

ADOPTION OF ENERGY SAVING EQUIPMENTS AT RAMZAN SUGAR MILLS

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ABSTRACT

In sugar industry energy conservation means to increase the earning of the organization, decrease in energy consumption for processing reduces the cost of production and give saving of fuel. Keeping in view these aspects and future vision of our honorable Managing Director, the management of Ramzan Sugar Mills is continuously working on energy saving program since last 5 years. Some bold steps have been taken in this respect; modern technologies and efficient energy saving equipments are adopted such as:

Falling Film Evaporators
Evaporator Arrangement
Vapor Line Heaters
Direct Contact Heaters
Flash Heat Recovery
Molasses Conditioning With Low Temperature Vapor
Use of Hot Condensate for Sugar Drying
Auto Condensing and Spray system

Installation of VFDs

The whole team of RSML is committed to optimal use of energy to ensure cost effective operations and conservation of energy resources. By grace of ALLAH it is the hour of satisfaction that we have achieved a goal of remarkable decrease in steam consumption and bagasse saving. This is the reason why RSML is travelling efficiently and successfully towards power co-generation with available resources in the existing setup of project.

Introduction

Any attempt at Energy Conservation in a steam generation system is constituted of two basic aspects,

a- Installation of suitable energy efficient equipment in the factory.

b-Energy efficient operation of the factory.

The presentation deals essentially with the first.

1. Falling film Evaporator

In this popular type of evaporator, juice travels from top to the bottom and as it descends, it takes the entrained vapour along with it to a lower chamber, where the vapour and liquid are separated. The falling film evaporators have many advantages over the conventional evaporators: Effective juice distribution and short contact time

between juice and steam. The falling film evaporator offers an excellent heat transfer.

The design of the evaporators is such that, the juice is in contact with the heating surface in a thin layer over the length of the heating surface.

In Ramzan Sugar Mills Limited, Chiniot, we got the opportunity to install a pair of falling film evaporators (3000 M2 + 3000 M2) and by the grace of ALMIGHTY ALLAH,

after successful operation of 1st set of FFEs, it was decided to install more FFEs for further steam economy and enhancement in crushing, so in 2011 one more pair of FFEs (3000M2) each was installed and operated with considerable steam economy and remarkable fuel saving in season 2012-13 and 2013-14. All these results and success encourages the management of RSML to work more in this respect. Now another FFE of 6000M2 is being installed to decrease steam consumption up to 42% on cane and to enhance crushing capacity up to 12000 TCD.

2- VAPOR LINE HEATER

The vapors exerted by the last effect of evaporators set generally goes to condenser. These vapors contain a smart amount of heat energy which is wasted in spray pond and creates extra load on spray system. We decide to use this energy for 1st stage primary heating. For this purpose in RSML tubular heaters are installed in vapor line of last effects.

These heaters give a remarkable rise in temperature of raw juice, which gives considerable economy of vapors and load on condensers is also reduced which leads towards less consumption of injection water too.

The Advantages

It works as an effective entrainment catcher.

Consumes last effect evaporator effectively. Additional amount of condensate is obtained which can be used to fulfill boiling house needs.

Steam economy due to usage of vapors going to condenser and less consumption of injection water.

3- Direct Contact Heaters

This invention is more efficient in respect of transmission of heat because of direct contact of heating media with juice. No heat loss occurs in shape of condensate because total heat content of vapors is transmitted to juice.

In R.S.M.L three D.C heaters were installed in year 2010. Direct Contact (DC) Heaters have high heat transfer coefficient due to absence of resistances like liquid film resistance, condensing vapor resistance, resistance of scale and tube material.

Main benefits of DC heaters:

Eliminate juice heater cleaning
Economical system as no standby vessel is required for cleaning

Low maintenance

Easy to operate and control
High heat transfer efficiency

Can be operated at low pressure vapor

Heating of juice in counter current manner that removes dissolved gases very efficiently and enhances clarification efficiencies

FLASH CIGAR:

In 2010 at the start of energy saving program at RSML when it was decided to install a set of 1st two FFEs, it was also considered to install centralized control management system of condensate.

Condensate from all evaporators of quintuple effect except steam condensate enters in different chambers accordingly, flash is taken out from each chamber and condensate travels towards next chamber and at the end, from last chamber after taking out maximum flash it is pumped towards over head service tank.

Flash Cigar improves water management of the plant by reducing the final condensate temperature to level required for process use.

The basic principle is to recover the flash from the condensate coming out from the heaters, evaporators and pans.

It gives steam economy about = 1.76 %on cane

Advantages

Eliminates the installation of no. of condensate tanks along with its Pumping System. This

in turn saves electrical energy and also reduces cost of maintenance

Elimination of sealing tanks and piping removes congestion at the Process House

Trouble free operation and easy to maintain

No air leakage in the vacuum system

Improves the water management of the plant

Stainless steel siphons are provided to transfer the condensate to lower pressure chambers making its operation trouble free and fool proof.

5- Plate Heat Exchanger

It is a simple plate heat exchanger in which from one end condensate of 1st effect FFE (steam condensate) enters having temperature about 120 °C, from the other end a part of condensate of about 84°C from last chamber of cigar enters as counter current flow, here heat transfer takes place and steam condensate of about 110 °C pumped for boilers storage tanks, and from the other end temperature of circulated condensate of last chamber rises up to 112 °C enters again in first chamber of cigar tank for flash recovery.

6- Molasses Conditioners

Previously for molasses conditioning at RSML traditional method of dilution, stirring and heating with

washing steam was implemented, but in 2010-2011 imported molasses conditioner were installed and operated successfully. This type of conditioners gives some benefits leading towards energy savings, and works without additional water for dilution. Direct contact molasses conditioners ensure perfect dissolution of crystals by using heat content of low pressure vapor for savings in steam.

Advantages

Direct heating of molasses under vacuum helps perfect dissolution of crystals
Avoids addition of water but also improves the quality of conditioned molasses which is very good for the process
High heat transfer efficiency.
Efficient operation on low pressure vapors. No stirrer required thus no troubles associated with using mechanical stirring.

7- Hot Water Radiators

We all are well aware that extra moisture content in finished product creates huge problems and leaves bad effect over packed sugar. So drying of sugar is an important matter of sugar manufacturing. Traditionally steam radiators are used in sugar industry to get hot air for sugar drying. At R.S.M.L, in energy saving struggles these steam radiators also

replaced with hot water radiators. For this purpose hot water of about 80 - 85°C from overhead service tank is used. The temperature of hot air gained is 60 to 65 °C, while the dried sugar temperature is 38 – 42 °C.

8- Efficient Condensing & Spray System

In the year 2009 decision was taken by management to replace the old multi jet condensers and spray system with more efficient automated condensers and spray system. All multi jet condensers were replaced with automated condensers. Old injection pumps of 3200 M3/hr replaced with 2200 M3/hr. Similarly on spray side pumps of 3200 M3/hr were replaced. At spray pond old nozzles were replaced with more effective clusters. Each cluster consists of 5 nos. of nozzles
As a result of modification at spray pond remarkable drop in temperature was achieved.

Previously the temperature difference was 5°C to 6°C. After installation of new clusters it becomes 10°C to 12°C positively. As a result of all these changes, consumption of injection water reduced to give us huge saving of electrical energy. It is computerized control system. The main aim of which is to reduce the power consumption and number of pumps required for injection

water and spray pond water by monitoring the vacuum and temperature at various locations. Power consumption at injection and spray with old and new pumps is given below.

Injection Pumps

Without Auto Condensing Running Load 1033 KW
With Auto Condensing Running Load 576 KW
Energy Saving 457 KW 1033 KW - 576 KW =

Spray Pumps

Without Auto Condensing Running Load 549 KW
With Auto Condensing Running Load 202 KW
Energy Saving 347 KW 549 KW - 202 KW =
Total Saving on Auto Condensing System

Without Auto Condensing
With Auto Condensing
Injection Pumps 1033KW 576KW
Spray Pumps 549KW 202KW
Total 1582KW 778KW

Difference 1582KW - 778KW = 804 KW

9- Installation of VFDs

For saving of electrical energy VFDs are installed at Feed tables, Cane carriers, Cane cutters and boilers.

Total Saving on Feed Tables

Without VFD With VFD
Feed Table-1. 20 KW 10 KW
Feed Table-2. 24 KW 12 KW
Feed Table-3. 17 KW 7 KW
Feed Table-4. 30 KW 15 KW
Total 82 KW 47 KW
Difference 82KW - 47KW = 35KW

Total Saving on Cane Carriers

Without VFD With VFD
Cane Carrier-1 43KW 25KW
Cane Carrier-2 80KW 60KW
Cane Carrier-3 60KW 40KW
Total 183KW 125KW
Difference
183KW - 125KW = 58KW

Total Saving on Boilers

Without VFD With VFD
Boiler-2. 366KW 260KW
Boiler-3. 370KW 263KW
Total 736KW 523KW
Difference

736KW - 523KW = 213KW
GRAND TOTAL
BOILERS 213KW
CANE CARRIERS 58KW
FEED TABLES 35KW
G. TOTAL 306KW

CONCLUSIONS:

Although the falling film evaporators are the main source of energy saving endeavor in Ramzan Sugar Mills Limited and since installation of vapor line heaters, they are also giving considerable energy saving, but "Many Small Drops Make a River" Spray system, Flash Cigar, D.C Heaters, P.H.E, Molasses Conditioners, Hot Water Radiators and VFDs etc all these equipments jointly contributed in energy saving and shared a reasonable amount of saved fuel. This saving of fuel is encouraging the management for power co-generation in the light of vision of our honorable Managing Director. So work on 60 MW power plant installations has been started and in future we are planning for complete electrification of the project.