Proceedings STAI, Factory Engineering
Vol. 82 (2024) : 236-238 doi: 10.69794/82SAC/978-81-969264-0-3/236-238

Revenue Generating Process Integration for Spent Wash Fired Boilers in Molasses Based Distillery Plants

Rajesh Verma[1]*, Prakhar[2] and Mohan Dongare[3]
[1]CEO – Enviropol Engineers Pvt. Ltd., A-50, Sector-65, Noida, India,
[2]Manager – Enviropol Engineers Pvt. Ltd., A-50, Sector-65, Noida, India.
[3]Consultant – Enviropol Engineers Pvt. Ltd., 707- The Work Club, PCMC, Pune

Received : June 11, 2024; Accepted : June 25, 2024

ABSTRACT

During the last one decade, over 100 spent wash fired boilers have come up in the industry. While the initial hiccups related to boiler are mostly resolved, the concerns on flue gas cleaning remains. The prevailing technologies such as ESP and BF, used for emission control in most installation, still have operational concerns due to typical (sticky and hygroscopic) nature of dust with high percentage of fines. EGB, an incumbent polishing filter recently introduced in the industry by the author, to deliver consistency on emission control is gradually finding traction. The fly ash of this boiler contains high quantity of potassium salts which is soluble in water. It also has near 1000 PPM of oxides of sulphur (Sox) which also need to be absorbed to meet the current emission norms. Considering above properties, authors tried to introduce WESP as an ultimate solution on this application in the industry few years back but failed to get any takers owing to regeneration of some liquid effluent in the process, which contradicts with the sole objective (i.e. ZLD) of putting up SLOP fired boiler. However, with building momentum on recovery of Muriate of potash (MOP) from this ash.

Keywords: WESP-wet electrostatic precipitator, AR-absorption reactor, FDB-flash dryer for bagasse, PRS-potash recovery system, PDC-pre-dust collector, DeSOX-desulhurization, ZLD-zero liquid discharge, MOP-muiriate of potash, eRGPI-enviropol revenue generating process integration, HVBF-horizontal vacum belt filter, MEE-multi effect evaporators, EEPL-Enviropol Engineers Pvt. Ltd.

INTRODUCTION

The authors have conceptualised an innovative process as depicted below (Figure 1), not only to resolve the long pending concerns on flue gas cleaning but also to generate handsome revenue from three different streams of the process.

Process description

The dusty flue gas from the boiler @ 160-220 ^{0}C is first passed through a specially designed PDC to reduce substantial dust load. The partially cleaned flue gas is then entered to a flash dryer for drying of supporting fuel (bagasse) using waste heat from the flue gas. The dried bagasse is fed back to the boiler. low temp flue gas from the dryer is sent for absorption of Sox using hydrated lime in the integrated polishing Tower, consisting of absorption reactor (AR) and wet electrostatic precipitator (WESP).

The ultra clean gas (SPM: <30 mg/Nm^3 & Sox:<100 PPM) is let out from the stack with minimal opacity.

The fly ash collected from PDC is mixed with the slurry generated from polishing tower. This mix is prepared to dissolve all the potash content from the fly ash in aqueous solution.

This solution is the then passed through an innovative and tested potash recovery system (PRS) to separate “muriate of potash” (MOP) using HVBF, MEE, crystallizer and centrifuge.

*Corresponding Author email: ceo@enviropolengineers.in

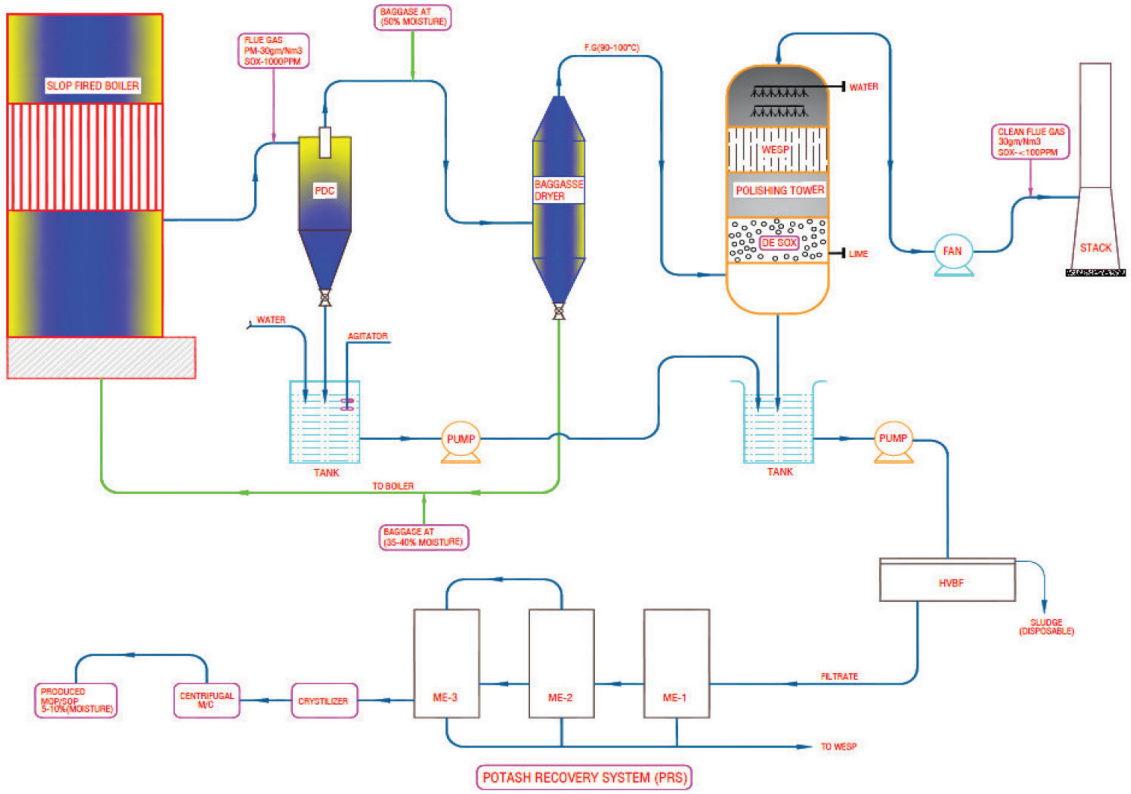

Figure 1 : Innovative revenue generating process

The left out solid cake (ash and gypsum) from HVBF can also be used to make cement blocks as third stream for revenue generation besides MOP and bagasse saving.

Economics of the proposed process integration

Authors have worked out a sample economics as displayed below (Table 1) for a standard 40 TPH spent wash fired boiler considering two major source of revenue generation (Bagasse saving and potash recovery). The revenue generated from third stream (solid cake) is not considered for the time being while working out the economics.

CONCLUSION

The proposed e-RGPI™ *(enviropol-revenue generating process integration)* for SLOP fired boilers is a way forward to generate appreciable revenue while

Table 1 : Sample economics for 40TPH spent wash fired boiler

Sample economics of "revenue generating process integration" for 40 tph slop fired boilers				
Sl No	**Particulars**	**unit**	**Qty**	**Remarks, if any**
1	Quantity of flue gas	Nm^3/sec	25.0	
2	Flue gas temp	Deg C	180.0	
3	Inlet dust Concentration	mg/Nm^3	20000.0	Avg. basis
4	Outlet dust concentration	mg/Nm^3	**30.0**	Below CPCB norms
5	Dust (Fly ash) collected in the process	mg/Nm^3	19970.0	
6	Inlet Sox content	mg/Nm^3	2000.0	Taken on Avg. basis
7	Outlet Sox content	mg/Nm^3	**200.0**	Under CPCB norms

8	Soxabsorbed in the process	kg/hr	156.0	
9	Hydrated lime used for absorption	kg/hr	212.0	95 % purity
10	Gypsum produced in the process	Tons/day	10.5	
11	Mill Bagasse consumed in boiler	kg/hr	6000.0	@ 50 % moisture
12	Net Bagasse saved on a/c of Flash dryer	kg/hr	750.0	@ 30 % moisture
13	Total Fly ash recovered from the process	Tons/day	38.8	Net of losses @10 %
14	Quantity of MOP produced	Tons/day	**11.6**	@ 30 % of fly ash
15	Quantity of available solid cake	Tons/day	**37.7**	
16	Cost of Production for MOP	INR Lacs/day	0.9	@ INR 7500/Ton
17	Revenue generated from sale of MOP	INR Lacs/day	2.9	@ INR 25000/Ton
18	Net saving on sale of MOP	INR Lacs/day	2.0	
19	Net saving on sale of saved bagasse	INR Lacs/day	0.5	
20	Total Savings from Integrated Process	INR Lacs/day	2.5	
21	Total savings for 300 working days in a year	INR Lacs/PA	746.4	
22	Estimated Capex on complete Process	INR Lacs	1500.0	
	IRR	Years	**2.0**	
	Other benefits			
a.	*Clean stack - PM & Sox well under CPCB norms*			
b.	*Complete Freedom from heavy maintenance cost on ESP/BF*			
c.	*The left out Solid cake (Fly ash + Gypsum) can be used for making cement blocks*			
d.	*Improved boiler operation due to supporting fuel being at lower moisture(30-35 %)*			

meeting most stringent emissions norms with minimal maintenance cost as compered to prevailing technologies.

The integrated technologies such as PDC, FDB, DeSOX and WESP are well proven and are in use across Industry. The PRS used in the down stream of WESP is recently doveloped and tested under the collaboration with our consultant to recover MOP from the waste flue gases from spent wash fired boilers.

ACKNOWLEDGEMENT

Team ENVIROPOL are grateful to consultant and overseas collaborators who participated quite actively in formulating and vetting the process integration conceived by the authors

REFERENCES

Mohan K Dongare (2022). Recovery of potash from spent wash incineration boilers. STAI proceeding, 2022, NCL-Pune

Rajesh Verma (2011), WESP-Wet electrostatic precipitator – STAI Proceeding Annual Convention, 2011.

Rajesh Verma (2012). Flash drying for bagasse using waste heat from boiler flue gas presented. SASTA Proceeding, 2012.

Rajesh Verma (2019). A case study on hybrid model of bagasse dryer. STI Proceeding Annual Convention, 2019.