SECTION 10 - CLOTHES DRYERS

THE DESIGN OF GAS FIRED CLOTHES DRYERS

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INTRODUCTION

The basic construction of gas dryers consists of the following:

1. A heat source consisting of a gas burner.
2. A means for circulating the air either by a fan or blower, or by the clothes themselves.
3. A chamber or drum to hold the clothes to be dried.
4. A heating chamber to house the heat source.
5. A system of control devices which control the drying cycle.
6. A means of tumbling or otherwise exposing the surface of the articles being dried.
7. A cabinet to house the complete drying mechanism.
8. An ignition system for the gas.

BASIC TYPES OF DRYERS

Dryers are divided into three groups, namely, the high pressure systems, the low pressure systems and the condenser type dryers. Most generally used is the low pressure system.

Figure 1 illustrates the low pressure system in which the fan or blower is located on the exhaust end of the system, which in turn sucks the air through the entire system; that is, the air is sucked through the heat source into the drum where it passes through the clothes. The air passes out of the drum into the lint collector, through the fan, and is exhausted from the dryer.

Figure 2 discloses the high pressure system which consists of the fan or blower on the intake of the dryer. The fan forces the air through the complete dryer system; that is, the air is forced through the heat source into the drum, then through the lint collector and is exhausted from the dryer.

Types of Dryers

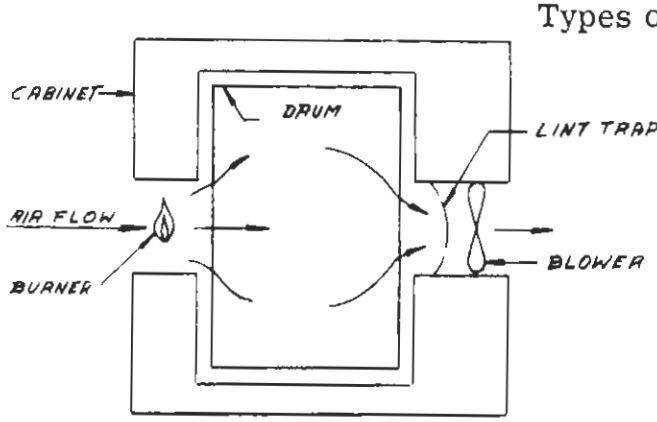


Figure 1 - Low Pressure System

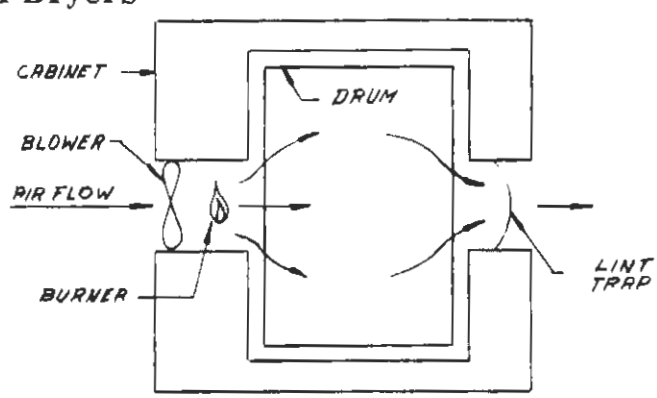


Figure 2 - High Pressure System

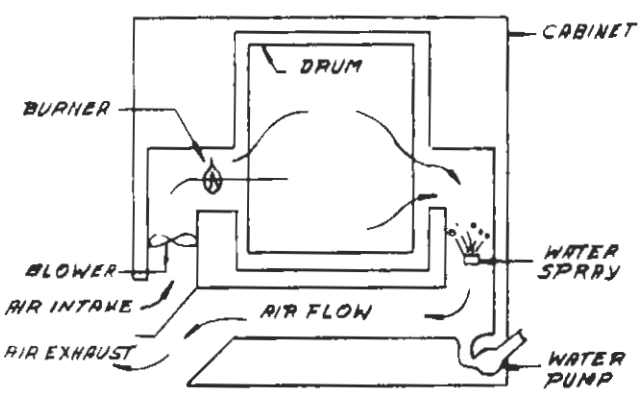


Figure 3

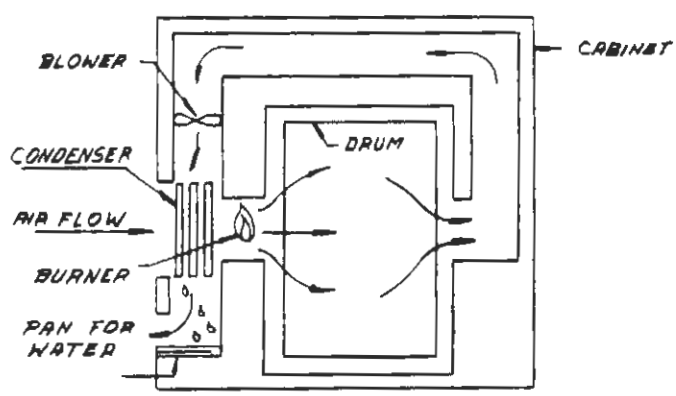


Figure 4

Condenser Type Dryers

ADVANTAGES AND DISADVANTAGES OF THE TWO SYSTEMS:

Low Pressure System

Advantages

1. Less loss of air pressure at discharge of dryer.
2. Simpler construction of dryer chassis, sealing of drying chamber not required.
3. Lower temperature of parts.
4. Lint is less likely to accumulate in cabinet.

Disadvantages

1. Potential of blower clogging slightly greater.

High Pressure System

Advantages

1. Lint is less likely to accumulate in the fan or blowers.

Disadvantages

1. High temperature of parts.
2. More costly construction of seals required.
3. Loss of exhaust air pressure.
4. Lint accumulation in cabinet if seals fail.

CONDENSER TYPE DRYERS

The two basic condenser type dryers are the water condenser and the air condenser dryers. The water condenser dryer consists of a heat source, drum, a spray or cool wall chamber, a fan and a pump. The operation is as follows:

The air is heated and passed into the drum, where it evaporates the water from the clothes. This moisture laden air then passes into the spray or cool wall chamber where condensation takes place. This processed air is then exhausted from the unit. The lint is absorbed in the condenser water and washed down the drain.

The air condenser system uses the incoming air to promote the condensation of the processed air, in place of the water. In Figure 4, the air first passes through the condenser, then into the heater where it is heated and passed into the drum. Inside the drum the heated air evaporates the water from the clothes. This moisture laden air is then passed through the air condenser where part of the moisture is removed. After leaving the condenser, the air is exhausted from the unit. This air condenser removes about 30 to 40% of the moisture from the air, whereas the water condenser removes 100% of the moisture. (See Figure 3).

ADVANTAGES AND DISADVANTAGES OF THE WATER CONDENSER DRYER VERSUS THAT OF THE CONVENTIONAL DRYER

Water Condenser System

Advantages

1. No moisture is exhausted.
2. No heat is added to room.
3. No lint is exhausted.

Disadvantages

1. Higher basic costs.
2. More service problems.
3. Additional plumbing is required.

Conventional Air System

Advantages

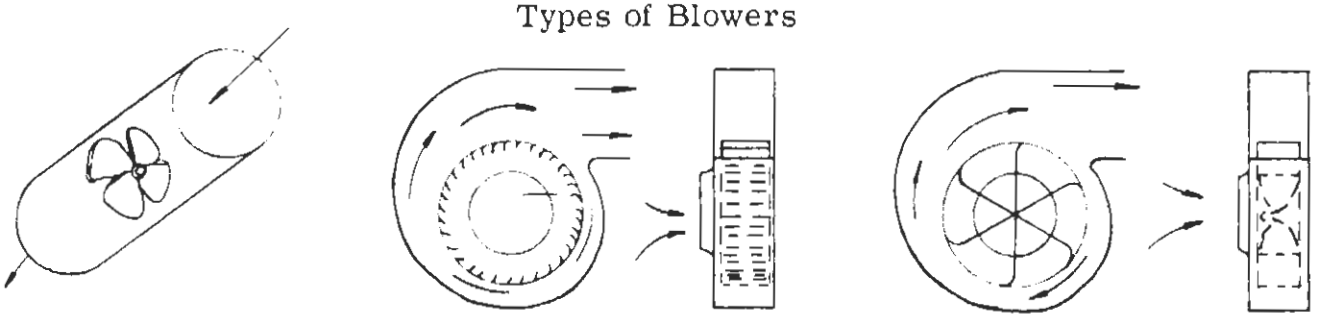
1. Lower basic costs.
2. Less service required.
3. No water source required.

Disadvantages

1. Exhaust of moisture heat and some lint into the room (can be eliminated by outside venting)

As the air condenser system is only about 40% effective, and no provision has been made for outside venting, the problem of the heat, moisture and lint cannot be eliminated. The design of this unit is more costly.

Types of Blowers



- 1. Fan 2. Squirrel Cage 3. Paddle Wheel

Figure 5

FANS, BLOWERS AND AIR MOVEMENT

The three basic types of blowers or fans are the axial flow fan, the centrifugal squirrel cage blower and the paddle wheel blower. The three basic types are shown in Figure 5. In most dryers of today, the paddle wheel blower is most commonly used. The paddle wheel type blower is the least likely to become clogged with lint. The most important factor in the air movement in a dryer is air pressure. The higher the pressure the greater distances the dryer can be exhausted. Air movement in a dryer is directly related to the design but a high air flow is not necessarily indicative of a good design.

If the design of a dryer is fixed, increasing the air flow usually does not decrease the drying time. This increase in air flow may reduce the efficiency of the dryer. Increasing the air flow may reduce the temperature of the air passing thru the clothes thus reducing the evaporation rate.

DRUM CONSTRUCTION

The two so called basic types of clothes cylinders are the perforated and the solid type. In actuality, there are no solid clothes cylinders. There must be openings to admit air to and from the clothes cylinder.

The finish on clothes cylinders is usually zinc plating, porcelain enamel or synthetic enamel. The synthetic enamel finish is usually an open base high temperature synthetic enamel. This finish gives exceptional field life. The condenser type dryers should use porcelain enamel because of the very high humidity conditions in this type of dryer.

CONTROL SYSTEMS

There are two basic control systems, the timer thermostat combination and the heat rise thermostat system. The timer thermostat system consists of a heat control (thermostat) on which the desired clothes temperature can be set and a timer control on which a pre-determined time can be set. Figure 6 shows a typical drying cycle. When the timer is turned ON the clothes temperature begins to rise until a predetermined temperature is reached. At this point, the thermostat begins to cycle, to maintain the desired clothes temperature. This temperature is maintained until near the end of drying cycle (usually the last five minutes) then the timer turns OFF the heat.

Figure 7 illustrates the operation of a typical dryer using the heat rise thermostat system. As before, the dryer is started and

Drying Control Systems

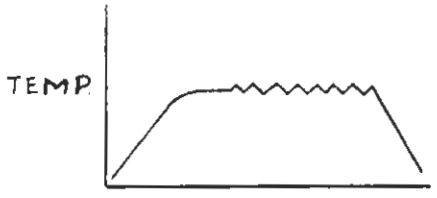


Figure 6 - Time Timer Thermostat

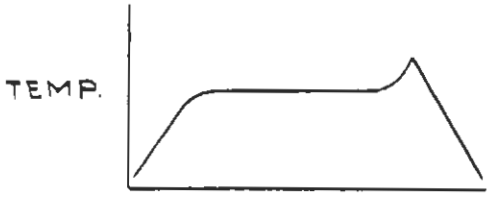


Figure 7 - Time Thermostat

the same characteristic heat rise is seen until near the end of the cycle; a heat rise occurs. This heat rise is an indication that the clothes are dry. At this point, the thermostat trips and shuts off the heat. This system does not give satisfactory performance for all loads, because of the constant source of heat which gives a false heat rise on light loads. There are many innovations of the two basic drying control systems.

IGNITION SYSTEMS

Automatic ignition can be obtained by any of the three methods listed below:

1. Stand by pilot
2. Glow coil
3. Direct spark ignition

The stand by pilot is a constant burning gas pilot. Shielding is usually required around the stand by pilot to prevent the incoming air from blowing it out. The glow coil type ignition system allows the pilot burner to be off when the dryer is not in operation. When the drying cycle starts, the glow coil is energized and gas flows to the pilot burner. When the pilot burner is ignited the glow coil is de-energized, thus the pilot burner remains on until the complete drying cycle is over. Shielding is also needed for this type of pilot.

Direct spark ignition systems can also be used. Direct spark ignition systems are either high or low voltage. With the high voltage type a transformer is required. The low voltage spark is usually obtained with an intermittent spark at 115 volts. Both systems require a flame sensing device to prove ignition of the main burner. Generally there is less or no shielding required with a direct spark ignition system.