

Blogs › Boiler Efficiency ›

Ten Steps to Improve the Boiler Efficiency

By Forbes Marshall . – July 22, 2015

Improving the boiler efficiency even slightly can cut down the fuel bills significantly. Improvement in boiler efficiency can be achieved if certain steps are followed. This article defines a simple ten step plan which will ensure an improved boiler efficiency.

1. Monitor Feedwater Quality

The quality of boiler feedwater affects the overall boiler performance and hence the boiler efficiency. Poor feedwater quality increases the TDS levels in the boiler drum. Increased TDS calls for more blowdown which results in increased blowdown losses and lower boiler efficiency. If the TDS level is not brought down in the approved limits, it leads to water carryover which results in poor operational efficiency of the steam system.

Monitoring and maintaining the feedwater quality helps efficient operation of the boiler.

2. Boiler Sizing

The first step to ensure high boiler efficiency is selecting a correctly sized boiler. If the boiler is over sized, it will result in frequent on-off. Every time a boiler shuts down and re-starts, boiler efficiency comes down drastically.

3. Blowdown Control and Heat Recovery from Blowdown

In order to maintain the TDS level within specified limits, we need to drain out water from boiler drum with higher salt concentration and replace it with fresh water. Draining out the water from boiler drum results in loss of energy as the water inside will be hot and pressurized. Manual blowdown is rarely accurate and results in either under or over blowdown. Over blowdown brings down the boiler efficiency. Instead of depending on manual blowdown, implementing a blowdown control system will certainly help.

At the same time, heat from blowdown water should be recovered by using a blowdown vessel.

4. Furnace Draft Tuning

Pressure inside the boiler furnace should be tuned properly (-2 to -5 mm of water column for small boilers) to get a good boiler efficiency. If the pressure falls below -5, it will result in increased unburnt losses and will bring down the boiler efficiency. This makes furnace pressure draft tuning an essential adjustment to improve the boiler efficiency.

5. Excess Air

Excess air increases the enthalpy losses and as a result, the boiler efficiency goes down. For proper combustion of fuel inside the furnace, certain amount of air (oxygen) is required. If sufficient quantity of air is not supplied, the carbon present in the fuel is incompletely oxidized to carbon monoxide and less amount of heat is released which brings down the overall efficiency of the fuel. On the other hand, if the excess air is more than required, this air absorbs the energy by absorbing the heat from combustion and this energy is lost

along with the flue gases which again brings down the boiler efficiency. Monitoring stack oxygen levels and controlling them within the required band is essential for high boiler efficiency.

6. Fuel Quality

Quality of fuel is of prime importance as far as boiler efficiency is concerned. Just as an example, if fuel has high moisture content, the enthalpy losses taking place will be much higher and as a result, the boiler efficiency will come down. In case of solid fuel fired boilers, drying the fuel before combustion can avoid enthalpy losses and hence improve the boiler efficiency.

7. Tube Cleaning

Over the period, soot deposition takes place on the fire side of the boiler tubes and scaling on the water side. The layer of soot/scales acts as insulator and brings down the heat transfer rate. As a result, the hot gases pass away without actually transferring the heat to the water. Cleaning boiler tubes periodically removes all the soot and scales and improves the efficiency of the heat transfer and results in improved boiler efficiency.

8. Online Monitoring of Boiler

Boilers do not operate at the rated efficiencies all the time. The operating practices play an important role in determining the real time boiler efficiency. Using an online efficiency monitoring system for boilers can give insights about actual real-time efficiency and can generate suggestions to improve the boiler efficiency based on that.

9. Boiler Automation

Boiler automation results in efficient and safe boiler operation. Many times, manual operation leads to following operating practices that bring down the boiler efficiency. Boiler automation ensures that boiler operates only in the safest and most efficient way and hence significantly improve the boiler efficiency.

9. Heat Recovery from Exhaust

Flue gases coming out from the boiler contain considerable amount of heat energy due to their hot temperature. This energy from the hot flue gases can be recovered and used to heat feedwater. This system improves the boiler efficiency. If the sulphur contents of the fuel are high, there might a risk of dew point corrosion and hence, the heat should be recovered to a certain extent only.

Please let us know any suggestions are questions you have in the comment box below!

Forbes Marshall .