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50-251

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SUBJECT:

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LTR 3 ENCL 3

ANALYSIS PROVIDING ADDITIONAL INFO. CONCERNING PREVIOUSLY SUBMITTED
REQUEST FOR AMEND. TO OPERATING LICENSE WHICH WOULD REQUIRE THAT
THE UNIT 4 STEAM GENERATORS BE INSPECTED DURING THE NEXT REFUELING
OUTAGE OR SOONER IF OPERATING EXPERIENCE SHOWED THAT A

PLANT NAME: TURKEY POINT - UNIT 4

REVIEWER INITIAL: XRL
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***** DISTRIBUTION OF THIS MATERIAL IS AS FOLLOWS *****

GENERAL DISTRIBUTION FOR AFTER ISSUANCE OF OPERATING LICENSE.
(DISTRIBUTION CODE A001)

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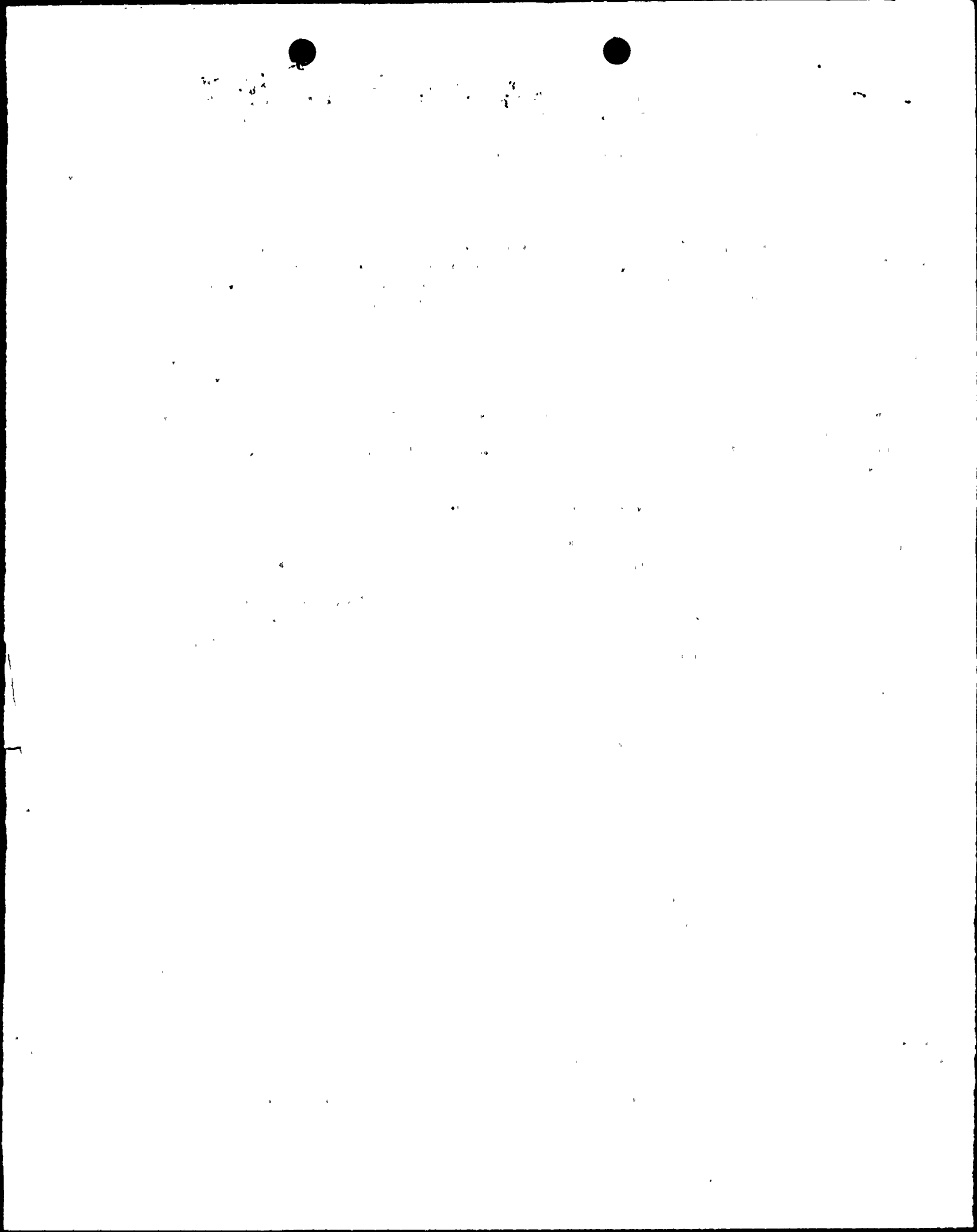
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SIZE: 2P+4P

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***** THE END *****

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February 1, 1978
L-78-40

Director of Nuclear Reactor Regulation
Attention: Mr. Victor Stello, Director
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington DC 20555

Dear Mr. Stello:

Re: Turkey Point Unit 4
Docket No. 50-251
Request for Amendment to
Operating License DPR-41
Additional Information



On January 18, 1978, (L-78-23) we requested an amendment to our operating license which would require that the Unit 4 steam generators be inspected during the next refueling outage or sooner if operating experience showed that an inspection was warranted. Attached is an analysis providing additional information supporting this request.

As discussed with members of your staff, on November 24, 1977, Unit 3 was shut down to perform a steam generator inspection as required by the Unit's operating license, and to perform the annual refueling. Unit 3 is still shut down with an estimated startup date of February 8, 1978, pending repairs to a main coolant pump seal.

St. Lucie Unit No. 1 has been experiencing spurious trips due to a malfunction in one of the Turbine Generator control circuits. We are investigating the problem, but presently the unit's availability is less than optimal.

If Unit 4 is required to shut down before Unit 3 is returned to service, a loss of our St. Lucie unit could reduce our generating capability to less than desired in light of the cold weather and resultant high demand for electricity which we have been experiencing. During month of January, peak demand exceeded last summer's peak.

It is therefore highly desirable to postpone shutting Turkey Point Unit 4 down until after Turkey Point Unit 3 is returned to service.

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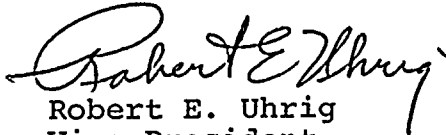
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Director of Nuclear Reactor Regulation
Attention: Mr. Victor Stello, Director
Division of Operating Reactors

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If you should have any question in this matter, please feel free to contact me.

Very truly yours,


Robert E. Uhrig
Vice President

REU/GDW/lsh

CC: Robert Lowenstein, Esq.
J. P. O'Reilly

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Turkey Point 4 was last inspected in May-June of 1977. Based on that inspection, the appropriate tubes were preventively plugged to provide in excess of six months of additional safe operation. The plugging criteria and plugging pattern are based on conservative assumptions regarding the future growth of high plate strain and subsequent high tube strain.

Unit 4's operating experience and gauging inspection performed at other plants have confirmed the implemented plugging pattern to be overly conservative. Analysis of this margin of conservatism has provided a basis for continued operation of Turkey Point Unit 4 for an additional three effective months with the present plugging pattern.

In all previous evaluations of tube inspection results, the most severe rate of plate expansion (among the steam generators of a given plant) was used for all steam generators. This is very conservative, and in the case of Turkey Point 4, severely penalized two of the three steam generators. Figure 1 shows the flow slot closure history for all three steam generators. The rate of closure used to develop the current stress pattern was .12 in/mo based on the second tube support plate in steam generator B. From this figure it can be seen that no plate in steam generators A and C has a closure rate exceeding .08 in/mo. Based on this, and the direct relationship previously developed between growth of critical strain and closure rate, the plugging patterns used for steam generators A and C support safe operation for:

$$\frac{.12}{.08}(6) = 9 \text{ months}$$

Since the return to power of Turkey Point 4 in August 1977, two other plants have had a second round of inspections using the tube gauging approach to develop plugging patterns. These re-inspections have provided additional insight into the progression of tube restrictions and the development of plugging criteria and patterns. Several observations can be made from these re-inspections to support an extension of the current operation period of Turkey Point 4.

- a) Upon re-inspection of the Surry 1 and Surry 2 sites, only a small number of tubes in the tube lane region developed severe restrictions (i.e., tubes restricting .540" probe) between inspections (less than twenty-five at Surry 2 and less than 5 at Surry 1).
- b) Of all the tubes at both Surry 1 and Surry 2 that restrict .650" probes at both the previous and current outage, 70% still passed the 0.610" probe and more than 94% passed the 0.540" probe at the second outage.
- c) The re-inspection programs have indicated that the strain contour used to develop growth is a conservative representation of critical strain. The critical strain is closer to 17% than the 14% previously used. A re-evaluation of growth plots (Figure 2), considering the



c) (cont'd)

progression of the 17% contour rather than the 14% contour, yields a reduction of the growth rates to .25 rows/month along the tube lane and .5 rows/month at the outside columns. Thus, for the Turkey Point 4 plugging pattern of 2 rows out along the tube lane and 4 rows out at the outside columns, this new rate allows for 8 months of operation, or an additional 2 months beyond the current operating period, for all three steam generators.

In addition to these observations, the results of the Turkey Point 3 inspection are of interest. At Turkey Point 3, there were a significant number of tubes (63) which restricted the 0.540" probe while only one tube leaked over nine months of operation. It would not be expected that all of these become 0.540's overnight. This is especially true since 31 of these tubes were in S/G B, which is approximately six months further along than A and C in terms of degradation, while A and C only have a combined total of 32 tubes that restricted the 0.540" probe. Thus, a statistical evaluation would find some tubes restricted by the 0.540" probe for in excess of six months and many for in excess of three months. It is reasonable to expect 3 months of operation for a tube that has just restricted a 0.540" probe.

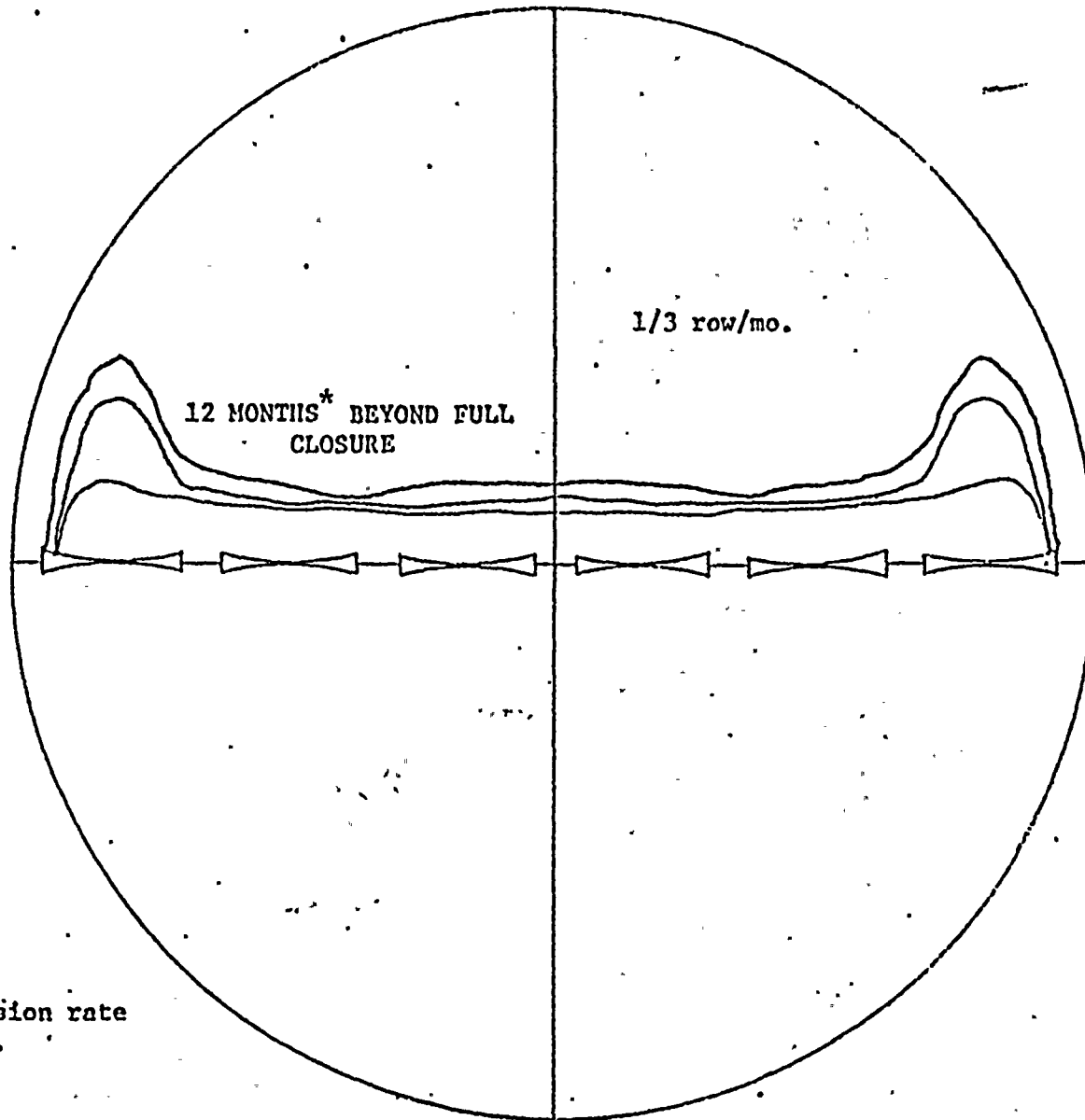
Since the implementation of the gauging program only 5 tubes have leaked near the tube lane at the Turkey Point and Surry sites. This represents over 30 EFPH's of operation altogether.

Therefore, Florida Power & Light Company has concluded that good engineering judgement indicates that Turkey Point Unit 4 can be safely operated for an additional 3 effective months with the current plugging pattern. First, the plugging pattern implemented at Turkey Point 4 is good for 9 months in two of the three steam generators based only on rates of flow slot closure and plate expansion. Second, the current plugging criteria have been shown to significantly limit the occurrences of 540" probe restrictions after six months of operation. Third, the strain growth rates used to develop the six month operating period were rather conservative and could easily be used to defend an 8 month operating period with the same plugging. Fourth, there is sufficient reason to believe that a great majority (<95%) of all tubes that restrict the 0.540" probe remain in operation for more than 3 months before leaking. Finally, the very small incidence of leakage over the last nine months at all plants involved is testimony to the effectiveness of this approach.

1-20

5.0 MONTHS* BEYOND
FULL CLOSURE

2.0 MONTHS* PRIOR TO
FULL CLOSURE



$\approx 2/3$ row/mo. (maximum)

1/3 row/mo.

Note that only this one area of the plate (near the 3 and 9 o'clock wedge) must be examined separately with regard to growth of strain contours. In all other regions, 1/3 row/mo. is a conservative growth rate.

*Based on maximum expansion rate considered in analysis.

"Growth" of 14% Hoop Strain Contour

Figure 2

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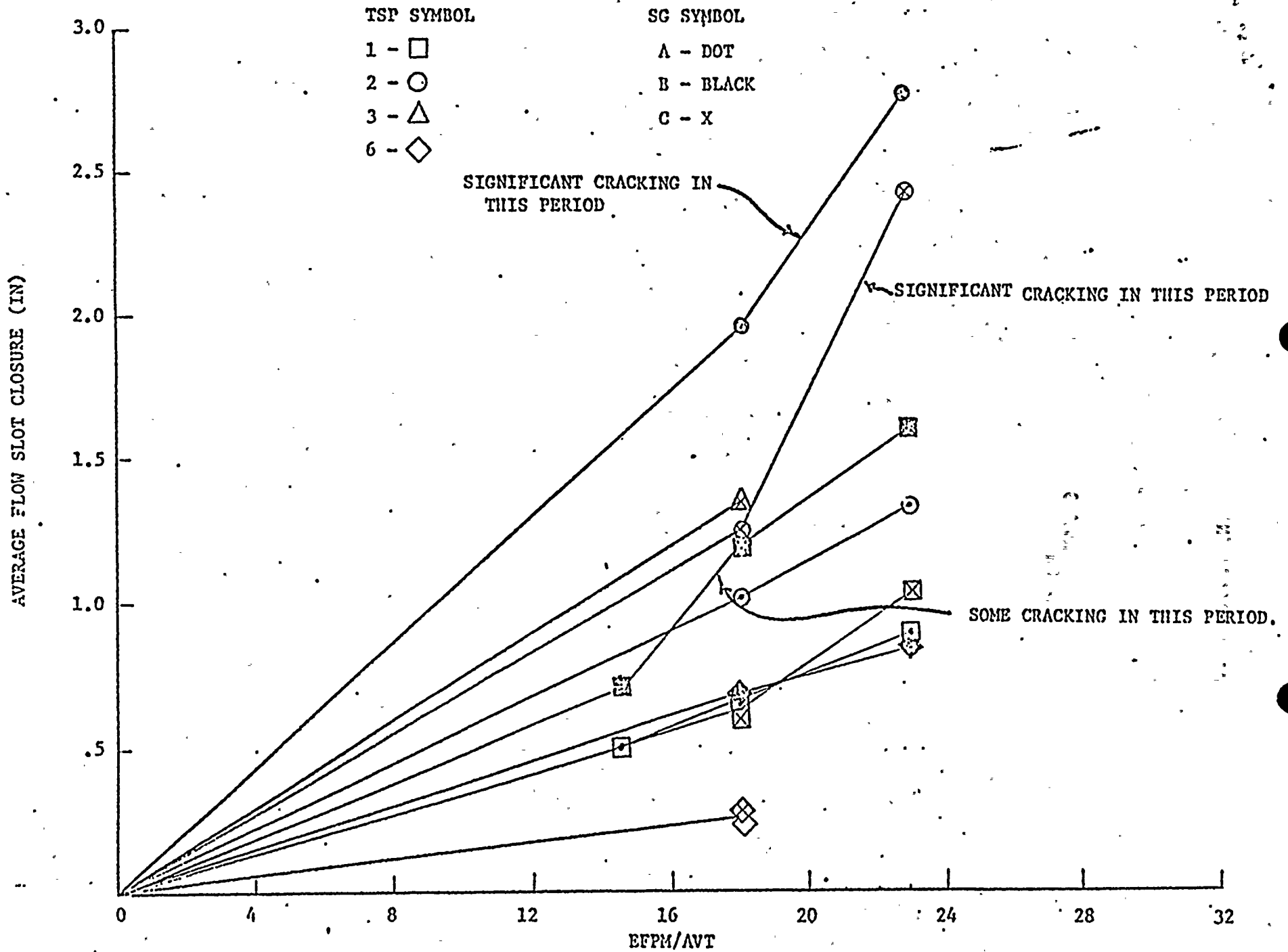


Figure 1

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