Experimental Study of the Flow of Coal in Chutes at Riverside Generating Station

R. F. Legget. This lucid account of an exhaustive experimental study into a complex operating problem has proved of unusual interest to the writer since he was working on an allied problem at the University of Toronto, apparently simultaneously with the authors of the paper. His findings, which to some extent supplement those of the authors, will be presented at a future date.

The writer’s investigation was concerned with the clogging of bituminous coal in the large reinforced-concrete bunkers of the new steam-generating plant of the Polymer Corporation at Sarnia, Ontario. A model of a bunker was used, one-twelfth full size, but made of wood and not of such a convenient material as pyramal. The grading of the coal used did not correspond with that shown in Fig. 1 of the present paper; however, the coal used for experiments was modified as the authors suggested.

In all the experiments conducted at Toronto, no “scale effect” was noted, and the writer is therefore puzzled by the authors’ statement with regard to this matter, especially since it is difficult to see what should cause a difference between the behavior of coal in model and prototype. Possibly the authors will discuss this matter further in their closure.

The comment given on the use of “wetting agents” confirms the writer’s experience; he cannot but think, however, that in some way these remarkable chemical products may one day assist in the solution of problems involving the movement of coal.

In view of the differing character of the units being studied, it is the authors’ interesting discussion of the physical properties of the coal which provides the closest link between the two investigations. Although the approaches to the study of the properties of coal were somewhat different, the moisture content is paramount in both. Accordingly, it would be helpful if the authors would state how their moisture contents are expressed, i.e., as percentages of the dry or of the wet weights of coal.

Development of the Lysholm-Smith Torque Converter

The author’s closure

Mr. Eksergian agrees with the author that the flow of a multistage reaction converter increases with reduced speed. The influence of this increased flow on the input torque is, however, not correctly interpreted by Mr. Eksergian. By using his theory, the input would increase on both sides on the optimum point, which is not substantiated by the test results. For the converter in question, the last turbine stage acts like a guide to the pump impeller giving a counterrotating vortex. The higher the secondary speed is, the less the circulation of this vortex will be, causing an increased unloading of the impeller. It has also been confirmed by tests made by the author that if a stationary guide is arranged before the pump impeller, the input torque will be substantially constant near the optimum point but, due to the increased flow decreases somewhat at stalling and racing. The dimensions of the various parts of the converter may be obtained from Fig. 1, which is drawn to a scale of 1:6.7.

Mr. Wislicenus comes to the conclusion that by using the equation given below Eq. 2, the actual pressure drop will be twice as great as derived from Eq. [1]. This is not correct, as Equation [1] applies both to guide and rotating blades, thus making up for the missing factor of 2. The author regrets that this was not stated in his paper.

The author agrees that it is very difficult to separate losses in a hydraulic converter. The approximate method used when computing Table 1 was to estimate leakage, rotation, and mechanical losses according to usual formulas and try to balance the remaining losses in a reasonable way to correspond to the total losses obtained by the tests.

The carry-over losses are the losses in the open space between turbine and pump, or vice versa.

The author’s Equation [2] was taken over from a similar equation used for calculating losses of the Ljungström double-rotation steam turbine. As shown in Fig. 4, this factor is by no means constant, but varies considerably over the range of inlet angles.

The rate of flow indicated in Fig. 2 is valid for constant input horsepower—that is to say, a constant value of $Q_2\Delta h$. The values have been computed from test data for a great number of primary and secondary speeds by means of a Pitot tube fitted after the guide blade G in Fig. 1. This characteristic has to be accepted as correct on account of these tests, but it is also possible to confirm the test results by the cut-and-try method described below Fig. 2 in the paper.

A. Lysholm. The inference may be drawn that other factors could be devised in order to be added to the exponent in Equations [16] and [20], to cover other departures from complete reversibility.

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