The research and implementation of desulfurization monitoring system

Wendong Ji[1,a], Lijian Zhang[1,b], Yuzhen Cao[2,c], Tingting Wang[3,d]

[1]College of Electrical Engineering, Binzhou Polytechnic, Shandong, 256600,China
[2]State grid binzhou power supply company
[3]Bohai Piston Co.,Ltd, Binzhou, Shandong, 256600,China

[a]xianruibrother@163.com, [b,c]41350992@qq.com, [c]1653226361@qq.com

Abstract: With the development of economy, are the main sources of air pollution of sulfur dioxide, seriously affecting the quality of life of the people. Improve the desulphurization is an important part of today's enterprise production. The desulfurization system is complex, high to the requirement of control system. After sufficient demonstration, the control system and control scheme is optimized, this set of PLC control flue gas desulfurization system is designed and developed. System running stability is high, greatly reduces the maintenance workload, flue desulphurization rate increased by 21% than the original system.

Keywords: Sulfur, Dioxide, Desulfurization, PLC, Control.

Introduction

Coal is the main fuel, which causes air pollutants to be mainly smoke and sulfur dioxide, and the acid rain is harmful to the area, which seriously affects the health of plants and human beings. Therefore, effective control of sulfur dioxide in flue gas is essential to improve the environment. The control technology of SO2 is divided into three types: pre-combustion desulfurization, desulphurization and post-combustion desulfurization after combustion in coal combustion.

The equipment is based on huichuan PLC, which is the upper computer based on Beijing kunlun tongtai MCGS. The system adopts the PID control, cascade control and switch volume control, and has two operation modes: manual and automatic. The system is easy to operate, stable and easy to maintain.

System introduction

Technological process

The desulfurization system is composed of chimney, desulfurization absorption tower, circulating pool, lime tank, lye tank, pressure filter machine drying field, etc. The various components work together to ensure the stable operation of the whole system. The entire process is shown in figure 1.

The desulphurization of the desulfurization absorber and the lime in the circulating tank were chemically reacted, and the sodium alkaloid successively completed the first regeneration and the second regeneration process. Adjust the amount of lime slurry and alkali liquor according to the PH value.

Requirements of control loop

PH automatic regulating circuit (range 0-14ph)

Start off the valve SV013DO-KG with PH value and turn off the valve when the PH value > 6. Open the valve at 4.

SO 2 automatic regulating circuit (range 0-2000mg /NM3)

(1) starting order: A--B--C pump; Single loop automatic adjustment (single pump running a given value 0-2000mg adjustable)

At the given value of >, the A circulating water pump is activated, which is automatically adjusted according to the SO.

(2) cascade adjustment

When the A pump runs 1200 ", SO the concentration of SO is higher than 200MG, and the pump operation forms A cascade regulating loop, and the B pump is automatically adjusted with the concentration of SO, and the A pump is running at A steady speed.

(3) manual intervention

A/B pump starts operation, SO the concentration is higher than the design concentration.

Cleaning pump number SV007DO-KG.

It has the function of manual and automatic operation. The panel sets the fixed value and can modify the running time, according to the process or operating experience value to put in the running time and stop interval time. 30 minutes apart, run 45-60. The flushing pressure is controlled between 140 and 280Kpa.

Automatic interlocking state (the soft contact point of PLC control loop of flue gas lift is delayed 5 seconds)

The screen sets the interlock input resection button.

(1) when the temperature of the absorber inlet temperature T1, T2 any > 100° and the entrance of 21% oxygen, close, 2 # 1 furnace flue damper SV018DO - KG SV019DO - KG, open flue gas lift SV014DO - K, SV016DO - K, start the circulation pump run A SV001DO - KG force 600 ".

(2) below 100° startup sequence when the first open A circulating water pumps running 60, to open flue damper SV018DO - KG SV019DO - KG.

(3) the circulating pump does not open the flue to adjust the damper.

Adjust the automatic drop button of the damper.

2 sets of 2 # furnace flue respectively installed smoke electric control valve, adjustable within the range of 90°. Open conditions: flue inlet temperature < 100°, circulating water pump is open, the entry for less than 21% oxygen.

Historical records

The record points are: circulating pump start and stop instructions, the inlet and outlet temperature of the flue, SO the concentration, and the flue regulating the air door opening and closing instruction information, the PH value.

Network type and control mode.

According to the principle of "control decentralization and centralized management", distributed network structure is adopted. The desulfurization control system consists of DCS monitoring station, PLC control process station, field instrument station and electrical control cabinet. PLC control process station is composed of PLC and touch screen, which facilitates the operation of process personnel, and realizes the signal interaction with DCS monitoring station through field bus. The computer of DCS monitoring station is connected to the enterprise management computer through Ethernet, realizing the automation and efficient operation of the whole system.

This system realizes two operation modes by switching switch, namely manual mode and automatic mode. All field signals, including pumps, valves and PH values, were collected through the PLC extension module and finally recorded in the DCS monitoring room.

System design

System hardware design.

The whole control system selects the H2U series PLC produced by the domestic huichuan company, the model H2U-2416MR,

PLC system includes a power supply module, a CPU units, digital quantity input/output module, analog input and output module, temperature module, respectively, 1 piece of enn, 2 pieces of H2U H2U - 0800-4 AD, 1 piece of H2U - 4 pt, 1 piece of H2U - 4 am.

Software design

Inovance company use special programming software Autoshop V2.07 for controller, write support function block, ladder diagram and instruction list program mode, the programming software developed with mitsubishi PLC software can mix. The desulphurization monitoring PLC control program includes two parts: main program and interrupt program. The main program to complete parameter initialization, throttle, cleaning pump, such as control, the interrupt service routine PID control, complete the SO2 concentration containing SO2 data acquisition, data scale transform, manual switch and PID control algorithm, PID control algorithm is shown in the following program.

```
// collect the values of SO2.LD        M8000
FROM        K0 K7 D50 K1
LD      M8000
DESUB       K200 K0 D20
DESUB       K1000 K0 D22
DEDIV       D20 D22 D24
DEMUL       D24 D50 D48
INT     D48 D62
//PID control d62 value d62 measurement d300 parameter setting (25), output value d64, M39 B pump operation, A pump fixed speed operation to remove PID control.LD      M8000
ANI     M39
PID     D226 D62 D200 D64
//11/5000
Physical quantity transform 4DA module.
LD      M8000
ANI     M39
DESUB       K1000 K0 D30
DESUB       K32767 K0 D32
DEDIV       D30 D32 D34
DEMUL       D34 D64 D38
INT     D38 D66
//The 4#-4DA module sets the channel 1 to the A circulating pump.
LD      M8000
ANI     M39
TOP     K4 K0 H1111 K1
TO      K4 K1 D66 K1
LD      M8000
AND     M39
PID     D226 D62 D300 D68
LD      M8000
AND     M39
DESUB       K1000 K0 D40
DESUB       K32767 K0 D42
DEDIV       D40 D42 D44
DEMUL       D44 D68 D28
INT     D28 D70
LD      M8000
AND     M39
TOP     K4 K0 H1111 K1
TO      K4 K2 D70 K1
```

Monitoring configuration

The MCGS software consists of five parts: main control window, device window, user window, real-time database and operation strategy. The configuration of the upper computer monitor software includes the window configuration, I/O connection, database creation, animation configuration and script writing. The window configuration completes the window properties, the layout of the screen and the call. I/O connection completes monitoring software and PLC serial communication connection to realize data interaction. Real-time database completion variable definition, is the data exchange center of each part. The functions of other parts are not detailed.

Some running policy procedures: W_1=1/(SM_1^2)
Merge W_2 = 1 / (merge SM_2 ^ 2)
Merge W_3 = 1 / (merge SM_3 ^ 2)
Merge W_4 = 1 / (merge SM_4 ^ 2)
Merge W_5 = 1 / (merge SM_5 ^ 2)
Merge W_6 = 1 / (merge SM_6 ^ 2)
With the mean M = (merger W_1 * M_1 + W_2 * M_2 + merger W_3 * M_3 + W_4 * M_4 + merger W_5 * M_5 + W_6 * M_6)/(merger W_1 + W_2 + the combining W_3 + + W_5 + the combining W_6 W_4)
Horizontal SM =! SQR (1/(merge W_1+ W_2+ merge W_3+ merge W_4+ merge W_5+ merge W_6))
So k is equal to 6 'and the 3 dose is always equal to 6.
F = m * (m - 1) * (k - 1) ', 162
If m = 2 then '2 * 1 * 5
T = 2.2281
endif
If m = 3 then '3 * 2 * 5
T = 2.0423
endif
If m > = 4 then '4 * 3 * 5
T = 2.0423
endif
FL upper limit of combined M mean = combined M mean + merged t* combined with horizontal SM.
FL lower limit of combined M means = combined M mean - merged t* combined with horizontal SM.
The mean merger PT = 10 ^ M
Merger PT FL limit = 10 ^ M average FL limit
Merger PT FL lower limit = 10 ^ M average FL limit
The FL trusted limit for the combination of PT =(the FL upper limit of the combined PT - combined PT)/ merged PT*100.
Combine PT with FL trusted limit b=! STR (combined PT's FL confidence limit)+"%"
Its party = (merge W_1 * M_1 ^ 2 + W_2 * M_2 ^ 2 + the combining W_3 * M_3 ^ 2 + merger W_4 * M_4 ^ 2 + merger W_5 * M_5 ^ 2 + merger W_6 * M_6 ^ 2) - (merger W_1 * M_1 + W_2 * M_2 + merger W_3 * M_3 + W_4 * M_4 + merger W_5 * M_5 + W_6 * M_6) ^ 2 / (merger W_1 + W_2 + the combining W_3 + + W_5 + the combining W_6 W_4)

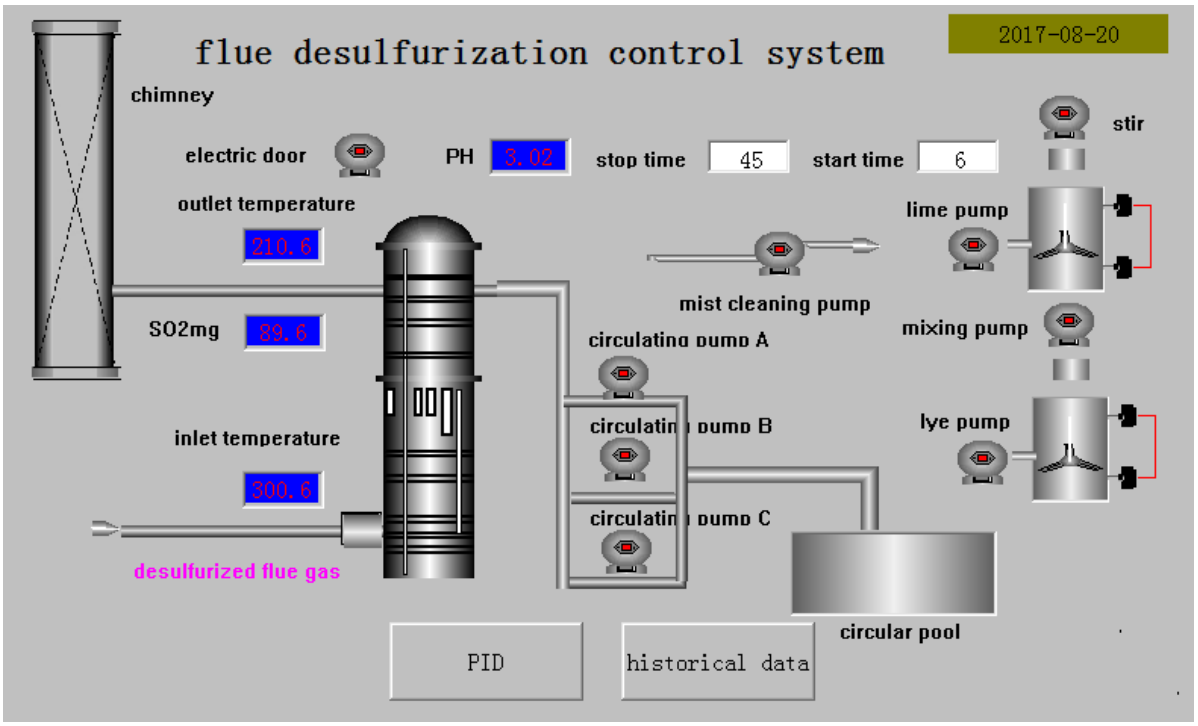

Fig.1 monitoring interface

Operation effect

(1) process flow screen shows the process flow of desulfurization equipment, and provides a vivid image process interface for the process personnel to monitor the operation status and control of production equipment.

(2) real-time curve and historical curve of process data, the past and present of the process data can be viewed through the curve, which really brings great convenience to the management of production process.

(3) powerful alarm function is set up, and real-time processing is powerful, covering all input and output points of desulfurization equipment. Since put into production, the technology personnel reflect this equipment recorded more than 2000 300 analog digital alarm and alarm, greatly shortens the time of technological personnel troubleshooting conveniently in a short period of time to resume production.

Conclusion

Through the half a year's operation, proved that the newly developed equipment operation is stable, low failure rate, in the event of failure, troubleshooting time is short, shorten the recovery time of equipment, improved the operation efficiency of enterprises.

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