



Memorandum

VIRGINIA POWER
NORTH CAROLINA POWER

To: T. R. Huber, SPS
From: J. G. Beck, IN/GO

Innsbrook Technical Center
December 8, 1997

MATERIALS ENGINEERING LABORATORY REPORT
NESML-Q-333

The attached Materials Analysis Report, NESML-Q-333 - Unit 2 Let Down Orifice Inspection, is provided for your use. If you have any questions or comments please contact me at Innsbrook on 8-730-3805.

JG BSL
John G. Beck

cc:

S. W. Semmes, SPS
W. F. McCloskey, SPS
R. K. MacManus, SPS
M. A. Ringler, SPS
E. W. Throckmorton, IN/3NW
L. L. Spain, IN/3NW
Records Management, Materials Analysis Report, NESML-Q-333, INGW

9806040050 971208
PDR ADOCK 05000280
P PDR

AUDIT

NES MATERIALS ENGINEERING LABORATORY
MATERIALS ANALYSIS REPORT

December 4, 1997

NESML-Q-333

1. **Station:** Surry Power Station

2. **Unit:** 2

3. **Sample Origin:** Let down orifices 2-CH-RO-20RLD1, 20RLD2, and 20RLD3.

4. **Safety Classification:** SR

5. **Description of Work Required or Laboratory Service:** The orifices were suspected of having experienced material loss similar to those from Unit 1, and were therefore removed from service and submitted to the SRF Metallurgical Hot Lab for inspection.

6. **Laboratory Analysis Results:** The three orifices were visually inspected in their as received condition. Two of the orifices, LD2 and LD3, displayed evidence of damage along the discharge end. A section approximately five inches long, containing the discharge end was removed from each orifice. These sections were then cut longitudinally to allow inspection of the ID surface. As expected from the initial inspection, orifice LD1 exhibited no evidence of material loss, as shown in *Figure 1*. The damage to orifice LD2 is shown in *Figure 2*, while the damage to LD3 is displayed in *Figure 3*. Both areas exhibited cone-shaped patterns, wider at the discharge and tapering down toward the inlet end. The surface profiles from each were very rough and irregular, typical of cavitation attack. The material loss to orifice LD2 extended approximately 2 ½ inches along the ID, while the damage to LD3 extended roughly 2 inches into the orifice.

7. **Comments:** The damage to the two letdown orifices from Unit 2 was the result of cavitation. This was the same mechanism responsible for the wall loss experienced by the Unit 1 orifices, which were examined in report NESML-Q-309. The pattern of attack was very similar between the two units. The only exceptions noted were in the extent of the damage, and in which orifice was affected. On Unit 1, LD1 and LD2 were attacked, while LD3 showed no signs of material loss. Furthermore, the damage on LD1 from Unit 1 was slightly more extensive, extending approximately 5 inches along the ID. Both variations are undoubtedly the result of differences in age and operating conditions.

Prepared by: J. G. Beck
J. G. Beck

Reviewed by: Leslie L. Spain
Leslie L. Spain

Flow Direction

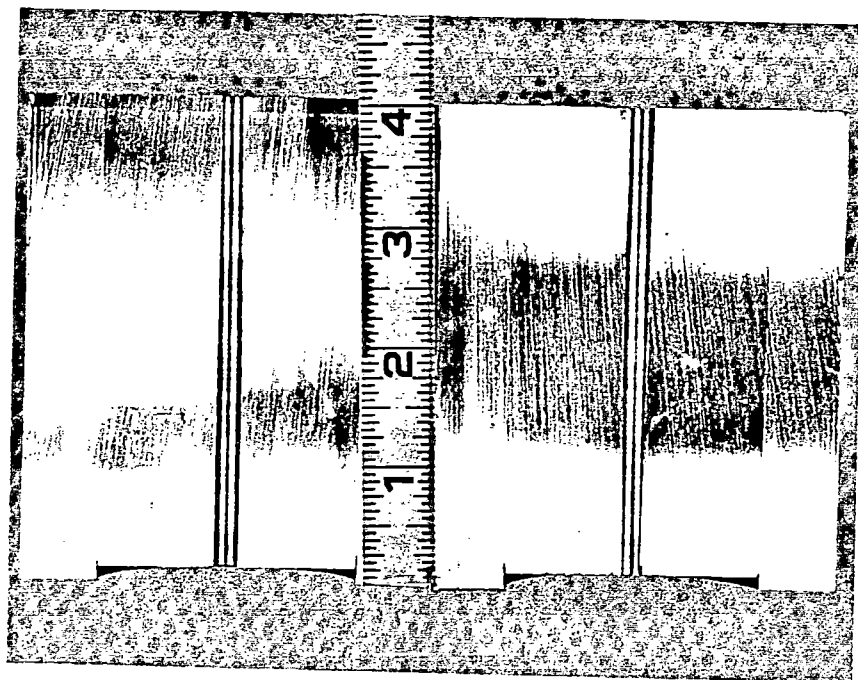


Figure 1: Photograph showing the Unit 2 let down orifice LD 1. No damage was observed along the ID of the orifice.

Flow Direction

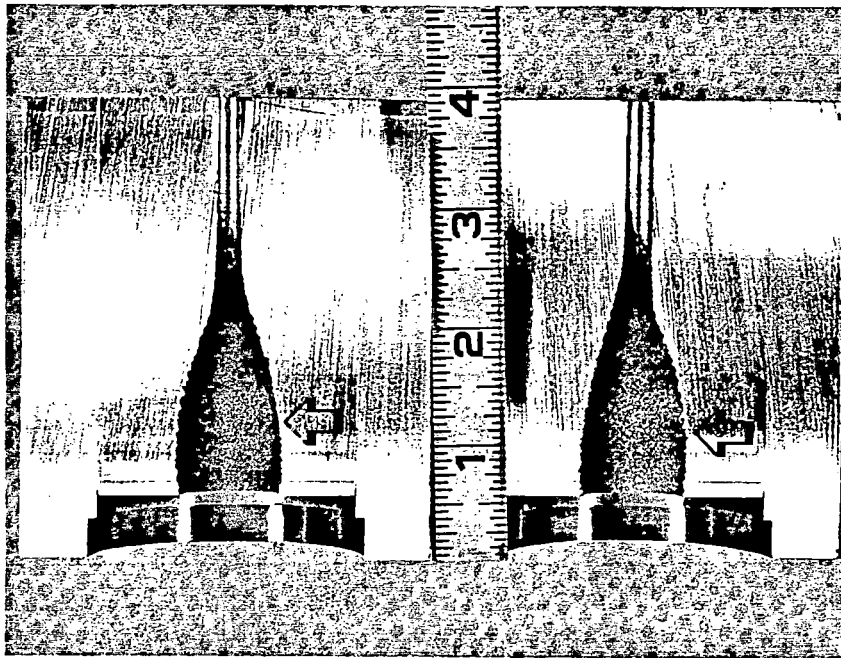


Figure 2: Photograph showing the Unit 2 let down orifice LD 2, after sectioning to reveal the ID. The damage, which is indicated with the arrows, measured approximately 2 ½ inches into the orifice from the discharge end.

Flow Direction

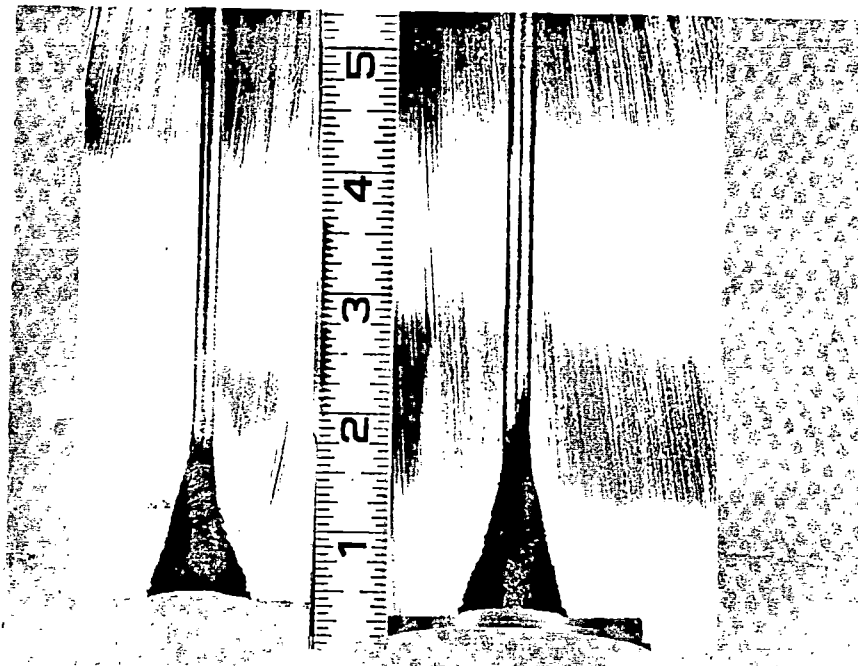


Figure 3: Photograph showing the Unit 2 let down orifice LD 3, after sectioning to reveal the ID. The damage along this orifice measured approximately 2 inches from the discharge end.