm
3	2700	4	50% Transco, 50% Brushed Newtherm
4	4500	4	50% Transco, 50% Brushed Newtherm
5	6300	2	50% Transco, 50% Brushed Newtherm
Final	10800		



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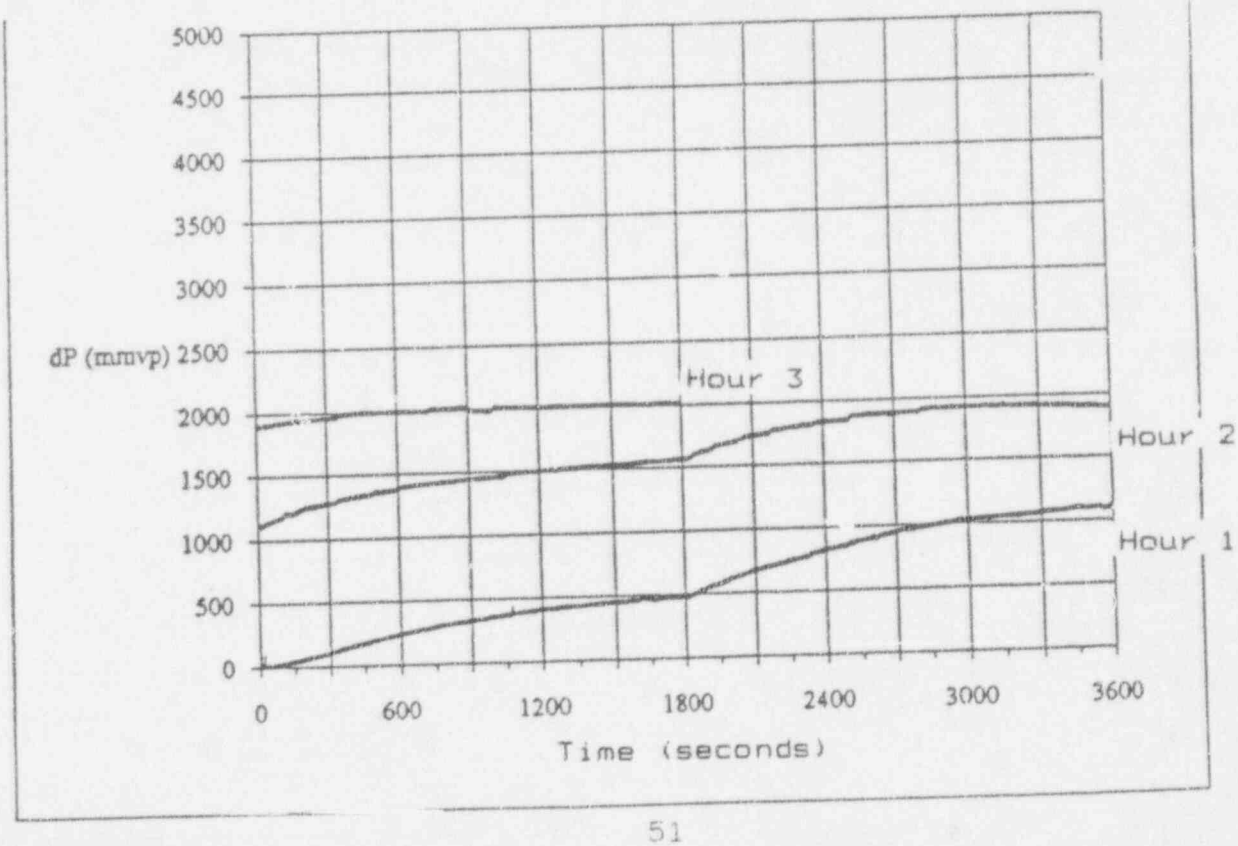
Test Number: 101
Date: 5/24/93
Average Temperature: 21.2 Degrees Celsius
Average Speed: 4.00 cm/s
Cake Thickness loaded: 15 mm
Cake Thickness not loaded: 19 mm
Cake Weight dry 15.96 g
Cake Weight/surface: 2002.09 g/m2

Comments: The water was clear and no sediment at the end.

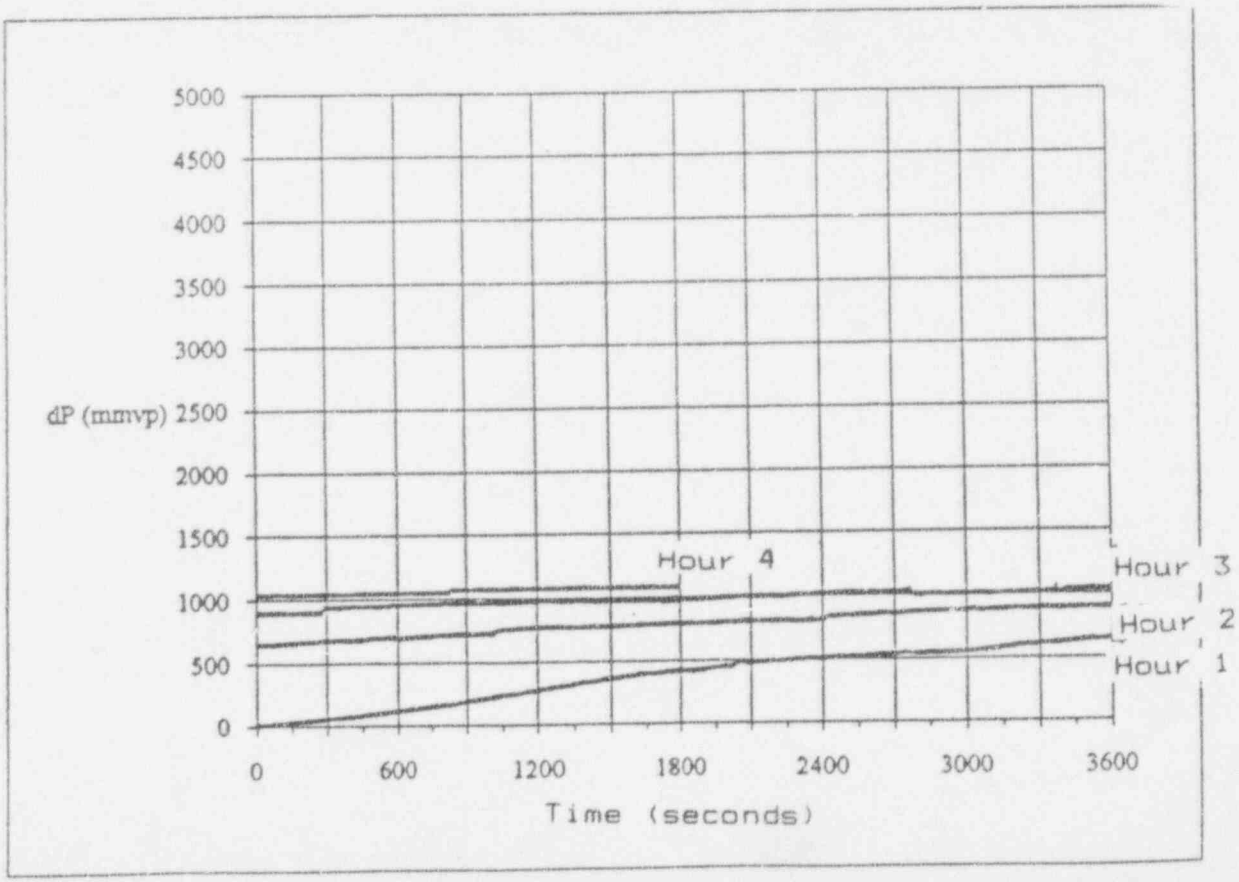
Additions Number	Time (s)	Amount (g)	Added Material
1	0	5	Stem Blasted Transco
2	1800	5	Steam Blasted Transco
3	3600	5	Steam Blasted Transco
4	5400	5	Steam Blasted Transco
5	7200	50	Steam Blasted Transco
Final	9000		



Test Number: 102
Date: 5/25/93
Average Temperature: 22.2 Degrees Celsius
Average Speed: 1.01 cm/s
Cake Thickness loaded: 84-119 mm
Cake Thickness not loaded: 86-124 mm
Cake Weight dry 81.91 g
Cake Weight/surface: 10429.08 g/m2

Comments: The water was slightly colored and only clumps remained in the water at the end. No sediment.

Additions Number	Time (s)	Amount (g)	Added Material
1	0	20	Stem Blasted Transco
2	3000	20	Steam Blasted Transco
3	6000	20	Steam Blasted Transco
4	9000	20	Steam Blasted Transco
5			
Final	12600		

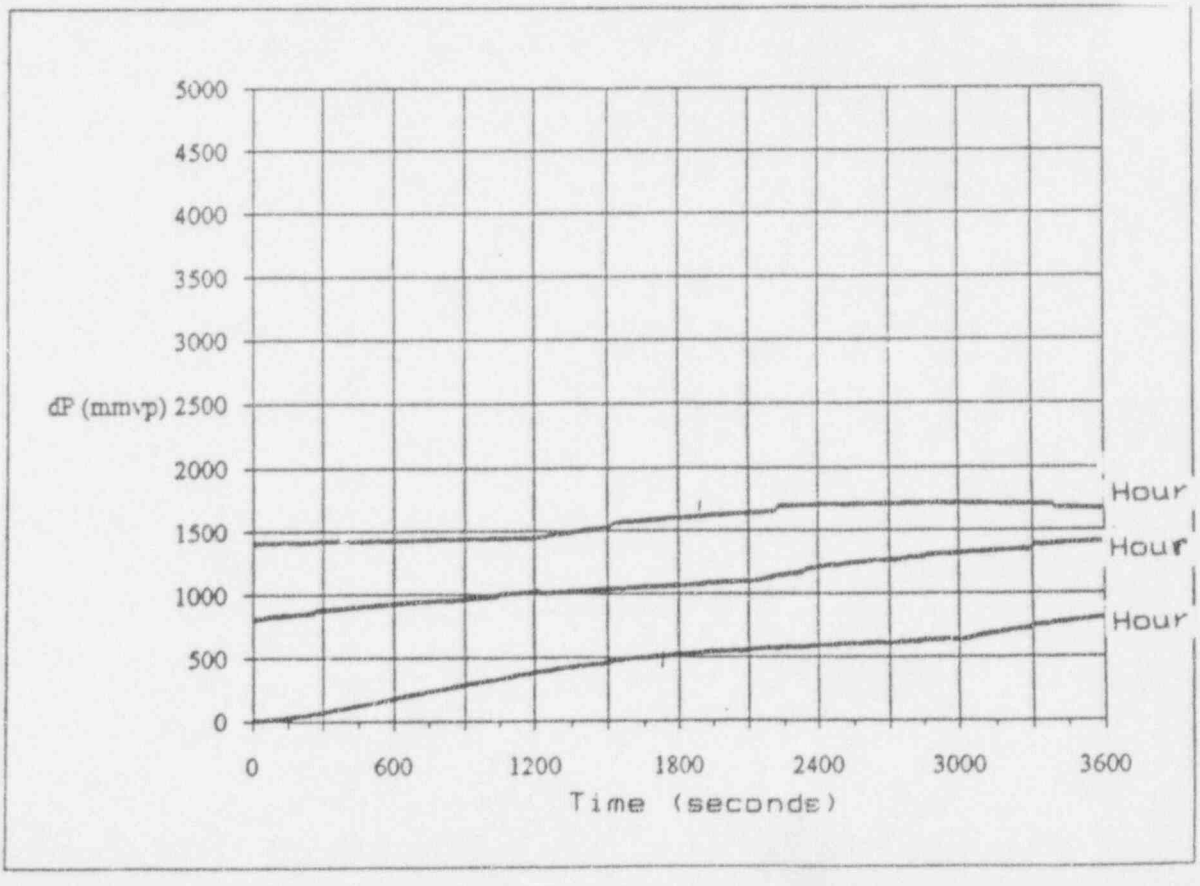


Flow Technology

Test Number:	103
Date:	5/25/93
Average Temperature:	22.0 Degrees Celsius
Average Speed:	2.01 cm/s
Cake Thickness loaded:	40 mm
Cake Thickness not loaded:	51 mm
Cake Weight dry	32.91 g
Cake Weight/surface:	4190.22 g/m2

Comments: No sediment at the end.

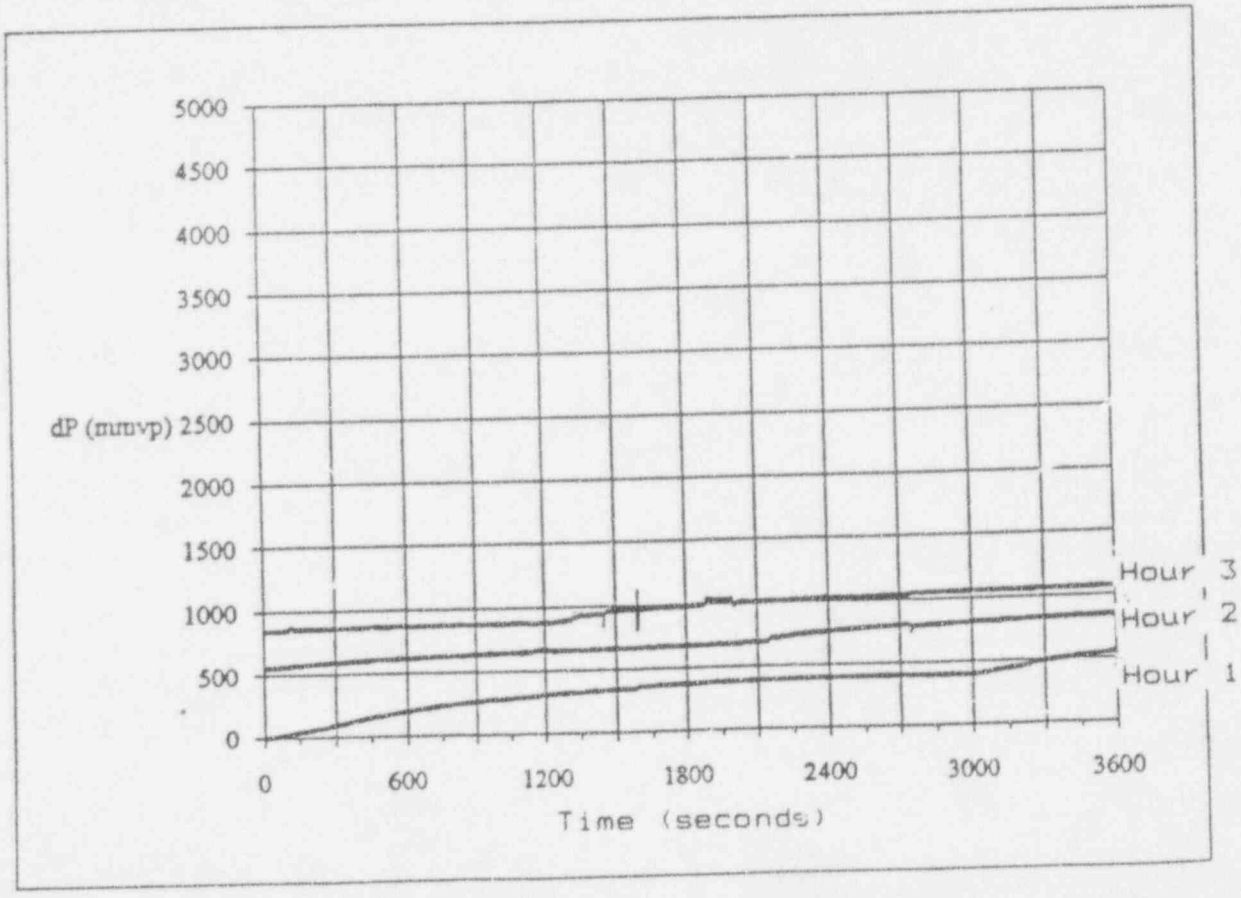
Additions Number	Time (s)	Amount (g)	Added Material
1	0	10	Stem Blasted Transco
2	3000	10	Steam Blasted Transco
3	5700	10	Steam Blasted Transco
4	8400	10	Steam Blasted Transco
5			
Final	10800		



Test Number:	104
Date:	5/26/93
Average Temperature:	21.8 Degrees Celsius
Average Speed:	2.02 cm/s
Cake Thickness loaded:	46-61 mm
Cake Thickness not loaded:	56-71 mm
Cake Weight dry	47.30 g
Cake Weight/surface:	6022.41 g/m2

Comments: No sediment at the end.

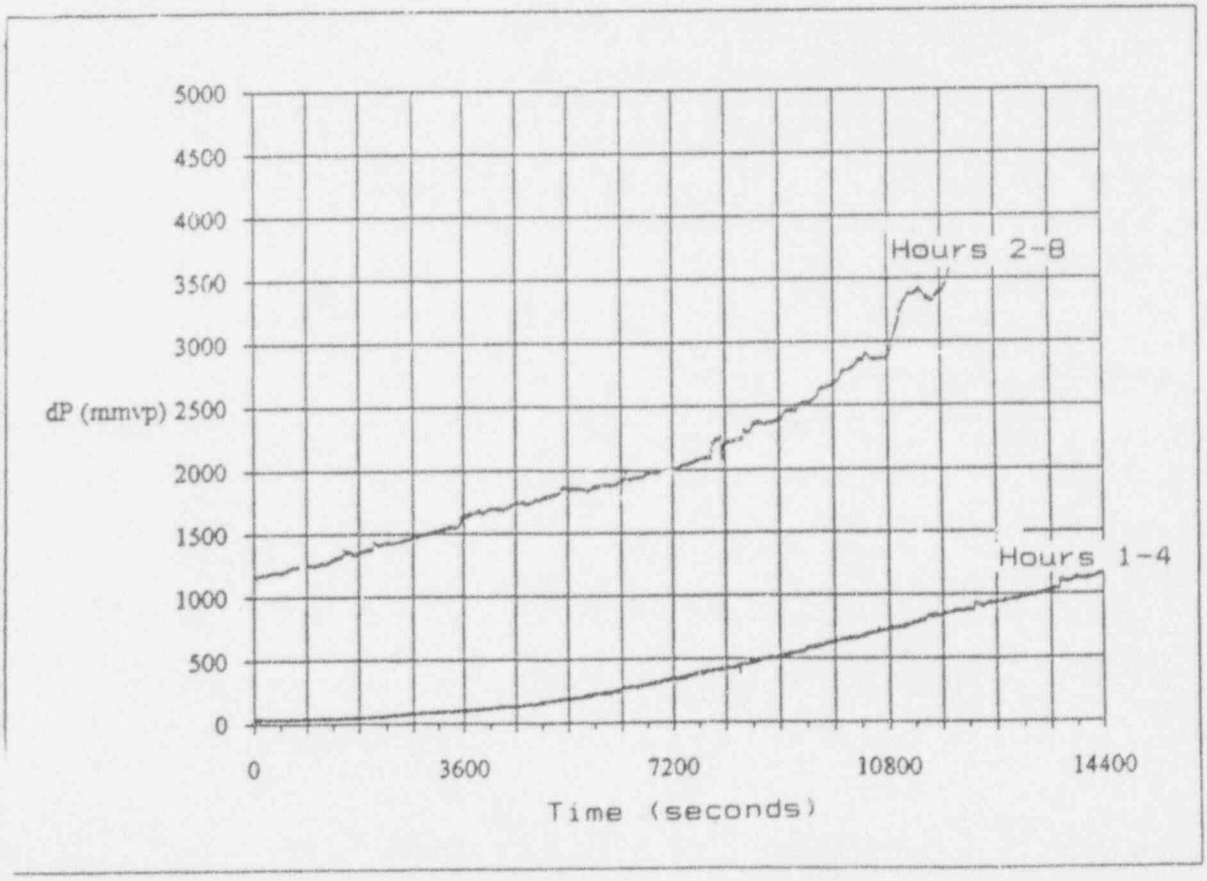
Additions Number	Time (s)	Amount (g)	Added Material
1	0	10	Stem Blasted Transco
2	3000	10	Steam Blasted Transco
3	5700	10	Steam Blasted Transco
4	8400	10	Steam Blasted Transco
5			
Final	10800		



Test Number:	105
Date:	6/01/93
Average Temperature:	24.2 Degrees Celsius
Average Speed:	1.00 cm/s
Cake Thickness loaded:	not measured mm
Cake Thickness not loaded:	<1 (in air) mm
Cake Weight dry	1.77 g
Cake Weight/surface:	225.36 g/m2

Comments: Very slow course. Note different time scale than other reports. Net 0.5 mm was used. After 10.00 seconds sharper increase whereby the pump began to lose flow and the test was stopped.

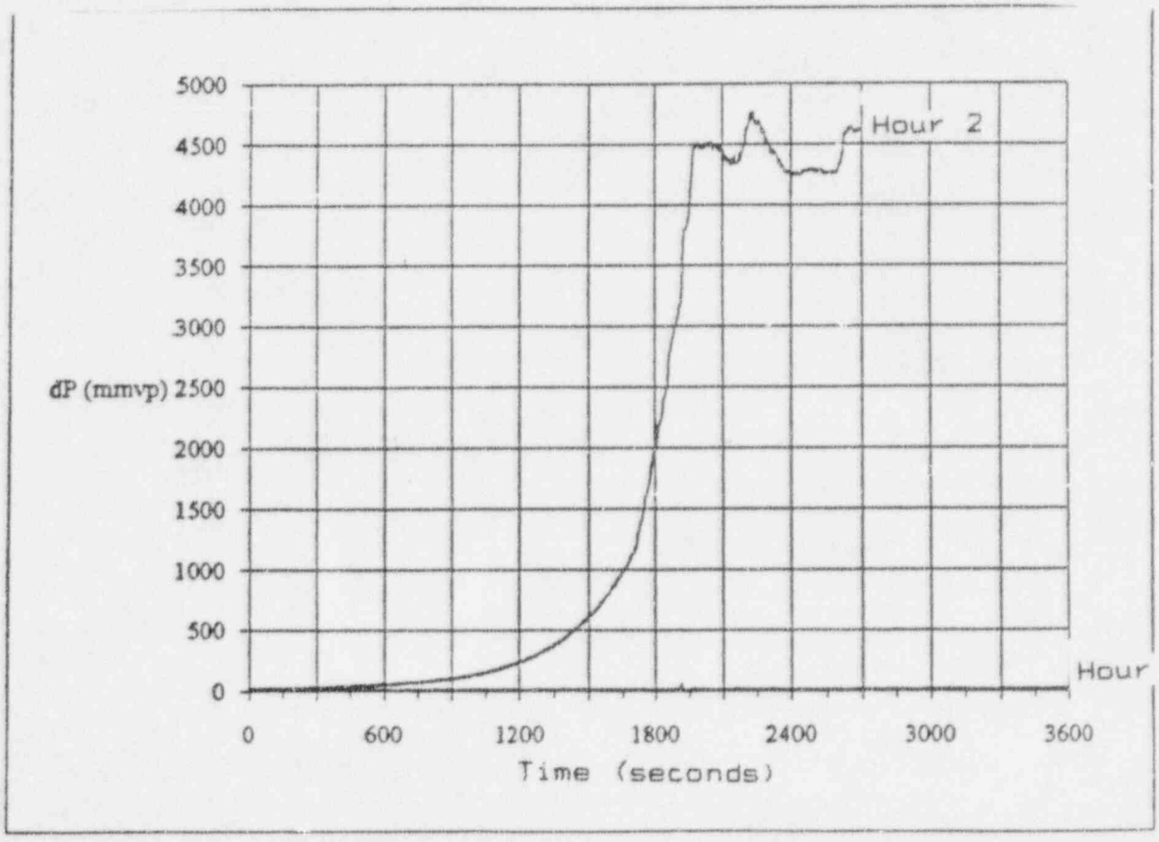
Additions Number	Time (s)	Amount (g)	Added Material
1	0	5	Brushed Newtherm
2			
3			
4			
5			
Final	26280		



Test Number:	106
Date:	6/02/93
Average Temperature:	21.3 Degrees Celsius
Average Speed:	1.03 cm/s
Cake Thickness loaded:	mm
Cake Thickness not loaded:	1 (in air) mm
Cake Weight dry	2.64 g
Cake Weight/surface:	336.13 g/m2

Comments: At the e[illegible] the pump could not produce the flow and the test was stopped. [illegible]er 6120 seconds, about 0.26 cm/s. The water was somewhat milky at the end. 0.5 mm net was used over the hole plating.

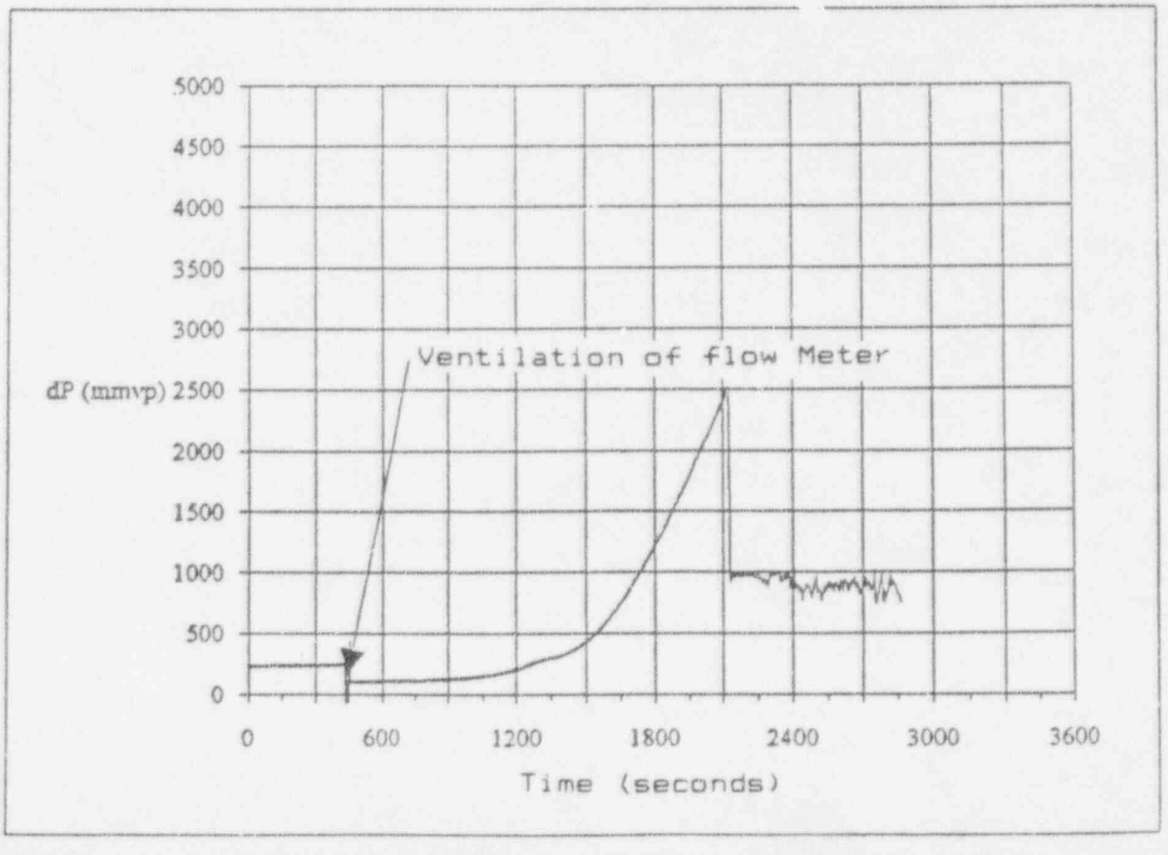
Additions Number	Time (s)	Amount (g)	Added Material
1	0	2	50% Brushed Newtherm, 50% Transco
2	1800	2	50% Brushed Newtherm, 50% Transco
3	3600	2	50% Brushed Newtherm, 50% Transco
4			
5			
Final	6300		



Test Number: 107
Date: 6/02/93
Average Temperature: 19.4 Degrees Celsius at the start
Average Speed: 1.01 cm/s
Cake Thickness loaded: not measured mm
Cake Thickness not loaded: <1 (in air) mm
Cake Weight dry 0.91 g
Cake Weight/surface: 115.86 g/m2

Comments: At the end the pump could not produce a flow and the test was stopped. After 1260 seconds <1 cm/s. The flow was not corrected up to the maximum due to the relatively low dP at the end. The water was somewhat milky at the end. 0.1 mm net was used over the hole plating.

Additions Number	Time (s)	Amount (g)	Added Material
1	0	2	50% Brushed Newtherm, 50% Transco
2			
3			
4			
5			
Final	2820		



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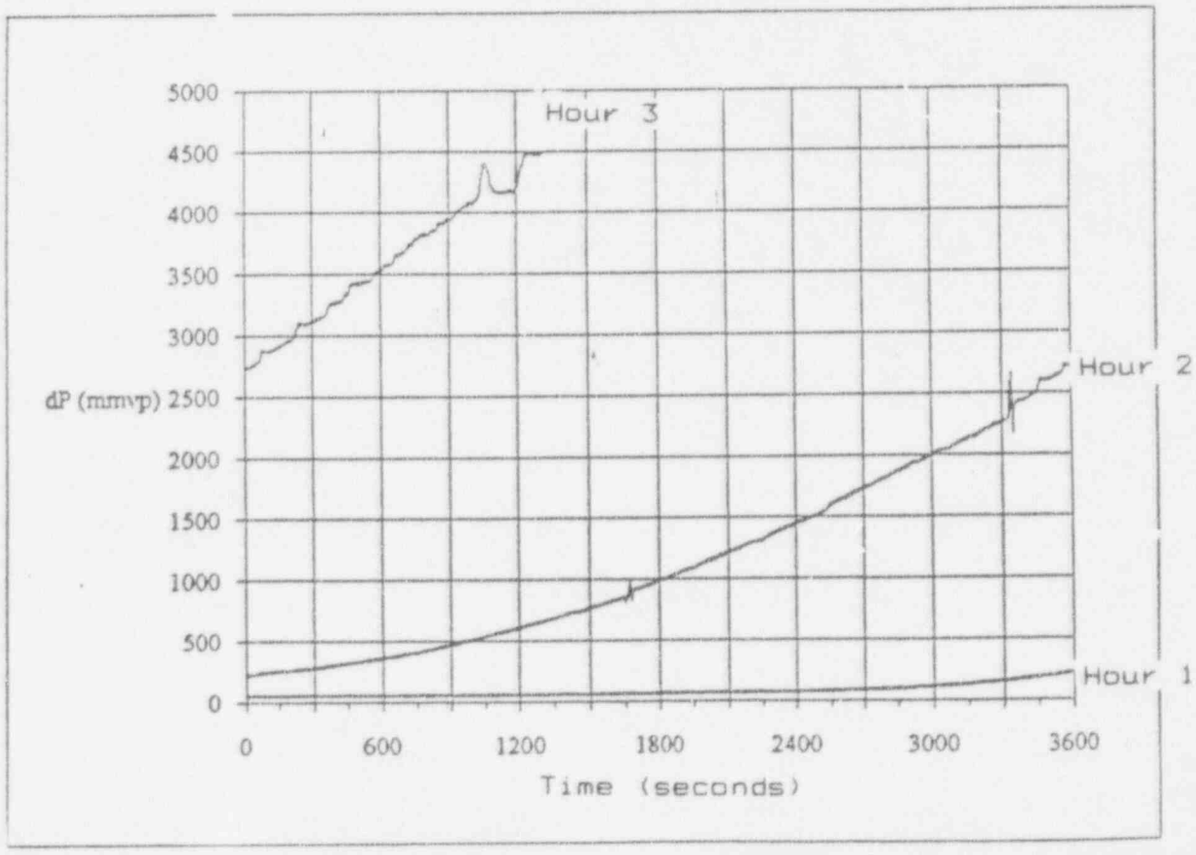
Test Number:	108
Date:	6/02/93
Average Temperature:	20.9 Degrees Celsius
Average Speed:	0.97 cm/s
Cake Thickness loaded:	not measured mm
Cake Thickness not loaded:	<1 (in air) mm
Cake Weight dry	0.68 g
Cake Weight/surface:	86.58 g/m2

Comments: At the end the pump could not produce a flow and the test was stopped. The water was clear at the end. 0.1 mm net was used over the hole plating.

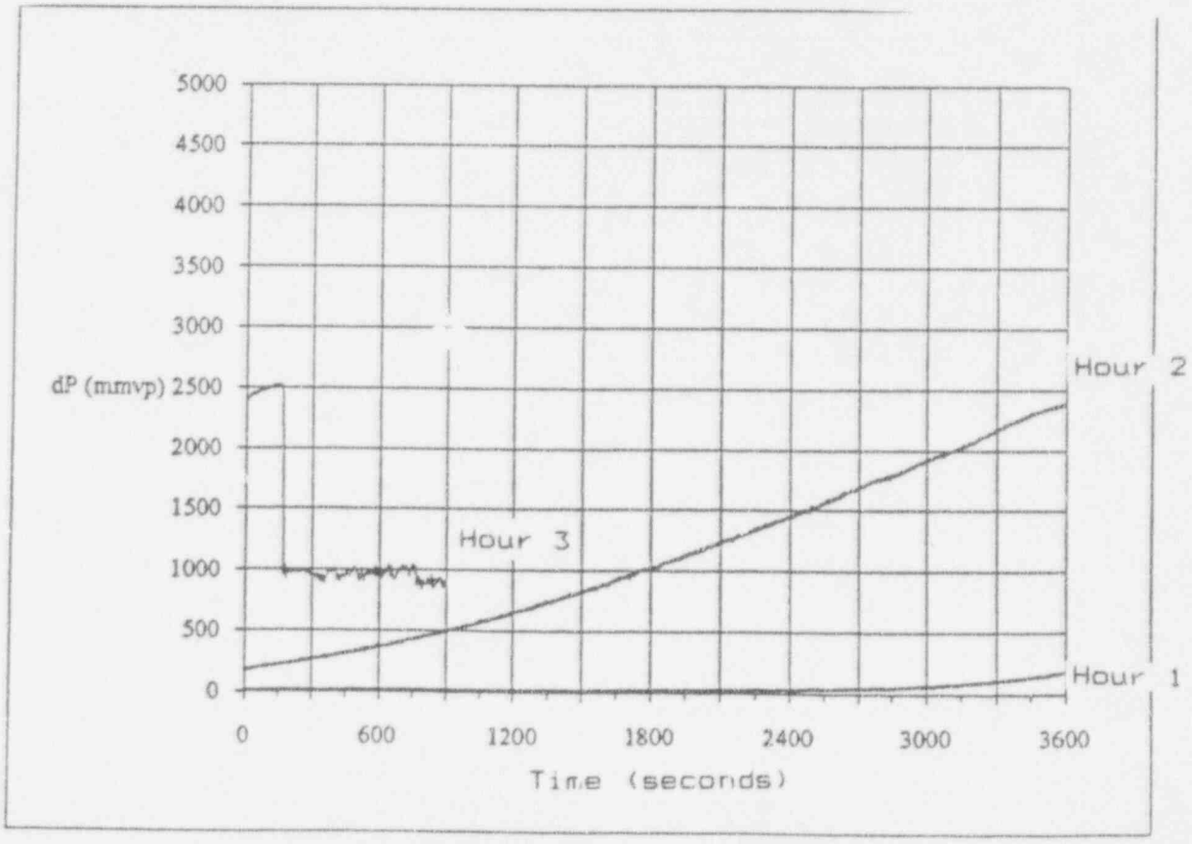
Additions Number	Time (s)	Amount (g)	Added Material
1	0	1	50% Brushed Newtherm. 50% Transco
2			
3			
4			
5			
Final	8520		



Test Number: 109
Date: 6/02/93
Average Temperature: 19.3 Degrees Celsius at the start
Average Speed: 1.01 cm/s
Cake Thickness loaded: not measured mm
Cake Thickness not loaded: <1 (in air) mm
Cake Weight dry 0.60 g
Cake Weight/surface: 76.39 g/m2

Comments: At the end the pump could not produce a flow and the test was stopped. The water was clear at the end. 0.1 mm net was used over the hole plating. The test was not monitored and the flow was not adjusted up to the maximum at the end.

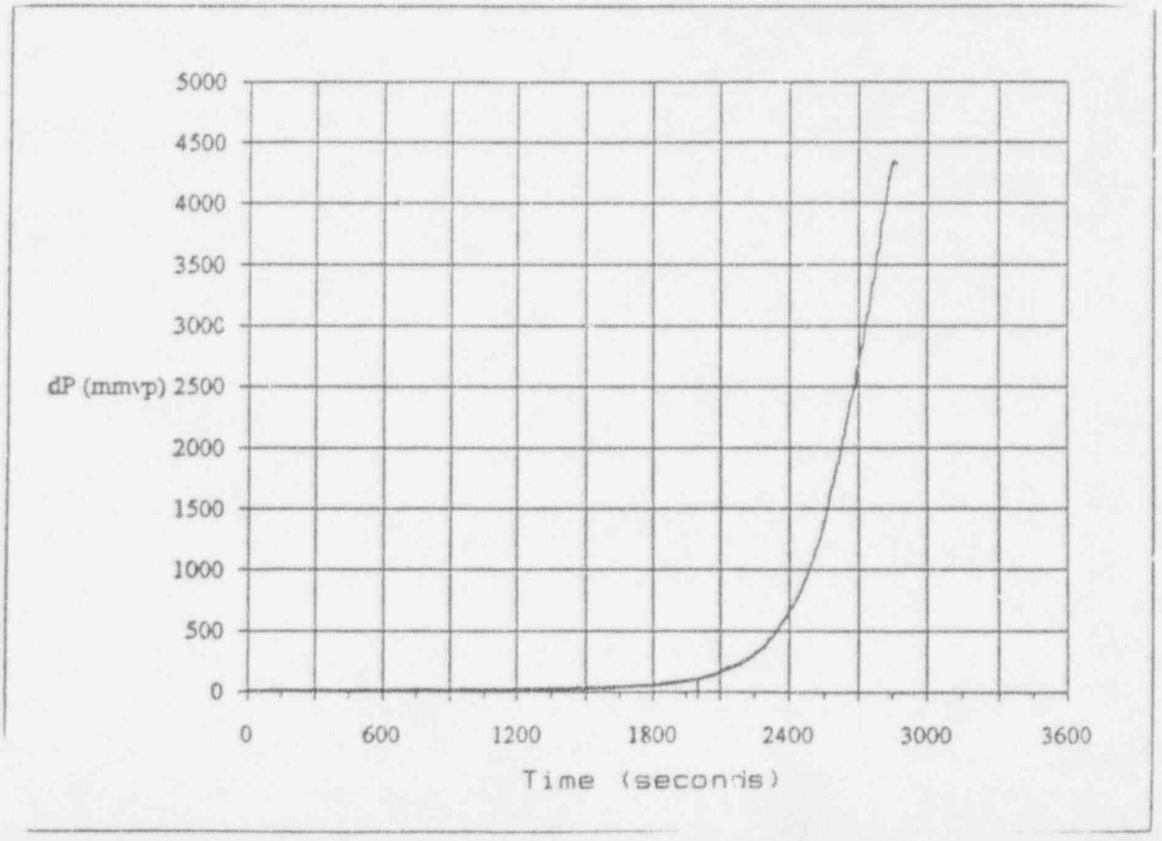
Additions Number	Time (s)	Amount (g)	Added Material
1	0	1	50% Brushed Newtherm, 50% Transco
2			
3			
4			
5			
Final	8100		



Test Number: 111
Date: 6/03/93
Average Temperature: 20.5 Degrees Celsius
Average Speed: 1.00 cm/s
Cake Thickness loaded: not measured mm
Cake Thickness not loaded: about 05. (in air) mm
Cake Weight dry 0.26 g
Cake Weight/surface: 33.10 g/m2

Comments: At the end the pump could not produce a flow and the test was stopped. The water was somewhat milky at the end. 0.1 mm net was used over the hole plating.

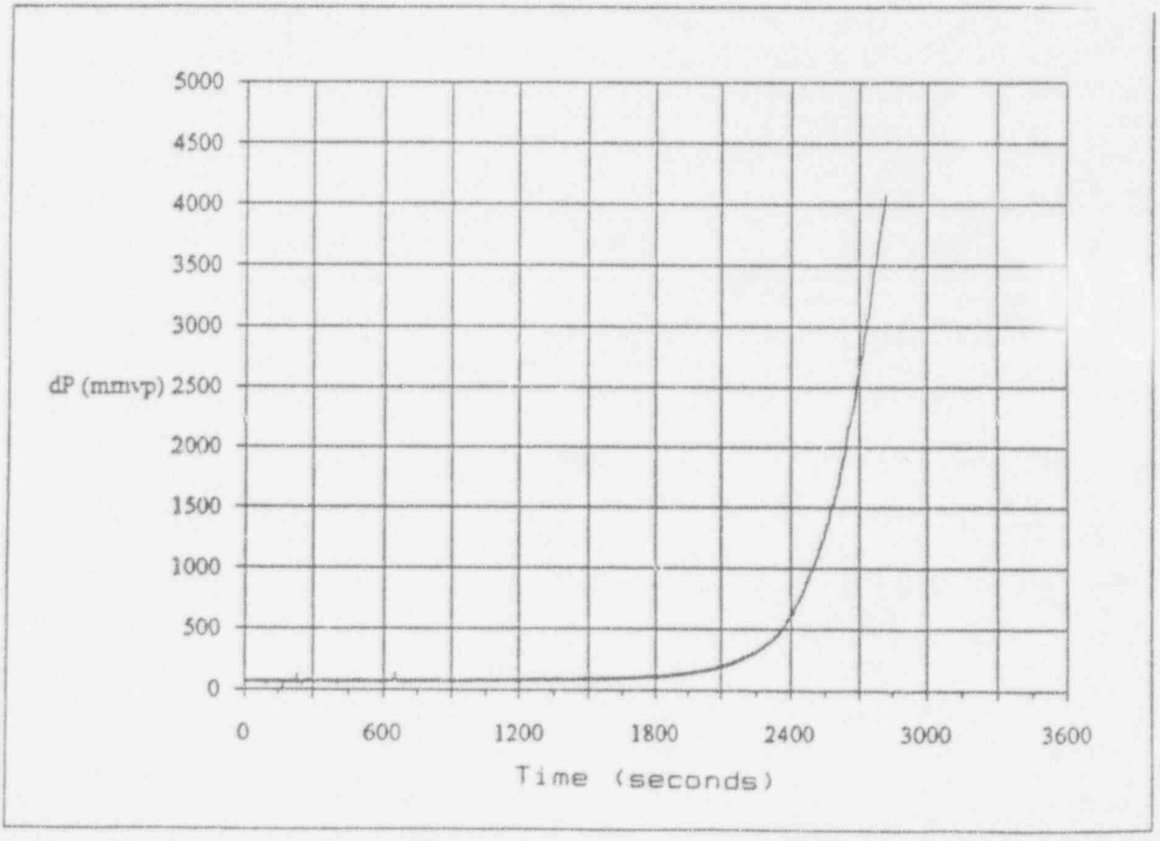
Additions Number	Time (s)	Amount (g)	Added Material
1	0	1	50% Caposil HT1, 50% Transco
2			
3			
4			
5			
Final	2820		



Test Number: 110
Date: 6/03/93
Average Temperature: 19.9 Degrees Celsius
Average Speed: 0.97 cm/s
Cake Thickness loaded: not measured mm
Cake Thickness not loaded: about 05. (in air) mm
Cake Weight dry 0.42 g
Cake Weight/surface: 53.48 g/m2

Comments: At the end the pump could not produce a flow and the test was stopped. The water was somewhat milky at the end. 0.1 mm net was used over the hole plating.

Additions Number	Time (s)	Amount (g)	Added Material
1	0	1	50% Caposil HT1, 50% Transco
2			
3			
4			
5			
Final	2820		



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(See instructions on the reverse)

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Vattenfall Development Corp., Sweden

10. SUPPLEMENTARY NOTES

11. ABSTRACT *(200 words or less)*

This report provides information on the experiences from covering and pressure loss tests that were carried out in a small circulation model with parallel flow against a small filter surface. It is part of an overall program that is being carried out by the power plants at Ringhals, Barsebäck, Oskarshamn. The test rig consists of a circulation loop with a pump, a magnetic flow meter, and a small cylindrical tank with a propeller type agitator and a heating cartridge. Pressure loss is measured via the strainer and the fiber cake. The thickness of the fiber cake is also measured at the end of the test both with a flow against the cake and without a flow. The fiber cake is then dried and weighed. Materials used in the test include mineral wool, steam blasted newtherm, fiberglass, caposil, and transco. Since the tests contains a number of sources of error and problems with sedimentation and exact dosages, it is difficult to draw reliable conclusions. In the filtering of just fiber, the pressure loss is slow and heavily dependent on the load on the strainer. In the filtering of a mixture of fibers and caposil HT1 or fiber and newtherm 1000, the combination of stable pressure loss and clear water is not possible without holes developing in the cake. It is not possible to state clearly under what conditions these cases will occur without studying several parameters under controlled conditions.

12. KEY WORDS/DESCRIPTORS *(List words or phrases that will assist researchers in locating the report.)*

13. AVAILABILITY STATEMENT

14. SECURITY CLASSIFICATION

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15. NUMBER OF PAGES

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