

**Pitco AG14 Gas Fryer  
Performance Test**

Application of ASTM Standard  
Test Method F 1361-99

FSTC Report 5011.02.07

**Food Service Technology Center  
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## Executive Summary

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Pitco's AG14 fryer (Figure ES-1) incorporates a highly restrictive heat exchanger with forced draft to maximize the heat transfer from the hot flue gasses to the frying medium. The fryer's two 40,000 Btu/h burners are controlled by a cooking computer, which adjusts the cooking time based on oil temperature.

Food Service Technology Center (FSTC) engineers tested the fryer under the tightly controlled conditions of the American Society for Testing and Materials' (ASTM) standard test method.<sup>1</sup> Fryer performance is characterized by preheat time and energy consumption, idle energy consumption rate, cooking energy efficiency, and production capacity.

Cooking performance was determined by cooking frozen French fries under three different loading scenarios (heavy—3 pounds per load, medium—1½ pounds and light—¾ pound per load). The heavy-load cook time for the AG14 fryer was 2.58 minutes. Production capacity includes the cooking time and the time required for the frying medium to recover to 340°F (recovery time).

Cooking energy efficiency is a measure of how much of the energy that an appliance consumes is actually delivered to the food product during the cooking process. Cooking energy efficiency is therefore defined by the following relationship:

$$\text{Cooking Energy Efficiency} = \frac{\text{Energy to Food}}{\text{Energy to Appliance}}$$

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<sup>1</sup> American Society for Testing and Materials. 2000. *Standard Test Method for the Performance of Open, Deep Fat Fryers*. ASTM Designation F 1361-99, in *Annual Book of ASTM Standards*, Philadelphia.

## Executive Summary

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A summary of the test results is presented in Table ES-1.



**Figure ES-1.**  
**Pitco AG14 Fryer.**

**Table ES-1. Summary of Fryer Performance.**

Rated Energy Input Rate (Btu/h)	80,000
Measured Energy Input Rate (Btu/h)	77,395
Preheat Time to 350°F (min)	11.4
Preheat Energy to 350°F (Btu)	11,956
Idle Energy Rate @ 350°F (Btu/h)	4,991
Cooking Energy Efficiency:	
Heavy-Load (%)	53.3 ± 1.3 <sup>a</sup>
Medium-Load (%)	46.0 ± 3.0 <sup>a</sup>
Light-Load (%)	35.8 ± 1.2 <sup>a</sup>
Production Capacity (lb/h) <sup>b</sup>	58.4 ± 0.8 <sup>a</sup>
Average Frying Medium Recovery Time (sec) <sup>b</sup>	30.0

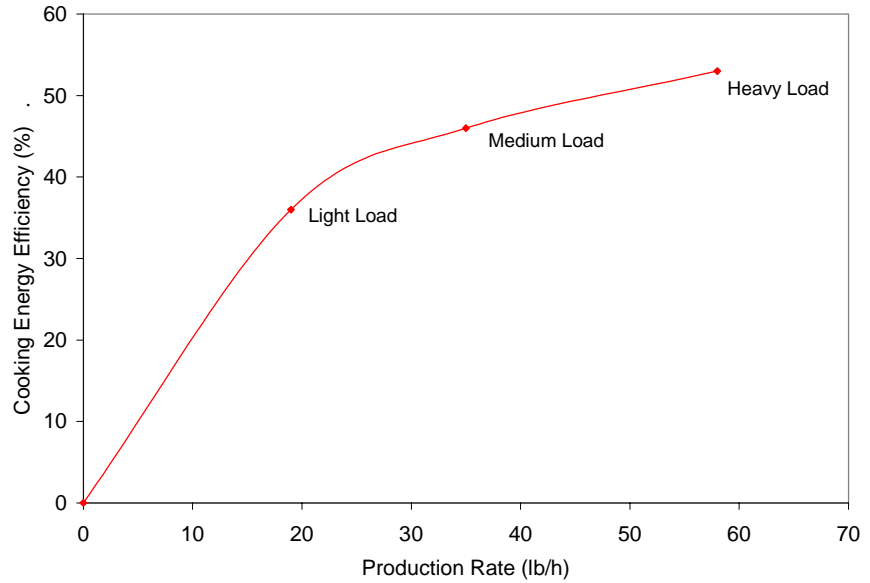
<sup>a</sup>This range indicates the experimental uncertainty in the test result based on a minimum of three test runs.

<sup>b</sup>Based on the heavy-load cooking test with a minimum 10-second preparation time between loads.

Pitco's AG14 gas fryer performed very well when compared to similar atmospheric fryers of its class. The AG14 fryer exhibited higher cooking energy efficiencies and production capacities than many of the atmospheric burner fryers tested at the FSTC. The AG14 fryer had a very low idle rate and short cook time in comparison to fryers tested at the FSTC.

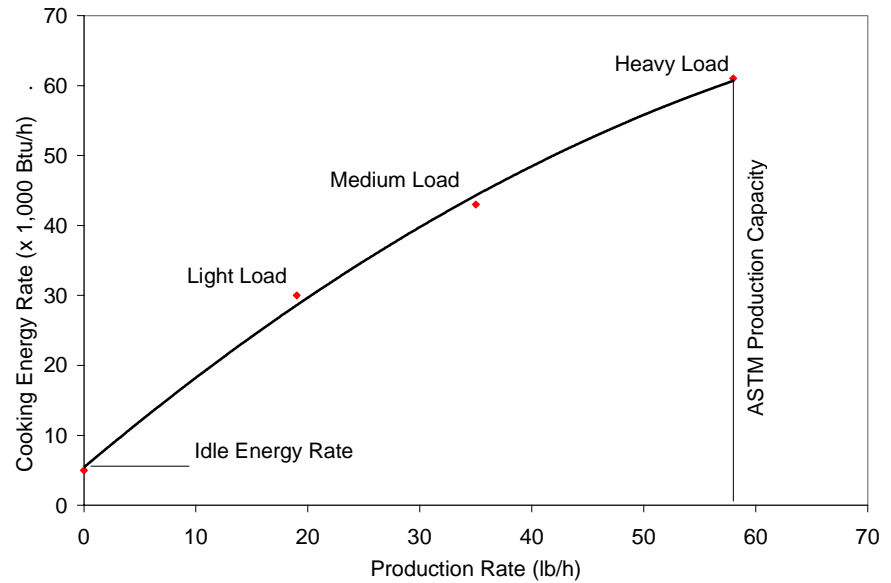
Figure ES-2 illustrates the relationship between cooking energy efficiency and production rate for the fryer. Figure ES-3 illustrates the relationship between the fryer's average energy consumption rates and the production rates. This graph can be used as a tool to estimate the daily energy consumption for the fryer in a real-world operation. Average energy consumption rates at 10, 30, and 50 pounds per hour for the AG14 fryer are 18,250 Btu/h, 39,810 Btu/h, and 55,920 Btu/h respectively.

# Executive Summary



**Figure ES-2.**  
*Fryer part-load cooking energy efficiency.*

Note: Light-load = ¼ pounds/load; Medium-load = 1½ pounds/load; Heavy-load = 3 pounds/load.



**Figure ES-3.**  
*Fryer cooking energy consumption profile.*

Note: Light-load = ¼ pounds/load; Medium-load = 1½ pounds/load; Heavy-load = 3 pounds/load.

## Executive Summary

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Pitco approached the FSTC to test an advanced gas atmospheric burner fryer. The AG14 gas fryer uses two atmospheric burners, a blower and a programmable cooking computer. The fryer demonstrated a high heavy-load cooking energy efficiency (53.2 %) and a production capacity (58.4 lb/h) that places it within the top five fryers tested at the Food Service Technology Center. The AG14 had a respectable preheat of just over 11 minutes while exhibiting one of the lowest idle rates (4,991 Btu/h) of any gas fryer tested, offering lower energy bills to the food service operator.

Most food service establishments cook under partial load conditions and medium and light loads are more representative of real world application. The AG14 fryer posted excellent medium- and light-load cooking energy efficiencies (46.0 % and 35.8 %), consistent with its heavy-load performance, and rank it well within the high-efficiency class of fryers.

The AG14 fryer offers a fully programmable computer allowing a foodservice operator the ability to preprogram a cook time for multiple food products.

# 1 Introduction

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## Background

Fried foods continue to be popular on the restaurant scene. French fried potatoes are still the most common deep fried food, along with onion rings, chicken and fish. Recent advances in equipment design have produced fryers that operate more efficiently, quickly, safely and conveniently.

Dedicated to the advancement of the food service industry, the Food Service Technology Center (FSTC) has focused on the development of standard test methods for commercial food service equipment since 1987. The primary component of the FSTC is a 10,000 square-foot appliance laboratory equipped with energy monitoring and data acquisition hardware, 60 linear feet of canopy exhaust hoods integrated with utility distribution systems, appliance setup and storage areas, and a state-of-the-art demonstration and training facility.

The test methods, approved and ratified by the American Society for Testing and Materials (ASTM), allow benchmarking of equipment such that users can make meaningful comparisons among available equipment choices. By collaborating with the Electric Power Research Institute (EPRI) and the Gas Technology Institute (GTI) through matching funding agreements, the test methods have remained unbiased to fuel choice. End-use customers and commercial appliance manufacturers consider the FSTC to be the national leader in commercial food service equipment testing and standards, sparking alliances with several major chain customers to date.

Since the development of the ASTM test method for fryers in 1991, the FSTC has tested a wide range of gas and electric fryers.<sup>2,3,4,5,6,7,8,9,10,11</sup>

Fryer performance is characterized by preheat time and energy consumption, idle energy consumption rate, pilot energy consumption rate, cooking energy efficiency and production capacity.

# Introduction

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Pitco's use of a highly restrictive heat exchanger allows the atmospheric-burner AG14 fryer to compete with the infrared burner fryers that previously stood alone among high performance units. The AG14 advanced gas fryer features two atmospheric burners, a stainless steel frypot and backsplash, with a programmable frying computer. An integrated melt cycle prevents frying medium from scorching during preheat.

This report presents the results of applying the ASTM test method to the Pitco AG14 gas fryer. The glossary in Appendix A is provided so that the reader has a quick reference to the terms used in this report.

## Objectives

The objective of this report is to examine the operation and performance of Pitco's AG14, 14-inch gas fryer, under the controlled conditions of the ASTM standard test method. The scope of this testing is as follows:

1. Verify that the appliance is operating at the manufacturer's rated energy input.
2. Determine the time and energy required to preheat the appliance from room temperature to 350°F.
3. Characterize the idle energy use with the thermostat set at a calibrated 350°F.
4. Document the cooking energy consumption and efficiency under three French fry loading scenarios: heavy (3 pounds per load), medium (1½ pounds per load), and light (¾ pound per load).
5. Determine the production capacity and frying medium temperature recovery time during the heavy-load test.

## Appliance Description

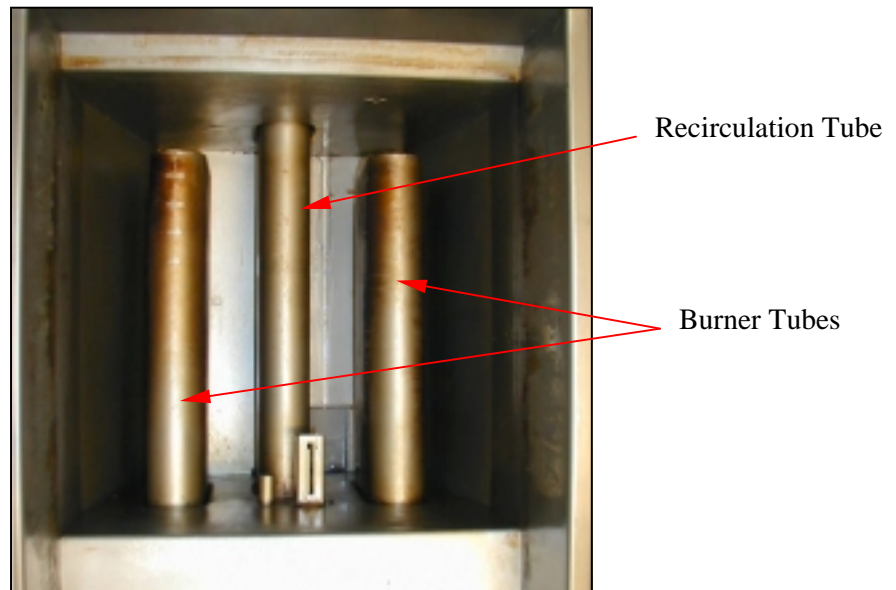
Pitco's AG14, 14-inch gas fryer has a power rating of 80,000 Btu/h. The frypot contains two atmospheric burners that route through two chambers running from the front into the frypot and back to the front. The gasses are then

# Introduction

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routed through a center tube, which carries the flue gasses back through the frypot to maximize heat transfer to the frying medium (see Figure 1-1).

Appliance specifications are listed in Table 1-1, and the manufacturer's literature is in Appendix B.



*Figure 1-1.  
Pitco AG14 Frypot.*

***Table 1-1. Appliance Specifications.***

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Manufacturer	Pitco
Model	AG14
Generic Appliance Type	Open Deep Fat Fryer
Rated Input	80,000 Btu/h
Oil Capacity	50 lb
Frying Area	14" x 14"
Controls	Programmable cooking computer
Construction	Stainless Steel

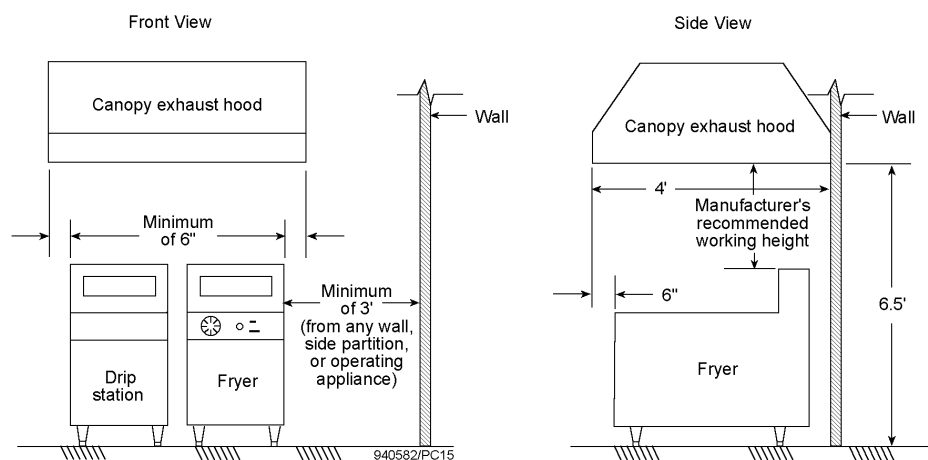
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## 2 Methods

### Setup and Instrumentation

FSTC researchers installed the fryer on a tiled floor under a 4-foot-deep canopy hood that was 6 feet, 6 inches above the floor. The hood operated at a nominal exhaust rate of 300 cfm per linear foot of hood. There was at least 6 inches of clearance between the vertical plane of the fryer and the edge of the hood. All test apparatus was installed in accordance with Section 9 of the ASTM test method.<sup>1</sup> See Figure 2-1.

Researchers instrumented the fryer with thermocouples to measure temperatures in the cold and the cooking zones and at the thermostat bulb. Two thermocouples were placed in the cook zone, one in the geometric center of the frypot, approximately 1 inch above the fry basket support, and the other at the tip of the thermostat bulb. The cold zone thermocouple was supported from above, independent of the frypot surface, so that the temperature of the cold zone reflected the frying medium temperature, not the frypot's surface



**Figure 2-1.**  
**Equipment configuration.**

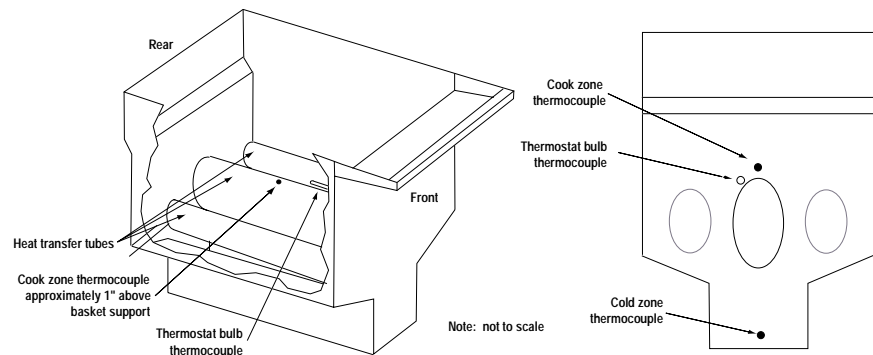
## Methods

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temperature. The cold zone temperature was measured toward the rear of the frypot, 1/8-inch from the bottom of the pot. See Figure 2-2.

Natural gas consumption was measured using a positive displacement-type gas meter that generated a pulse every 0.1 ft<sup>3</sup>. The gas meter and the thermocouples were connected to an automated data acquisition unit that recorded data every 5 seconds. A chemical laboratory used a gas chromatograph to determine the gas heating value on each day of testing. All gas measurements were corrected to standard conditions.

The fryer was filled with Melfry Brand, partially hydrogenated, 100% pure vegetable oil for all tests except the energy input rate determination test. This test required the fryer to be filled with water to inhibit burner cycling during the test.



**Figure 2-2.**  
*Thermocouple placement for testing.*

## Measured Energy Input Rate

Rated energy input rate is the maximum or peak rate at which the fryer consumes energy—as specified on the fryer's nameplate. Measured energy input rate is the maximum or peak rate of energy consumption, which is recorded during a period when the burners are operating (such as preheat). For the purpose of this test, the fryer was filled with water to the frypot's indicated fill-line. The controls were set to attain maximum output and the energy con-

## Methods

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sumption was monitored for a period of 15 minutes after a full rolling boil had been established. Researchers compared the measured energy input rate with the nameplate energy input rate to ensure that the fryer was operating properly.

### Cooking Tests

Researchers specified Simplot<sup>®</sup> brand ¼-inch blue ribbon product, par-cooked, frozen shoestring potatoes for all cooking tests. Each load of French fries was cooked to a 30% weight loss. The cooking tests involved “barrel-ing” six loads of frozen French fries, using fry medium temperature as a basis for recovery. Each test was followed by a 10-minute wait period and was then repeated two more times. Researchers tested the fryer using 3-pound (heavy), 1 ½-pound (medium), and ¾-pound (light) French fry loads.

Due to the logistics involved in removing one load of cooked French fries and placing another load into the fryer, a minimum preparation time of 10 seconds was incorporated into the cooking procedure. This ensures that the cooking tests are uniformly applied from laboratory to laboratory. Fryer recovery was then based on the frying medium reaching a threshold temperature of 340°F (measured at the center of the cook zone). Reloading within 10°F of the 350°F thermostat set point does not significantly lower the average oil temperature over the cooking cycle, nor does it extend the cook time. The fryer was reloaded either after the cook zone thermocouple reached the threshold temperature or 10 seconds after removing the previous load from the fryer, whichever was longer.

The first load of each six-load cooking test was designated a stabilization load and was not counted when calculating the elapsed time and energy used. Energy monitoring and elapsed time of the test were determined after the second load contacted the frying medium. After removing the last load and allowing the fryer to recover, researchers terminated the test. Total elapsed time, energy consumption, weight of fries cooked, and average weight loss of the French fries were recorded for the last five loads of the six-load test.

## Methods

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Cooking tests were run in the following sequence: three replicates of the heavy-load test, three replicates of the medium-load test, and three replicates of the light-load test. This procedure ensured that the reported cooking energy efficiency and production capacity results had an uncertainty of less than  $\pm 10\%$ . The results from each test run were averaged, and the absolute uncertainty was calculated based on the standard deviation of the results.

The ASTM results reporting sheets appear in Appendix C.

## 3 Results

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### Energy Input Rate

Prior to testing, the energy input rate was measured and compared with the manufacturer's nameplate value. This procedure ensured that fryer was operating within its specified parameters. The measured energy was 77,395 Btu/h (a difference of 3.3% from the nameplate rating.)

### Preheat and Idle Tests

These tests show how the fryer uses energy when it is not cooking food. The preheat time allows an operator to know precisely how long it takes for the fryer to be ready to cook. The idle energy rate represents the energy required to maintain the set temperature, or the appliance's stand-by losses.

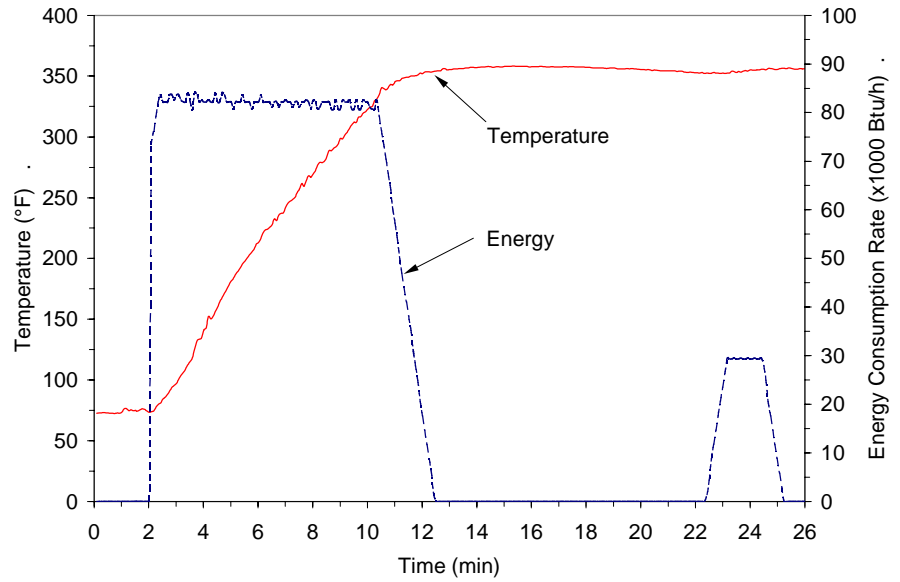
#### Preheat Energy and Time

Researchers filled the fryer with new oil, which was then heated to 350°F at least once prior to any testing. The preheat tests were conducted at the beginning of a test day, after the oil had stabilized at room temperature overnight. Pitco's cooking computer has an integrated melt cycle to prevent scorching of solid shortening during preheat, however this feature was disabled since the ASTM test procedure specifies liquid shortening. Pitco's AG14 gas fryer was ready to cook in approximately 11 minutes. Figures 3-1 shows the preheat characteristics for the AG14 fryer.

#### Idle Energy Rate

Once the frying medium reached 350°F, the fryer was allowed to stabilize for half an hour. Time and energy consumption was monitored for an additional two-hour period as each fryer maintained the oil at 350°F. The idle energy rate during this period was 4,991 Btu/h.

# Results



**Figure 3-1.**  
*Pitco AG14 preheat characteristics.*

## Test Results

Input, preheat, and idle test results are summarized in Table 3-2.

**Table 3-1. Input, Preheat, and Idle Test Results.**

Rated Energy Input Rate (Btu/h)	80,000
Measured Energy Input Rate (Btu/h)	77,400
Preheat	
Time to 350°F (min)	11.4
Gas Energy (Btu)	11,960
Electric Energy (Wh)	17.7
Rate to 350°F (°F/min)	24.3
Idle Gas Energy Rate @ 350°F (Btu/h)	4,990
Idle Electric Energy Rate (W)	16.4

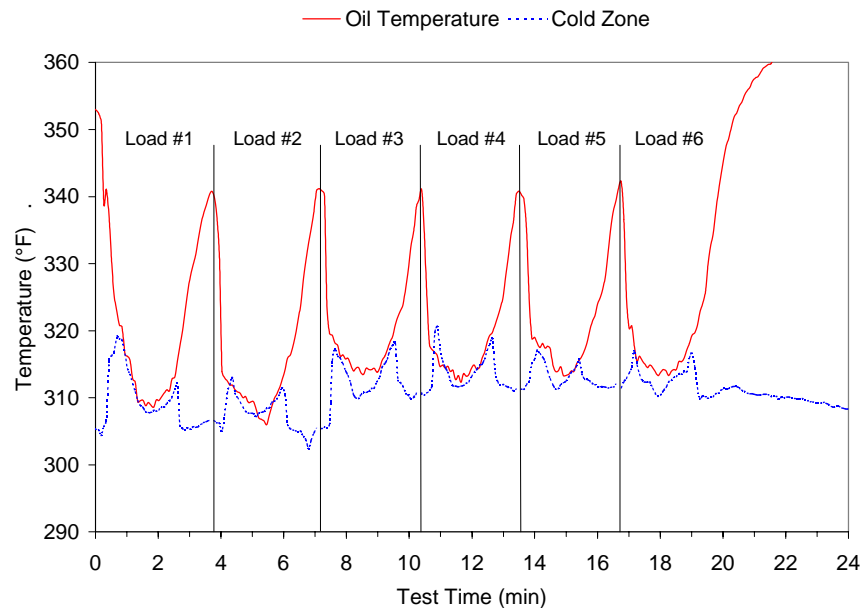
# Results

## Cooking Tests

The fryers were tested under three loading scenarios: heavy (3 pounds of fries per load), medium (1 ½ pounds of fries per load) and light (¾ pound of fries per load). The fries used for the cooking tests consisted of approximately 6% fat and 66% moisture, as specified by the ASTM procedure. Researchers monitored French fry cook time and weight loss, frying medium recovery time, and fryer energy consumption during these tests.

### Heavy-Load Tests

The heavy-load cooking tests were designed to reflect a fryer's maximum performance. The fryers were used to cook six 3-pound loads of frozen French fries—one load after the other in rapid succession, similar to a batch-cooking procedure. Figures 3-2 shows the average temperature of the frying medium and cold zone during the heavy-load tests.

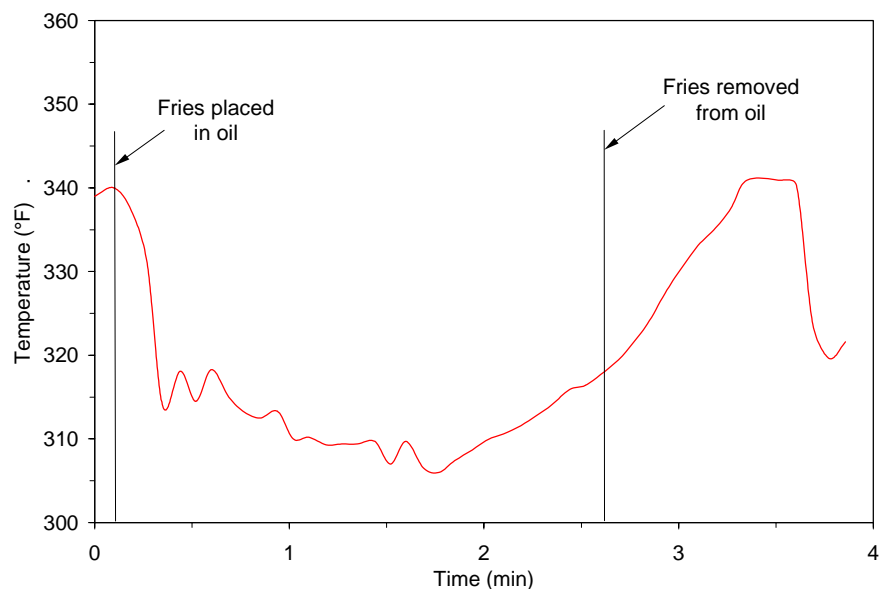


**Figure 3-2.**  
*Frying medium temperature during a heavy load test for the AG14 fryer*

## Results

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The first load was used to stabilize the fryer, and the remaining five loads were used to calculate cooking energy efficiency and production capacity. The average frying medium and cold zone temperatures during the heavy-load test were 321°F and 361°F, respectively. The average cook time for the heavy-load test was 2.58 minutes with an average recovery time of 30 seconds, Figure 3-3 illustrates the temperature response of the AG14 fryer while cooking a 3-pound load of frozen French fries. Production capacity includes the time required to remove the cooked fries and reload the fryer with a new batch of frozen fries (approximately 10 seconds per load).



*Figure 3-3.*  
*Fryer cooking cycle*  
*temperature signature.*

### Medium and Light-Load Tests

Medium- and light-load tests represent a more typical usage pattern for a fryer in cook-to-order applications. Since a fryer is often used to cook single basket loads in many food service establishments, these part-load efficiencies can be used to estimate the fryer's performance in an actual operation.

# Results

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Both the medium- and light-load tests were conducted using a single fry basket. The medium-load tests used 1½-pounds of fries per load and the light load tests used ¾-pounds of fries per load. Cooking energy efficiencies at 35.3 (medium) and 19.1 (light) pounds per hour were 46.0% and 35.8%, respectively.

## Test Results

Energy imparted to the French fries was calculated by separating the various components of the fries (water, fat, and solids) and determining the amount of heat gained by each component (Appendix D). The fryer's cooking energy efficiency for a given loading scenario is the amount of energy imparted to the fries, expressed as a percentage of the amount of energy consumed by the fryer during the cooking process.

Heavy-load cooking energy efficiency results were 52.9%, 52.9%, and 53.8%, yielding a maximum uncertainty of 1.3%. Table 3-2 summarizes the results of the ASTM cooking energy efficiency and production capacity tests.

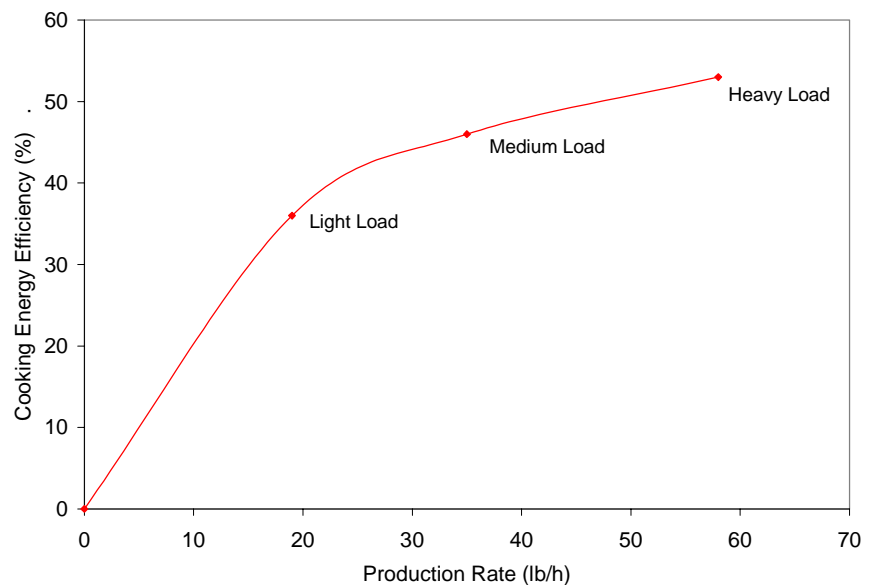
*Table 3-2. Cooking Energy Efficiency and Production Capacity.*

	<i>Light Load</i>	<i>Medium Load</i>	<i>Heavy Load</i>
Load Size (lb)	¾	1 ½	3.0
French Fry Cook Time (min)	2.03	2.28	2.58
Average Recovery Time (sec)	20	16	30
Production Rate (lb/h)	19.1 ± 1.0	35.3 ± 0.4	58.4 ± 0.8
Energy Consumption (Btu/lb)	1,606	1,238	1,060
Cooking Energy Rate (Btu/h)	30,490	43,490	61,630
Electric Energy Rate (W)	50	73	96
Cooking Energy Efficiency (%)	35.8 ± 1.2	46.4 ± 3.0	53.2 ± 1.3

# Results

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Figure 3-4 illustrates the relationship between cooking energy efficiency and production rate for this fryer. Fryer production rate is a function of both the French fry cook time and the frying medium recovery time. Appendix D contains a synopsis of test data for each replicate of the cooking tests.

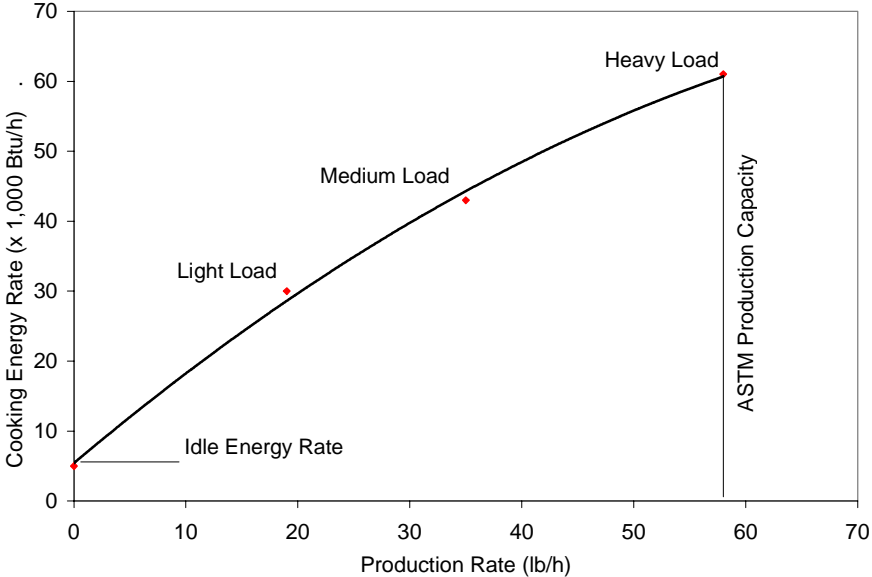


**Figure 3-4.**  
*Fryer part-load cooking energy efficiency.*

Note: Light-load = ¾ pounds/load; Medium-load = 1½ pounds/load; Heavy-load = 3 pounds/load.

Figure 3-5 illustrates the relationship between the fryer’s average energy consumption rate and the production rate. This graph can be used as a tool to estimate the daily energy consumption for the fryer in a real-world operation. Average energy consumption rates at 10, 30, and 50 pounds per hour for the stock model were 18,250 Btu/h, 39,810 Btu/h, and 55,920 Btu/h, respectively. For an operation cooking an average of 15 pounds of food per hour over the course of the day (e.g., 150 lb of food over a ten hour day), the average daily energy consumption for the AG14 fryer would be 24,150 Btu/h.

# Results



**Figure 3-5.**  
*Fryer cooking energy consumption profile.*

Note: Light-load = ¼ pounds/load; Medium-load = 1½ pounds/load; Heavy-load = 3 pounds/load.

## 4 Conclusions

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Pitco Frialator's AG14 fryer lives up to its high-performance billing with a respectable 53.2% cooking energy efficiency, placing it securely within the top five gas fryers tested at the Food Service Technology Center. While the AG14 fryer placed well under heavy-load conditions, it also preformed well under part-load conditions. With part-load efficiencies of 46.0% (medium) and 35.8% (light), this Pitco fryer competes well with other high performance fryers in its class.<sup>2,3,4,5,6,7,8,9,10,11</sup>

Pitco's highly restrictive heat exchanger design allows the fryer to impart more heat to the oil with a lower input rate. In fact, its 4,990 Btu/h idle rate was among the lowest for any gas fryer tested at the FSTC—about a third that of the average high input (120,000 Btu/h) fryer.

The forced draft system did slow down the fryer's response somewhat by adding a three second delay before the burner ignited. This translated to a slightly longer recovery time (about 10 seconds) and pushed the preheat time just above the ten-minute mark (11.4 minutes). However, this did not dramatically impact the fryer's productivity. With a production capacity of 58.4 pounds per hour, the fryer was able to keep pace with other high-production units.

The AG14's competitive production capacity means that the fryer will have no trouble keeping up with a busy operation, while its low standby (idle) losses will keep that energy bill from getting out of hand. The AG14 is a well-rounded high performance fryer that is sure to please the demanding consumer.

## 5 References

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9. Food Service Technology Center 2000. *Vulcan 14-inch Fryer Performance Testing*. Report 5011.00.87 prepared for Customer Energy Management. San Francisco. Pacific Gas and Electric Company.
10. Food Service Technology Center 2000. *Vulcan High Capacity Fryer Performance Testing*. Report 5011.00.88 prepared for Customer Energy Management. San Francisco. Pacific Gas and Electric Company.
11. Food Service Technology Center 2001. *Anets Fryer Performance Tests*. Report 5011.01.03 prepared for Customer Energy Management. San Francisco. Pacific Gas and Electric Company

# A Glossary

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## **Cooking Energy** (kWh or kBtu)

The total energy consumed by an appliance as it is used to cook a specified food product.

## **Cooking Energy Consumption Rate** (kW or kBtu/h)

The average rate of energy consumption during the cooking period.

## **Cooking Energy Efficiency** (%)

The quantity of energy input to the food products; expressed as a percentage of the quantity of energy input to the appliance during the heavy-, medium-, and light-load tests.

## **Duty Cycle** (%)

Load Factor

The average energy consumption rate (based on a specified operating period for the appliance) expressed as a percentage of the measured energy input rate.

$$\text{Duty Cycle} = \frac{\text{Average Energy Consumption Rate}}{\text{Measured Energy Input Rate}} \times 100$$

## **Energy Input Rate** (kW or kBtu/h)

Energy Consumption Rate  
Energy Rate

The peak rate at which an appliance will consume energy, typically reflected during preheat.

## **Heating Value** (Btu/ft<sup>3</sup>)

Heating Content

The quantity of heat (energy) generated by the combustion of fuel. For natural gas, this quantity varies depending on the constituents of the gas.

## **Idle Energy Rate** (kW or Btu/h)

Idle Energy Input Rate  
Idle Rate

The rate of appliance energy consumption while it is “idling” or “holding” at a stabilized operating condition or temperature.

## **Idle Temperature** (°F, Setting)

The temperature of the cooking cavity/surface (selected by the appliance operator or specified for a controlled test) that is maintained by the appliance under an idle condition.

## **Idle Duty Cycle** (%)

Idle Energy Factor

The idle energy consumption rate expressed as a percentage of the measured energy input rate.

$$\text{Idle Duty Cycle} = \frac{\text{Idle Energy Consumption Rate}}{\text{Measured Energy Input Rate}} \times 100$$

# Glossary

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## **Measured Input Rate (kW or Btu/h)**

Measured Energy Input Rate

Measured Peak Energy Input Rate

The maximum or peak rate at which an appliance consumes energy, typically reflected during appliance preheat (i.e., the period of operation when all burners or elements are “on”).

## **Pilot Energy Rate (kBtu/h)**

Pilot Energy Consumption Rate

The rate of energy consumption by the standing or constant pilot while the appliance is not being operated (i.e., when the thermostats or control knobs have been turned off by the food service operator).

## **Preheat Energy (kWh or Btu)**

Preheat Energy Consumption

The total amount of energy consumed by an appliance during the preheat period.

## **Preheat Rate (°F/min)**

The rate at which the cook zone heats during a preheat.

## **Preheat Time (minute)**

Preheat Period

The time required for an appliance to “preheat” from the ambient room temperature ( $75 \pm 5^\circ\text{F}$ ) to a specified (and calibrated) operating temperature or thermostat set point.

## **Production Capacity (lb/h)**

The maximum production rate of an appliance while cooking a specified food product in accordance with the heavy-load cooking test.

## **Production Rate (lb/h)**

Productivity

The average rate at which an appliance brings a specified food product to a specified “cooked” condition.

## **Rated Energy Input Rate**

(kW, W or Btu/h, Btu/h)

Input Rating (ANSI definition)

Nameplate Energy Input Rate

Rated Input

The maximum or peak rate at which an appliance consumes energy as rated by the manufacturer and specified on the nameplate.

## **Recovery Time (minute, second)**

The average time from the removal of the fry baskets from the fryer until the frying medium is within  $10^\circ\text{F}$  of the thermostat set point and the fryer is ready to be reloaded.

## **Test Method**

A definitive procedure for the identification, measurement, and evaluation of one or more qualities, characteristics, or properties of a material, product, system, or service that produces a test result.

## **B** Appliance Specifications

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Appendix B includes the product literature for the Pitco AG14 fryer.



**Advanced  
GAS Frying System  
Model AG14S and AG14S/FD**



(Shown with Intellifry computer)

Project \_\_\_\_\_

Item No. \_\_\_\_\_

Quantity \_\_\_\_\_

**STANDARD SPECIFICATIONS**

**CONSTRUCTION**

- Welded tank with a super smooth machine peened finish ensures easy cleaning.
- Long lasting, high temperature alloy stainless steel heat baffles are mounted in the heat exchanger tubes to provide maximum heating and combustion efficiency.
- High production/fast recovery fryer assembly available in combination of full tank (F) and split tank (S) fryers.
- Fryers are available in combinations of two or more units with filter drawer.
- Assembly constructed with stainless steel tanks, splashback, exterior front panel and door.

**CONTROLS**

- Digital controller maintains the fryer temperature between 250° (122°C) and 380°F (193°C).
- Temperature limit automatically shuts off all gas flow if the fryer temperature exceeds 435°F (224°C) ±15°F (10°C).

**STANDARD ACCESSORIES**

- Digital Control
- Baskets (Twin Size)
- Lift off basket hangers
- Joining strip
- 9" adjustable legs
- Electronic Ignition
- Stainless steel tank, aluminized cabinet
- Drain valve interlock
- Tube racks
- Clean out rod
- Fryer cleaning brush
- Rear gas connection

**AVAILABLE OPTIONS & ACCESSORIES**

- Intellifry computer
- Filter drawer filter system with heat tape (for 2 or more fryers)
- Stainless steel exterior
- Bread & Batter cabinet
- Filter/fryer brush
- Flush hose
- Filter powder
- Filter paper
- 9" adjustable heavy duty casters

**OPTIONAL FILTER SYSTEM**

(Available on 2 or more units)

- Filter drawer glides on heavy duty stainless steel rollers.
- 1 1/4" NPT drain valve for quick draining on full tanks, 1" NPT drain valve on split tanks.
- Easy to remove filter unit for fast cleaning and paper replacement.
- Filter piping integrated into the fryer for no-hassle filtering.
- Heat tape standard on filter units.

**APPROVALS**

- ◆ AGA Certified
- ◆ CE Approved
- ◆ CGA Certified
- ◆ NSF Listed

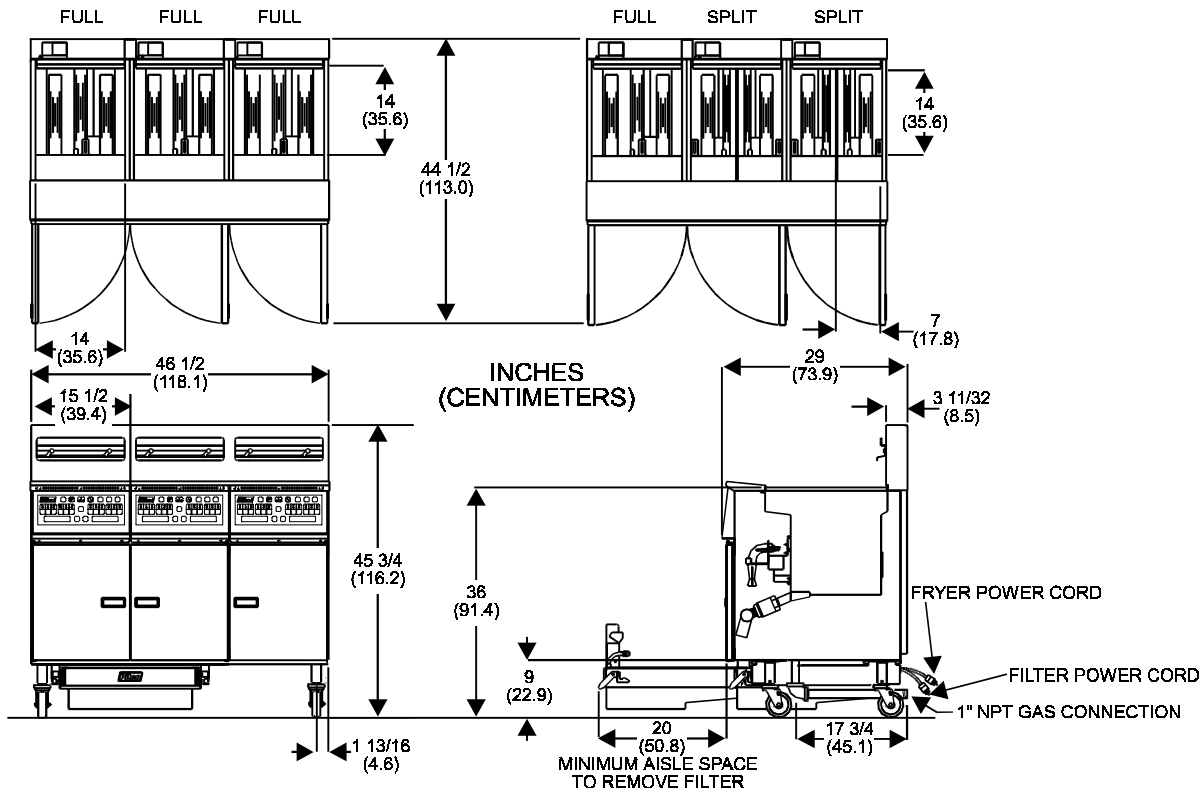


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(800) 258-3708 • (603) 225-6684 • FAX (603) 225-8472



# Model AG14S and AG14S/FD - Advanced Gas Frying System



ELECTRICAL		OIL CAPACITY	
Option	VOLTAGE/PHASE/HZ		Split Tank: 25 - 30 pounds (11.3 - 13.6 KG) 3.2 - 3.9 gallons (12.1 - 14.8 liters) Full Tank: 40 - 50 pounds (18.1 - 22.7 KG) 5.2 - 6.5 gallons (19.7 - 24.6 liters)
	120/1/60	220-240/1/50	
	AMPS/EA	AMPS/EA	
FRYER CONTROLS (per fryer)	2.0	1.0	
FILTER PUMP WITH HEAT TAPE (varies with size)	15.0	7.5	
GAS CONSUMPTION		SHIPPING INFORMATION	
40,000 BTU's/Hour (10,080 KCal/Hr) - per Split Tank 80,000 BTU's/Hour (20,160 KCal/Hr) - per Full Tank 22.5 - 23 KW - CE Rating for Full and Split Tanks  Available in Natural or Propane gas.		AG14S/Full - 220 Pounds AG14S/Split - 230 Pounds Filter drawer - 150 Pounds	
SHORT FORM SPECIFICATION		PERFORMANCE CHARACTERISTICS	
Provide Pitco Model AG14S and AG14S/FD Advanced tube fired gas fryer. Fryer shall have a blue flame burner system combined with stainless steel heat tubes utilizing high temperature alloy baffles. Fryer shall be equipped with a digital cooking controller. Fryer shall have a deep cool zone; minimum 15% of total oil capacity to trap burnt particles, crumbs and black specks. Fryer cooking area shall be 14" x 14" (35.6 cm x 35.6 cm) for full tank and 7" x 14" (17.8 cm x 35.6 cm) for split tank. Each tank configuration shall have a cooking depth of 4" (10.16 cm). Unit may have an integrated piped filtration system located underneath the fryer. Filter assembly shall utilize filter paper. Provide accessories as follows:		Split Tank Frying Area 7" x 14" (17.8 cm x 35.6 cm) 42.5 pounds (19.3 Kg.) of potatoes per hour Full Tank Frying Area 14" x 14" (35.6 cm x 35.6 cm) 85.0 pounds (38.6 Kg.) of potatoes per hour	
TYPICAL APPLICATION			
High efficiency frying that requires a high volume production rate.			

## C Results Reporting Sheets

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Manufacturer: Pitco  
Models: AG14  
Date: May 2002

### Test Fryers and Burners

Description of operational characteristics: Pitco's AG14 fryer (Figure ES-1) incorporates a highly restrictive heat exchanger with forced draft to maximize the heat transfer from the hot flue gasses to the frying medium. The fryer's two 40,000 Btu/h burners are controlled by solid-state controls and a frying computer, which adjusts the cooking time based on oil temperature.

### Apparatus

√ Check if testing apparatus conformed to specifications in section 6.

Deviations: None.

### Energy Input Rate

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Gas Heating Value (Btu/scf)	1017
Name Plate (Btu/h)	80,000
Measured (Btu/h)	77,395
Percentage Difference (%)	3.26

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### Thermostat Calibration

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Thermostat Setting (°F)	350
Oil Temperature (°F)	350

---

# Results Reporting Sheets

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## Preheat Energy and Time

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Gas Heating Value (Btu/scf)	1018
Starting Temperature (°F)	72
Energy Consumption (Btu)	11,956
Electric Energy (Wh)	17.7
Duration (min)	11.4
Preheat Rate (°F/min)	24.3

---

## Idle Energy Rate

---

Gas Heating Value (Btu/scf)	1017
Idle Energy Rate @ 350 °F (Btu/h)	4,991
Electric Energy Rate (W)	16.4

---

## Heavy Load Cooking Energy Efficiency and Cooking Energy Rate

---

Gas Heating Value (Btu/scf)	1018
Load Size (lb)	3.00
French Fry Cook Time (min)	2.58
Average Recovery Time (sec)	30
Production Rate (lb/h)	58.4 ± 0.8
Energy to Food (Btu/lb)	568
Cooking Energy Rate (Btu/h)	61,627
Electric Energy Rate (W)	96
Energy per Pound of Food Cooked (Btu/lb)	1,060
Cooking Energy Efficiency (%)	53.2 ± 1.3

---

## Results Reporting Sheets

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### Medium Load Cooking Energy Efficiency and Cooking Energy Rate

---

Gas Heating Value (Btu/scf)	1018
Load Size (pounds)	1.50
French Fry Cook Time (min)	2.28
Average Recovery Time (sec)	16
Production Rate (lb/h)	35.3 ± 0.4
Energy to Food (Btu/lb)	569
Cooking Energy Rate (Btu/h)	43,491
Electric Energy Rate (W)	73
Energy per Pound of Food Cooked (Btu/lb)	1,238
Cooking Energy Efficiency (%)	46.0 ± 3.0

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### Light Load Cooking Energy Efficiency and Cooking Energy Rate

---

Gas Heating Value (Btu/scf)	1018
Load Size (pounds)	.75
French Fry Cook Time (min)	2.03
Average Recovery Time (sec)	20
Production Rate (lb/h)	19.1 ± 1.0
Energy to Food (Btu/lb)	575
Cooking Energy Rate (Btu/h)	30,494
Electric Energy Rate (W)	50
Energy per Pound of Food Cooked (Btu/lb)	1,606
Cooking Energy Efficiency (%)	35.8 ± 1.2

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## D Cooking Energy Efficiency Data

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*Table D-1. Specific Heat and Latent Heat.*

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<b>Specific Heat (Btu/lb, °F)</b>	
Ice	0.500
Fat	0.400
Solids	0.200
Frozen French Fries	0.695
<b>Latent Heat (Btu/lb)</b>	
Fusion, Water	144
Fusion, Fat	44
Vaporization, Water	970

---

## Cooking Energy Efficiency Data

*Table D-2. Heavy-Load Fry Test Data.*

	Repetition #1	Repetition #2	Repetition #3
<b>Measured Values</b>			
Electric Energy Consumption (Wh)	24.6	24.9	24.6
Gas Energy Consumption (Btu)	15,795	15,938	15,720
<b>Cook Time (min)</b>	<b>2.58</b>	<b>2.58</b>	<b>2.58</b>
Total Test Time (min)	15.4	15.5	15.3
Weight Loss (%)	29.05	29.03	28.97
Initial Weight (lb)	15.000	15.000	15.000
Final Weight (lb)	10.643	10.646	10.654
Initial Fat Content (%)	6.1	6.1	6.1
Initial Moisture Content (%)	65.2	65.2	65.2
Final Moisture Content (%)	45.5	44.8	44.4
Initial Temperature (°F)	0	0	0
Final Temperature (°F)	212	212	212
<b>Calculated Values</b>			
Initial Weight of Water (lb)	9.780	9.780	9.780
Final Weight of Water (lb)	4.843	4.769	4.730
Sensible (Btu)	2,210	2,210	2,210
Latent - Heat of Fusion (Btu)	1,407	1,407	1,407
Latent - Heat of Vaporization (Btu)	4,786	4,855	4,888
Total Energy to Food (Btu)	8,403	8,473	8,506
<b>Energy to Food (Btu/lb)</b>	<b>560</b>	<b>565</b>	<b>567</b>
Total Energy to Fryer	15,955	16,101	15,881
<b>Energy to Fryer (Btu/lb)</b>	<b>1,059</b>	<b>1,068</b>	<b>1,054</b>
<b>Cooking Energy Efficiency (%)</b>	<b>52.9</b>	<b>52.9</b>	<b>53.8</b>
<b>Cooking Energy Rate (Btu/h)</b>	<b>61,537</b>	<b>61,776</b>	<b>61,566</b>
<b>Electric Energy Rate (W)</b>	<b>95.7</b>	<b>96.4</b>	<b>96.2</b>
<b>Production Rate (lb/h)</b>	<b>58.4</b>	<b>58.1</b>	<b>58.7</b>
<b>Average Recovery Time (sec)</b>	<b>30.0</b>	<b>31.2</b>	<b>28.8</b>

## Cooking Energy Efficiency Data

*Table D-3. Medium-Load Fry Test Data.*

	Repetition #1	Repetition #2	Repetition #3
<b>Measured Values</b>			
Electric Energy Consumption (Wh)	14.58	15.85	15.74
Gas Energy Consumption (Btu)	9,100	9,152	9,439
<b>Cook Time (min)</b>	<b>2.33</b>	<b>2.27</b>	<b>2.25</b>
Total Test Time (min)	12.7	12.7	12.8
Weight Loss (%)	29.97	30.83	30.36
Initial Weight (lb)	7.500	7.500	7.500
Final Weight (lb)	5.252	5.188	5.223
Initial Fat Content (%)	6.1	6.1	6.1
Initial Moisture Content (%)	65.2	65.2	65.2
Final Moisture Content (%)	45.7	43.9	45.4
Initial Temperature (°F)	0	0	0
Final Temperature (°F)	212	212	212
<b>Calculated Values</b>			
Initial Weight of Water (lb)	4.890	4.890	4.890
Final Weight of Water (lb)	2.400	2.277	2.371
Sensible (Btu)	1,105	1,105	1,105
Latent - Heat of Fusion (Btu)	704	704	704
Latent - Heat of Vaporization (Btu)	2,414	2,532	2,438
Total Energy to Food (Btu)	4,222	4,341	4,247
<b>Energy to Food (Btu/lb)</b>	<b>563</b>	<b>579</b>	<b>566</b>
Total Energy to Fryer	9,199	9,259	9,546
<b>Energy to Fryer (Btu/lb)</b>	<b>1,220</b>	<b>1,228</b>	<b>1,266</b>
<b>Cooking Energy Efficiency (%)</b>	<b>46.1</b>	<b>47.2</b>	<b>44.7</b>
<b>Cooking Energy Rate (Btu/h)</b>	<b>43,095</b>	<b>43,133</b>	<b>44,244</b>
<b>Electric Energy Rate (W)</b>	<b>69.1</b>	<b>74.7</b>	<b>73.8</b>
<b>Production Rate (lb/h)</b>	<b>35.5</b>	<b>35.3</b>	<b>35.2</b>
<b>Average Recovery Time (sec)</b>	<b>12.6</b>	<b>16.8</b>	<b>18.6</b>

## Cooking Energy Efficiency Data

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*Table D-4. Light Load Fry Test Data.*

	Repetition #1	Repetition #2	Repetition #3
<b>Measured Values</b>			
Electric Energy Consumption (Wh)	8.87	10.74	10.08
Gas Energy Consumption (Btu)	6,165	5,967	5,834
<b>Cook Time (min)</b>	<b>2.05</b>	<b>2.04</b>	<b>2.00</b>
Total Test Time (min)	11.8	12.0	11.5
Weight Loss (%)	31.51	30.55	29.72
Initial Weight (lb)	3.750	3.750	3.750
Final Weight (lb)	2.569	2.605	2.636
Initial Fat Content (%)	6.1	6.1	6.1
Initial Moisture Content (%)	65.2	65.2	65.2
Final Moisture Content (%)	43.6	44.4	44.7
Initial Temperature (°F)	0	0	0
Final Temperature (°F)	212	212	212
<b>Calculated Values</b>			
Initial Weight of Water (lb)	2.445	2.445	2.445
Final Weight of Water (lb)	1.120	1.157	1.178
Sensible (Btu)	553	553	553
Latent - Heat of Fusion (Btu)	352	352	352
Latent - Heat of Vaporization (Btu)	1,284	1,248	1,226
Total Energy to Food (Btu)	2,188	2,152	2,131
<b>Energy to Food (Btu/lb)</b>	<b>584</b>	<b>574</b>	<b>568</b>
Total Energy to Fryer	6,225	6,040	5,902
<b>Energy to Fryer (Btu/lb)</b>	<b>1,652</b>	<b>1,601</b>	<b>1,565</b>
<b>Cooking Energy Efficiency (%)</b>	<b>35.3</b>	<b>35.8</b>	<b>36.3</b>
<b>Cooking Energy Rate (Btu/h)</b>	<b>31,239</b>	<b>29,833</b>	<b>30,409</b>
<b>Electric Energy Rate (W)</b>	<b>44.9</b>	<b>53.7</b>	<b>52.5</b>
<b>Production Rate (lb/h)</b>	<b>19.0</b>	<b>18.8</b>	<b>19.5</b>
<b>Average Recovery Time (sec)</b>	<b>18.6</b>	<b>21.6</b>	<b>18.0</b>

## Cooking Energy Efficiency Data

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*Table D-8. Cooking Energy Efficiency and Production Capacity Statistics.*

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	Cooking Energy Efficiency			Production Capacity
	Heavy Load	Medium Load	Light Load	
Replicate #1	52.9	46.1	35.3	58.4
Replicate #2	52.9	47.2	35.8	58.1
Replicate #3	53.8	44.7	36.3	58.7
<b>Average</b>	<b>53.2</b>	<b>46.0</b>	<b>35.8</b>	<b>58.4</b>
Standard Deviation	0.5	1.2	0.5	0.3
Absolute Uncertainty	1.3	3.0	1.2	0.8
Percent Uncertainty	2.5	6.5	3.4	1.3

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