Influence of Sinter Raw Mix on Sinter Dust Emissions at Baosteel

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Abstract: This paper studies the relationship among sinter feed, dust components and dust emissions from sinter plant stack. Among the chemical components of sinter feed, alkali metal such as K、Na exerts a negative effect on electrostatic precipitator efficiency. The effective way to improve E.P efficiency is to decrease the content of alkali metal.

Keywords: electrostatic precipitator, sinter plant, sinter feed

1 Introductions

An important factor which influences dust emissions from sinter plant stack is sinter raw mix. To utilize the waste, some new additives are added. Among the chemical components of sinter feed, alkali metal such as K, Na exerts a negative effect on electrostatic precipitator efficiency. This paper studies the relationship among sinter feed, dust components and dust emissions from sinter plant stack.

2 The status of electrostatic precipitator (E.P) in the sinter plant at Baosteel

There are three sintering machines producing 15 million tons of sinter at baosteel. Each DL sinter strand is equipped with two identical E.Ps, of which one is designed for waste gas desulphurization in the future. Table 1 shows the E.P' s parameters.

Table 1 Parameters of E.P

Parameter	Ⅰ Ⅱ Ⅲ Phase
Gas volume of each EP /($m^3 h^{-1}$)	1260000×3
Gas temperature/℃	150
Dust concentration of inlet /($g.m^{-3}$)	0.5~3.0
Negative pressure in EP /Pa	19110
Field number	3
Different polars distance /mm	300
Height of fields/ mm	10500
Length of each field/ /	4690
Rating voltage /kV	90
Rating current /mA	1100 /1500/1500

In recent years many additives have been added to sinter raw mix, such as limonite, fine-grained concentrate, CDQ dust, coal fine, limestone sludge and dust from E.P of sinter strand. Sinter back ratio is about 23%. The bed height has reached 620mm. All changes in the raw mix lead to increases of alkali metal content and dust resistance, decreases of gas temperature and dust average diameter. The designed dust average diameter was 25~85μm. Now the dust average diameter is 3.8-12.6μm. The E.P dedust efficiency is about 87%. Therefore, the amount of dust emission can't meet the environmental regulations of Baosteel. To improve sinter productivity, sinter strand will be modified in two years. It is predicted that the amount of dust emissions from sinter plant stack will increase because of the high production. Possible techniques has been considered such as E.P pulse system, sound scatters, moving net electrode, skew gas flow and so on. The research on influence of sinter raw mix on dedusting efficiency is shown as below.

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3 Experimental Method

To maintain production some of the raw mix such as limonite and fine-grained concentrate must be used. Our study mainly focuses on the CDQ dust, coal fine, limestone sludge and E.P dust from sinter strand. These four materials are mixed in sinter in our daily work. We designed experiments to test the effect of sinter raw mix on sinter dust emissions. By controlling four input materials we tested the dust emissions and the dust components. At the same time we remained other conditions such as strand speed unchanged.

We chose ten points along the direction of the diameters of inlet and outlet of the flue respectively. The data collected on ten points were combined as one set of sample data, and 3 sets of sample data were averaged as one group of data. Under each condition, we tested 2 groups of data, which were averaged to get the final result.

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4 Results and discussions

The results of sintering test are shown in figure 1 and table 2.

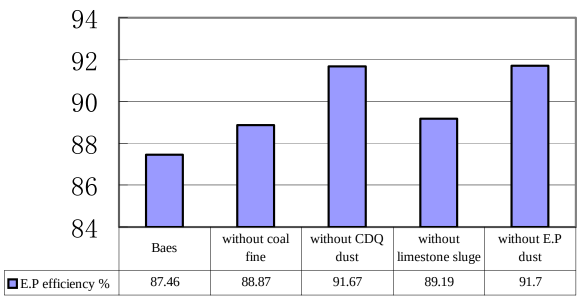

Fig.1 Sinter raw mix vs. E.P efficiency

Table2 E.P dust component content %

Sinter raw mix	K_2O	Na_2O	Cl
Base	14.67	2.13	21.14
Without coal fine	13.14	2.00	-
Without CDQ dust	12.01	2.00	-
Without limestone sludge	14.20	2.03	-
Without E.P dust	10.15	1.92	0.49

Figure 1 shows the result of sintering test for controlling input material. E.P efficiency could be increased by 4.24% without E.P dust addition and by 4.21% without CDQ dust addition. Influence of coal fine and limestone sludge is not obvious on E.P efficiency. The large portion of fine dust of CDQ dust leads to bad efficiency of E.P.

The alkali metal contents such as K, Na in the sinter mix are very high, most of which exist as NaCl and KCl. When temperature is above 1200℃, NaCl and KCl in the sinter raw mix will vaporize and emit from the E.P with waste gas. Alkali metal dust has high resistance. It is too fine to be trapped by E.P. We test the components of dust out of stack. The result shows that the total content of Cl, K, Na, S, F and Pb is 48%. The experiments show that, without recycled E.P dust, the content of Cl, K and Na decreased magically in collected dust of E.P, and dust emission concentration decreased remarkably. In practice, the E.P efficiency can be improved by watering the collected dust so as to lessen the Alkali metal content before recycle.

A series of experiments are carried out to verify the result. Under different strand speed, we test the E.P efficiency after abandoning E.P dust in the sinter feed. The dust emission concentrations are shown in figure 2. Most of them are between 20~40mg/m^3.

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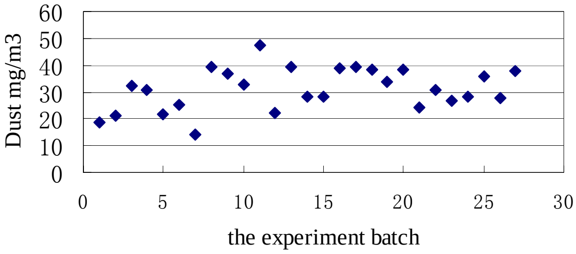

Fig.2 The dust emissions from E.P

5 Conclusions

Among the chemical components of sinter feed, alkali metal such as K、Na has a negative effect on electrostatic precipitator efficiency. The effective way to improve E.P efficiency is to decrease the content of alkali metal. Extensive study should be carried out to treat E.P dust to realize waste recycle.

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