

**Case Study: Boiler Technology – Knouse Foods**  
**Location: Allentown, PA**

## **Boiler Technology Offers Fast Start-Up, 83+ Percent Efficiency for Fruit Processor**



The Donlee TurboFire™ XL boiler, installed at Knouse Foods, reaches production capacity of 34,500 pounds of steam per hour (at 125 psi) within 30 to 45 minutes of start-up.

For years, Knouse Foods Cooperative of Adams County, Pa., operated its fruit processing plant from steam generated by two ancient boilers dating back to 1945. The steam, used to cook apples in a retort with a 600-pound capacity, varied in demand by as much as 25,000 pounds per hour. Steam was also used for plant heating and clean up.

As might be expected, the old boilers had a number of drawbacks, including extended start-up times. Technicians had to arrive at the plant and fire the boilers as early as 3:00 a.m. to generate sufficient steam to begin processing at 6:00 a.m.

An upgrade was required by 1992, and Knouse management set four criteria for a replacement boiler. It was to deliver quick start-up; clean, contaminant-free steam in sufficient quantity; high combustion efficiency; and low NOx emission levels.

Through a joint effort by GRI and the boiler manufacturer, Knouse Foods agreed to install a newly designed 1000 HP Donlee TurboFire™ XL boiler. Originally developed in response to regulations under the Clean Air Act Amendments of 1990, the Donlee boiler employs a patented cyclonic burner capable of achieving NOx levels of less than 30 ppm, well within regulatory standards.

The cyclonic burner produces a swirl of flame and hot gases. Steam, injected into the combustion zone, reduces NOx formation to low levels without the need for a NOx removal system, as well as limiting CO production.

The boiler, installed in 1992, produces up to 34,500 pounds of steam per hour at 125 psi within 30 to 45 minutes of start-up. Moreover, the steam is exceptionally high quality with very little water carryover. Water in the steam line will cause the fruit to become too wet; the TurboFireXL delivers better than 99.5 percent steam quality.

An integral economizer captures heat from flue gases, helping the boiler achieve better than 83 percent thermal efficiency. In addition to generating process steam, the TurboFireXL also heats the entire building while operating at 75 percent of capacity, saving Knouse Foods about \$400 daily during peak operation periods.