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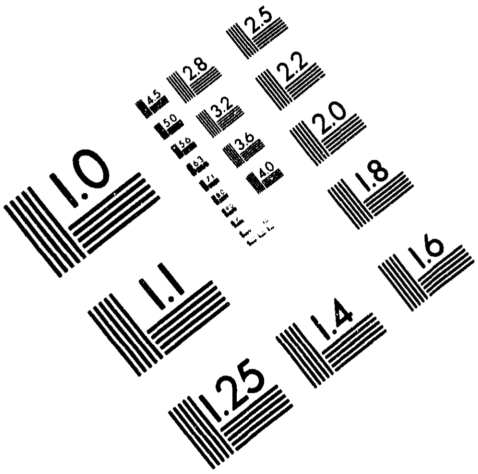

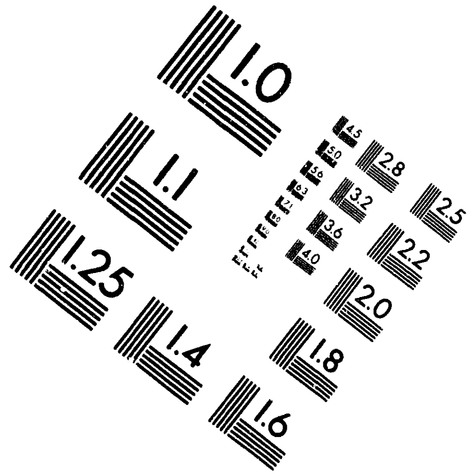

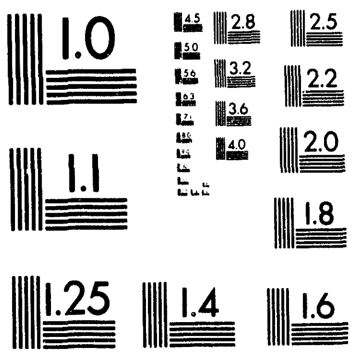

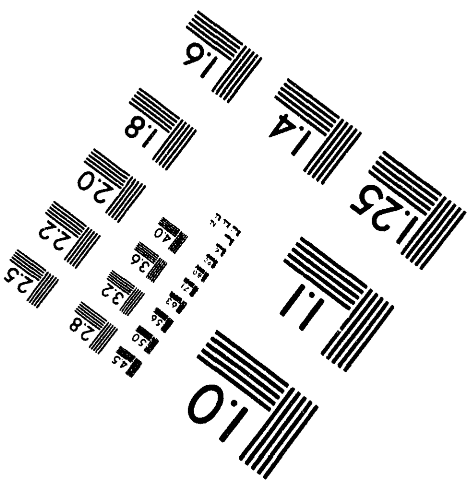

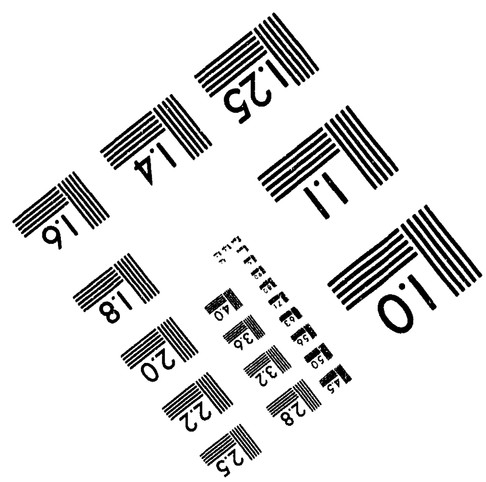

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190-H DRAWDOWN TEST

by
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IRRADIATION PROCESSING DEPARTMENT

January 17, 1963

190-H DRAWDOWN TEST

Introduction

A discrepancy of about 1000 gpm has existed between the full-flow recorded 190, 105 and ROL[1] flows. While past operating practices have not used the 190 or ROL flow rates for official purposes, the disquieting, though not theoretically unexplicable, differences require some quantitative resolution. On November 24, 1962, a drawdown test of the 190-H storage tanks was performed to establish the accuracy of the various flowmeters.

Summary and Conclusion

The drawdown test of the 190 storage tanks was run at the beginning of a scheduled reactor shutdown. With the full reactor flow supplied by the electric process pumps feeding from the storage tanks, the 183-H supply to the storage tanks was valved off. Additionally, non-process water usually taken from the storage tanks was valved off.[2] The storage tank water levels were taken then recorded as a function of time. The test results are summarized in Table I.

TABLE I

	Flow	Error	% Error
Average actual 190-H drawdown flow =	83,870	---	---
Average actual drawdown flow - 100 gpm turbine pump bearing coolant =	83,770	---	---
Total average flow metered by the 190-H flowmeters -	82,870	-900	-1.1%
Total average flow metered by the 105-H flow transmitters =	83,300	-470	-0.6%
Average recorded flow on 105-H control room Foxboro recorder =	83,990	+220	+0.3%

From the results shown in Table I it is apparent that normal operating flow is measured and recorded by the 105-H control room recorder to an accuracy

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[1] ROL flow is defined as the summation of the individual process tube flow rates, as reported in the Reactor Operating Limits (ROL) print-out.

[2] To assure continuous water backup adequacy during the drawdown test, the process water used to cool the steam turbine pump bearings was left on. This water, visually estimated at 100 gpm, was the sole non-process use of storage tank water during the test.

well within the 1 per cent accuracy specified by standards.[3] Therefore, the current practice of using the 105 control room flow for official calculations and reports, etc. should be continued.

Discussion

While this test established the accuracy of the 105 flow meters in the range of normal operating flow, it is not valid to extrapolate this accuracy into the range of shutdown flow. Because of construction limitations, the 105 flowmeters simply cannot be used to provide reliable flow data below 10,000 to 20,000 gpm. Therefore, reliable shutdown flow data must be supplied by either the 190 flowmeter summation or the newly installed high pressure manometers.

Close aggreement between the 105 and 190 flowmeters, while desirable, is not likely to ever occur often because of the precision of the 190 flowmeters. Since each of the 190 flowmeters has a "least count" of 500 gpm, it is quite unlikely that any single reading can be more precise than about 100 gpm. Actually, there is some logic in not claiming a precision greater than 1/2 the least count, or 250 gpm. In any case, however, the contributing error of each of the eight 190 flowmeters can cause a total flow error of as much as 8 x 250 = 2000 gpm. More probably, the 190 flowmeter error would be only about 800 gpm; however, even this is significant. Thus it seems prudent to use the present 190 flowmeters only for gross flow checks, or possibly in the low flow range wherein the 105 flowmeter is ineffective.

The ROL flow summation suffers, precisionwise, in the same manner the 190 flowmeters do: relatively small individual errors when multiplied by the total number of flowmeters (i.e., venturis or orifices) cause a significant total flow error. For example, an average individual tube flow error of only 1/2 gpm can cause the total ROL flow to be in error by as much as 1000 gpm. Since individual tube flow errors of 1/2 gpm can easily result from venturi machining tolerances, front header pressure variations, etc., it is imprudent to use the total ROL flow as representative of the true reactor flow.

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[3] HW-41000, "Process Equipment Standards, A-010."

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