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On the design of deep-hole drills with non-traditional ejectors

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This work deals with the development of design criteria for deep-hole drills with non-traditional ejectors of circular and plain type. An analytical method for design on non-traditional ejectors with circular jet was developed. The experimental investigation of the developed method was found suitable for the design of single lip non-traditional ejector gundrills of bigger diameter. For smaller diameter drills the results were not satisfactory. For smaller diameter size gundrills the equations analytically developed were modified to suit the experimental results. Further investigation of these modified equations found them to be appropriate. In the case of plain type ejectors, the design methods were developed based on experimental results since this type of ejector does not lend itself easily to theoretical analysis.

Nomenclature

b, h_1	width and height of the nozzle respectively (of the plane ejector)
b_h	nozzle width
C_1	constant
d_c	nozzle diameter
E	jet expansion coefficient
h	relative ejector head
H_0	swarf head past ejector nozzle, m
H_1	SLCM operating head
l	length of SLCM jet
P_0	Operating SLCM pressure
P_s	Pulp pressure
$\bar{P}_k$	ratio of chamber pressure to operating SLCM pressure
q_0	relative flow rate
q	relative ejector flow rate
Q_0	swarf flow rate, suction of the ejector jet
Q	SLCM operating flow rate
dQ_1	suction flow rate
r	radius of jet at distance Z from nozzle
r_0	nozzle radius
R_e	The Reynold's number
R	Magnitude which is characteristic of parameters in the mixed region of operating and suction SLCM flow
V_{z_0}	SLCM velocity at the nozzle outlet
V_z	axial jet velocity
V_m	maximum velocity in cross-sectional area
$\bar{X}_0$	the relative pole distance for jet

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