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Office Memorandum

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Memorandum

TO : H. M. Martin

BUREAU OF RECLAMATION
HYDRAULIC LABORATORY

Denver, Colorado

DATE: July 31, 1959

FROM : D. Colgate

OFFICE
FILE COPYSUBJECT: P-4 pump bearing failure--Grand Coulee Dam--May 22, 1959
WHEN BORROWED RETURN PROMPTLY

Mr. William L. Newmeyer, Division of Power Operations, Denver Office, visited the pumping plant at Grand Coulee Dam after the power failure on May 22, 1959. During Mr. Newmeyer's discussion with operating personnel, it was disclosed that the gage glass on the pump oil reservoir indicated a "safe" level of oil although it had been determined that the oil reservoir was empty immediately after bearing failure.

An examination of the gage glass installation disclosed a 1/4-inch-outside-diameter, 3/16-inch-inside-diameter bleeder tube leading from the top of the gage glass back into the oil reservoir. The ends of this bleeder tube had not been reamed after cutting with a wheel-type tube cutter. The upset metal burr restricted the tube ends to about 3/32-inch-diameter. Mr. Newmeyer thought that this tube might act as an oil trap and cause a "false" oil level to be shown in the gage glass. He, therefore, brought the bleeder tube in question to the Hydraulic Laboratory to determine if such a false reading were possible.

LABORATORY STUDY

(These tests were conducted by D. Colgate)

A 1/2-inch-inside-diameter by 8 inches-long glass tube was installed in a piping system, as shown in the accompanying photograph, to simulate the installation at Grand Coulee Dam. The bleeder tube from the project was installed at the top of the glass. The overflow pipe representing the oil reservoir was erected and filled with 20-W oil at room temperature (about 85° F) until the gage glass was about two-thirds full. Next, the open end of the bleeder tube was submerged in a small container of oil, then the overflow pipe was lowered until the oil level in it was below the visible part of the glass gage. The oil draining out of the overflow tube drew oil up into the bleeder tube. When the system reached equilibrium, the container of oil was removed from the open end of the bleeder tube. The oil that had been drawn up into the bleeder tube was trapped in the outside vertical leg and created sufficient siphon head to hold a "false" oil level in the gage glass to about 3 inches above the level which was open to atmosphere in the overflow tube. (This test was witnessed by Mr. Newmeyer and Mr. Edward C. Schurch, Division of Power Operations, Denver Office.) The apparatus was allowed to stand for 24 hours and the oil level

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in the glass gage did not drop. The open end of the bleeder tube was forced to the side about 3/4-inch and allowed to snap back violently. This action broke the siphon and the oil in the glass gage drained out.

The above test was repeated using 30-W oil at 50° F, the temperature at Grand Coulee Dam at the time of bearing failure. Under these conditions, the false reading was about 4-1/2 inches above the open surface in the overflow pipe. (This test was witnessed by Messrs. William L. Newmeyer, Sidney M. Denton, Ireal A. Winter, and Edward W. Wengler, all of the Denver Office, and Mr. W. R. Dixon, Special Representative for Westinghouse.) This apparatus was allowed to stand for 24 hours during which time the oil level in the gage glass did not drop. ~~Wrapping~~ and vibrating of the bleeder tube failed to break the siphon.

An additional test was made with a bleeder tube the same size and shape as the one from the project, but with the ends reamed smooth. The test was performed using 30-W oil at room temperature. The false reading was 4-1/2 inches, the same as that with the bleeder tube from the project. Vibration failed to break the siphon and the false reading persisted for 24 hours.

These tests were performed for the witnessing personnel. The laboratory was not requested to furnish a report or draw conclusions regarding the study.

D. Colgate



