

CN 089

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REGIONAL COPPER-NICKEL STUDY
ESTIMATION OF PARTICLE SIZE DISTRIBUTION:
RUN-OF-MINE WASTE ROCK AND PRIMARY
CRUSHER PRODUCTS

April, 1978
Draft

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Kim Lapakko
April 1978
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Regional Copper-Nickel Study
ESTIMATION OF PARTICLE SIZE DISTRIBUTION:
Kim LaPakko 5-24-78

RUN-OF-MINE WASTE ROCK AND PRIMARY CRUSHER PRODUCTS

METHOD

Information from the "Mineral Processing Studies" by the MRRC was used to estimate size distributions for various products of the mining process. The data was taken from the rough draft of the "Dust Generation in Crushing and Handling" final report. ^(Iwasaki, et. al., 1976) Size distribution presented in the report for products of jaw crushing and cone crushing were used. A linear fit of the log-log plots of these size distributions was determined using a regression analysis. The arithmetic mean of the computed slopes was calculated and incorporated as the slope for size distribution of the mining products. Maximum diameters for the various products was estimated and are presented on page 2. Using a log-log equation with the calculated slope the exact equation for a given product was determined using the boundary condition of 100% passing at the maximum diameter.

ASSUMPTIONS

It was assumed that:

1. the shape and slope of the size distribution graph is independent of maximum diameter of size fraction
2. The slope of the size distribution graph is the same for products of crushing and blasting

Dr. Iwasaki stated that the use of these assumptions was the best available method of making the estimation.

LIMITATIONS

Dr. Iwasaki stated that the error of this approximation increases in the range $d < 74\mu\text{m}$ due to a leveling tendency of the size distribution graph for small particles. A maximum percentage of these particles could, however be estimated.

RESULTS

GENERAL FORMULA: $\log P = m \log d + b$ or $P = d^m \cdot 10^b$

d = diameter in μm

P = percent passing (finer than) given diameter

m = slope

b = ordinate value when $d = 1 \mu\text{m}$

VALUES CALCULATED FROM MRRC DATA

Jaw crusher, $d < 3.5$ in. : $m = 0.562$, $b = -1.076$, $r^2 = 0.9559$

Cone crusher, $d < 1$ in. : $m = 0.711$, $b = -1.244$, $r^2 = 0.9871$

AVERAGE SLOPE: $m = 0.64$

FOR OPEN PIT: $d_{\text{max}} = 4$ ft. = $1.22 \cdot 10^6 \mu\text{m}$

$$\log P = 0.64 \log d - 1.895; 10^{-1.895} = 1.27 \cdot 10^{-2}$$

FOR UNDERGROUND MINE: $d_{\text{max}} = 2$ ft = $6.10 \cdot 10^5 \mu\text{m}$

$$\log P = 0.64 \log d - 1.703; 10^{-1.703} = 1.98 \cdot 10^{-2}$$

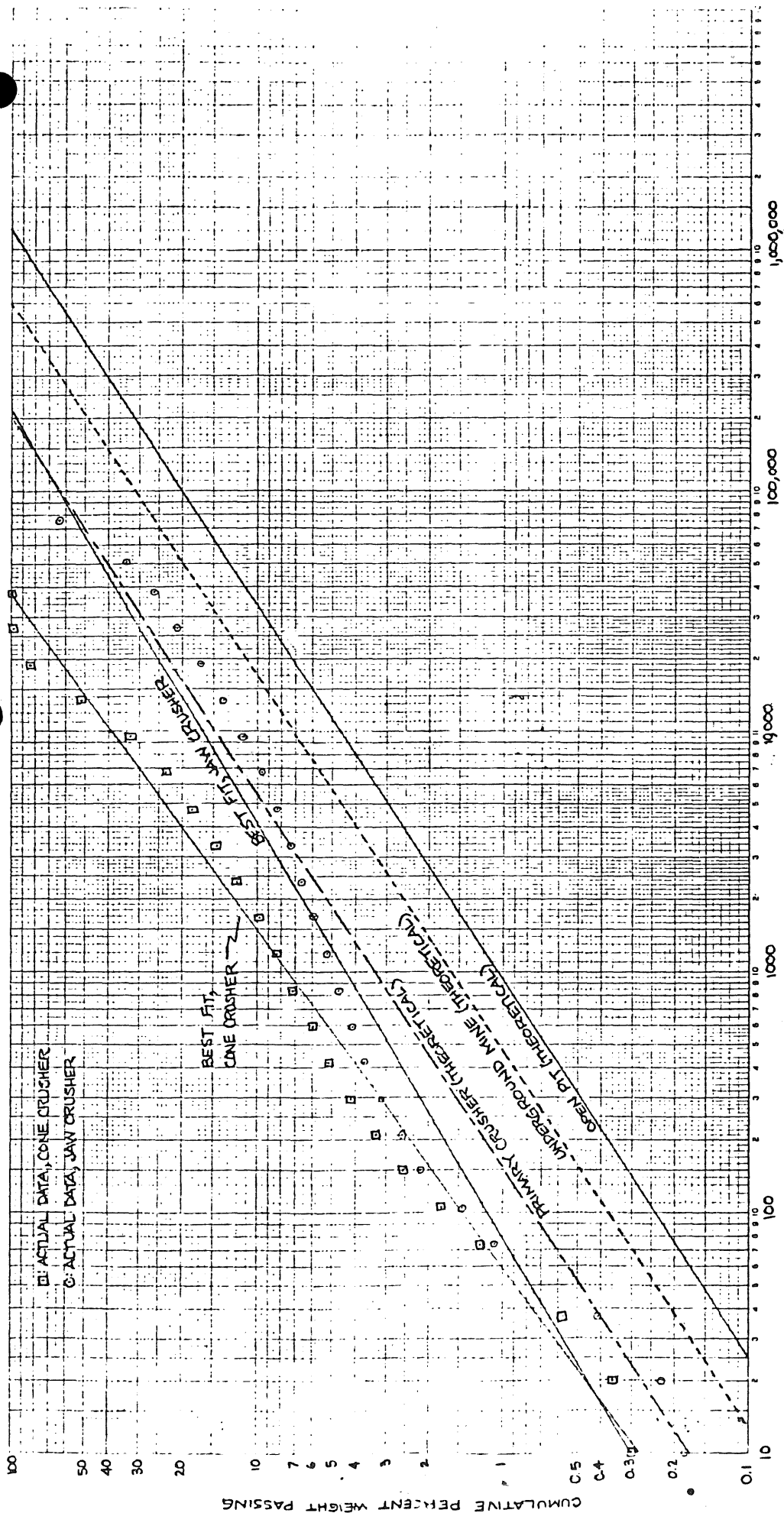
FOR PRIMARY CRUSHER: $d_{\text{max}} = 8$ in = $2.03 \cdot 10^5 \mu\text{m}$

$$\log P = 0.64 \log d - 1.397; 10^{-1.397} = 4.01 \cdot 10^{-2}$$

SEE GRAPH P.3

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PARTICLE SIZE, μ M



PERCENT PASSING

CUMULATIVE PERCENT WEIGHT PASSING