

**Giles Model CF-400G Gas
Fryer Performance Testing**

Application of ASTM Standard
Test Method F 1964-99

FSTC Report 5011.03.07

**Food Service Technology Center
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Executive Summary

The Giles CF-400G gas kettle fryer is powered by an atmospheric burner rated at 43,250 Btu/h. The fryer is controlled by a solid state programmable computer. Figure ES-1 illustrates the CF-400G gas kettle fryer tested at the Food Service Technology Center (FSTC).



Figure ES-1.
**Giles CF-400G gas
fired fryer.**

Food Service Technology Center engineers tested the fryer under the controlled conditions of the American Society for Testing and Materials' (ASTM) Standard Test Method for the Performance of Pressure and Kettle Fryers.¹ 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 breaded 8-piece cut 2 ¾ pound frying chicken under two load scenarios: heavy—40 pieces and light—8 pieces. The cook time for the CF-400G heavy load test was 14.4 minutes. Production capacity is based on heavy load tests. Production capacity includes the cooking time and the time required for the frying medium to recover to 325 ± 5°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:

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

¹ American Society for Testing and Materials. 1999. *Standard Test Method for the Performance of Pressure Fryers*. ASTM Designation F 1964-99, in Annual Book of ASTM Standards, Philadelphia.

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

Table ES-1. Summary of Fryer Performance.

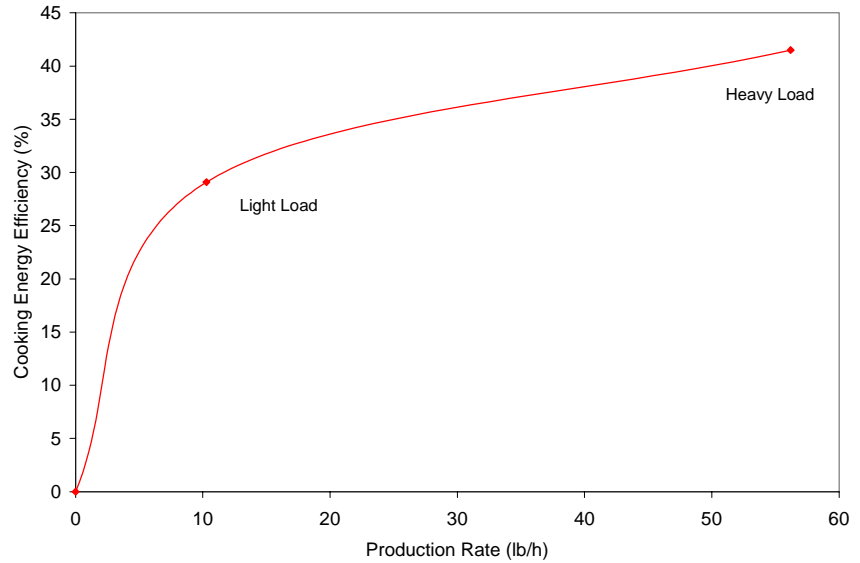
Rated Energy Input Rate (Btu/h)	43,250
Measured Energy Input Rate (Btu/h)	45,098
Preheat Time to 325°F (min)	8.91
Preheat Energy to 325°F (Btu)	6,863
Idle Energy Rate @ 325°F (Btu/h)	3,748
Cooking Energy Efficiency:	
Heavy-Load (%)	44.3 ± 2.5 ^a
Light-Load (%)	27.8 ± 2.1 ^a
Production Capacity (lb/h) ^b	56.2 ± 3.7

^aThis range indicates the experimental uncertainty in the test result based on a minimum of three test runs.

^bBased on the heavy-load cooking test

The CF-400G fryer demonstrated a very low idle rate of 3,748 Btu/h, indicating low standby losses. Testing under heavy-load conditions (40 pieces of chicken) proved the CF-400G can perform on par with fryers of much higher input rates. Heavy-load testing produced cooking energy efficiencies of 44.3% and a production capacity of 56.2 lb/h. The fryer did not suffer in performance during light-load (8 pieces of chicken) testing with a respectable 27.8% cooking energy efficiency. Figure ES-2 illustrates the relationship between cooking energy efficiency and production rate for the CF-400G fryer.

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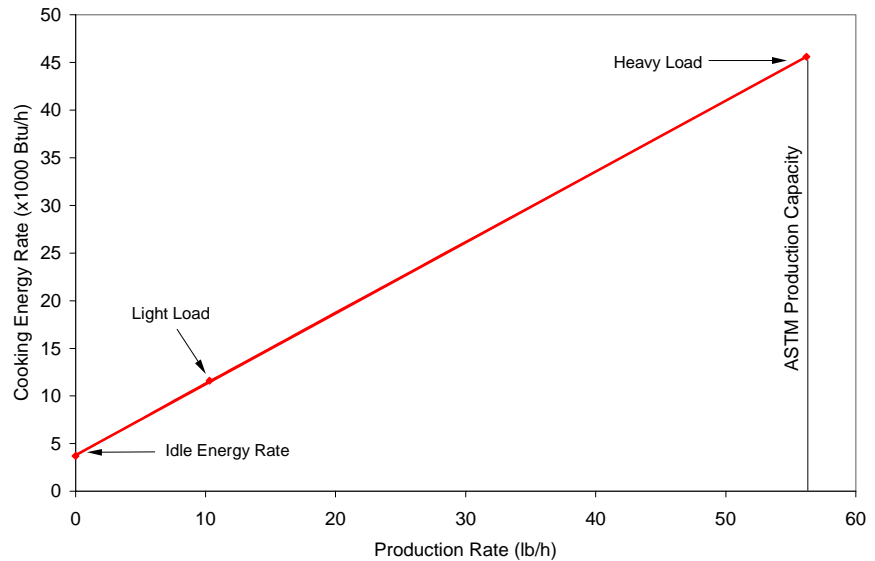


*Figure ES-2.
Fryer part-load cooking energy efficiency.*

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 CF-400G gas fryer are 11,247 Btu/h, 26,129 Btu/h, and 41,011 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 rate for this fryer would be 14,967 Btu/h.

Executive Summary

Figure ES-3.
Fryer cooking energy consumption profile.



Giles' CF-400G kettle fryer demonstrated impressive cooking performance during testing under the rigorous conditions of the ASTM test method. The innovative heat exchanger proved very effective in transferring heat into the oil. Heavy-load cooking energy efficiencies were higher than other chicken fryers tested at the FSTC.^{2,3} Light-load cooking energy efficiencies proved equally impressive. The CF-400G's low idle rate, high cooking energy efficiencies and respectable production rates, coupled with an array of features, such as all stainless-steel construction, auto-basket lift, and integrated filtration system, provides quality and performance an end-user can appreciate.

² Zabrowski, D., Young, R., Ardley, S., Knapp, S., Selden, S., 1995. *Delicatessen Appliance Performance Testing*. Food Service Technology Center Report 5016.95.23. October.

³ Cowen, D., Zabrowski, D. 2000. *Vulcan High Capacity Fryer Performance Test: Application of ASTM Standard Test Method F1361-99*. Food Service Technology Center Report 5011.00.88, December.

1 Introduction

Background

Fried foods continue to be popular on the restaurant scene. Kettle and pressure fryers typically are used for cooking foods such as 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.

In 1991, FSTC researchers developed a uniform test procedure to evaluate the performance of gas and electric fryers. This test method was submitted to the American Society for Testing and Materials' (ASTM) Committee F26 on Food Service Equipment and, in January 1992, it was accepted as a standard test method (Designation F 1361-99).¹ Pacific Gas and Electric Company's Development and Application of a Uniform Testing Procedure for Open,

Introduction

Deep-fat Fryers ² documents the developmental procedures and test results of several gas and electric fryers. Fryer performance is characterized by preheat time and energy consumption, idle energy consumption rate, pilot energy consumption rate, cooking energy efficiency and production capacity.

In 1995, the FSTC tested eight different pressure and kettle fryers as part of a larger undertaking for a major food service customer. ⁵ The results of the 1995 study laid the initial groundwork for quantifying pressure fryer performance using a simplified cooking test. This cooking test, with breaded chicken pieces, was refined and blended with the non-cooking portions of the original fryer test method. ASTM subsequently approved and ratified test methods for kettle and pressure fryers (Designation F1964-99), ³ and for large-vat chicken fryers (Designation F2144-01). ⁴

The Giles CF-400G kettle fryer is rated at 43,250 Btu/h and can use either natural or propane gas. The fryer features a cylindrical frypot with a tube burner surrounding the fry basket at the bottom. The fryer utilizes an automatic “Auto-Basket lift” system allowing the operator safe handling of the fry basket. A cooking computer controls temperatures and cooking times, as well as, the “Auto-Basket lift” feature. The CF-400G kettle fryer also features an integrated automatic oil filtration system.

Objectives

The objective of this report is to examine the operation and performance of the Giles CF-400G kettle 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 325°F.
3. Characterize the idle energy use with the thermostat set at a calibrated 325°F.

Introduction

4. Document the cooking energy consumption and efficiency under two fry loading scenarios: heavy (40 piece load) and light (8 piece per load).
5. Determine the production capacity during the heavy-load test.

Appliance Description

Giles' CF-400G gas-fired kettle fryer has an input rating of 43,250 Btu/h. A patented heat exchanger surrounds the fry basket inside the frypot (see Figure 1-1). The fryer features a polished stainless-steel cabinet and frypot, automatic basket lift, and a built-in filtration system (see figure 1-2). A cooking computer controls oil temperature, cook times and the auto-basket lift.

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

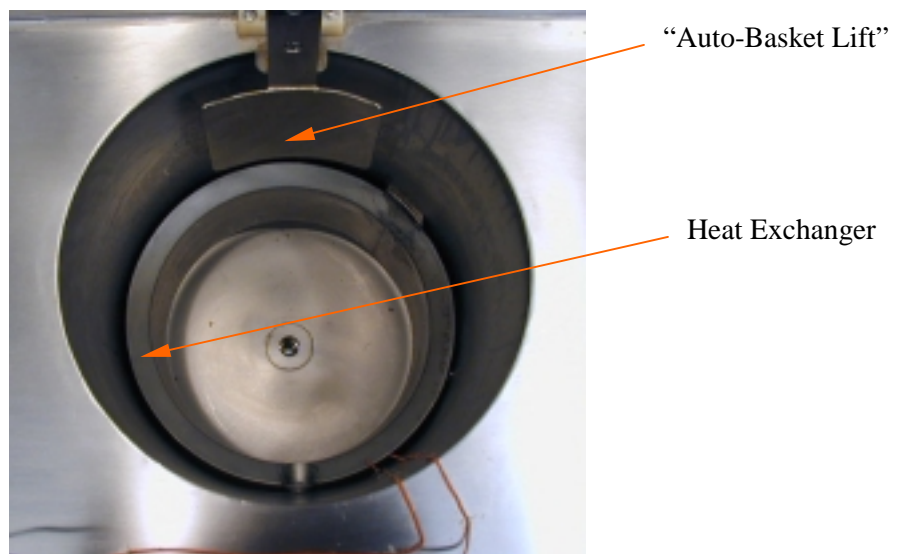
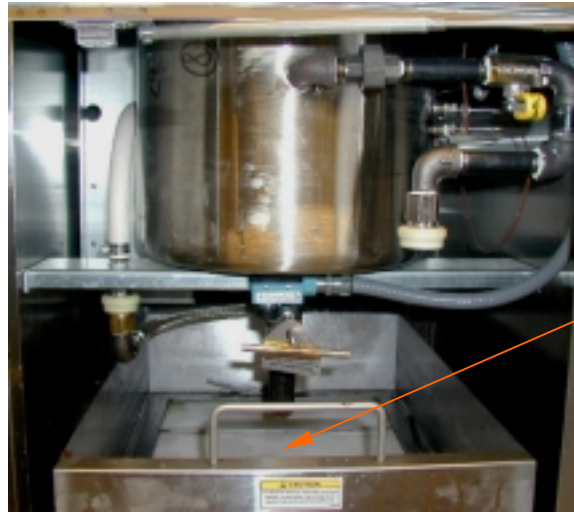


Figure 1-1.
Giles Frypot.

Introduction



Filtration system

*Figure 1-2.
Automatic filtration
system.*

Table 1-1. Appliance Specifications.

Manufacturer	Giles
Model	CF-400G
Rated Input	43,250 Btu/h
Oil Capacity	35 lbs
Frying Area	13 ⁵ / ₈ " in diameter
Construction	Polished stainless cabinet and frypot
Controls	Solid State
Generic Appliance Type	Kettle Fryer

2 Methods

Setup and Instrumentation

FSTC researchers installed the fryers 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 fryers and the edge of the hood. All test apparatus were installed in accordance with Section 9 of the ASTM test method.¹ See figure 2-1.

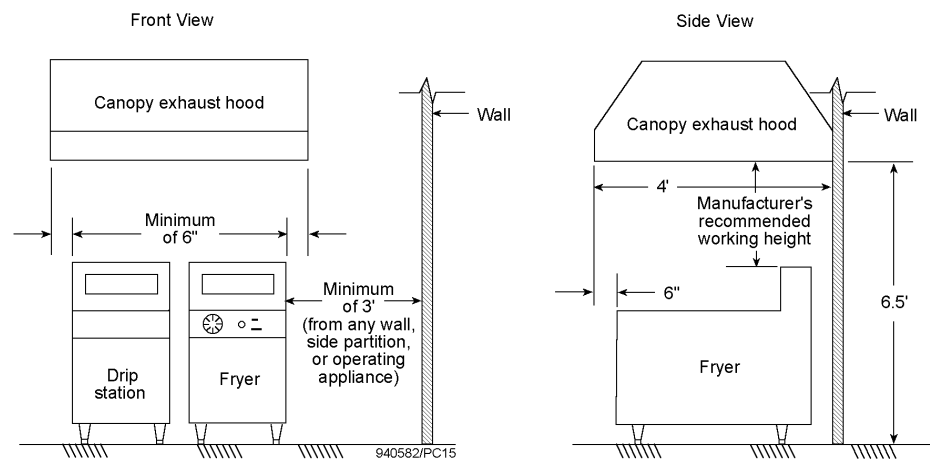


Figure 2-1.
Equipment configuration.

Researchers instrumented the fryer with a thermocouple to measure oil temperature. The thermocouple was placed in the cook zone 2 inches below the oil fill line and $\frac{1}{2}$ inch from the rear wall of the fry pot. See Figure 2-2.

Methods

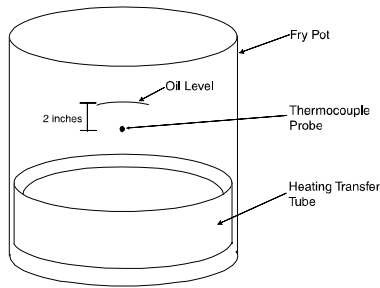


Figure 2-2.
Thermocouple placement for testing.

Natural gas consumption was measured using a positive displacement-type gas meter that generated a pulse every 0.1 ft³. 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.

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 consumption 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

The fryer was tested with 8-piece cut, 2 ¾-pound, individually quick frozen (IQF) frying chicken, which had been thawed, breaded, and stabilized in a refrigerator at 38 °F. Researchers tested the fryer using nominal heavy- and light-loads of chicken (Table 2-1). Each load comprised an equal number of breasts, wings, legs, and thighs. The chicken was cooked to an average weight loss of 27 ± 2%. This ensured fully-cooked chicken with no redness in the center.

Methods

During the testing, energy, time and oil temperature were recorded at 5-second intervals. Chicken temperature and weight loss were measured and recorded for use in energy calculations.

Table 2-1. Chicken Load Size.

	<i>Pieces</i>	<i>Avg. Weight</i>
Heavy Load	40	13.98
Light Load	8	2.96

Due to the logistics of removing one load of cooked chicken and placing another load into the fryer, a minimum preparation time of 10 minutes was incorporated into the cooking procedure. This ensured that the cooking tests were uniformly applied from laboratory to laboratory. Fryer recovery was then based on the frying medium reaching a threshold temperature of $325 \pm 5^\circ\text{F}$.

The cooking tests were run in the following sequence: three replicates of the heavy-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

Energy Input Rate

Prior to testing, the energy input rate was measured and compared with the manufacturer's nameplate value. This procedure ensured that the fryer was operating within its specified parameters. The measured energy input rate is listed in Table 3-1.

Table 3-1. Input Rate.

Name Plate (Btu/h)	43,250
Measured (Btu/h)	45,098
Percentage Difference (%)	4.27

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 325°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. The Giles CF-400G fryer was ready to cook in about 9 minutes. Figure 3-1 shows the preheat characteristics.

Results

Idle Energy Rate

Once the frying medium reached 325°F, the fryer was allowed to stabilize for half an hour. Time and energy consumption was monitored for an additional two-hour period while the fryer maintained the oil at 325°F. The idle energy rate during this period was 3,750 Btu/h.

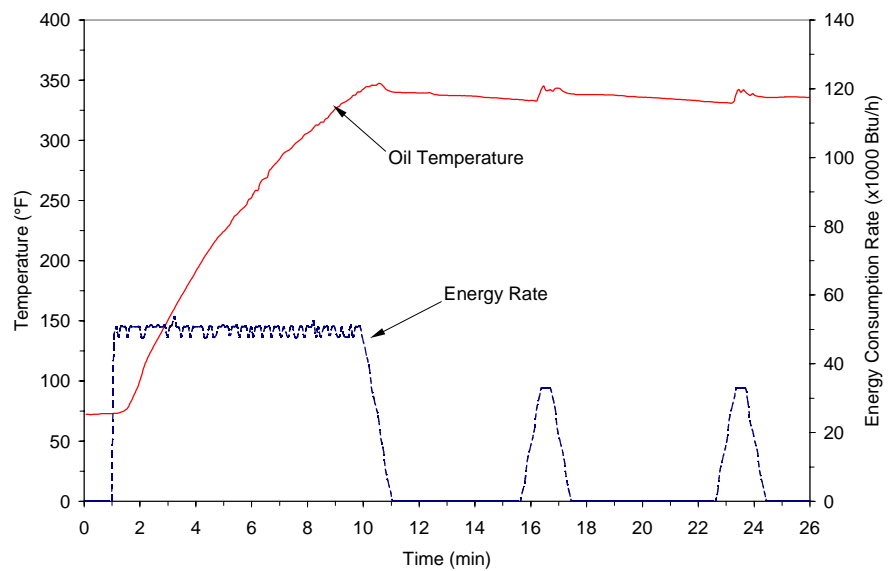


Figure 3-1.
Preheat characteristics to
325 °F.

Test Results

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

Results

Table 3-2. Input, Preheat and Idle Test Results.

Name Plate (Btu/h)	43,250
Measured (Btu/h)	45,098
Percentage Difference (%)	4.27
Preheat	
Time to 325°F (min)	8.91
Gas Energy Consumption (Btu)	6,860
Control Energy Consumption (Wh)	10.4
Rate to 325°F (°F/min)	28.5
Idle	
Gas Energy Rate (Btu)	3,750
Control Energy Rate (W)	17.2

Cooking Tests

The fryer was tested using 8-piece cut, 2 $\frac{3}{4}$ -pound (5.8 oz per piece) chicken that had been thawed, breaded, and stabilized at 38°F to 40°F. For heavy-load tests, the Giles CF-400G fryer cooked 40 pieces per load (10 of each type of piece—breast, wings, legs and thighs), while light-load tests used 8 pieces per load (two of each type of piece). Researchers monitored chicken cooking time and weight loss, frying medium temperature, 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 fryer was used to cook three or more heavy loads of chicken—one load after another in rapid succession, simulating a peak cooking period. Cooking energy efficiency and production capacity was determined from these tests. The characteristic temperature curve, or temperature signature, during a single heavy-load indicates how well the fryer maintained the oil

Results

temperature during a cooking test. This curve is also an indicator of product quality, as the chicken pieces begin to absorb more oil at lower cooking temperatures. Figure 3-4 illustrates the temperature signature for the CF-400G fryer under a heavy-load test.

The cook time for a heavy-load test was 14 minutes. Production capacity includes the cook time and recovery time.

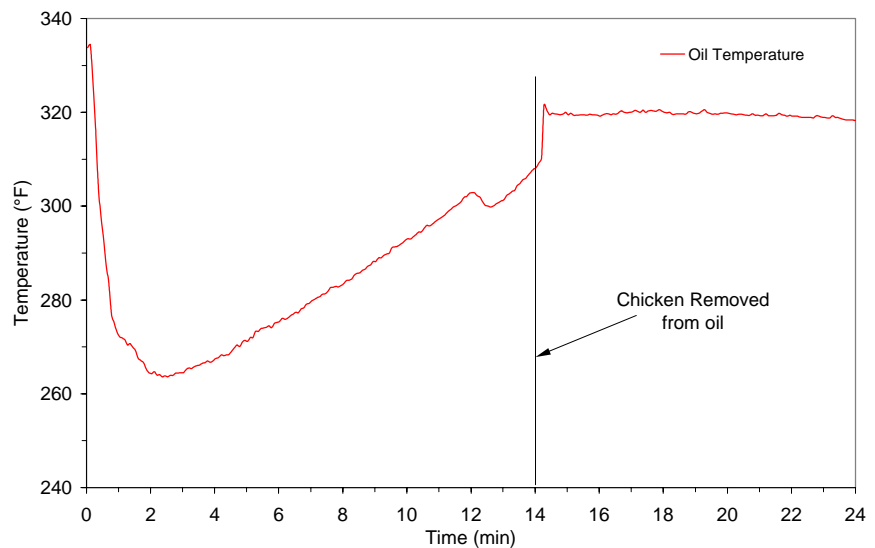


Figure 3-2
Chicken cooking cycle temperature signature.

Light Load Tests

Light load tests represent the fryer's performance under non-peak conditions. Since a fryer is often used to cook single-basket loads during slow periods, part-load efficiencies can be used to estimate a fryer's performance in an actual operation.

Results

Test Results

Energy imparted to the chicken was calculated by separating the various components of the chicken (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 chicken, expressed as a percentage of the amount of energy consumed by the fryer during the cooking process.

Heavy-load cooking energy efficiency results for the Giles CF-400G gas fryer were 45.3%, 44.7%, 45.1% and 42.0%, yielding a maximum uncertainty of 2.5% in the test results. Table 3-3 summarizes the results for the heavy- and light-load tests.

Table 3-3. Cooking Test Results.

	<i>Heavy</i>	<i>Light</i>
Load Size (pieces)	40	8
Cook Time (min)	14.4	14.0
Production Capacity (lb/h)	56.2 ± 3.7	10.3 ± 0.3
Gas Energy Consumption (Btu/lb)	10,155	3,455
Control Energy Consumption (W)	62.6	30.0
Cooking Energy Rate (Btu/h)	40,575	11,914
Cooking Energy Efficiency (%)	44.3 ± 2.5	27.8 ± 2.1

Figure 3-3 illustrates the relationship between cooking energy efficiency and production rate for the CF-400G fryer. Fryer production rate is a function of both the chicken cook time and the reloading time. Appendix D contains a synopsis of test data for each replicate of the cooking tests.

Results

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

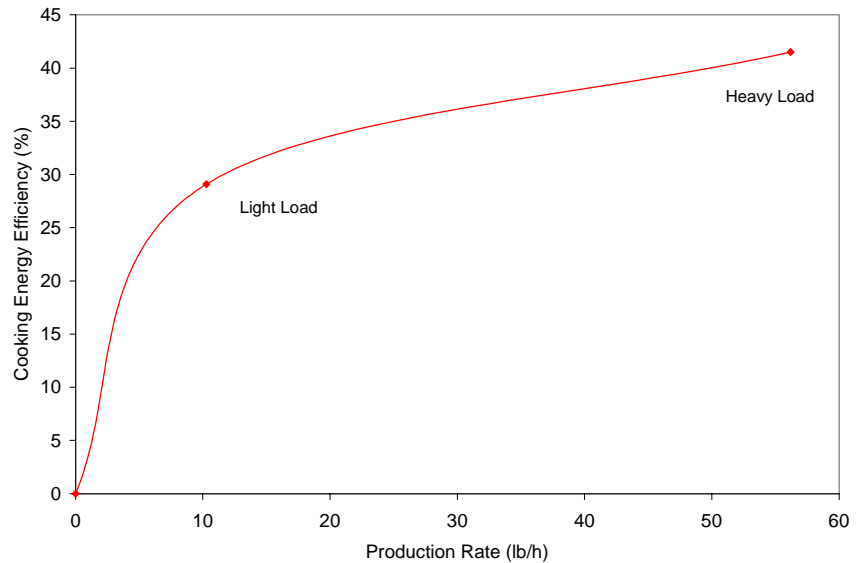


Figure 3-4 illustrates the relationship between the fryer’s average energy consumption rate and the production rate for frying chicken. This graph can be used as a tool to estimate the daily energy consumption for the fryer in a real-world operation. For example, the CF-400G fryer had estimated energy consumption rates of 11,247 Btu/h, 26,129 Btu/h, and 41,011 Btu/h at 10, 30, and 50 pounds per hour, 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 rate for this fryer would be 14,967 Btu/h.

Results

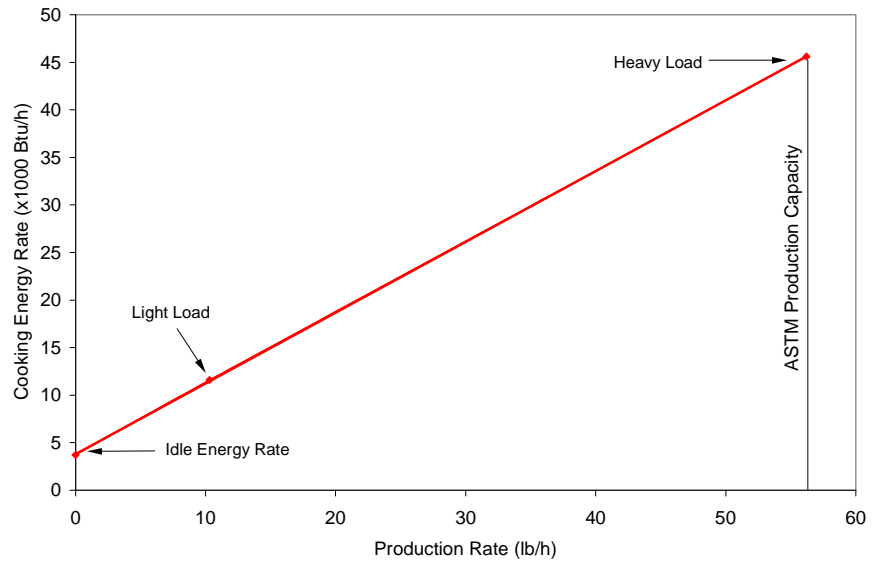


Figure 3-4.
Fryer cooking energy consumption profile.

Energy Cost Model

The test results can be used to estimate the annual energy consumption for the Giles CF-400G fryer in a real-world operation. A simple cost model was developed to calculate the relationship between the various cost components (e.g., preheat, idle and cooking costs) and the annual operating cost, using the ASTM data. Table 8 summarizes the daily energy consumption and associated annual energy cost for the CF-400G fryer under this scenario. For this model, the fryer was used to cook 150 pounds of chicken over a 12-hour day with one preheat per day, 365 days per year. The idle (standby) time for the fryer was determined by taking the difference between the total daily on-time (12 hours) and the time cooking and preheating.

Results

Table 3-4. Estimated Fryer Energy Consumption and Cost.

Gas Preheat Energy (kBtu/year)	2,504
Gas Idle Energy (kBtu/year)	9,312
Gas Cooking Energy (kBtu/year)	44,293
Annual Energy (kBtu/year) ^a	56,109
Annual Cost (\$/year) ^b	337

^a 1 kBtu = 1,000 Btu

^b Fryer energy costs are based on \$0.60/therm (1 therm = 100,000 Btu).

4 Conclusion

Giles' low pressure CF-400G kettle fryer offers energy-efficient food production in a durable stainless steel package. The CF-400G comes with an auto-basket lift mechanism that raises and lowers the fry basket into the frypot. This feature is immensely helpful to a food service operator. The auto-basket lift reduces the dangers associated with lowering and removing food product from 325°F oil. The fryer also incorporates an automatic oil filtration system, allowing for quick and easy cleaning of the frypot, while extending the life of the oil for the end-user.

During testing at the FSTC the CF-400G fryer posted impressive performance numbers. Heavy-load cooking energy efficiency was 44% with a production rate of 56 lb/h. Light-load testing was equally impressive with a production rate of 10 lbs/h and a cooking energy efficiency of 28%. The innovative heat exchanger proved very effective in transferring heat into the oil and food product. The CF-400G demonstrated a very low idle rate and preheat time confirming the ability of the heat exchanger to efficiently transfer heat.

Giles' CF-400G fryer compared very well to other gas fryers tested at the Food Service Technology Center.^{5,6} The CF-400G posted the fastest heavy-load cook time, giving it one of the highest production rates. The cooking energy efficiency was the highest tested to date, due in part to the effective heat exchanger design. Furthermore, the fryer's low idle rate maintains this high level of performance under part-load conditions as well. With its excellent cooking performance and low standby losses, the Giles' CF-400G gas kettle fryer sets the benchmark for gas-fired chicken fryers.

The low operating cost, based on the energy cost model and innovative designs features of the fryer, offer an enticing appliance for a food service operator.

5 References

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5. Zabrowski, D., Young, R., Ardley, S., Knapp, S., Selden, S., 1995. *Delicatessen Appliance Performance Testing*. Food Service Technology Center Report 5016.95.23. October.
6. Cowen, D., Zabrowski, D. 2000. *Vulcan High Capacity Fryer Performance Test: Application of ASTM Standard Test Method F1361-99*. Food Service Technology Center Report 5011.00.88, December.

A Glossary

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/ft³)

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.

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

Kettle Fryer

An appliance with a deep cooking container containing oil or fat at such a depth that the cooking food is essentially supported by displacement of the cooking fluid rather than by the bottom of the vessel.

Glossary

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.

Pressure Fryer

An appliance with a deep kettle containing oil or fat and covered by a heavy, gasketed lid with a pressure valve; the appliance kettle operates between 10 and 12 psig.

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 5°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

Appendix B includes the product literature for the Giles fryer.



Fry Kettle

Model CF-400G

Available for natural or propane gas, the Giles Gas Fry Kettle will cook 12-14 pounds of crispy, moisturized fried chicken, as well as other mouthwatering foods.

The completely automatic "Auto-Basket Lift," on the Giles Gas Fry Kettle, enables the operator to load the fryer, set the timer and activate the basket lift in one step. When the pre-set time for the frying cycle is complete, the Auto-Basket Lift automatically raises the finished product out of the oil to avoid over cooking.

Constructed of durable, polished stainless steel, the CF-400G is also equipped with casters for easy cleaning and maintenance, ensuring years of efficient, attractive service.



Design Features



Patented Gas Heat Exchanger

The exceptional design of the Giles Gas Heat Exchanger allows for a true "cold zone" and a more efficient heat transfer resulting in an increase in energy savings. The Heat Exchanger heats the shortening evenly inside the pot in a 360° radius from the sides of the pot. This special patent delivers 43,250 BTUs using natural or propane gas.



Automatic Oil Filtration System

Designed to complete a filter cycle within five minutes, the Automatic Oil Filtration System allows the operator to wash, rinse, drain, and filter the oil in one motion. Refill is automatic and will increase your shortening life by 50%.

Accessories

Unit is shipped with fry basket, drain hose wand, 5 filter papers, pot brush, K/D brush, stir paddle and manual.



Giles Foodservice Equipment A Division of Giles Enterprises, Inc.

P.O. Box 210247 • 2750 Gunter Park Drive West • Montgomery, AL 36121-0247 USA

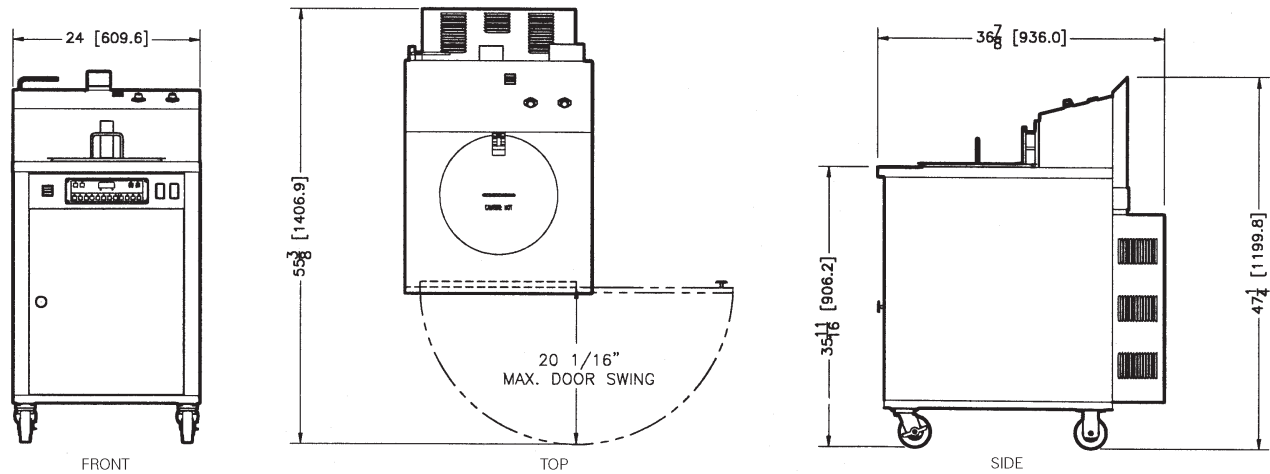
334.272.1457 • Fax 334.272.3561 • Phone Toll Free 1.800.554.4537

Web Site: www.gilesent.com • Email: info@gilesent.com

Fry Kettle

Model CF-400G

Job _____ Item No. _____ AIA# _____



Inches (millimeters)

36293-A

Legend

Construction:

Cabinet & Frypot: Polished Stainless Steel
Patented Heat Exchanger

We reserve the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements additions or replacements or previously purchased equipment.

Dimensions:

Width: 24" 610 mm
Depth: 37" 940 mm
Height: 47 1/2" 1206 mm
Fry Vat: 15 3/16" depth x 13 7/8" diameter 390 x 350 mm

Capacity:

Shortening Capacity: 36 lbs. (16.3 kg)
Production Capacity: 12-14 lb. chicken (5-6 kg)

Cooking Computer:

8 Menu Items
Variable Solid State
Range: 190 - 375°F 88 - 177°C
High Limit Thermostat: 425°F 220°C

Electrical Specifications:

120/208/230 V
7 AMPS/ 120 V = 1 phase
4 AMPS/ 208/230 V = 1 phase
(Service cord on 120 V only)

Gas Specifications:

1/2" Gas Line Input
43,250 BTUs on Natural or Propane Gas
Propane 10.5 W.C. Natural 3.5 W.C.

Listings:

AGA Design Certified, NSF, CGA Certified, CE.

Product Number:

CF-400G

How To Specify

- Specify as model CF-400G - Part #79175 (Natural, 208V), Part #79176 (LP, 208V), Part #79182 (Natural, 230V), Part #79183 (LP, 230V), Part #79192 (Natural, 120V), Part #79198 (LP, 120V).
- Specify voltage (120/208/230V).
- Specify altitude above sea level of installation site.
- Specify extra fry baskets (P#70275).*
- Specify extra filter paper (P#65490 - case = 100 sheets, extra filter powder (P#73275) - case = 25 lbs).*
- Specify shipping method.
- For export consult factory.

* Additional charges

Weights:

Shipping Weight:

390 lbs. (177 kg)

Shipping Cube Size:

420" x 30" x 56" = 41 cu. ft.
1067 mm x 762 mm x 1423 mm = 1.1 cu. meters

C Results Reporting Sheets

Manufacturer: Giles Enterprise Inc.
Model: CF-400G
Date: January 2003

Test

Description of operational characteristics: The Giles CF-400G gas fryer has an input rating of 43,250. Heat is transferred into the frying medium through a heat exchanger tube that circles the frypot surrounding the fry basket. An auto lift raises and lowers the fry basket into the frying medium through a switch on the control panel. The CF-400G gas fryer is controlled by a programmable cooking computer which uses an auto ignition for the burner.

Apparatus

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

Deviations: None.

Energy Input Rate.

Gas Heating Value (Btu/scf)	1015
Name Plate (Btu/h)	43.250
Measured (Btu/h)	45,098
Percentage Difference (%)	4.27

Thermostat Calibration

Thermostat Setting (°F)	315
Oil Temperature (°F)	330

Results Reporting Sheets

Preheat Energy and Time

Gas Heating Value (Btu/scf)	1017
Starting Temperature (°F)	72.2
Energy Consumption (Btu)	6,863
Control Energy Consumption (Wh)	10.4
Duration (min)	8.91
Preheat Rate (°F/min)	28.5

Idle Energy Rate

Gas Heating Value (Btu/scf)	1020
Gas Energy Rate @ 325 °F (Btu/h)	3,748
Control Energy Rate (W)	17.2

Heavy Load Cooking Energy Efficiency and Cooking Energy Rate

Gas Heating Value (Btu/scf)	1017
Load Size (pieces)	40
Cook Time (min)	14.4
Average Recovery Time (min)	56.2
Production Rate (lb/h)	56.2 ± 3.7
Energy to Food (Btu/lb)	321
Cooking Energy Rate (Btu/h)	40,575
Electric Energy Rate (W)	62.6
Energy per Pound of Food Cooked (Btu/lb)	726
Cooking Energy Efficiency (%)	44.3 ± 2.5

Results Reporting Sheets

Light Load Cooking Energy Efficiency and Cooking Energy Rate

Gas Heating Value (Btu/scf)	1015
Load Size (pieces)	8
Cook Time (min)	14.0
Average Recovery Time (min)	3.26
Production Rate (lb/h)	10.3 ± 0.2
Energy to Food (Btu/lb)	324
Cooking Energy Rate (Btu/h)	11,914
Electric Energy Rate (W)	30.0
Energy per Pound of Food Cooked (Btu/lb)	1,168
Cooking Energy Efficiency (%)	27.8 ± 2.1

D Cooking Energy Efficiency Data

Table D-1. Specific Heat and Latent Heat.

Specific Heat (Btu/lb, °F)	
Fat	0.400
Solids	0.200
Chicken	0.688
Latent Heat (Btu/lb)	
Fusion, Water	144
Fusion, Fat	44
Vaporization, Water	970

Cooking Energy Efficiency Data

Table D-2. Heavy-Load Test Data.

	Repetition #1	Repetition #2	Repetition #3	Repetition #4
Measured Values				
Electric Energy Consumption (Wh)	15.3	15.9	15.4	15.69
Gas Energy (Btu)	9,607	10,247	10,078	10,475
Cook Time (min)	14.5	15.0	14.0	14.0
Total Test Time (min)	15.0	15.6	14.9	14.3
Weight Loss (%)	27.10	29.88	24.81	25.30
Initial Weight (lb)	13.690	13.933	14.262	14.046
Final Weight (lb)	9.979	9.770	10.723	10.492
Initial Moisture Content (%)	63.0	63.0	63.0	63.0
Final Moisture Content (%)	55.4	55.6	52.7	54.4
Initial Temperature (°F)	38	39	39	39
Final Temperature (°F)	184	182	176	181
Water Loss (lb)	3.09	3.34	3.33	3.14
Calculated Values				
Initial Weight of Water (lb)	8.620	8.774	8.980	8.845
Final Weight of Water (lb)	5.526	5.431	5.651	5.703
Sensible (Btu)	1,377	1,364	1,338	1,370
Latent - Heat of Vaporization (Btu)	3,001	3,242	3,229	3,048
Total Energy to Food (Btu)	4,379	4,606	4,568	4,417
Energy to Food (Btu/lb)	320	331	320	314
Total Energy to Fryer (Btu)	9,659	10,301	10,131	10,529
Energy to Fryer (Btu/lb)	706	739	710	750
Cooking Energy Efficiency (%)	45.3	44.7	45.1	42.0
Cooking Energy Rate (Btu/h)	38,377	39,538	40,528	43,860
Electric Energy Rate (W)	61.2	61.5	62.1	65.7
Production Rate (lb/h)	54.7	53.8	57.4	58.8
Recovery Time (sec)	31.2	33.0	55.2	19.8

Cooking Energy Efficiency Data

Table D-3. Light-Load Test Data.

	Repetition #1	Repetition #2	Repetition #3	Repetition #4
Measured Values				
Electric Energy Consumption (Wh)	8.02	9.12	8.88	8.50
Gas Energy (Btu)	3,215	3,512	3,512	3,463
Cook Time (min)	14.0	14.0	14.0	14.0
Total Test Time (min)	17.1	17.9	16.9	17.1
Weight Loss (%)	26.01	27.06	30.21	27.45
Initial Weight (lb)	2.998	3.097	2.859	2.893
Final Weight (lb)	2.218	2.259	1.995	2.099
Initial Moisture Content (%)	62.6	62.6	62.6	62.6
Final Moisture Content (%)	54.7	55.3	52.9	55.7
Initial Temperature (°F)	39	39	38	39
Final Temperature (°F)	183	182	184	182
Water Loss (lb)	0.66	0.69	0.74	0.64
Calculated Values				
Initial Weight of Water (lb)	1.877	1.939	1.790	1.811
Final Weight of Water (lb)	1.214	1.249	1.055	1.169
Sensible (Btu)	298	306	297	286
Latent - Heat of Vaporization (Btu)	643	669	713	623
Total Energy to Food (Btu)	941	975	1,010	908
Energy to Food (Btu/lb)	314	315	353	314
Total Energy to Fryer (Btu)	3,243	3,543	3,542	3,492
Energy to Fryer (Btu/lb)	1,082	1,144	1,239	1,207
Cooking Energy Efficiency (%)	29.0	27.5	28.5	26.0
Cooking Energy Rate (Btu/h)	11,281	11,759	12,461	12,156
Electric Energy Rate (W)	28.1	30.5	31.5	29.8
Production Rate (lb/h)	10.5	10.4	10.1	10.2
Recovery Time (min)	3.10	3.92	2.91	3.09

Cooking Energy Efficiency Data

Table D-4. Cooking Energy Efficiency and Production Capacity Statistics.

	Cooking Energy Efficiency		Production Capacity
	Heavy Load	Light Load	
Replicate #1	45.3	29.0	54.7
Replicate #2	44.7	27.5	53.8
Replicate #3	45.1	28.5	57.4
Replicate #	42.0	26.0	58.8
Average	44.3	27.8	56.2
Standard Deviation	1.6	1.3	2.3
Absolute Uncertainty	2.5	2.1	3.7
Percent Uncertainty	5.6	7.6	6.6
