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DESCRIPTION: Ltr re their 9-8-75 ltr....furn info on the drawdown performance of the Three Mile Island Unit 1 (TMI-I) Reactor Building Spray System & confirm that it=meets with FSAR requirements & with attachment's 1 & 2....

ENCLOSURES:

PLANT NAME: Three Mile Island Units 1

### FOR ACTION/INFORMATION

DHL 10-20-75

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METROPOLITAN EDISON COMPANY

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October 13, 1975
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Director of Nuclear Reactor Regulation
ATTN: Mr. Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Reactor Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

DL

Dear Mr. Reid:

Operating License No. DPR-50
Docket No. 50-289

By letter dated September 8, 1975, Metropolitan Edison Company (Met-Ed) was requested to reanalyze the drawdown performance of the Three Mile Island Unit #1 (TMI-1) Reactor Building Spray System and confirm that the system will perform within the criteria stated in the FSAR. The results of our reanalysis have been completed and are discussed below.

The design performance characteristics for the TMI-1 Reactor Building Spray System are described in Section 6.2.2, Section 14.2.2.3 and Supplement 1, Part I of the TMI-1 FSAR. The basic objectives established during the design of this system were that:

1) during drawdown the spray solution contains about 3.5 percent weight Sodium Thiosulfate at a pH of about 9.5, and

2) sufficient Sodium Thiosulfate and Sodium Hydroxide be injected by the Building Spray System and Emergency Core Cooling Systems to establish an initial Reactor Building sump condition of 1% by weight Thiosulfate at a pH of approximately 9.5.

The dose calculations presented in the TMI-1 FSAR do not take credit for thiosulfate solution concentrations greater than 1% wt.

In order to meet the above objectives, the piping configuration was based on full flow conditions (i.e. operation of all engineered safeguards equipment). These flow conditions were selected since they established the minimum concentration and amount of thiosulfate and hydroxide which could be delivered and since they were considered to represent the most likely conditions which would exist under accident conditions.

During the TMI-1 Start-up and Test Program, a drawdown test was performed to verify proper drawdown under full flow conditions. Pure water was used in both

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the thiosulfate tank and hydroxide tank since it was not feasible to use the actual solutions. This test did not indicate any deficiency with the TMI-1 piping lay out in that, as expected, the Borated Water Storage Tank emptied prior to the thiosulfate and hydroxide tanks.

Subsequently, we and our consultants have developed a computer program to calculate the drawdown performance of the thiosulfate, hydroxide, and Borated Water Storage Tanks. The original Start-up and Test data were used to verify the subject program.

Using the program discussed above, the hydraulic performance of the Building Spray System has been reanalyzed. Figure 1 presents the predicted performance under full flow conditions and Figure 2 presents the predicted performance under single failure conditions (i.e. half flow). These figures are based on the following conditions and assumptions:

1) The thiosulfate tank contains 30% wt. sodium thiosulfate and 1% wt. boric acid buffered to a pH of 10.

2) The thiosulfate tank initial level is 1.5 ft. below the tank low level alarm.

3) The sodium hydroxide tank contains 21.6% wt. of hydroxide at an initial level within 0.5 ft. of the tank high level alarm.

4) The Borated Water Storage Tank contains the minimum quantity of borated water permitted by Technical Specification at the minimum permitted concentration of 2270 ppm boron.

5) The Building Spray pumps and the Decay Heat Removal pumps are operating at the minimum flow rate permitted by TMI emergency procedures. The high pressure injection pumps are not operating.

The above parameters and assumptions are considered to provide conservative values for minimum thiosulfate concentrations, maximum pH conditions, and mismatch in drawdown times.

Based on the results of Figure 1, it has been determined that during drawdown the building spray will contain 3.55% wt. thiosulfate. The spray solution will reach a maximum pH of 10.3 which will only exist for about 23 minutes. The reactor building sump will initially contain 0.92% wt. thiosulfate at a pH of 9.6. Furthermore, as indicated on Figure 1, the thiosulfate and hydroxide tank will empty about 3 minutes prior to establishing flow from the reactor building sump.

For the half flow conditions of Figure 2, the spray solution will contain 3.89% wt. thiosulfate and reach a maximum pH of 10.8 which will only exist for about 30 minutes of the drawdown. The thiosulfate and hydroxide tank empty in about 16 and 10 minutes, respectively, prior to establishing flow from the reactor building sump. The initial sump conditions will be the same as above.

Based on the above reanalysis of the hydraulic performance of the Building Spray System, it is concluded that the as-built TMI-1 system performs within the criteria stated in the FSAR. This conclusion is based on:

1) Parameter studies conducted on a typical reactor building indicate the lack of thiosulfate in the spray solution for 16 minutes and the slightly reduced sump thiosulfate concentration will only result in an increase in the two-hour thyroid dose of about 6%.

2) The sodium thiosulfate concentration during the initial injection phase is always greater than the 1.0 weight percent assumed in the FSAR analyses. If credit were taken for the more realistic initial spray solution composition, the two-hour thyroid dose would decrease about 1.5%.

3) The lack of thiosulfate in the spray solution occurs at a time in the Loss of Coolant Accident when the reactor building pressure has been reduced significantly. Therefore, containment leakage and resulting exposures will be less than those assumed in the FSAR accident analysis during this time.

4) For 6 minutes out of the 16 minutes during which thiosulfate will not exist in the spray solution under half flow conditions, sodium hydroxide will still be present. Since hydroxide is almost as effective in removing elemental iodine as thiosulfate, the dose effects discussed in (1) above are conservative.

5) The effect of spraying 0.92 weight percent sodium thiosulfate while recirculating from the sump will have negligible effect on the thirty day thyroid dose. Calculations performed by B&W for a typical set of parameters at a typical plant indicate that reducing thiosulfate concentration to 0.82 weight percent increases the thirty day thyroid dose by about 1.4%. However, if credit is taken for the higher concentrations which exist during the initial injection, the thirty day thyroid dose would decrease by about 7.0%.

6) The protective coatings have been qualified for long term exposure at a pH of 9.5. Short exposure of 30 minutes at a pH of 10.8 is not considered to be a significant extrapolation of the existing test data and, therefore, no degradation of the coating systems is expected.

We have evaluated the matter of potential pump damage due to cavitation resulting from mismatched drawdowns. Neither the start-up and test data nor our computer calculations indicate that any syphoning effect on the thiosulfate or sodium hydroxide tanks occur. As a result, once these tanks drawdown to the bottom of their suction nozzle, static flow conditions in these lines will be approached and a nearly static head of water will be maintained in the tank discharge lines. Therefore, no pump cavitation will occur.

In summary, our evaluation of the hydraulic performance of the TMI-1 Reactor Building Spray system has established that the system's hydraulic performance is basically consistent with that described in our FSAR and that the minor variations in performance, which could result, do not increase the environmental consequences of the Loss of Coolant Accident.

Sincerely,

R. C. Arnold
Vice President

RCA:CWS:tas

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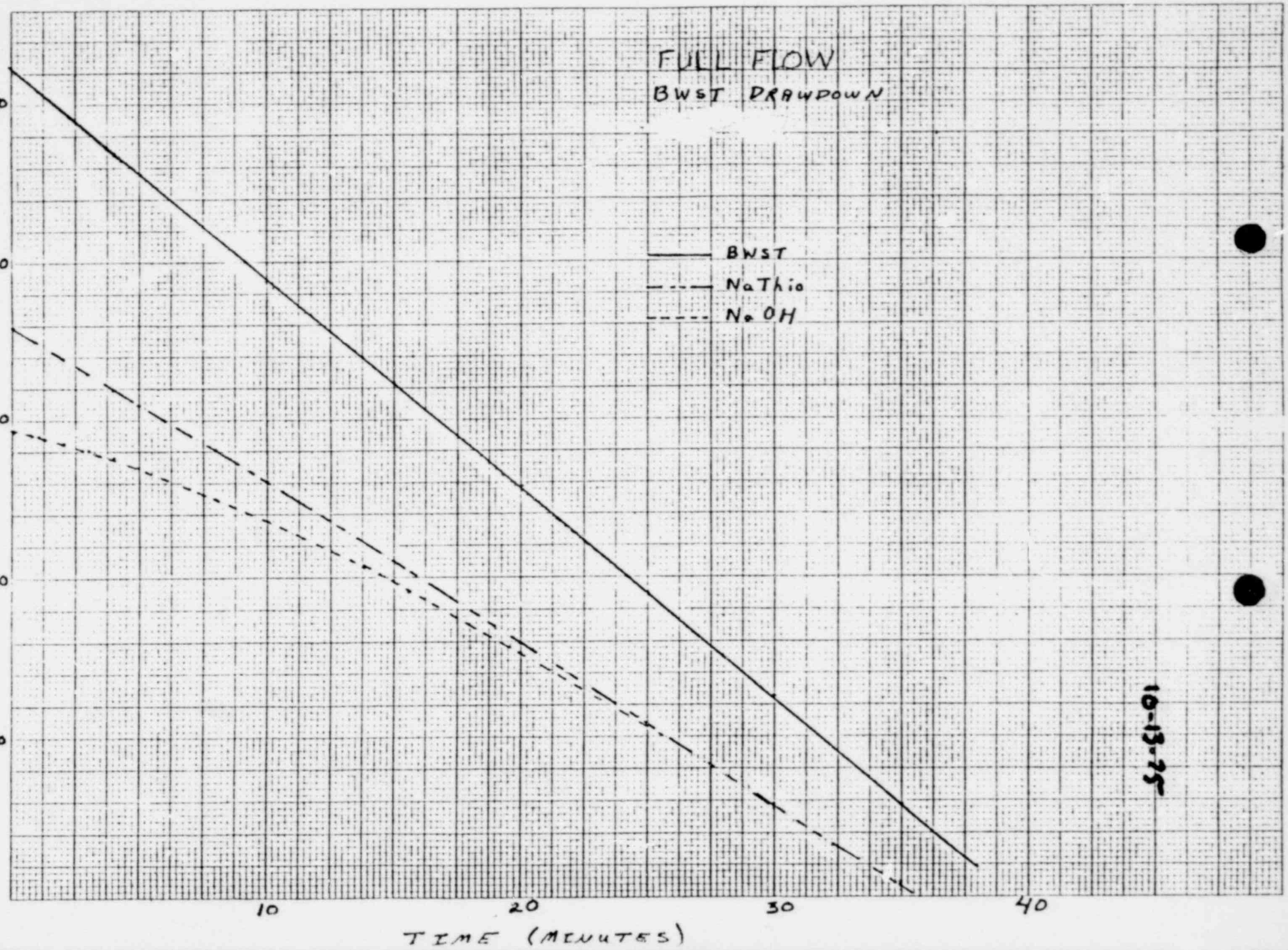


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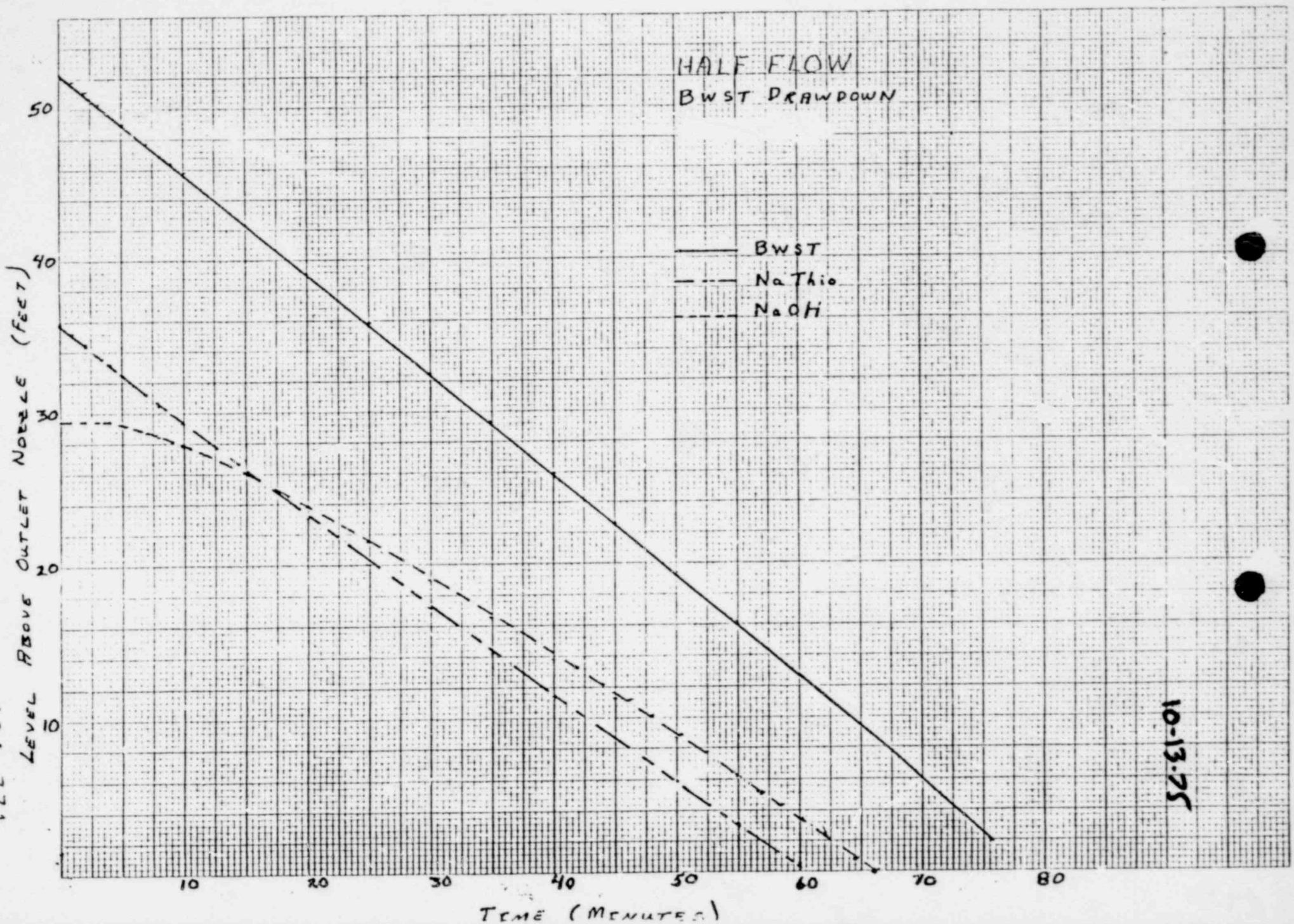


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