Sootblowers

Learning Outcome
*When you complete this module you will be able to:*
Discuss sootblowers.

Learning Objectives
*Here is what you will be able to do when you complete each objective:*

1. Describe the types, applications and operation of sootblowers.
INTRODUCTION

In modern steam generators, automatic routine soot blowing is essential in order to ensure continuing operation, accuracy of control, and reliability of performance.

The boiler heating surfaces exposed to combustion gases tend to become coated with soot and ash. This is particularly true of coal-fired boilers, and occurs to some extent in oil-fired units as well. The soot and ash act as insulation, which reduces the heat transfer rate through the heating surface and, as a result, lowers both the efficiency and capacity of the boiler. In addition, these deposits tend to obstruct the passage of the combustion gases through the boiler and so increase the draft power required.

TYPES OF SOOTBLOWING SYSTEMS

Fig. 1 illustrates a typical sootblower arrangement for a large coal-fired steam generator with sootblowers in the convection and radiant zones.

Sootblowers are located in the high temperature zones of the steam generating unit, such as the furnace walls, superheater, re heater, and economizer sections, and lower temperature zones such as air heaters.
The two cleaning mediums are steam and compressed air, with both being equally effective in deposit removal.

In the case of air, large compressors must be installed with an integrated piping system around the boiler. The steam systems are usually supplied from the boiler through a pressure reduction station so that after pressure reduction, a dry superheated steam is available at the sootblower nozzle. Steam has the advantage of availability whenever the boiler is in service. When using air, the blowing medium will be unavailable when the compressor is out of service.

**Furnace Wall Sootblowers**

A short, single-nozzle retractable blower, called a wall blower, removes the ash deposited on the walls of furnace chambers. See Fig. 2.

It is a short-stroke lance, which, through special openings, penetrates the furnace wall 25 to 51 mm (1 to 2 inches), depending on furnace design. The jet is slightly angled back toward the furnace wall and uses superheated steam or air to dislodge the slag deposits. The lance rotates through $360^\circ$ and cleans approximately a 1.5 m (5 ft.) radius, the effective radius depending upon the tenacity of the deposit.
The blower shown in Fig. 3 is a retractable furnace wall blower illustrating its operation cycle.

![Retractable Furnace Wall Sootblower](Image)

**Figure 3**

*Retractable Furnace Wall Sootblower*

The wall blower operation can be controlled remotely, and is usually automatic in sequence with other blowers.

**Long Retractable Sootblowers**

These sootblowers are designed to dislodge deposits from the convection and radiant heating surfaces, such as those located in the superheater, reheater, and economizer sections.

![Retractable Sootblower Cleaning Patterns](Image)

**Figure 4**

*Retractable Sootblower Cleaning Patterns*
The convection sections are cleaned with long, fully retractable lances, which penetrate the cavities between major heat absorbing sections. The lance normally has two opposed nozzles at the tip which emit a jet of superheated steam or compressed air perpendicular to the lance, as illustrated in Fig. 4.

While the lance traverses the boiler it rotates, forming a helical blowing pattern which effectively cleans the tubes and spaces between tubes in a superheater, reheater, or economizer bank of tubes.

Figure 5

*Long Retractable Sootblower*

During sootblowing periods, the boiler should be operating at 30% rating or more, to insure stable combustion. Furnace pressure should be below atmospheric to prevent blowback through inspection doors and other openings.

It is important that sootblowers be adjusted so that they do not impinge directly upon tubes. If they do, erosion of these parts will take place. This erosion would be accelerated if the blowing medium contains any moisture; therefore, if air is used it must be dry, or if steam is used it must be dry or preferably superheated.
Fig. 6 illustrates a typical coal-fired unit showing furnace wall and long retractable sootblower locations.

The retractable type of sootblower, when not in service, is withdrawn from the unit. The lance is thereby protected against overheating, since the steam no longer cools it.

**Stationary Sootblowers**

Fig. 7 illustrates the blowing pattern for a multinozzle rotary type of sootblower for hand operation. It is used where there is not enough space for fitting the single-nozzle type and where the flue gas temperature is sufficiently low to allow the nozzles or elements to remain permanently in the gases.
Shot Cleaning

Shot cleaning is a method that is often used for removing soot and ash deposits from economizer, air heater, and superheater tubes. Iron shot or pellets, usually of 6 mm diameter, fall by gravity onto the surfaces of the tubes and ricochet from one tube to another. A hopper at the bottom of the boiler section is used to collect the shot, which is then returned pneumatically to a distributing chamber at the top of the section, for recycling. Most of the ash removed by the shot is carried away in the flue gas stream. Any large particles will fall with the shot into the collecting hopper, and are recycled with the shot until they are broken up into fine particles and carried away by the flue gas.

Fig. 8 shows an arrangement for shot cleaning not currently used.
References and Reference Material

For further information on this topic, the following are recommended:


