



Reducing Fuel Costs in Process Ovens and Dryers Which Use Solvent

The cost of natural gas used for heating process ovens and dryers can be substantial. This note describes how the use of solvent vapor analyzers can lower oven-heating costs.

Hot Air Ventilation

Many manufacturing processes must use chemical solvents in the production of their products. As a result, hot air dryers are frequently used as a means of evaporating those solvents.

Moving and heating large amounts of air can be extremely expensive. Most think the first approach to cost control is reducing ventilation air to the point which just assures complete drying at the desired production speed. However, this could lead to fire or explosion due to a dangerous build-up of flammable vapors, caused by insufficient ventilation.

Control of Flammable Vapors

To prevent such incidents, the National Fire Protection Association (NFPA) developed NFPA 86—the national standard for the safe operation of ovens and dryers.

Section 11.6.8.1 of the standard states "*...the safety ventilation rate shall be designed, maintained and operated to prevent the vapor concentration in the oven exhaust from exceeding 25 percent of the LFL*"¹.

This standard provides a method for either estimating or calculating the minimum amount of ventilation air required to achieve this. In most cases, the estimation method requires the use of 12,000 cu/ft of air per gallon of solvent evaporated.

Using Solvent Vapor Monitors

The cost of heating large volumes of ventilation air is high. However, NFPA 86 allows a substantial reduction in air in cases "*where a continuous solvent vapor concentration indicator and controller is provided...*"

When such instruments are installed to continuously sample the exhaust of an oven zone, the vapor concentration in that zone is allowed to rise as high as 50% LFL².

This allows the implementation of several money-saving steps:

- ◆ A reduction of ventilation air without affecting existing production rates or violating NFPA safety directives
- ◆ An increase in production speed without increasing existing air or fuel costs
- ◆ Compound savings by reusing, rather than expelling, some of a hot exhaust stream back into an oven zone
- ◆ Reduction of oven exhaust rates to lower the demand on VOC destruction oxidizers

Benefits can range from a simple reduction of heated ventilation air to a combination of both reduced heating and increased production. This can result in dramatic fuel savings.

Other advantages to adding analyzers are often overlooked, because they do not seem to be associated with the problem in another part of the plant. This would be the case when a thermal oxidizer has reached its maximum rated airflow capacity, preventing the addition of new process lines without a sizeable investment. Instead of adding another oxidizer for the new equipment, an option would be to reduce the outflow from existing process lines, by recirculating a portion of their exhaust air. The cost of the solvent vapor analyzers would be quickly recouped.

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¹ Lower Flammable Limit: the minimum concentration of solvent vapors in air which, given a source of ignition, will sustain combustion.

² NFPA 86: 2010 sections 11.6.8.1 and 11.6.10.