

Understanding Class A Ovens

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Just what is a Class A oven? Often, its definition and function are misunderstood. If you process combustible product at your facility, there are certain requirements that your oven must meet.

Because a Class A oven is directly fuel-fired and made specifically for industries that process a combustible product or remove combustible vapors from a product in the oven, it is important to understand its definition and function. This is a brief synopsis of what they are; however, anyone who needs the complete requirements is best served by getting a copy of NFPA 86 Standard for Ovens and Furnaces, 1999 Edition, from the National Fire Protection Association (www.nfpa.org).

A Class A oven is defined in NFPA 86 to include those ovens that are directly fuel-fired and those ovens that process a combustible product or remove combustible vapors from a product in the oven. Class A ovens have several features that are not required on other types of ovens with other process requirements. The major requirements for a Class A oven are outlined below.

Class A ovens must have an explosion-relief area. The requirement for an explosion-relief area is that the interior cubic volume of the oven must have an explosion-relief area equal to at least one-fifteenth of the interior volume, or a 15:1 volume-to-venting-area ratio. For example, an oven with a total volume of 45 ft³ needs to have at least 3 ft² of vent area.

They also must have positive forced ventilation sized to accommodate the amount of combustible product in the maximum oven load. The normal ventilation requirement for a solvent-drying batch oven must be sufficient to render the average vapor concentration below 10 percent of the lower flammable limit if the oven is operated at 250°F (121°C) or below. If the oven is operated between 250 to 500°F (121 to 260°C), that ratio increases, and a 14:1 ratio is required. Above 500°F, special considerations must be addressed to determine the ventilation ratio. The reason for the high ventilation requirements is the high rate of initial solvent release when a batch of parts is placed in a hot oven. Continuous ovens require a lower 4:1 ratio because product is fed at a constant rate, producing much smaller peaks in solvent vaporization.

The image shows a safety design data form titled "DESIGN INFORMATION AND SPECIFICATION". The form is a vertical rectangle with a purple header. Below the header, there are several lines of text with blank spaces for input. The text includes: "THIS EQUIPMENT (SERIAL NUMBER) _____", "HAS BEEN DESIGNED SPECIFICALLY FOR _____", "AND THE FOLLOWING CONDITIONS: _____", "AMOUNT OF PRODUCT _____", "HEATING TIME _____", "OPERATING TEMPERATURE ____°C ____°F", "MINIMUM PURGE TIME REQUIRED _____ MINUTES", "TYPE OF SOLVENT (FLAMMABLE LIQUID OR GAS) _____", and "MAXIMUM AMOUNT ALLOWED _____". At the bottom of the form, there is a warning: "DO NOT CHANGE THIS EQUIPMENT OF THE PROCESS STATED ABOVE WITHOUT WRITTEN PERMISSION."

Figure 1. A typical safety design data form outlines the operating parameters of Class A ovens operating with solvent atmospheres.

Class A ovens must have a purge period before the heat source can be energized. This purge period must be long enough to get at least four air changes of interior volume. An oven with an interior volume of 100 ft³ and exhaust ventilation of 125 ft³/min would require 3.2 min purge time ($100 \text{ ft}^3 \times 4 = 400/125 = 3.2 \text{ min}$).

The exhaust ventilation of the oven must be proven before powering the heat source. This requires an airflow switch or other means of verifying the exhaust. The exhaust and recirculation fan motors must be electrically interlocked to prevent the heat source from being energized if the fan motors are not running.

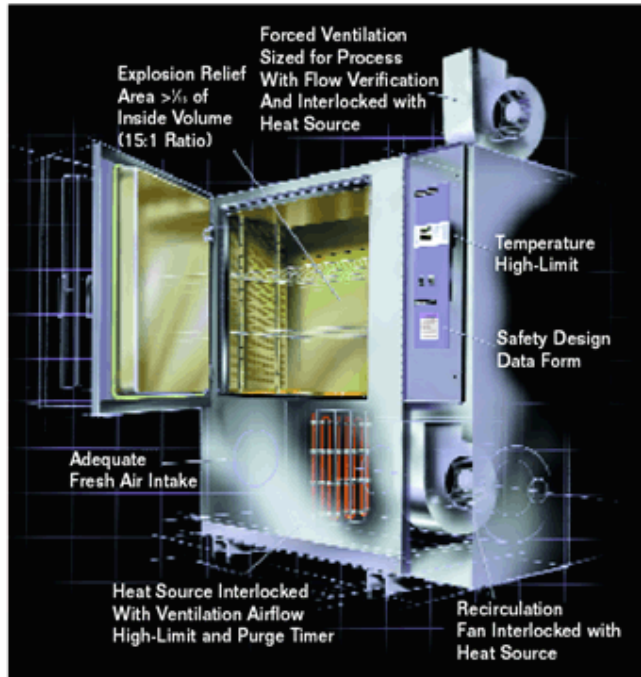


Figure 2. Class A oven design guidelines dictate that several features must be included in the oven design.

A safety design data form must be attached if solvent atmospheres are present, and it must include the solvent in quantity per hour or batch, purge time, operating temperature and exhaust rating. Figure 1 is a typical safety design data form.

Finally, Class A ovens must have an excess temperature control (high temperature limit).

In addition to these equipment requirements, operators must be trained to understand what the ratings of the equipment are and how they relate to the product being processed. Figure 2 is a general oven configuration highlighting major areas that must be included in the design of any Class A oven.

Understanding and complying with these National Fire Protection guidelines is the best way to ensure long-term safe operation of ovens that are either fuel-fired or process combustible or flammable solvent materials.

The environment in which the oven resides tempers all of the above requirements. Class A ovens without additional modification are not usable in hazardous atmosphere areas such as those requiring Class 1, Group D electrical construction. If they are to be utilized in hazardous areas, additional safety precautions spelled out by the National Electric Code must be met.

Note: The complete definition, including the calculations required for determining exhaust ventilation rates for different volatile solvents, are contained in NFPA 86 Standard for Ovens and Furnaces.