A Kind of Light Type ESP

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Liu WeiPing Zhang Xiong Wen
Wuhan Safety & Environmental Protection Research Institute,China

Abstract: The everlasting subject of ESP technology development is to reduce equipment construction cost, to enlarge application range. Surrounding the target, China has developed diversiform ESP with new structure mode. A kind of light type ESP is introduced in this paper. Different from traditional structure mode, anode is also of wire type structure. Between cathode and anode add assistant electrode insulated from the ground. Practice proves that it is insensible to collect high specific resistance, with excellent dust collecting performance at the same time.

Keyword: Light Type ESP

In recent years, electrostatic precipitation academe in China has been active all along in experimental research of ESP electrode configuration. The aim is to improve ESP efficiency, decrease equipment construction cost, enlarge application range, reduce maintenance and operation cost and ensure long liable operation. Among a good many research related to improve ESP performance, electrode configuration mode is the first topic. During the last 80's,11 units had conducted the experimental research simultaneously in China. These units are based on the aim and divide the work, emphasize particularly on different electrode configuration modes , electrode field intension distribution, current density, plate & wire form and optimal vibration form respectively. Research production has made a great progress on the knowledge to ESP. The representative electrostatic lentoid electric field's research leads to new breakthrough to general ESP theory.

Lately China has succeeded in a new light type ESP by experiments.The difference between it and routine ESP is that wire replaces dust collecting plate,simultaneously additional plate vertical to airflow near anode wire,forming additional electric field.Therefore,compared with the routine, this new electrode configuration mode has the following features:

1. The structure adopts wide space collocation,homopolar space is 500~700mm,anode wire grounded,additional electric field insulated from the ground.Due to leave out special equipment for electrode plate manufacture,simplify electric field configuration,simultaneously reduce needed material.
2. After airflow enter electric field,wire-wire structure won't block off airflow from lengthwise.Uneven flue gas flow field will become even automatically among certain range by means of pressure difference.Simultaneously make temperature field of flue dust,dust concentration distribution even similarly.
3. Additional electric field make static dust collect section relative to dust precipitation in the electric field of ESP.That makes positive and negative ions produce active dust collection effect.And can collect dust with high specific resistance and not produce anti-corona,also overcome corona obstruction,etc.
4. Energy saving.Under the precondition of treating the same flowrate and keeping the same efficiency,compared with the routine ESP,corona current needed decreases greatly,electric power can reduce one half.

Light type ESP electric field structure is shown in Figure 1:

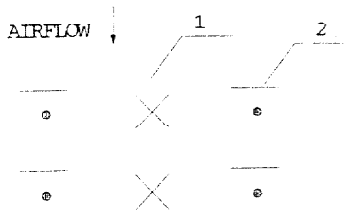

Figure 1 Electric Field Structure Schematic

1——corona wire 2——assistant electrode,insulated from the ground 3——dust collecting plate ,grounded

As shown in Figure 1,additional electric field is near anode wire.Because of insulation from the ground,in high intension electric field additional electric field is formed and adapts to gradient distribution of electric field.The intension and direction of additional electric field form negative electric field,relative to anode;form positive electric field,relative to cathode.Dust collecting plate is zero potential,relative to corona wire.Assistant electrode is not zero potential,relative to corona wire,but it has a great potential difference.The relationship is 1>2>3.So combine assistant electrode and dust collecting electrode into anode,form a high intension electric field,relative to high potential cathode.A partial additional electric forms between assistant electrode and dust collecting electrode.Assistant electrode,relative to cathode,the polarity is negative,keeping dust with negative charge from adsorbing,not make dust deposited on cathode wire thick.On the other hand,assistant electrode near cathode wire can arrest particulates with positive charge nearby.If purifying high specific resistance dust,because of anti-corona produced by dust layer.,the positive ion will move to assistant electrode.In this case the traditional double channel which positive and negative ion flow double direction turn into single channel flow single direction.This form has positive effect to corona obstruction and second dust raise.

Wire-wire light type ESP first is applied to ripe stuff cooler in cement factory.The production of cooler is 28t/h,gas emission 80000m3/h,temperature fluctuates in 100~300□,dust specific resistance>$10^{12}\Omega$.cm.In order to purify waste gas from cooler,already make use of pulse-jet bagfilter,cyclone dust collector,tubular mode ESP successively.Because of bag failure,pipe blockage or too low efficiency,too high energy consumption,all are not successful.Electric field section area of this experimental equipment is 20 m^2,electric field length 4.68m,equipment weight not more than 20 ton.After operation,though temperature go up and down frequently,parameters change graetly,dust collection efficiency is stable all the time.The efficiencies all exceed 98%,dust emission concentration is below 50mg/Nm^3.But to the traditional two electric field ESP with the same specifications,the efficiency is only 70 ~75%.Since then,another ESP with 20 m^2 section area is installed in the other cooler,still one electric field,length 5.2m.After ESP with this structure mode succeeds to purify high specific resistance dust ,and treating quartz dust(normal temperature) is successful in a glass factory.ESP with the same specification,the application of collecting dust from cement milling is of nicer economical benefit.The examples above show that:this kind of light type ESP,compared with traditional ESP,not only low weight,but also overcome ESP's connatural weakness,i.e.insensible to dust specific resistance.Now the problem is that:This kind of light ESP is still in experimental stage.Whether encouter obstacles during equipment scale up, whether those obstacles will be effectively solved or not.The answer only lies in the future application and generalization.