THE RAINFALL DISTRIBUTION OF ATOMIZED FLOW IN LARGE DAMS

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Nowadays, with the dam height of hydropower project getting into 300m level and above, the atomization induced by the discharging flow has aroused more and more attention. Especially, the influence region of atomization and the rainfall distribution need to be determined quantitatively for the practical use, but the phenomena of atomized flow and its mechanism are so complex that the former study can't provide the credible results.

In this paper, with the use of field data from prototype observation and the dimension analysis method, the influence of hydraulic factors on the atomization phenomenon, especially, the influence range of atomization and the rainfall distribution are studied quantitatively. The results show that the determinative factors on atomization are the flood discharge, the incident velocity, and the incident angle into the cushion pool.

The experimental formulas which can be used to estimate the influence range of atomization are brought forward as following,

$$L = 10.267\xi, \quad \xi = \left(\frac{V_c^2}{2g}\right)^{0.7651}\left(\frac{Q}{V_c}\right)^{0.11745}(\cos\theta)^{0.06217}$$

Under the collision condition of two layer Jets, the atomization border can be calculated by,

$$L = L_1 + 1.13L_2 = 10.267\xi, \quad \xi = \xi_1 + 1.13\xi_2$$

Furthermore, it is indicated that the rainfall distribution along the longitudinal direction can be estimated by the following experimental formula,

$$L_p / L = f(\frac{P}{\xi}) = \begin{cases} 1.0 & if \quad p/\xi \le 0.0002 \\ -0.0565\ln(P/\xi) + 0.5174 & if \quad 0.0002 < p/\xi \le 0.60 \\ 0.6019e^{-0.1706\,p/\xi} & if \quad p/\xi > 0.60 \end{cases}$$

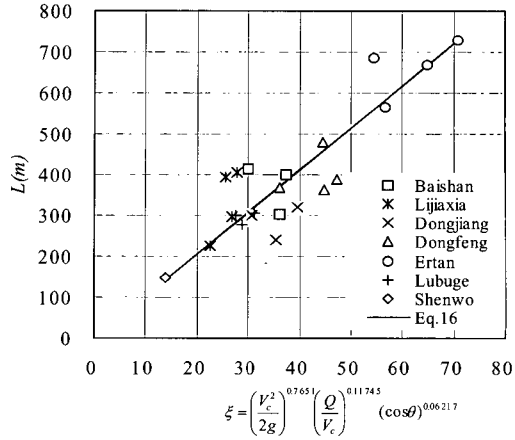

Fig. 1 The relationship between the Eq.16 and the field data

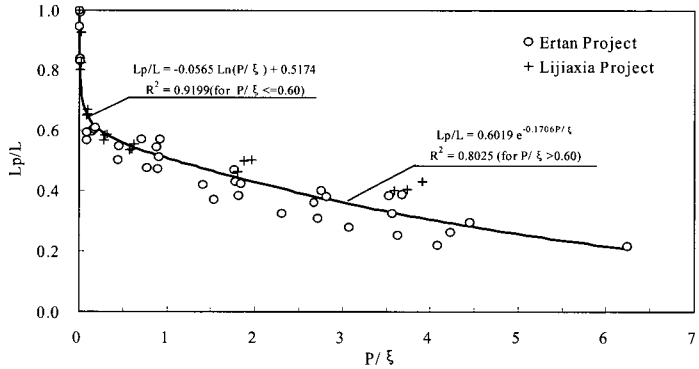

Fig.1 The relationship between the regressive of P/ξ~L_p/L and the field data from Ertan Project and Lijiaxia Project

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