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Energy Conversation Technology for an India

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A B S T R A C T

Energy is a basic requirement for any sector but issues are concerning with pollution and harmful gases generation. To minimise these problems number of experiments are going to be done for better combustion. Ratio of fuel and air must be maintained at proper level for increased efficiency of the plant. In India pollution is a great issue especially in major cities which are really near the power houses and foggy geographical area. In this article, number of various techniques are employed to decrease the pollution level and efforts are done to provide sufficient amount of Oxygen and fuel for proper working of system. Catalytic materials are most favourable in this concept for the filtration of gases and capable to remove unwanted particle from the exhaust gases.

Keywords: Power saving, Gas temperature, Cooling time, Energy loss, Material temperature, Boiler efficiency and its exhaust gases recovery .

1. Introduction

As energy prices continue to rise, farmers must reduce electricity and fuel use on the farm in order to reduce operation costs. Many energy conservation measures are free, low- cost, or have a cost-effective payback. This publication provides an overview of energy conservation across the many operations of the average livestock or field crop farm in Massachusetts. After reading this, the next step is to use a farm energy calculator as a self assessment tool to determine where energy inefficiencies are occurring on your farm and where improvements can be made. Next, conduct an energy audit of your farm. Many utility companies can recommend an auditor or audit information can be found through the Massachusetts Farm Energy Program (MFEP) or the USDA Rural Energy for America Program (REAP). Finally, take advantage of state and federal tax breaks, grants, and inventive programs for reducing energy use on your farm.

Tractors, field work, grain driers, buildings, watering systems, fences, and other farm equipment are all part of the daily operations on a crop and livestock farm today and can incur high costs in energy use. The two main types of energy use on farms are electricity from the local utility company and fuel use such as heating oil or petroleum for running farm equipment. The following pages offer simple ways energy improvements can be made on the farm.

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Nomenclature

SP Saturation point

DBT Dry bulb Temperature

WCT Water critical Temperature (%)

HTW Heating of wall

WT time. Waiting time

Eff BL. Boiler efficiency

Vol Up Voltage increment

BL Temp Temperature of Boiler .

Cool-BL = Boiler cooling rate

1.1 Combined cycle power generation through Pressurized Fluidized Bed Combustion

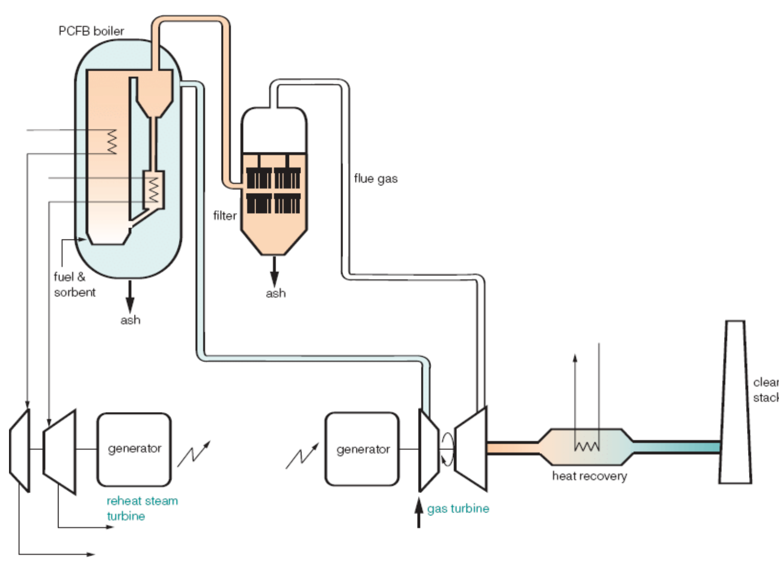

Figure 1 Pressurized Fluidized Bed Combustion (PFBC)

Fluidized Bed Combustor (PFBC) is shown in Fig. PFBC is used to supply hot gases at elevated pressure to a gas turbine via a hot gas clean-up system. Coal and limestone are supplied to the pressurized combustor. The limestone used as the bed material absorbs sulphur. The combustion products leaving the combustor are passed through a clean-up system before steam in the HRSG.

Oxygen produces a gas of lower calorific value. The exhaust gases from the gas turbine raise a pressure vessel, the coal being gasified by oxygen and steam. The use of air instead of clean-up is burnt in the combustion chamber of the gas turbine. Coal and limestone are fed to this system, coal is gasified, either partially or wholly, and the synthetic gas produced after A schematic diagram of integrated gasification combined cycle is shown in Fig. In combustion of gasified coal gives more heat rate than the combustion of solid coal.

The exhaust gases are then passed being expanded in the gas turbine. Cooling tubes immerged in the fluidized bed are used to genera and economizer which heats up the feed water before being discharged. Also the temperature of the gases is measured and tries to control the temperature of gas to reduce the exhaust emission. Different polluted gases are reduced by this method properly.

2. Integrated Gasification Combined Cycle Power Plant

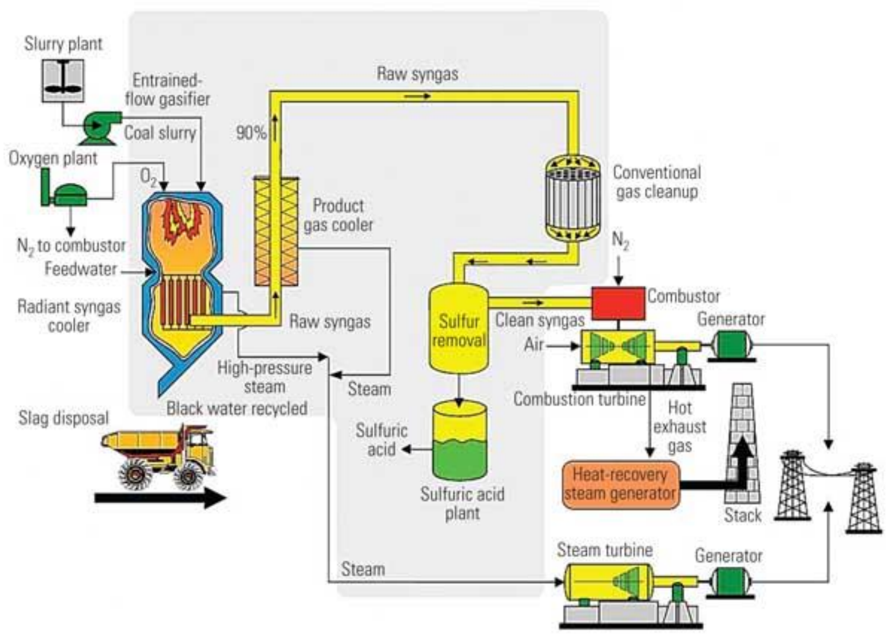

Figure 2. Integrated gasification combined cycle power plant

Integrated gasification combined cycle (ICGCC technology has been developed during 1980s to satisfy the stringent conditions on the emissions from coal fired power plants. Combustion of gasified coal has less pollutant than combustion of solid coal. Secondly, combustion of gasified coal gives more heat rate than the combustion of solid coal.

A schematic diagram of integrated gasification combined cycle is shown in Fig. In this system, coal is gasified, either partially or wholly, and the synthetic gas produced after clean-up is burnt in the combustion chamber of the gas turbine. Coal and limestone are fed to a pressure vessel, the coal being gasified by oxygen and steam. The use of air instead of oxygen produces a gas of lower calorific value. The exhaust gases from the gas turbine raise steam in the HRSG.

3. Energy Conservation Objective

Broadly energy conservation program initiated at micro or macro level will have the following objectives of manufactured goods availability and profitability, and in consequence raise the standard of living both of the workers in industry and of those who buy the products.

Some points are considered to for energy conversation as follows:

1 Reduction in the cost of products.
2. To reduce imports of energy and reduce the drain on foreign exchange.
3. To improve exports of manufactured goods (either lower process or increased availability helping sales) or of energy, or both.
4. To reduce environmental pollution per unit of industrial output - as carbon dioxide, smoke, sulphur dioxide, dust, etc.
5. Thus reducing the costs that pollution incurs either directly as damage, or as needing, special measures to combat it once pollutants are produced.
6. To relief from energy shortage and improve development.
7 To create new job opportunities.
8 To promote non-renewable energy assets.

4. Principles of Energy Conservation

Some general principles of energy conservation are explained below:

(1) Recycling of energy from waste

Discarded, rejected, scrapped, waste material (solid, liquid, gaseous and containing intrinsic energy) contains valuable and useful materials. The same can be separated and reused in economical manner. Recycling is a process of recovering usable material from waste, processing it to required acceptable specifications and reintroduce in the economy for use.

The advantages of recycling are as:

(i) The problem of waste disposal and environmental degradation due to discarded material is minimized economically.

(ii) Saving of energy as the energy spent in recycling is only a fraction of the energy needed in extraction of fresh material from new source. This, recycling saves and recovers a part of energy that has already spent to process the fresh material.

(iii) Conventional resources of new material are saved. For example, recycling of waste papers into new papers saves precious trees which form raw material for paper production.

(2) Waste heat utilization

Various industrial processes require heat of different grades. Waste heat from one process can serve the need of another, which requires heat at a lower grade. For example, the glass industry requires heat to melt glass at about 1500°C. It produces waste heat at about 400°C to 500°C in the form of flue gases from the furnace. Flue gases may be used to raise medium pressure steam and fed to back pressure turbine to generate electric power. The exhaust from back pressure turbine, which is at about 120°C, may further be used for crop Alternate Energy Sources it 292 drying or for paper drying. The condensed water vapour, which is about 60°C, may be used for heating of space, fish farm or greenhouse.

(3) Modernization of technology

The energy consumption can be reduced by adopting energy efficient modern technology. Developed countries have been able to reduce the energy consumption significantly compared to developing countries by adopting energy efficient modern technology. For example, energy used by Indian steel industry per ton is more than double amount used by Italy or Japan. Similarly, energy used by Indian cement industry per ton is also more than double amount used by Italy or USA. Therefore, modern energy efficient technology should be adopted by retrofitting / replacing the existing old inefficient equipments.

(4) Total energy system or Cogeneration

Many industries like paper and pulp, textile, chemical, iron and steel, etc. need both electrical power and low pressure steam for various processes. In these industries, cogeneration is more feasible and economical compared to separate generation of electricity and process heat. In these cases, the power can be generated by using primary fuel like coal in steam turbine power plant and the low pressure steam can be withdrawn at suitable point during expansion in a turbine which can be directly used for process heating.

(5) Training of manpower.

The manpower should be trained to adopt habits in efficient use of energy. 931 (h

1. Using solar energy during solar sunshine hours.
2. Proper operation and maintenance.
3. Judicial use of proper types of energy and fuel

Energy conservation strategy

A three pronged energy conservation strategy is given as:

(1) Short term ECOs

(a) Meeting operational improvements requiring nil/ negligible capital investment.

- Improved fuel storage, handling and preparation practices
- Insulation of steam lines and equipment
- House keeping and scheduling of process equipment
- Minimizing radiation losses through opening
- Improved load factor.

The short term ECOs provides the potential savings about 5 to 10%.

(2) Medium term ECOs

(a) Waste heat recovery devises and modifications and design of equipment, needing moderate capital investment with payback period of around three years.

(b) Installation of waste heat recovery devices.

(c) Reducing wall losses in the furnaces with better insulting materials.

(d) Instrumentation of furnace and process house

(e) Change of grate design and firing system.

- Incorporation of condensate recovery system
- Power factor improvement
- Optimization

The medium term ECOs provides the potential savings about 15 to 20%.

(3) Long term ECOs (Potential savings of 20 to 25%)

- Fuel substitution, modernization of equipment, process as well as utilities and capital intensive heat recovery devices with payback period of 5 to 6 years.
- Replacement of old inefficient boilers / equipments.
- Substitution of fuel oil to coal in boilers and thermal fuel heater or other equipments.
- Modernization of inefficient drives
- Replacement of furnaces with modern efficient ones
- Standardization
- Use of correct size of motors.
- Optimisation.

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5.Conclusion

Energy resources are limited and the existing sources are based on the pure ignition method, so these sources are spreading the pollution continuously. To reduce the amount of pollution the complete combustion is required and some catalytic converters are also required for the purification of the gases. Combine power plants which are working on the two different fluids technology are also effective for better heat transfer with smaller area. So overall size of the plant can be reduced and total cost of the may also be reduced up to the mark level. Especially BWR reactor and other new technologies can reduce the cost of initial installation of the plants and basic amount can be reduced. Low boiling fluid can transfer heat at lower temperature and also carry heat at high rate compare to the other fluids. So total quantity of fluid required may be reduced and the cost of fluid is also reduced. So in this manner overall efficiency of the can be increases and cost of the plant can be reduced.

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