Equation (10) can also be applied to jacketed rod penetration when co-erosion occurs so long as Y_p and ρ are replaced with Y_{eq} and ρ_{eq} which are determined by the following equations[20]

$$\begin{cases} Y_{eq} == Y_j + \left(Y_c - Y_j\right)\dfrac{r_{c0}^2}{r_{j0}^2} \\ \rho_{eq} = \rho_j + \left(\rho_c - \rho_j\right)\dfrac{r_{c0}^2}{r_{j0}^2} \end{cases} \quad (14)$$

where r_{c0} and r_{j0} are core and jacket radii respectively, ρ_c and ρ_j are respective core and jacket material densities, Y_c and Y_j are the dynamic strengths of core and jacket materials, respectively. The relationship of v-u for a jacketed rod penetration when co-erosion occurs can also be determined by those of unitary long rod penetration of the same core material from (11) and (12) where $Y_p = Y_c$ and $\rho_p = \rho_c$.

Figure 3 shows comparison of (10) with the experimental data reported by Cullis et al [23] for EN24 steel jacketed tungsten alloy long-rod penetrators. The dynamic strength of the core and jacket material were taken to be 3.5 GPa and 1.49 GPa by WEN HeMing, HE Yu et al[20]. The RHA(Rolled Homogeneous Armour) target yield stress (i.e. Y in Table 1) is 1.37 GPa[23] and the other constants are taken to be the same as given in Table 1. It can be seen from Figure 3 that good agreement is obtained between (10) and the test data.

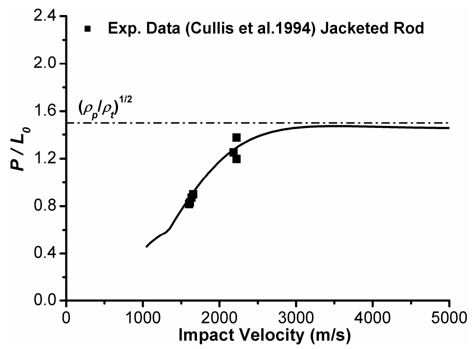

Figure 3. Comparison of equation (10) with the experimental data for EN24 steel jacketed tungsten alloy long rods and tungsten unitary long rods penetrating semi-infinite armor steel targets [23]

IV. CONCLUSIONS

Analytical equations have been given in this paper to predict the penetration of semi-infinite metallic targets struck normally by high speed long rods. The analysis is based on energy balance where the kinetic energy of a long rod is equated to the energy dissipated by the plastic deformations in the target, the energy consumed by the long-rod itself and the kinetic energy remaining in the ejected rod debris. It is shown that the present analytical equation is in good agreement with the experimental data for a wide range of impact velocities.

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