Improve the performance of bag filter on preheating and calculate the amount of Fine and heat transferred
(case study: almahdi-hormozal aluminium smelter)

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Abstract:
The project has been tried that bag filter "J" performance improve on pre-heated in unit green anodes and Redirection can prevent the frequent stoppages. The difficulties is intensifying in Bandar Abbas climatic conditions (high humidity).For better efficiency production of the Anodes Green, anode unit should be production continuous otherwise , Batch production will be prevented from standard anode production. non-discharge of bag filter j is One of the constraints in the production . This bag filter suck Fine and fumes caused by the pre-heating equipment But because of high pah and high humidity environment, the output is stuck and stopping production. [1].

Keywords: Bag filter ,pre-heating ,pitch vapour treatment ,green anode production

Introduction

Coke and coal particular matter is generated during material handling and screening operation. These hydrocarbons are evolved in paste mixing operation. These hydrocarbons are controlled by wet scrubber. In new plants pulverized coke is added (similar to dry scrubber) in exhaust gas and the gas in passed through the bag filter. The mixture of hydrocarbons and coke is separated in, the bag filter and clean gas is vented.

A bag filter is composed mainly of two casings :
- The clean air casing connected to the clean air outlet and to the fan located upstream the filter, which keeps a negative pressure in this casing and in the inner part of the sleeves connected to this casing . A metallic basket prevents the sleeve from collapsing.
- The dusty air casing containing the filtering sleeves which collect on their surface the dust carried by the air stream while clean air passes through. [2].

To remove the dust collected on the sleeves, compressed air contained in an air tank is periodically released in the inner part of the sleeves thanks to a solenoid valve energised when the pressure drop is too high.

The dust falls into a hopper, is collected by a screw conveyor then a rotary valve which prevents the filter from any outside air entrance.

To check the filtering sleeves, maintenance door traps are provided.(fig1)
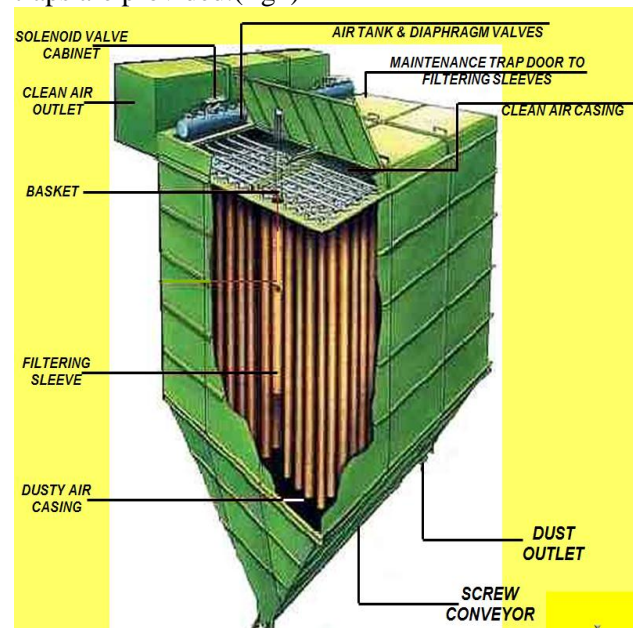

Figure 1-bag filter

Pitch fumes and fumes bearing coke from various emitting locations are drawn by the fan through the bag filter.

The air passes through the filter sleeves and is released to atmosphere whereas coke fines are collected on the bags area.

During filter operation, the thickness of the coke layer increases and accordingly, the pressure drop

between the inlet and the outlet of the filter increases and the efficiency of the filtration decreases (fig2). [3].
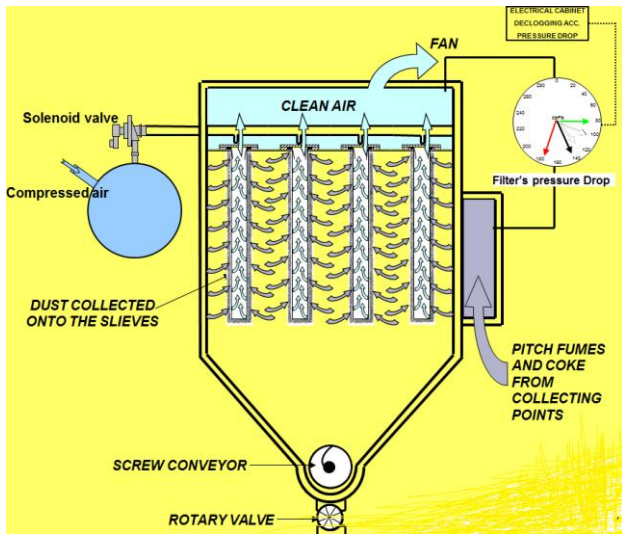

Fig2-filteration storage

Experimental Procedure

two completely separate bag filter are with different characteristics that have the following characteristics :

Bag filter "J" that called it "J1240" has suction ability fine of raw materials in pre-heating according to Table 1 and Figure1.

Bag filter "M" that called it "M1060" has suction ability pitch vapour on mixer according to Table 2 and Figure1.
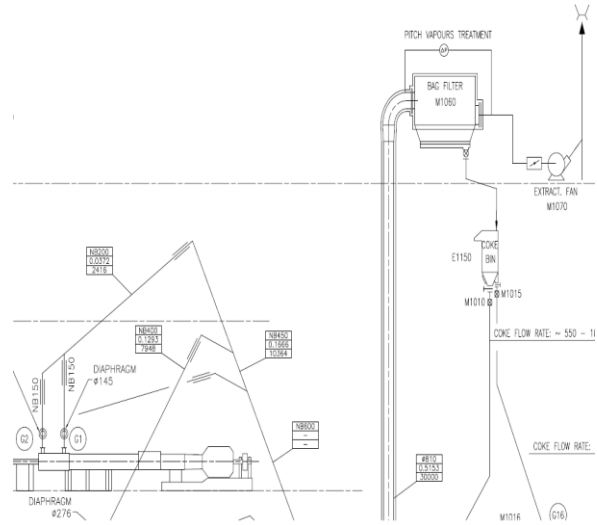

figure2(operation bag filter "M")

Table 1 -(properties of bag filter "J")
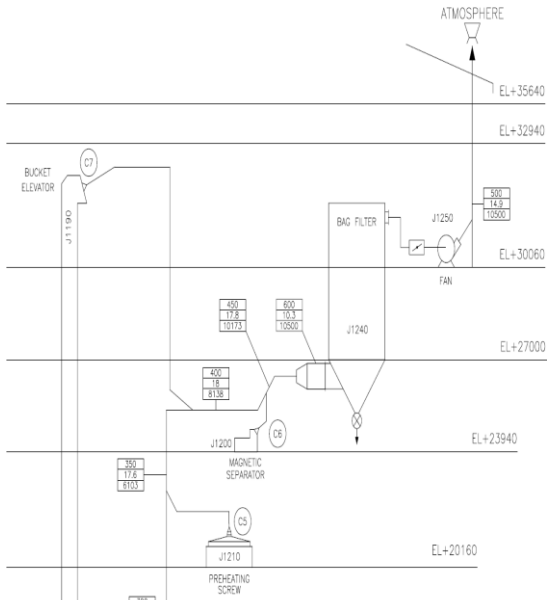

Figure 1(operation bag filter 'j')

1. Process data

- Flow rate at temperature (m³/h)   :   30 000

- Temperature (°C)   :   50 to 70 (maxi : 80)

- Moisture content (%)   :   ≤ 0.5

- Nature of dust   :   pitch vapour + petroleum coke

- Pitch fumes concentration average (mg/m³) :   300

- Coke dust concentration (g/m³)   :   30 / 60

- Rejects to atmosphere (mg/Nm³)
  - dust   :   ....
  - condensed tars   :   ....

- Exhaust fan static head (mmWG)   :   620

Table 2 (properties of bag filter "M")

ITEM	DIAMETER mm	DEDUSTING ZONE		SECTION m²	SPEED m/s	FLOW RATE m³/h
C1	200	Foot of elevator	J1190	0.0314	18	2035
C2	120	Screw conveyor	J1160	0.0113	18	732
C3	120	Screw conveyor	J1170	0.0113	18	732
C4	160	Weigh belt feeder	J1140	0.0201	18	1302
C5	160	Preheating screw	J1210	0.0201	18	1302
C6	200	Magnetic separator	J1200	0.0314	18	2035
C7	200	Head of elevator	J1190	0.0314	18	2035
	600	General collector		0.2827	10.3	10500
		Reserve				327
		Filter	J1240			10500
	500	Stack		0.1963	14.9	10500

Table 3- (properties of suction lines of bag filter "J")

Due to high humidity there is which most times the suction path of pre-heated equipment is shown in Figure 1. In most cases, humidity of coke with air arrive bag filter j is causing to stop the incessant and should be used to avoid clogging and stop production, according to direction calculations the direction be moved.

As was said, according to calculations made without change being efficiency bag filter "M" , performance of bag filter "J" in the discharge of fine collected is much improved and the redirection of the on equipment preheated direction connected to suction direction of bag filter "M" that with according to the calculation , this operation will be very simple and easy. [4].

Results and Discussions

According to Tables 1 , 2 , 3 and 4 and the following calculations, the amount of fine transferred is achieved.

1. Process data

- Flow rate at temperature (m³/h)   :   35 000

- Temperature (°C)   :   50 to 70

- Moisture content (%)   :   ≤ 0.5

- Nature of air   :   condensed tar and dust

- Condensed tar concentration (mg/m³)   :   5 maxi

- Total dust concentration (mg/m³)   :   20

- Static head (mmWG)   :   620

Table 4- (properties of fan of bag filter "M")

Stream N°	Inside Diameter mm	Equipment		section m²	Speed m/s			Working flow rate Am³/h			Temp. °C
					1	2	3	1	2	3	
G1	154.08	Mixer	J1220	0.0186	18	18	18	1208	1208	1208	57°
G2	154.08	Mixer	J1220	0.0186	18	18	18	1208	1208	1208	57°
G4	311.20	Hot air generator	M1040	0.0761	16.4	16.4	16.4	4500	4500	4500	165°
G5	–	Paste cooler	J1230	–	–	–	–	3448	3448	3448	90°
G6	311.20	Vibrating feeder	K1020	0.0761	18	18	18	4929	4929	4929	37°
G7	311.20	Reject on belt conveyor	K1140	0.0761	6.1	6.1	18	1679	1679	4929	28°
G8	260.30	Vibrating area dedusting	K1030	0.0532	6.7	15.1	6.7	1276	2901	1276	28
G9	260.30	Vibrating area dedusting	K1030	0.0532	6.7	15.1	6.7	1276	2901	1276	28°
G10	339.76	Vibrating area dedusting	K1030	0.0907	17.8	7.8	7.8	5802	2552	2552	28°
G12	128.2	Pitch melters	F0120	0.0129	22.6	22.6	22.6	1050	1050	1050	30°
G13	128.2	Pitch melters	F0110	0.0129	22.6	22.6	22.6	1050	1050	1050	30°
G14	128.2	Pitch tanks	G0080	0.0129	21.7	21.7	21.7	1007	1007	1007	20°
G15	128.2	Pitch tanks	G0050	0.0129	21.7	21.7	21.7	1007	1007	1007	20°
G16	65.78	Coke	M1016	0.00340	21.9	21.9	21.9	268	268	268	20°
		TOTAL FLOW RATE						29708	29708	29708	
		RESERVE / MARGIN						292	292	292	
	800	General collector		0.5027		16.6			30000		–
		Filter	M1060	–		0.02			30000		–

Table 5 (properties of suction lines of bag filter "M")
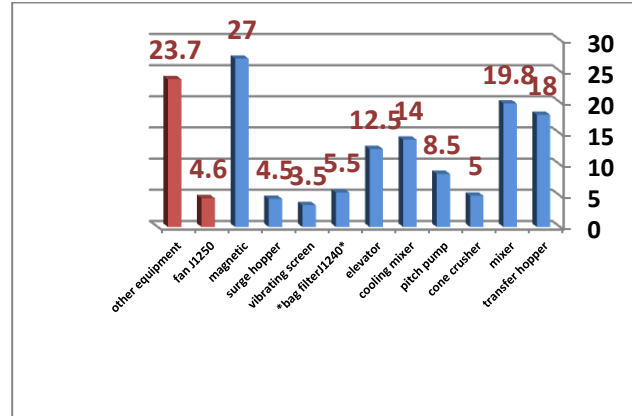

Figure (3) cessation statistics graph of production in the 2012 related to hour
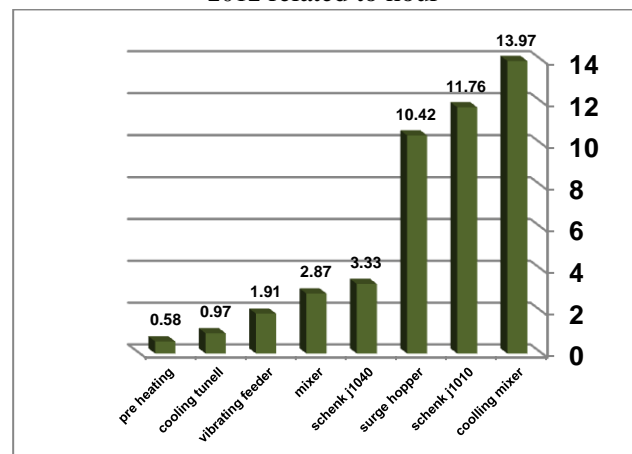
Figure (4) cessation statistics graph of production in the 2015 related to hour.

In Table 3, item C5, the suction of the pre-heated to indicate the amount of which is equal to 1302 m³/h . In Table 4, the characteristics of bag filter suction fan M1060 is determined the name M1070 that is shown. As shown in Table 5 total suction of vapor and fine equivalent to 30,000 m³/h . If the amount of suction of on pre-heated add to total amount of vapor and fine suction of filter bag" M", the following results will be achieved:

$$Flow = 30000 + 1302 = 31302 \; \frac{m^3}{h}$$

This amount could not be impaired in amount suction fan because of suction fan M1070 is created 35000 m³/h and efficiency of bag filter fan will not be diminished. [5].

Conclusion

The following, cessation statistics graph of production in the years 2012 , 2015. As is specified from the graph in 2012, cessation due to parameter exists related to bag filter j1240 . then in the year 2015 that created is this redirect , completely problem in this case was resolved.

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