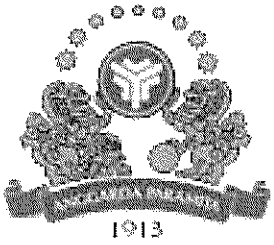
Schneider Electric

Energy Audit Final Report
September - 2014



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Description	Unit	Value
Feed water enthalpy	kJ/kg	385.45
	kCal/kg	92.06
Proposed water level	%	50 to 60
Feed water temperature after tank level reduction	°C	102.0
Feed water enthalpy	kJ/kg	427.61
	kCal/kg	102.13
Feed water flow	TPH	7.90
Heat loss reduction	kCal/hr	79,582
Annual Operating hour of feed water pump	hrs	6,600
Annual heat loss reduction	kCal	525,239,943
GCV of LNG as per gas bill	m^3/MMBTU	29
	kCal/m^3	8,689
Estimated annual LNG saving	m^3	60,445
Estimated annual energy saving	MMBTU	2,084
LNG cost	IDR/m^3	750
Energy cost	USD/MMBTU	6.43
Expected annual monetary (LNG) saving	Million IDR	45
Expected annual monetary (Energy) saving	USD	13,402
Expected total annual monetary (Energy + LNG) saving	Million IDR	201
	USD	17,310
Estimated Investment	USD	10,000
Payback	Months	7

5.3.3 *Reduce oxygen (O_2) level in flue gas of hot air generator at PP – 2*

Background

In PP – 2 one hot air generators is installed for diet process. Hot air is used to drying the tobacco from diet vessel to cyclone.

Findings

During energy audit study the flue gas of hot air generator is analyzed and it is found that Oxygen in flue gas is around 13.9% and it's indicates that % of excess air is supplied for combustion is high which is increased the natural gas consumption in hot air generator.

Recommendation

Install oxygen sensor in flue gas path and the oxygen will be controlled through on line oxygen sensor with combustion blower air flow to burner , which is reduces the heat loss as well as natural gas consumption in hot air generator.

Benefits:

The cost benefit analysis is given below:

Table 14. ***Cost benefit analysis of reduce the excess air level in hot air generator.***

Description	Unit	Value
Overall O_2 Level at hot air generator outlet	%	13.9
Average excess air	%	195.8
Temperature of flue gas	°C	395
Temperature of combustion air	°C	32
Average Hourly Fuel Consumption	M^3/Hr	13.1
Theoretical Air Required M^3/M^3 of natural gas	M^3	9.50
Actual Air Supplied NM^3/NM^3 of natural gas	M^3	28.1
Excess air requirement for optimum combustion	%	12
Optimum air requirement	M^3/M^3 of NG	10.6
Reduction in supplied air	M^3/M^3 of NG	17.5
Specific heat capacity of air	Kcal/M^3 °C	0.277
Reduction in heat loss due to reduction in excess air	Kcal/M^3 of NG	1,755
GCV of natural gas	M^3/MMBTU	29.00
	Kcal/M^3	8,689
Saving potential	%	20.2
Estimated annual natural gas consumption	M^3	106,896
Expected annual natural gas saving	M^3	21,595
Expected annual energy saving	MMBTU	745
LNG cost	Rp/M^3	750
Energy cost	USD/MMBTU	6.43
Expected annual monetary (LNG) saving	Million Rp	16.20
Expected annual monetary (Energy) saving	USD	4,788
Expected total annual monetary (Energy + LNG) saving	Million Rp	71.7
	USD	6,184
Expected Investment	USD	15,000
Payback	Months	29

Description	Unit	Clove process Dust collector (Dust-42)
Present head loss	mmWC	-250
Power consumption	kW	15.8
Proposed system		
Present head loss		-250
Power consumption	kW	4.20
Reduction in fan power consumption	kW	11.60
Annual operating hours per year	hr/yr	5,280
Energy cost	IDR/kWh	1,057
Annual energy savings	kWh	61,270
Annual monetary savings	million IDR/year	64
	USD/year	5,631
Estimated investment	USD	10,000
Payback period	Months	21

5.5.4 Optimize the suction damper loss in main blower of diet plant

Background

In PP-2 diet plant main blower is cater the process gas and it's utilizing for tobacco drying. During the energy audit survey it was found that suction damper is controlled the flow by closing the damper and damper opening position is 28% .

Findings

Damper control is energy inefficiency process and waste energy main blower.

Recommendation

Provide VSD in main blower and open the damper maximum to maintained the require flow without head loss so that main blower power consumption will be reduced.

Benefits:

The cost benefit analysis is given below:

Table 21. *Cost benefit analysis to optimize suction damper control*

Description	Unit	Diet Blower (PF55)
Present system		
Suction pressure before damper	mmWC	-146
Suction pressure after fan	mmWC	-300
Present head loss	mmWC	-154
Actual Power consumption	kW	32.4