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(8) Granulation of Iron Ore Sinter Feeds

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SUMMARY

The granulation of iron ore sinter feeds has been examined empirically. The importance of using the correct mix moisture is indicated.

INTRODUCTION

The view that use of iron ores with high ultrafines content (minus 0.063 mm) results in sinter feeds with low pre-ignition permeability is derived from experimental work and plant practice in which sinter feed mix moisture is generally maintained constant. However, porosity, mineralogy and particle size distribution of the iron ore are significant in determining the granulation and air permeability characteristics of a sinter feed (ref. 1).

EXPERIMENTAL RESULTS

Sinter feeds comprising three types of iron ore fines, coke, limestone and return sinter fines were prepared. Figure 1 shows that the sinter feed containing ore fines B, a porous goethite, required 6% free moisture (i.e. $H_2O^{-110^oC}$) before granulation started whereas the sinter feed containing ore fines A, a dense hematite, needed only 2% free moisture to begin granulation. Sinter feed containing ore fines C, a porous hematite, required 4% free moisture to initiate granulation. This water, absorbed in the pores of the sinter feed constituents, is not available for the granulation process.

The increase in plus 4 mm granules with respect to water addition is also shown in Figure 1. Experimental work suggests this rate is dependent upon the ratio of ultrafine to near-ultrafine material (wt% minus 0.063 mm/wt% minus 0.25 plus 0.063 mm). A high ratio produces a sinter feed with a high rate of granulation (ref. 1). The ratio values for ore fines C, ore fines B and ore fines A sinter feeds were (16.8/12.4)= 1.4, (6.6/7.0)=0.9, and (10.5/27.8)=0.4 respectively, and this order is consistent with the observed granulation rates (see Figure 1).

The dependence of sinter feed air permeability on free moisture is shown in Figure 2. Maximum air flow rates vary markedly depending on the iron ore type. Differences in the moisture content at which maximum air flow is achieved can be explained by differences in sinter feed porosity and size distribution. It is common sinter plant practice to limit the range over which the sinter feed moisture is varied. If the plant moisture content is maintained at say 5% then the full potential of the ore fines B and C would not be realised in term of permeability. The importance of correct selection of sinter feed moisture is clearly demonstrated.

FIGURE 1

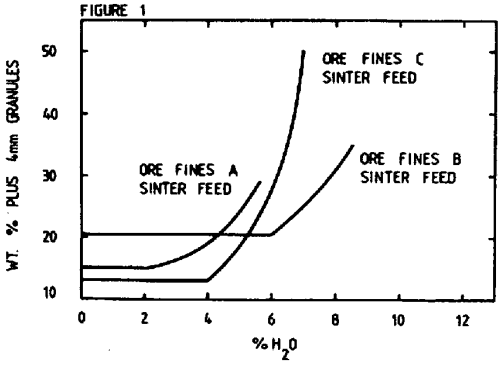
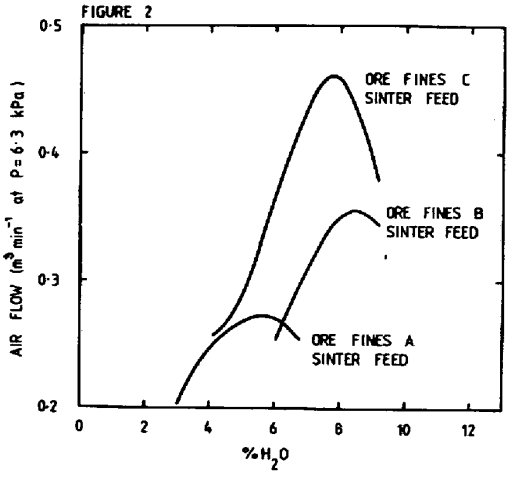


FIGURE 2



CONCLUSION

Pre-ignition sinter feed air permeability and degree of mix granulation can be optimised by using the correct mix moisture. The moisture value is strongly influenced by the porosity and size distribution, particularly the ultrafines content, of the iron ore used.

REFERENCE

(1) Roller, P. W. and Firth, B. A., B.H.P. Technical Bull., 1981.