Elemental Impact

An Independent Engineer's Report on

Water, Chemical, & Cost Savings in Commercial Kitchens

simplifying

Airborne Grease Filtration

grease LOCK SYSTEM

Ei Elemental IMPACT

August 16, 2013

Re: Water, Chemical, & Cost Savings in Commercial Kitchens By Using Grease Lock Filters

To Whom It Concerns:

Elemental Impact worked closely with Jay Parikh, Compliance Solutions International president, on orchestrating an independent restaurant pilot report to substantiate the economic and environmental savings when Grease Lock Filters are used in kitchen exhaust systems. For the pilot, three restaurants installed the GLF system for an eight-week trial period and were closely monitored throughout the pilot period.

Proactive in nature, the disposable GLF are placed in front of the kitchen exhaust system baffle filters and collect grease particulates from kitchen cooking prior to entering the exhaust system. Thus, grease build-up is significantly reduced on the baffle filters, within the exhaust duct system and on the roof surrounding the ventilation area.

Ei Partner Ellis Fibre manufactures the patented GLF and fully supported the three-restaurant pilot.

The following comprehensive report documents the impressive water, chemical and labor savings experienced by the participating restaurants. In each case, the restaurant's bottom line improved by using GLF due to reduced cleaning of the baffle filters and the entire kitchen exhaust system.

In addition to the documented labor, water and chemical savings in the report, the facility experiences reduced fire risk and repairs & maintenance due to less grease accumulation within the exhaust system and the roof ventilation area.

GLF create a scenario where the foodservice operator's bottom line, the community and the environment WIN!

Sincerely,

Holly Elmore

Elemental Impact
Founder & CEO

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Water, Chemical, & Cost Savings in Commercial Kitchens By Using Grease Lock Filters

A Report on Restaurant Pilots

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June 2013

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Executive Summary

Local and federal regulations require the food service industry to monitor the grease buildup in commercial kitchen exhaust systems to reduce the fire risk in the facility. According to the National Fire Protection Association (NFPA) November, 2012 report on Structure Fires in Eating and Drinking Establishments, during 2006-2010, an estimated average of 7,640 structure fires in eating and drinking establishments were reported to U.S. fire departments per year. Associated annual losses of 2 civilian deaths, 115 civilian injuries, and $246 million in property damage were reported.

All commercial kitchens are required by the various State authorities to adhere to certain codes and standards adopted by the individual State. Every State has adopted either the NFPA-96, the International Mechanical Code, or the Uniform Mechanical Code, with or without deviations, as the relevant code that pertains to commercial kitchens. Per these codes, all commercial kitchens must install and maintain an exhaust system for the purpose of evacuating heat, grease effluent, moisture and smoke from the cooking area.

These exhaust systems must then be monitored and maintained in accordance with the code to prevent excessive buildup of grease effluent inside the entire exhaust system, which includes the hood, baffle filters, duct, and exhaust fan. Grease effluent can build up inside these areas rapidly and provide a fuel source in the event of a fire in the exhaust system. The codes require the frequency of inspections depending on the cooking equipment used and also the volume of cooking. Most restaurant operators are required to inspect the exhaust systems monthly or quarterly, and usually with each inspection a cleaning may be required.

Traditionally, the methods used by the food service industry to manage the kitchen exhaust system grease buildup are reactive: accumulated grease is periodically cleaned from the entire exhaust system, including the hood and duct leading to the roof or external wall. Additionally, the baffle-type grease filters (also referred to as metal baffle filters or baffle filters) require frequent cleanings, usually daily or multiple times per week.

A substantial amount of water is used in cleaning the baffle filters. Water is also used in cleaning the exhaust system on a regular basis. Chemicals and labor are used in these cleanings as well. These cleanings generate significant amounts of wastewater, which also carries the chemicals. Use of water, chemicals, and labor in these cleanings, and treatment of the resulting wastewater, costs substantially.

This report examines the economic and environmental benefits of the Grease Lock System (GLS), which use patented disposable grease removal devices called Grease Lock Filters (GLFs), which proactively capture grease before it enters the exhaust system. Fire risk in commercial kitchens is reduced due to the minimized fuel source inside the exhaust systems. The report confirms significant reductions in water consumption and chemical usage along with associated cost-savings and the impact of less greasy, chemical-filled discharge in the municipal wastewater systems. According to the Safety Data Sheet for one of the cleaning products used, it is dangerous, corrosive, and very toxic to aquatic organisms, causes burns, and its contact with soil, waterways, drains and sewers is to be avoided.

This report documents the results from three GLS pilots in a cross-section of commercial kitchens - a Quick Service Restaurant (QSR) serving fried chicken, a high volume QSR restaurant that cooks hamburgers and fried food, and an Asian casual dining restaurant that uses woks, fryers and a flat top for a variety of foods.

The pilot results confirm the environmental and economic benefits referenced above and summarized in the chart below. Documented benefits are typical for foodservice operators using an exhaust hood of

about 20' in length with an average duct system of around 15 feet in length. Additional savings are expected for kitchens with longer exhaust hoods, and/or longer exhaust ducts having horizontal sections in the duct.

Average Annual Savings With GLFs – for Water, Chemical, Labor & Total Costs				
Area of Interest	**Water, Gallons/Yr.**	**Chemical, Gallons/Yr.**	**Labor Used, Hours/Yr. or No. of Cleaning Services/Yr**	**Total Cost, $/Yr**
Baffle GF[1]	10,559	121	175	$3,569
KES[2]	1,748	1	5	$1,726
WW[3]	12,307	122	-	$81

[1]GF – Grease filter; [2]KES - Kitchen exhaust system; [3]WW - Wastewater

Introduction

Background

In commercial kitchens, exhaust hoods capture and remove the grease effluent, moisture, heat, smoke, and products of combustion generated by the cooking appliances and food during cooking operations. Grease filters or grease removal devices are required at the inlet of an exhaust hood to remove the grease particulates before entering the hood and traveling through the exhaust system. Most hoods are equipped with typical baffle-type grease filters, which are inefficient in removing the grease particulates, and primarily function as a flame barrier to prevent flames from penetrating beyond 18" inside the hood.

Grease accumulates in the grease filters and in the exhaust system - hood, grease duct, and exhaust fan - and on the kitchen roof. The mechanical & fire codes require regular inspection and cleaning of the exhaust system and roof.

In 2009 Ellis Fibre USA introduced the Grease Lock System which uses the GLFs consisting of fiber-based filtering media in a multi-stage design. Placed upstream (or in front) of the baffle filters, the GLFs capture and remove grease particulates generated during cooking, prior to entering the kitchen exhaust system. GLF's grease particle removal efficiency is 95% to 99% (for 6 to 8 microns particle size), while the grease particle removal efficiency of a typical baffle filter for the same size grease particles is 10% to 20%. The efficiency for the smaller grease particles of 3 to 5 microns size drops significantly for the baffle filters to 2% to 6%, while the GLFs remain 58% to 90% efficient (based on independent testing).

The disposable, non-metallic, high efficiency, GLFs keep the baffle filters, hood, duct, exhaust fan, and roof cleaner and reduces cleaning frequency. By contrast, other types of "non-disposable" high efficiency grease filters (which are mostly made of metal) require frequent cleanings and do not offer the substantial savings of water (usage & wastewater treatment), labor, chemical, and replacement baffle filters, associated with reduced baffle filter cleaning.

Objective

The pilot project objectives include three primary goals: (1) quantify the water, chemical, and labor used in cleaning the baffle filters, exhaust system and roof in foodservice establishments, and associated wastewater and costs, (2) quantify the savings in water, chemical, and labor used in these cleanings, reduction in wastewater, and associated cost savings when the GLFs are used in these operations, and (3) document the economic and environmental benefits of using the GLFs based on pilot results in a comprehensive report.

Pilot Scope

The pilot project scope was to evaluate GLFs performance when installed in exhaust hoods of three existing restaurants. Savings were anticipated in water (usage & wastewater treatment), chemicals, and labor used in baffle filters, exhaust system and roof cleanings. Establishing a "baseline" of the current cleaning practices along with associated water, chemicals, and labor use by the participating restaurants was necessary prior to GLFs installation. GLF performance, defined as grease particulates removal and associated reduced baffle filter and kitchen exhaust system cleanings, was monitored during these pilots.

Pilot Plan

A comprehensive list of items was developed to establish a "baseline" of the current water, chemicals, and labor use by the participating pilot restaurants. It also included information on the GLF installation, and costs of water & wastewater. This information is referred to as "Before Pilot" data (see Appendix A1) which includes the following information:

1. Existing kitchen exhaust system (KES) condition - information on the hoods, baffle filters, cooking appliances, exhaust duct & fan, grease accumulation in KES, and the last KES cleaning date
2. Baffle grease filter cleaning - frequency, water & chemical quantities used, cost of chemical used, and labor required to clean the baffle filters
3. KES cleaning - quantity and cost of water & chemical used, and cost of cleaning & energy used t
4. GLF installation - the size & number of GLFs installed along with associated costs
5. Utility costs - which includes costs of water and wastewater where the participating restaurant is located, and
6. Photo documentation - photos of pertinent KES areas at critical pilot stages

GLF performance was documented in "During the Pilot" data (see Appendix A2) which includes the following information:

1. GLF replacement timing
2. Baffle grease filter cleaning timing, quantity & cost of water and chemicals used, and labor required
3. Photo documentation of pertinent KES areas at critical pilot stages

The following three restaurants participated in these pilots, two in the metro-Atlanta, GA area and one in the Dallas, TX area:

1. Kentucky Fried Chicken, (KFC), Winder, GA (2 Wall Canopy Hoods, 11' & 12' long, using a total of 14 Baffle Filters)
2. Pei Wei, Atlanta Airport, College Park, GA (2 Wall Canopy Hoods, each 11' long, using a total of 14 Baffle Filters)
3. Twisted Root Burger Company, Bedford, TX (2 Island- Canopy Hoods, each 8-1/3' long, using a total of 10 Baffle Filters)

The pilots documented eight weeks of GLF performance.

Data Collection

"Before Pilot" data for the respective pilots is documented as follows:

- Appendix B1 – KFC data gathered on February 18, 2013
- Appendix C1 – Pei Wei data gathered on February 20, 2013
- Appendix D1 – Twisted Root Burger Company data gathered on March 8, 2013

"During Pilot" data was gathered over an eight-week period and documented as follows:

- Appendix B2 – KFC data gathered beginning February 18, 2013
- Appendix C2 – Pei Wei data gathered beginning on February 20, 2013
- Appendix D2 – Twisted Root Burger Company data gathered beginning on March 8, 2013

Appendix E includes the "Before Pilot" and "During Pilot" photo documentation for the three restaurants.

Results and Discussion

The three main pilot results are categorized as follows:

1. Baffle grease filter cleaning, which includes: (a) water used & its cost, (b) chemical used & its cost, (c) labor used & its cost, and savings realized due to GLF use
2. KES cleaning, which also includes: (a) water used & its cost, (b) chemical used & its cost, (c) labor used & its cost, and savings realized due to GLF use
3. Wastewater generation which includes water and chemical used in baffle filter & KES cleanings, and savings realized due to GLF use

In addition, the GLF reduces fire hazard associated with grease accumulation in the baffle filters, KES, and on the roof due to a cleaner exhaust system. Reduced grease flowing into the KES reduces grease effluent discharge into the atmosphere and on surrounding HVAC equipment, such as coils and other components, and saves energy used in exhaust fan and other HVAC equipment operation.

Data Analysis

Below are the results for the three GLF restaurant pilots:

KFC

1. Baffle grease filter cleaning:

   (a) **Water Use & Cost** - A total of 14 baffle grease filters are used in 2 hoods in this kitchen. Three filters are cleaned every night, by soaking them in a 50-gallon container. Result: about 1,500 gallons of water used monthly to clean all the filters, or about 18,000 gallons per annum, to clean the baffle filters. The Winder, GA water cost (based on the recent utility bills of this restaurant) is $0.76/100 gallons. The water cost for cleaning the filters at this KFC is about $11.40/month, and $136.80/year.
   (b) **Chemical Use & Cost** – 0.5 gallon of chemical is used every night to clean 3 filters, which costs $2.86/night. Result: about 183 gallons of chemical is used per year at a cost of $1,030.
   (c) **Labor & Cost** – 0.5 hour of labor (by 1 person) is used every night to clean 3 filters, which costs $4.25/night. Result: about 183 hours of labor is used per year at a cost of $1,556/year.

2. KES cleaning:

   (a) **Water Use & Cost** - A total of 466 gallons of water was used in cleaning the kitchen exhaust system at KFC, which is scheduled every 3 months. Result: annual estimated KES water usage is 1864 gallons at $0.76/100 gallons. The water cost for cleaning the KES is about $3.60/cleaning, and $14.2/year.

(b) **Chemical Use & Cost** – About 0.2 gallon of chemical is used to clean the KES at KFC, which costs about $9.30/cleaning. Result: about 0.8 gallon of chemical is used per year to clean the KES at a cost of about $37.20.

(c) **Labor/Service & Energy Cost** – KFC pays a contractor $325 per KES quarterly cleaning, a $1,300 annual cost. The energy cost for pressure washing of KES using 1 gal of gasoline each quarter at a cost of $3.69, results in about $15/year.

3. Wastewater generation & cost

Total annual wastewater generated at KFC due to exhaust system cleaning is about 19,864 gallons (baffle filters: 18,000 gallons; KES: 1864 gallons). The wastewater treatment cost in Winder, GA is $3.84/1,000 gallons (based on the recent restaurant utility bills). Result: total annual wastewater treatment cost is $76.28 for these cleanings.

The 19,864 gallons of wastewater generated per annum contains 184 gallons of chemicals (baffle filters: 183 gallons: KES: 0.80 gallon).

4. GLF Performance

Photos 2 to 4 in Appendix E show the "Before Pilot" hoods, baffle grease filters, fire suppression system linkage, duct collar, and the exhaust duct looking up. Grease accumulation was seen in the duct collar, on the fire suppression system linkage, and in the exhaust duct. Photos 5 to 7 in Appendix E show the "During Pilot" hood, baffle grease filter, and the exhaust duct looking down.

Photos # 5 & 6 were taken during week 4 in the pilot, and show the baffle filter (after the GLF in its front removed), and the GLFs, respectively. After 4 weeks, the baffle filter looks as clean as that in photo # 2 (which is cleaned every day), and the GLFs do not show the sign of much grease accumulation. Photo # 7, taken during pilot week 6, shows minimal grease accumulation on the exhaust duct surfaces.

Pei Wei

1. Baffle grease filter cleaning:

(a) **Water Use & Cost** - A total of 14 baffle grease filters are used in 2 hoods in this kitchen. The filters are cleaned every night, by soaking them in 5 batches of 3 GFs/batch, which uses a total of 12 gallons each night to clean all 14 filters. Result: 365 gallons of water used monthly, 4,380 gallons per annum, to clean the baffle filters at this Pei Wei.

The cost of water for this Atlanta Airport restaurant is based on the City of Atlanta's published water & sewer (wastewater) rates, as advised by the Atlanta airport's Utilities Manager. The Atlanta City Watershed Management Dept.'s published rates for water & wastewater (WW) are tiered to promote water (& wastewater) conservation, are for CCF (1 CCF = 100 Cu. Ft. = 758 gallons), and are as follows:

Water: For 1 to 3 CCF - $2.58/CCF; for 4 to 6 CCF - $5.34/CCF; and for 7 & more CCF - $6.16/CCF
Wastewater: For 1 to 3 CCF - $9.74/CCF; for 4 to 6 CCF - $13.64/CCF; and for 7 & more CCF - $15.69/CCF

Since Pei Wei uses water for other things in addition to cleaning the filters, the water rate of $6.16/CCF is used in calculating the water cost, which is $0.81/100 gallons. So, the water cost for cleaning the filters at this Pei Wei is about $36/year.

(b) **Chemical Use & Cost** – 0.16 gallon of chemical is used every night to clean all 14 filters, which costs $4.06/night. Results: 58 gallons of chemical is used per year at a cost of about $1,482.

(c) **Labor & Cost** – 0.25 hour of labor (by 1 person) is used every night to clean all 14 filters, which costs $2.10/night. Result: 91 hours of labor is used per year at a cost of about $766/year.

2. KES cleaning:

(a) **Water Use & Cost** - A total of 342 gallons of water was used in cleaning the kitchen exhaust system at Pei Wei, which is scheduled every month. Result: annual estimated KES water usage is 4,104 gallons at a cost of $0.81/100 gallons. The water cost for cleaning the KES is about $2.78/cleaning, and $33.36/year.
(b) **Chemical Use & Cost** – About 0.2 gallon of chemical is used to clean the KES at Pei Wei, which costs about $9.30/month. Result: about 2.4 gallon of chemical is used per year to clean the KES at a cost of about $111.60.
(c) **Labor/Service & Energy Cost** – Pei Wei pays a contractor $325 per KES monthly cleaning, a $3,900 annual cost. The energy cost for pressure washing of KES using 1 gal of gasoline each month at a cost of $3.69, results in about $44/year.

3. Wastewater generation & cost

Total Annual wastewater generated at Pei Wei due to exhaust system cleaning is 8,484 gallons (baffle filters: 4,380 gallons; KES: 4,104 gallons). The wastewater treatment cost is $20.70/1,000 gallons (as mentioned in section 1(a) above). Result: total annual wastewater treatment cost is $175.62 for these cleanings.

The 8,484 gallons of wastewater generated per annum contains 60.4 gallons of chemicals (baffle filters: 58 gallons; KES: 2.4 gallons).

4. GLF Performance

Photos 9 to 12 in Appendix E show the "Before Pilot" fire suppression system linkage, the exhaust duct looking up & down, and exhaust fan blades & casing. Grease accumulation was seen on the fire suppression system linkage, in the exhaust duct, and on the exhaust fan casing. Photos 13 to 15 in that Appendix show the "During Pilot" hood plenum, baffle grease filter, a GLF, fire suppression system linkage, and exhaust fan blades & casing.

Photo # 13 was taken during week 4 in the pilot, and shows the baffle grease filter (after the GLF in its front removed), the GLF, and the hood plenum. After 4 weeks, the grease filter and hood plenum look clean, and the GLF does not show the sign of much grease accumulation. Photos # 14 & 15 were taken during week 6 in the pilot, and show almost no grease accumulation on fire suppression system linkage, and very little on exhaust fan casing.

Twisted Root Burger Company

1. Baffle grease filter cleaning:

(a) **Water Use & Cost** - A total of 10 baffle grease filters are used in 2 hoods in this kitchen. The filters are cleaned every night, by spraying & soaking all filters. Thirty gallons of water is used every night to clean all 10 filters. Result: 912.5 gallons of water used monthly, 10,950 gallons per annum, to clean the baffle filters. The Bedford, TX water cost (based on information provided by

the restaurant operator) is $0.29/100 gallons. The water cost for cleaning these filters at this Twisted Root is about $32/year.

(b) **Chemical Use & Cost** – about 0.4 gallon of chemical is used every night to clean all 10 filters, which costs $9.75/night. Result: about 139 gallons of chemical is used per year at a cost of about $3,559.

(c) **Labor & Cost** – 0.75 hour of labor (by 1 person) is used every night to clean all 10 filters, which costs $6.75/night. Result: about 274 hours of labor is used per year at a cost of about $2,464/year.

2. KES cleaning:

(a) **Water Use & Cost** - A total of 256 gallons of water was used in cleaning the kitchen exhaust system at Twisted Root, which is scheduled every 3 months. Result: annual estimated KES water usage is 1024 gallons at a cost of $0.29/100 gallons. The water cost for cleaning the KES is $0.74/cleaning and about $3/year.

(b) **Chemical Use & Cost** – 0.16 gallon of chemical is used to clean the KES at Twisted Root, which costs about $8/night. Result: about 0.6 gallon of chemical is used per year to clean the KES at a cost of about $31.70.

(c) **Labor/Service & Energy Cost** – Twisted Root pays a contractor $350 per KES quarterly cleaning, a $1,400 annual cost. The energy cost for pressure washing of KES using 1 gal of gasoline each quarter at a cost of $3.69, results in about $15/year.

3. Wastewater generation & cost

Total annual wastewater generated at Twisted Root due to exhaust system cleaning is 11,974 gallons (baffle filters: 10,950 gallons; KES: 1,024 gallons). The wastewater treatment cost is $1.72/1,000 gallons (based on information provided by restaurant operator). Result: total annual wastewater treatment cost is $20.60 for these cleanings.

The 11,974 gallons of wastewater generated per annum contains 140 gallons of chemicals (baffle filters: 139 gallons; KES: 0.6 gallons).

4. GLF Performance

Photos 17 & 18 in Appendix E show the “Before Pilot” fire suppression system linkage, duct collar, and the exhaust duct looking up & down. Grease accumulation was seen in the exhaust duct. Photos 19 to 22 in that Appendix show the “During Pilot” baffle grease filter (removed from the hood), the exhaust duct looking up, and exhaust fan blades & casing.

Photos # 19 & 20 were taken during week 3 in the pilot, and show the baffle grease filter and the exhaust duct looking up. After 3 weeks, both the grease filter and duct look very clean. Photos # 21 & 22 were taken during week 4 in the pilot, and show almost no grease accumulation on surfaces of the exhaust duct, and fan blades & casing. Since the photos of exhaust duct, and fan blades & casing taken during week 8 in the pilot did not show any more grease accumulation than seen during week 4, and the photos taken during week 4 were better in the photo quality than for the photos of week 8, photos from week 4 were used in this report.

For the three pilot restaurants, 384 gallons of chemicals per annum are used in the nightly baffle grease filter cleanings (substantially more in quantity than used in the exhaust systems cleanings). The 384 gallons of chemicals contaminate 40,322 gallons of waste water each year. One of these chemicals is classified as dangerous, causes burns, contains sodium hydroxide which is corrosive, and is very toxic to

aquatic organisms. Due to this risk to the environment, the following statement is included in the Materials Safety Data Sheet (MSDS) for this chemical regarding its disposal:

> "Methods of Disposal: The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional & local authority requirements. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers."

GLF Benefits

In these pilots, some of the major benefits of the GLFs were in: (1) savings of water, chemicals, and labor used in cleaning the grease filters and exhaust system, (2) reduction in wastewater generated due to these cleanings & the chemicals that go into the wastewater, and (3) associated cost savings.

These benefits are the environmental & economic benefits of the GLFs.

None of the baffle filters in the 3 restaurant pilots required cleaning during the 8-week pilots, as documented in Appendix B2, C2, and D2. Result: restaurant baffle filter cleanings would be less than 6 times per year. For these savings calculations, a conservative cleaning frequency of six times per year, or every 2 months with GLF use is assumed.

Based on the lack of grease accumulation in the exhaust system during the 8-week evaluation and Ellis Fibre USA experience with the GLFs in similar restaurants, KES cleaning frequency would be reduced by 75%. In the case of 2 of these pilot sites, the cleanings would reduce from four (4) times per year to once per year, when using the GLFs.

The specific annual water, chemicals, and labor savings, reduction in wastewater generated, and associated cost savings when GLFs are used for the three restaurants are quantified below.

KFC

1. Baffle grease filter cleaning (6 times/year)

   (a) Water use of 1,400 gallons vs. 18,000 gallons (w/ nightly cleaning), a saving of 16,600 gallons
   (b) Chemical use of 15 gallons vs. about 183 gallons (w/ nightly cleaning), a saving of 168 gallons
   (c) Labor use of 14 hours vs. 180 hours (w/ nightly cleaning), a saving of 166 hours
   (d) Cost of water, chemical, and labor combined of about $215 vs about $2,723 (w/ nightly cleaning), a total savings of about **$2,508**

2. Kitchen exhaust system (KES) cleaning (once/year)

   (a) Water use of 466 gallons vs. 1864 gallons (w/ quarterly cleaning), a saving of 1,398 gallons
   (b) Chemical use of about 0.2 gallon vs. about 0.8 gallon (w/ quarterly cleaning), a saving of 0.6 gallon
   (c) KES cleaning service of once per year vs. 4 times per year, a saving of 3 KES cleaning services per year
   (d) Cost of water, chemical, labor/service, and energy combined of about $342 vs $1,366 (w/ quarterly cleaning), a saving of a total of about **$1,024**

3. Wastewater generation

(a) Wastewater generation of 1,866 gallons vs. 19,864 gallons, a reduction of 17,998 gallons
(b) Chemicals in wastewater of 15.2 gallons vs. 183.8 gallons, a reduction of 168.6 gallons
(c) Wastewater cost of about $7 vs. about $76, a saving of about **$69**

The following table summarizes water, chemical, and labor used for cleaning grease filters and kitchen exhaust system with and without GLFs along with associated savings in water, chemical, labor, and total costs when GLFs are used. It also includes wastewater generated and chemical in the wastewater with and without GLFs, reduction in wastewater and chemical use along with associated cost savings due to GLF use.

KFC – Winder, GA

Area of Interest	Water Used, Gallons/Yr			Chemical Used, Gallons/Yr			Labor Used, Hours/Yr or No. of Cleaning Services/Yr			Total Cost, $/Yr (water + chemical + labor/services)		
	Without Grease Lock Filters	With Grease Lock Filters	Savings	Without Grease Lock Filters	With Grease Lock Filters	Savings	Without Grease Lock Filters	With Grease Lock Filters	Savings	Without Grease Lock Filters	With Grease Lock Filters	Savings
Baffle GF[1]	18,000	1,400	16,600	183	15	168	180	14	166	$2,723	$215	$2,508
KES[2]	1,864	466	1,398	0.8	0.2	0.6	4	1	3	$1,366	$342	$1,024

Area of Interest	Waste Water Generated, Gallons/Yr			Chemicals in Waste Water, Gallons/Yr			Total Cost, $ (water treatment)/Yr		
	Without Grease Lock Filters	With Grease Lock Filters	Reduction	Without Grease Lock Filters	With Grease Lock Filters	Reduction	Without Grease Lock Filters	With Grease Lock Filters	Savings
WW[3]	19,864	1,866	17,998	184	15	169	$76	$7	$69

[1]GF – Grease filter; [2]KES - Kitchen exhaust system; [3]WW - Wastewater

The total annual cost of GLFs for KFC, based on the GLF replacements shown in the Appendix B2 ("During Pilot" data table), which is extrapolated from 2 months to a year, is $ 585. The total annual cost savings with GLFs as shown in the above table (including for wastewater treatment) is $3,601. **KFC nets an annual savings of $3,016 with the GLFs.**

Pei Wei

1. Baffle grease filter cleaning (6 times/year)

   (a) Water use of 72 gallons vs. 4,380 gallons (w/ nightly cleaning), a saving of 4,308 gallons
   (b) Chemical use of 1 gallon vs. about 58 gallons (w/ nightly cleaning), a saving of 57 gallons
   (c) Labor use of 1.5 hours vs. about 91 hours (w/ nightly cleaning), a saving of 89.5 hours
   (d) Cost of water, chemical, and labor combined of about $38 vs $2,285 (w/ nightly cleaning), a total savings of about **$2,247**

2. Kitchen exhaust system (KES) cleaning (3 times/year)

   (a) Water use of 1,026 gallons vs. 4,104 gallons (w/ monthly cleaning), a saving of 3,078 gallons

(b) Chemical use of about 0.8 gallon vs. about 2.4 gallon (w/ monthly cleaning), a saving of 1.6 gallon
(c) KES cleaning service of 3 times per year vs. 12 times per year, a saving of 9 cleaning services per year
(d) Cost of water, chemical, labor/service, and energy combined of about $1,022 vs about $4,089 (w/ monthly cleaning), a saving of a total of about **$3,067**

3. Wastewater generation

(a) Wastewater generation of 1,098 gallons vs. 8,484 gallons, a reduction of 7,386 gallons
(b) Chemicals in wastewater of 1.8 gallons vs. 60.4 gallons, a reduction of 58.6 gallons
(c) Wastewater cost of about $23 vs. about $176, a saving of about **$153**

The following table summarizes water, chemical, and labor used for cleaning grease filters and kitchen exhaust system with and without GLFs along with associated savings in water, chemical, labor, and total costs when GLFs are used. It also includes wastewater generated and chemical in the wastewater with and without GLFs, reduction in wastewater and chemical use along with associated cost savings due to GLF use.

Pei Wei, Atlanta Airport, College Park, GA												
Area of Interest	**Water Used, Gallons/Yr**			**Chemical Used, Gallons/Yr**			**Labor Used, Hours/Yr or No. of Cleaning Services/Yr**			**Total Cost, $/Yr (water + chemical + labor/services)**		
	Without Grease Lock Filters	**With Grease Lock Filters**	**Savings**	**Without Grease Lock Filters**	**With Grease Lock Filters**	**Savings**	**Without Grease Lock Filters**	**With Grease Lock Filters**	**Savings**	**Without Grease Lock Filters**	**With Grease Lock Filters**	**Savings**
Baffle GF[1]	4,380	72	4,308	58	1	57	91	1.5	89.5	$2,285	$38	$2,247
KES[2]	4,104	1,026	3,078	2.4	0.8	1.6	12	3	9	$4,089	$1,022	$3,067

Area of Interest	**Waste Water Generated, Gallons/Yr**			**Chemicals in Waste Water, Gallons/Yr**			**Total Cost, $ (water treatment)/Yr**		
	Without Grease Lock Filters	**With Grease Lock Filters**	**Reduction**	**Without Grease Lock Filters**	**With Grease Lock Filters**	**Reduction**	**Without Grease Lock Filters**	**With Grease Lock Filters**	**Savings**
WW[3]	8,484	1,098	7,386	60.4	1.8	58.6	$176	$23	$153

[1]GF – Grease filter; [2]KES - Kitchen exhaust system; [3]WW - Wastewater

The total annual cost of GLFs for Pei Wei, based on the GLF replacements shown in the Appendix C2 ("During Pilot" data table), which is extrapolated from 2 months to a year, is $3,120. The total annual cost savings with GLFs as shown in the above table (including for wastewater treatment) is $5,467. **Pei Wei nets an annual savings of $2,347 with the GLFs.**

Twisted Root Burger Company

1. Baffle grease filter cleaning (6 times/year)

(a) Water use of 180 gallons vs. 10,950 gallons (w/ nightly cleaning), a saving of 10,770 gallons

(b) Chemical use of 2.4 gallons vs. about 139 gallons (w/ nightly cleaning), a saving of 136.6 gallons
(c) Labor use of 4.5 hours vs. about 274 hours (w/ nightly cleaning), a saving of 269.5 hours
(d) Cost of water, chemical, and labor combined of $103 vs. $6,055 (w/ nightly cleaning), a total savings of **$5,952**

2. Kitchen exhaust system (KES) cleaning (once/year)

(a) Water use of 256 gallons vs 1024 gallons (w/ quarterly cleaning), a saving of 768 gallons
(b) Chemical use of about 0.2 gallon vs about 0.8 gallon (w/ quarterly cleaning), a saving of 0.6 gallon
(c) KES cleaning service of once per year vs 4 times per year, a saving of 3 KES cleaning services per year
(d) Cost of water, chemical, labor/service, and energy combined of about $362 vs $1,450 (w/ quarterly cleaning), a saving of a total of about **$1,088**

3. Wastewater generation

(a) Wastewater generation of 436 gallons vs. 11,974 gallons, a reduction of 11,538 gallons
(b) Chemicals in wastewater of about 2.6 gallons vs. about 140 gallons, a reduction of 137.4 gallons
(c) Wastewater cost of about $1 vs. about $21, a saving of about **$20**

The following table summarizes water, chemical, and labor used for cleaning grease filters and kitchen exhaust system with and without GLFs along with associated savings in water, chemical, labor, and total costs when GLFs are used. It also includes wastewater generated and chemical in the wastewater with and without GLFs, reduction in wastewater and chemical use along with associated cost savings due to GLF use.

Twisted Root – Bedford, TX												
Area of Interest	**Water Used, Gallons/Yr**			**Chemical Used, Gallons/Yr**			**Labor Used, Hours/Yr or No. of Cleaning Services/Yr**			**Total Cost, $/Yr (water + chemical + labor/services)**		
	Without Grease Lock Filters	**With Grease Lock Filters**	**Savings**	**Without Grease Lock Filters**	**With Grease Lock Filters**	**Savings**	**Without Grease Lock Filters**	**With Grease Lock Filters**	**Savings**	**Without Grease Lock Filters**	**With Grease Lock Filters**	**Savings**
Baffle GF[1]	10,950	180	10,770	139	2.4	136.6	274	4.5	269.5	$6,055	$103	$5,952
KES[2]	1,024	256	768	0.8	0.2	0.6	4	1	3	$1,450	$362	$1,088

Area of Interest	**Waste Water Generated, Gallons/Yr**			**Chemicals in Waste Water, Gallons/Yr**			**Total Cost, $ (water treatment)/Yr**		
	Without Grease Lock Filters	**With Grease Lock Filters**	**Reduction**	**Without Grease Lock Filters**	**With Grease Lock Filters**	**Reduction**	**Without Grease Lock Filters**	**With Grease Lock Filters**	**Savings**
WW[3]	11,974	436	11,538	140	2.6	137.4	$21	$1	$20

[1]GF – Grease filter; [2]KES - Kitchen exhaust system; [3]WW - Wastewater

The total annual cost of GLFs for Twisted Root, based on the GLF replacements shown in the Appendix D2 ("During Pilot" data table), which is extrapolated from 2 months to a year, is $ 2,496. The total

annual cost savings with GLFs as shown in the above table (including for wastewater treatment) is $7,060. **Twisted Root nets an annual savings of $4,564 with the GLFs.**

Conclusions

Findings

The patented GLF installation in foodservice KES results in substantial reductions in baffle filter and exhaust system cleaning by catching the grease particulates before entering the KES. Cleaning reduction coincides with water usage, labor, cleaning chemical, and wastewater treatment savings, which parlay into cost savings for the foodservice operator. With substantially less grease entering the KES, fire safety is enhanced and potential roof repairs & maintenance are prevented.

Savings go beyond the foodservice facility to the community at-large due to the reduction in chemicals dispersed into the sewer system. Note the reduced carbon emissions associated with fewer KES system cleanings by an independent third party contractor traveling to the foodservice establishment is not addressed. Additionally, the energy savings experienced by a cleaner exhaust fan and more efficient HVAC system free of most grease particulates on fan blades, coils, and other operating parts is not addressed.

The following table summarizes the estimated average annualized savings the pilot restaurants will experience when the GLFs are installed in their respective KES:

Average Annual Savings With GLFs – for Water, Chemical, Labor & Total Costs				
Area of Interest	**Water, Gallons/Yr**	**Chemical, Gallons/Yr**	**Labor Used, Hours/Yr or No. of Cleaning Services/Yr**	**Total Cost, $/yr**
Baffle GF[1]	10,559	121	175	$3,569
KES[2]	1,748	1	5	$1,726
WW[3]	12,307	122	-	$81

[1]GF – Grease filter; [2]KES - Kitchen exhaust system; [3]WW - Wastewater

GLF Contact Information

For further information on the Grease Lock filters, please visit www.GreaseLock.com or contact Ellis Fibre USA directly at (888) 594-0063.

Acknowledgements

The pilot manager/author acknowledges those who helped with the planning, execution, and completion of this pilot project. The enthusiasm, assistance & support of all the people who helped with this project were remarkable.

I would also like to recognize the interest, enthusiasm, and support of these pilots by Holly Elmore, founder of Elemental Impact (Ei), who helped initiate these pilots, one of which was at Pei Wei, operated by HMSHost under their Atlanta Airport concessionaire contract. Ei's interest in documenting the economic and environmental benefits with respect to reduction in water consumption, reduction in chemical usage, and reduction of wastewater & chemicals in sewer systems based on these pilots and through this report, and making the restaurant and food service industries aware of these benefits is also well recognized.

Also, the team at Industrial Steam Cleaning – Atlanta, led by co-owner Doug Brandenberg, is recognized for their interest in conducting these pilots, and their assistance with collection of the data during the pilots in the Atlanta area.

Finally, I would like to recognize the commitment of Ellis Fibre USA, LLC to the fire safety, environment, and food service industry by developing the Grease Lock System.

Author's Bio

Jay Parikh is President of **Compliance Solutions International Inc. (CSI)**, a global management-consulting firm that he formed in August '04 after leaving **Underwriters Laboratories Inc. (UL)**. He has **41 years of experience** in manufacturing, consulting, product testing, certification & inspection, codes and standards, regulatory compliance, quality management systems, and international business development & operations.

Mr. Parikh is **a proven and knowledgeable professional in product approvals and international business** with the **26 years** of his career with **UL** in Northbrook, IL. At UL, he held many positions of increasing responsibility and worked with all its key functions and international operations. Throughout his UL career, he helped countless manufacturers and other UL constituents worldwide in the **commercial kitchen ventilation (CKV), HVAC**, **fire protection,** and other industries with their product testing and certification, standards, codes, regulatory compliance, and market acceptance needs.

Mr. Parikh has **published technical papers** in ASHRAE & NFPA Journals and FCSI, ICC, & other magazines, and also **made presentations** at ASHRAE, NFPA, ICC, IAPMO, and other seminars & conferences. He has received **awards** from FCSI in recognition of contribution to the foodservice industry, and from UL for establishing new product categories. He is a proactive member of NFPA-96 Technical Committee, UL's Standards Technical Panel for standards UL 710 (exhaust hoods) & UL 1046 (Grease Filters), ASHRAE TC 5.10 (Kitchen Ventilation) and ASHRAE Standing Standard Project Committee 154 (Ventilation for Commercial Cooking Operations), and NAFEM Technical Liaison Committee (TLC). He has earned **M.B.A.** in management from Roosevelt University in Chicago, and **M.S.** in mechanical engineering from Illinois Institute of Technology in Chicago. He is located in Buffalo Grove (Chicago area), IL, can be reached at 847-383-5088 or jay@csinternationalinc.com, and his website is www.csinternationalinc.com.

Appendix A1

Pilot for the Grease Lock Filter Savings

Data taken before the pilot begins

Item #	Information / Data	Hood 1	Hood 2
Sec. 1 Existing Kitchen Exhaust System (KES) Condition			
1.	Type of Hood (canopy, island, eyebrow, etc.)		
2.	Hood Size (L" x W" x H")		
3.	Baffle Grease Filter (Stainless Steel, Aluminum, or Galvanized)		
4.	Baffle Grease Filter Size (L" x W" x H")		
5.	# of Baffle Grease Filters		
6.	***Cooking Appliances & Size (L" x W")***		
	Furthest Left - #1 :		
	#2 :		
	#3 :		
	Furthest Right - #4 :		
7.	Exhaust Duct Size (L" x W" or Dia., in.)		
8.	Duct Length, feet		
9.	Exhaust Fan Spec. (Type & Drive) Type: Up-blast, or Inline Drive: Direct or Belt Driven		
10.	Grease Accumulation* in Hood (<.002" or <.078" or <.125")		
11.	Grease Accumulation* in Duct (<.002" or <.078" or <.125")		
12.	Grease Accumulation* in Exhaust Fan (<.002" or <.078" or <.125")		
13.	Grease Accumulation* on Rooftop (RT) Near Exhaust Fan (<.002" or <.078" or <.125")		
14.	Grease Accumulation* on RT Equip. (<.002" or <.078" or <.125")		
15.	Last Cleaning Date		
Sec. 2 Baffle Grease Filter (GF) Cleaning			
1.	Freq. of Baffle Grease Filter (GF) Cleaning (how often?)		
2.	How are the GFs Cleaned (Manually Scrubbed or in Dishwasher?)		
3.	Water Used to Clean All GFs, gal.		
4.	Name of Chemical Used in GF Cleaning		
5.	Amount of Chemical Used in Cleaning all GFs, lb. or gal.		
6.	Cost of Chemical Used to Clean All GFs, $		
7.	Number of Persons Used to Clean All GFs		

8.	Time taken to Clean all GFs, hrs		
9.	Avg. Labor Rate per GF Cleaner, $		
Sec. 3 Exhaust Fan Energy			
Instrument to be used to measure Current, (Amps), Voltage (V), and Energy (kWh) Name: 3-phase wattmeter Manufacturer: Model #:			
1.	Exhaust Fan, HP		
2.	Energy Used, kWh		
3.	Current, Amps (average)		
4.	Voltage, V (average)		
Sec. 4 Kitchen Exhaust System (KES) Cleaning			
1.	Cleaning Company Name		
2.	Contact Person (Name and Phone #)		
3.	Amount of Water Used in Cleaning and Water Temp., gal. and °F		
4.	Name of Chemical Used in KES Cleaning		
5.	Amount of Chemical Used in KES Cleaning, lb. or gal.		
6.	Cost of Chemical Used to Clean the KES		
7.	Number of Persons Used to Clean KES		
8.	Total time taken to clean KES, hrs		
9.	Avg. Labor Rate per KES Cleaner, $		
10.	Pressure Wash [PW] Energy Source (Electric/Gasoline/Diesel)		
11.	Amount of Energy (kWh or gallons) and Energy Cost per Unit to run the PW, $		
12.	Time taken for PW Cleaning, hrs		
13.	Total Cost to Operate PW for Cleaning, $		
14.	PW's Water Pressure, psi		
15.	Brief Description of Cleaning Process		
Sec. 5 GLF Installation			
1.	Grease Lock Filter [GLF] Size (H" x W")		
2.	Number of GLFs Installed		
3.	GLF Installation- Using Bracket (A, B or C Style) Welded, or Using 1" thick baffle GF		
4.	Cost of all GLFs		
5.	Cost of GLF Installation		
Sec. 6 Utility Costs			
1.	Water Cost (per 100 gallons)		
2.	Energy Cost (per kWh)		
3.	Wastewater Cost ($/1,000 gallons)		
4.	City, County , State		
Sec. 7 Photo Documentation – insert image number into the appropriate field below for each hood			
1.	Restaurant (from Outside)		
2.	Overall Cooking Appliance Line		
3.	Baffle GF		
4.	Baffle GFs in its channels		
5.	Hood and Plenum		

6.	Fire Suppression System Linkage		
7.	Duct Collar		
8.	Duct (view up)		
9.	Duct (view down)		
10.	Exhaust Fan (exterior view)		
11.	Exhaust Fan Blades and Casing		
12.	Exhaust Fan Grease Drain & Cup		
13.	Roof Surrounding the Fan		
14.	Rooftop Equip.		
15.	Exhaust Fan Energy Measurement		
16.	GF Cleaning Process		
17.	KES Cleaning Process		
18.	Pressure Washer		

* All grease accumulation measurements were made using a Grease Depth Gauge Comb specified in section A.11.6.2 in NFPA–96, 2011.

Appendix A2

Pilot for the Grease Lock Filter Savings

Data taken during the pilot

Sec.1 GLF Replacement – When a filter is replaced, write the date (ex. 2/18 means Feb 18th) when filter was changed in the field below for that week.

	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week
Date data taken on:	2/18	2/26 & 2/28	3/5	none	3/19	3/26 & 3/28	4/4	4/11
Hood #1								
Filter 1 (Furthest Left)								
Filter 2								
Filter 3								
Filter 4								
Filter 5								
Filter 6								
Filter 7								
Filter 8								
Filter 9 (Furthest Right)								
Hood #2								
Filter 1 (Furthest Left)								
Filter 2								
Filter 3								
Filter 4								
Filter 5								
Filter 6								
Filter 7								
Filter 8								
Filter 9 (Furthest Right)								
Hood #3								
Filter 1 (Furthest Left)								
Filter 2								
Filter 3								
Filter 4								

Sec.1 (Cont.) GLF Replacement								
	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week
Filter 5								
Filter 6								
Filter 7								
Filter 8								
Filter 9 (Furthest Right)								

Sec. 2 Exhaust Fan Energy (Use 3-phase wattmeter)								
	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week
1. Fan Energy Used, kWh								
2. Current, Amps & Voltage, V								

Sec. 3 Baffle Grease Filter (GF) Cleaning								
	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week
1. Date When GFs Cleaned								
2. How are the GFs Cleaned (Manually Scrubbed or Dishwasher?)								
3. Amount of Water Used to Clean All GFs, gal.								
4. Name of Chemical Used in GF Cleaning								
5. Amount of Chemical Used in Cleaning all GFs, lb. or gal.								
6. Cost of Chemical Used to Clean All GFs, $								
7. Number of Persons Used to Clean All GFs								
8. Time taken to clean all GFs, hrs								
9. Avg. Labor Rate per GF Cleaner, $								

Sec. 4 Photo Documentation – insert image number into the appropriate field below for each week								
	1st week	**2nd week**	**3rd week**	**4th week**	**5th week**	**6th week**	**7th week**	**8th week**
1. Overall Cooking Appliance Line								
2. Baffle GF								
3. Baffle GFs in its channels								
4. Hood and Plenum								
5. Fire Suppression System Linkage								
6. Duct Collar								
7. Duct (view up)								
8. Duct (view down)								
9. Exhaust Fan (exterior view)								
10. Exhaust Fan Blades and Casing								
11. Exhaust Fan Grease Drain & Cup								
12. Roof Surrounding the Fan								
13. Rooftop Equip.								
14. Exhaust fan Energy Measurement								
15. GF Cleaning Process								

Appendix B1

Pilot for the Grease Lock Filter Savings

Data taken before the pilot begins

Pilot Location

Restaurant: KFC, Winder, GA

Item #	Information / Data	Hood 1	Hood 2
Sec. 1 Existing Kitchen Exhaust System (KES) Condition			
1.	Type of Hood (canopy, island, eyebrow, etc.)	CaptiveAire Wall Mounted Canopy	CaptiveAire Wall Mounted Canopy
2.	Hood Size (L" x W" x H")	132" x 48" x 30"	144" x 48" x 30"
3.	Baffle Grease Filter (Stainless Steel, Aluminum, or Galvanized)	Traditional 2"thick SS	Traditional 2"thick SS
4.	Baffle Grease Filter Size (Qty-H" x W")	5-16" x 20" & 2-16"x16"	7-16" x 20"
5.	# of Baffle Grease Filters	7	7
6.	***Cooking Appliances & Size (L" x W")***		
	Furthest Left - #1 :	Oven 32"x45" (21" inside, 11"outside)	Open Area 51"x45"
	#2 :	Fryer 20"x45"	Pressure Fryer 24"x45"
	#3 :	Fryer 20"x45"	Pressure Fryer 24"x45"
	Furthest Right - #4 :	Fryer 20"x45"	XCEL Oven 30"x45"
7.	Exhaust Duct Size (L" x W" or Dia., in.)	12"x18"	12"x18"
8.	Duct Length, feet	15'	15'
9.	Exhaust Fan Spec. (Type & Drive) Type: Up-blast, or Inline Drive: Direct or Belt Driven	Up-blast , belt-driven	Up-blast , belt-driven
10.	Grease Accumulation* in Hood (<.002" or <.078" or <.125")	<.002"	<.002"
11.	Grease Accumulation* in Duct (<.002" or <.078" or <.125")	<.078"	<.078"
12.	Grease Accumulation* in Exhaust Fan (<.002" or <.078" or <.125")	<.002"	<.125"
13.	Grease Accumulation* on Rooftop (RT) Near Exhaust Fan (<.002" or <.078" or <.125")	<.002"	<.002"
14.	Grease Accumulation* on RT Equip. (<.002" or <.078" or <.125")	<.002"	<.002"
15.	Last Cleaning Date	Nov 12, 2012	Nov 12, 2012
Sec. 2 Baffle Grease Filter (GF) Cleaning			
1.	Freq. of Baffle Grease Filter (GF) Cleaning (how often?)	Nightly	
2.	How are the GFs Cleaned (Manually Scrubbed or in Dishwasher?)	Soaked Over Night	
3.	Water Used to Clean GFs/night, gal.	50 gallons per night for 3 GFs	
4.	Name of Chemical Used in GF Cleaning	Ecolab - Titan HD Degreaser	

5.	Amount of Chemical Used in Cleaning GFs/night, lb. or gal.	0.5 gal. per night	
6.	Cost of Chemical Used to Clean GFs, $	$22.56/4 gallons…so, $2.86 per night	
7.	Number of Persons Used to Clean GFs	1	
8.	Time taken to Clean GFs/night, Hr	0.5	
9.	Avg. Labor Rate per GF Cleaner, $	$8.50/Hr	
Sec. 3 Exhaust Fan Energy			
Instrument to be used to measure Current, (Amps), Voltage (V), and Energy (kWh) Name: 3-phase wattmeter Manufacturer: N/A Model #: N/A			
1.	Exhaust Fan, HP	1.5 HP	1.5 HP
2.	Energy Used, kWh	N/A	N/A
3.	Current, Amps (average)	N/A	N/A
4.	Voltage, V (average)	N/A	N/A
Sec. 4 Kitchen Exhaust System (KES) Cleaning			
1.	Cleaning Company Name	Industrial Steam Cleaning of Atlanta	
2.	Contact Person (Name and Phone #)	Doug Brandenburg	
3.	Amount of Water Used in Cleaning and Water Temp., gal. and °F	466 gallons @ 160°F	
4.	Name of Chemical Used in KES Cleaning	Grease Beast ($49.57/gallon)	
5.	Amount of Chemical Used in KES Cleaning, lb. or gal.	0.19 gal. (3 cups)	
6.	Cost of Chemical Used to Clean the KES	$9.29	
7.	Number of Persons Used to Clean KES	2	
8.	Total Cost of KES Cleaning Service (once/quarter), $	$325	
9.	Pressure Wash [PW] Energy Source (Electric/Gasoline/Diesel)	Gasoline	
10.	Amount of Energy (kWh or gallons) and Energy Cost per Unit to run the PW, $	1 gal/cleaning	
11.	Time taken for PW Cleaning, hrs	0.75 hrs	0.75 hrs
12.	Total Cost to Operate PW for Cleaning, $	Gas = $3.69	
13.	PW's Water Pressure, psi	3500 psi ; 3.8 gal per min	
14.	Brief Description of Cleaning Process	Scrap severe grease build-up areas, then spray with degreaser, then pressure wash, and then dry	
Sec. 5 GLF Installation			
1.	Grease Lock Filter [GLF] Size (H" x W")	16" x 20"	16" x 20"
2.	Number of GLFs Installed	6	7
3.	GLF Installation- Using Bracket (A, B or C Style) Welded, or Using 1" thick baffle GF	A-style ; Welded	A-style ; Welded
4.	Cost of GLF	$130/case of 20 filters	
5.	Cost of GLF Installation	$400	$425
Sec. 6 Utility Costs			
1.	Water Cost (per 100 gallons)	$0.763	$0.763
2.	Energy Cost (per kWh)	$0.07124	$0.07124
3.	Wastewater Cost ($/1,000 gallons)	$3.84	$3.84
4.	City, County , State	Atlanta, , GA	Atlanta, , GA

Sec. 7 Photo Documentation – insert image number into the appropriate field below for each hood			
1.	Restaurant (from Outside)	0332	0332
2.	Overall Cooking Appliance Line	0337	0340
3.	Baffle GF	0338	0341
4.	Baffle GFs in its channels	0346/47	N/A
5.	Hood and Plenum	0343	0354
6.	Fire Suppression System Linkage	0349	0355
7.	Duct Collar	0349	0355
8.	Duct (view up)	N/A	0359
9.	Duct (view down)	0424	0432
10.	Exhaust Fan (exterior view)	0400	0426
11.	Exhaust Fan Blades and Casing	0412	0429
12.	Exhaust Fan Grease Drain & Cup	0443	0444
13.	Roof Surrounding the Fan	0425	0419
14.	Rooftop Equip.	0395	0413
15.	Exhaust Fan Energy Measurement	N/A	N/A
16.	GF Cleaning Process	0386	0387
17.	KES Cleaning Process	0451	0454
18.	Pressure Washer	0389	0412

* All grease accumulation measurements were made using a Grease Depth Gauge Comb specified in section A.11.6.2 in NFPA–96, 2011.

Appendix B2

Pilot for the Grease Lock Filter Savings

Data taken during the pilot

Pilot Location

Restaurant: KFC, Winder, GA

Sec.1 GLF Replacement – When a filter is replaced, write the date (ex. 2/18 means Feb 18th) when filter was changed in the field below for that week.								
	1st week	**2nd week**	**3rd week**	**4th week**	**5th week**	**6th week**	**7th week**	**8th week**
Date data taken on:	2.28.13	3.7.13	3.11.13	3.17.13	3.25.13	4.2.13	4.9.13	4.18.13
Hood #1								
Filter 1 (Furthest Left)	None	None	None	None	None	None	None	4/18
Filter 2	None	None	None	None	None	None	None	4/18
Filter 3	None	None	None	3/17	None	None	None	4/18
Filter 4	None	None	None	3/17	None	None	None	4/18
Filter 5	None	None	None	None	None	None	None	4/18
Filter 6 (Furthest Right)	None	None	None	None	None	None	None	4/18
Hood #2								
Filter 1 (Furthest Left)	None	None	None	None	None	None	None	4/18
Filter 2	None	None	None	None	None	None	None	4/18
Filter 3	None	None	None	None	None	None	None	4/18
Filter 4	None	None	None	None	None	None	None	4/18
Filter 5	None	None	None	None	None	None	None	4/18
Filter 6	None	None	None	None	None	None	None	4/18
Filter 7 (Furthest Right)	None	None	None	None	None	None	None	4/18
Sec. 2 Exhaust Fan Energy (use 3-phase wattmeter)								

	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week
1. Fan Energy Used, kWh	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
2. Current, Amps & Voltage, V	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Sec. 3 Baffle Grease Filter (GF) Cleaning								
	1st week	**2nd week**	**3rd week**	**4th week**	**5th week**	**6th week**	**7th week**	**8th week**
1. Date When GFs Cleaned	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs
2. How are the GFs Cleaned (Manually Scrubbed or Dishwasher?)								
3. Amount of Water Used to Clean All GFs, gal.								
4. Name of Chemical Used in GF Cleaning	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs
5. Amount of Chemical Used in Cleaning all GFs, lb. or gal.								
6. Cost of Chemical Used to Clean All GFs, $								
7. Number of Persons Used to Clean All GFs								
8. Time taken to clean all GFs, hrs								
9. Avg. Labor Rate per GF Cleaner, $								
Sec. 4 Photo Documentation – insert image number into the appropriate field below for each week (DCSN is the prefix for each image #)								
	1st week	**2nd week**	**3rd week**	**4th week**	**5th week**	**6th week**	**7th week**	**8th week**
1. Overall Cooking Appliance Line	N/A	N/A	0233/34	N/A	No pictures taken	0349/	No pictures taken	N/A
2. Baffle GF	N/A	0214	0235	0278		0343		N/A
3. Baffle GFs in its channels	N/A	0213	N/A	N/A		N/A		0435/37
4. Hood and Plenum	N/A	N/A	N/A	0275/76		0354		0438
5. Fire Suppression System Linkage	N/A	N/A	N/A	N/A		0347		0446
6. Duct Collar	N/A	N/A	N/A	N/A		0352		0445
7. Duct (view up)	N/A	N/A	0238	N/A		N/A		0439/46
8. Duct (view down)	N/A	N/A	N/A	N/A	No pictures	0336/39	No pictures	0452/55
9. Exhaust Fan (exterior view)	N/A	N/A	N/A	N/A		N/A		N/A

10. Exhaust Fan Blades and Casing	N/A	N/A	0242	N/A	taken	0337/38/40	taken	0450/53
11. Exhaust Fan Grease Drain & Cup	N/A	N/A	N/A	N/A		N/A		N/A
12. Roof Surrounding the Fan	N/A	N/A	N/A	N/A		N/A		N/A
13. Rooftop Equip.	N/A	N/A	N/A	N/A		N/A		N/A
14. GF Cleaning Process	N/A	N/A	N/A	N/A		N/A		N/A

Appendix C1

Pilot for the Grease Lock Filter Savings

Data taken before the pilot begins

Pilot Location

Restaurant: Pei Wei, Atlanta Airport, College Park, GA

Item #	Information / Data	Hood 1	Hood 2
Sec. 1 Existing Kitchen Exhaust System (KES) Condition			
1.	Type of Hood (canopy, island, eyebrow, etc.)	Wall mounted canopy	Wall mounted canopy
2.	Hood Size (L" x W" x H")	132" x 48" x 30"	132" x 48" x 30"
3.	Baffle Grease Filter (Stainless Steel, Aluminum, or Galvanized)	Captrate Solo Filters Stainless Steel	Captrate Solo Filters Stainless Steel
4.	Baffle Grease Filter Size (Qty-H" x W")	5-20"x20" & 2-20"x16"	5-20"x20" & 2-20"x16"
5.	# of Baffle Grease Filters	7	7
6.	***Cooking Appliances & Size (L" x W")***		
	Furthest Left - #1 :	WOK 70" x 40"	WOK 56" x 40"
	#2 :	Fryer 30" x 30"	Fryer 18" x 30"
	#3 :	Wok (Portion) 30" x 40"	Flattop 24" x 30"
	Furthest Right - #4 :		Open 34" x 40"
7.	Exhaust Duct Size (L" x W" or Dia., in.)	18" x 18"	18" x 18"
8.	Duct Length, feet	45'	45'
9.	Exhaust Fan Spec. (Type & Drive) Type: Up-blast, or Inline Drive: Direct or Belt Driven	Forward curve up-blast fan	
10.	Grease Accumulation* in Hood (<.002" or <.078" or <.125")	<.002	
11.	Grease Accumulation* in Duct (<.002" or <.078" or <.125")	<.002	
12.	Grease Accumulation* in Exhaust Fan (<.002" or <.078" or <.125")	<.002	
13.	Grease Accumulation* on Rooftop (RT) Near Exhaust Fan (<.002" or <.078" or <.125")	<.002	
14.	Grease Accumulation* on RT Equip. (<.002" or <.078" or <.125")	<.002	
15.	Last Cleaning Date	Jan 15, 2013	
Sec. 2 Baffle Grease Filter (GF) Cleaning			
1.	Freq. of Baffle Grease Filter (GF) Cleaning (how often?)	Nightly	
2.	How are the GFs Cleaned (Manually Scrubbed or in Dishwasher?)	Soaked in mop sink with degreaser (3 GFs/soak ; 5 soaks/night)	
3.	Water Used to Clean All GFs, gal.	12 gallons/night	
4.	Name of Chemical Used in GF Cleaning	Ecolab – Greasecutter Plus	

5.	Amount of Chemical Used in Cleaning all GFs, lb. or gal.	0.16 gal. (2.5 cups)/night	
6.	Cost of Chemical Used to Clean All GFs, $	$65 for a 2.5 gallon jug ($4.06/night)	
7.	Number of Persons Used to Clean All GFs	1	
8.	Time taken to Clean all GFs, hrs	0.25 hr/night	
9.	Avg. Labor Rate per GF Cleaner, $	$8.40/hr	
Sec. 3 Exhaust Fan Energy			
Instrument to be used to measure: Current, (Amps), Voltage (V), and Energy (kWh) Name: 3-phase wattmeter Manufacturer: N/A Model #: N/A			
1.	Exhaust Fan, HP	2 HP	
2.	Energy Used, kWh	N/A	N/A
3.	Current, Amps (average)	N/A	N/A
4.	Voltage, V (average)	N/A	N/A
Sec. 4 Kitchen Exhaust System (KES) Cleaning			
1.	Cleaning Company Name	Industrial Steam Cleaning of Atlanta	
2.	Contact Person (Name and Phone #)	Doug Brandenburg	
3.	Amount of Water Used in Cleaning and Water Temp., gal. and °F	342 gallons @ 160°F	
4.	Name of Chemical Used in KES Cleaning	Grease Beast ($49.57/gallon)	
5.	Amount of Chemical Used in KES Cleaning, lb. or gal.	0.19 gal. (3 cups)	
6.	Cost of Chemical Used to Clean the KES	$9.29	
7.	Number of Persons Used to Clean KES	2	
8.	Total Cost of KES Cleaning (once/month), $	$325	
9.	Pressure Wash [PW] Energy Source (Electric/Gasoline/Diesel)	Gasoline	
10.	Amount of Energy (kWh or gallons) and Energy Cost per Unit to run the PW, $	1 gal/cleaning	
11.	Time taken for PW Cleaning, hrs	0.75 hr	0.75 hr
12.	Total Cost to Operate PW for Cleaning, $	Gas = $3.69	
13.	PW's Water Pressure, psi	3500 psi ; 3.8 gal per min	
14.	Brief Description of Cleaning Process	Scrap severe grease build-up areas, then spray with degreaser, then pressure wash, and then dry	
Sec. 5 GLF Installation			
1.	Grease Lock Filter [GLF] Size (H" x L")	20" x 19"	20" x 19"
2.	Number of GLFs Installed	7	7
3.	GLF Installation- Using Bracket (A, B or C Style) Welded, or Using 1" thick baffle GF	A-style ; Welded	A-style ; Welded
4.	Cost of all GLFs	$130 / case of 20 filters	
5.	Cost of GLF Installation	$400	$400
Sec. 6 Utility Costs – the airport pays for all water usage, not Pei Wei.			
1.	Water Cost (per 100 gallons)	$0.813	$0.813
2.	Energy Cost (per kWh)	$0.07124	$0.07124
3.	Wastewater Cost ($/1,000 gallons)	$20.70	$20.70
4.	City, County , State	Atlanta, GA	Atlanta, GA

Sec. 7 Photo Documentation – insert image number into the appropriate field below for each hood			
1.	Restaurant (from Outside)	0625	0625
2.	Overall Cooking Appliance Line	0643	0571
3.	Baffle GF	0573	0570
4.	Baffle GFs in its channels	0609	0605
5.	Hood and Plenum	0598	0596
6.	Fire Suppression System Linkage	0610	0603
7.	Duct Collar	0614	0603
8.	Duct (view up)	0613	0604
9.	Duct (view down)	0581	0588
10.	Exhaust Fan (exterior view)	0575	0582
11.	Exhaust Fan Blades and Casing	0591	0591
12.	Exhaust Fan Grease Drain & Cup	0650	0651
13.	Roof Surrounding the Fan	0652	0652
14.	Rooftop Equip.	N/A	N/A
15.	Exhaust Fan Energy Measurement	N/A	N/A
16.	GF Cleaning Process	N/A	N/A
17.	KES Cleaning Process	N/A	N/A
18.	Pressure Washer	0412/89	0412/89

* All grease accumulation measurements were made using a Grease Depth Gauge Comb specified in section A.11.6.2 in NFPA–96, 2011.

Appendix C2

Pilot for the Grease Lock Filter Savings

Data taken during the pilot

Pilot Location

Restaurant: Pei Wei, Atlanta Airport, College Park, GA

Sec.1 GLF Replacement – When a filter is replaced, write the date (ex. 2/18 means Feb 18th) when filter was changed in the field below for that week.

	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week
Date data taken on:	2.28.13	3.4.13	3.10.13	3.19.13	3.25.13	4.1.13	4.10.13	4.17.13
Hood #1								
Filter 1 (Furthest Left)	5 filters Replaced	5 filters Replaced	5 filters Replaced	5 filters Replaced	5 filters Replaced	5 filters Replaced	5 filters Replaced	5 filters Replaced
Filter 2								
Filter 3								
Filter 4								
Filter 5								
Filter 6								
Filter 7 (Furthest Right)								
Hood #2								
Filter 1 (Furthest Left)	5 filters Replaced	5 filters Replaced	5 filters Replaced	5 filters Replaced	5 filters Replaced	5 filters Replaced	5 filters Replaced	5 filters Replaced
Filter 2								
Filter 3								
Filter 4								
Filter 5								
Filter 6								
Filter 7 (Furthest Right)								

Sec. 2 Exhaust Fan Energy (use 3-phase wattmeter)								
	1st week	**2nd week**	**3rd week**	**4th week**	**5th week**	**6th week**	**7th week**	**8th week**
1. Fan Energy Used, kWh	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
2. Current, Amps & Voltage, V	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Sec. 3 Baffle Grease Filter (GF) Cleaning								
	1st week	**2nd week**	**3rd week**	**4th week**	**5th week**	**6th week**	**7th week**	**8th week**
1. Date When GFs Cleaned	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs
2. How are the GFs Cleaned (Manually Scrubbed or Dishwasher?)								
3. Did not Clean Any of the GFs								
4. Name of Chemical Used in GF Cleaning	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs
5. Amount of Chemical Used in Cleaning all GFs, lb. or gal.								
6. Cost of Chemical Used to Clean All GFs, $								
7. Number of Persons Used to Clean All GFs								
8. Time taken to clean all GFs, hrs								
9. Avg. Labor Rate per GF Cleaner, $								
Sec. 4 Photo Documentation – insert image number into the appropriate field below for each week								
	1st week	**2nd week**	**3rd week**	**4th week**	**5th week**	**6th week**	**7th week**	**8th week**
1. Baffle GF	0194	N/A	N/A	0255	0307	0365/80	N/A	0522
2. Baffle GFs in its channels	0195	N/A	N/A	0259	N/A	0364/80	N/A	0532
3. Hood and Plenum	1097	N/A	N/A	N/A	N/A	0374/84	N/A	0523
4. Fire Suppression System Linkage	1097	N/A	N/A	N/A	N/A	0375/85	N/A	0525
5. Duct Collar	1097	N/A	N/A	N/A	N/A	N/A	N/A	0525
6. Duct (view up)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0534
7. Duct (view down)	N/A	N/A	N/A	0263/64	0313/15/16	0393	N/A	N/A
8. Exhaust Fan (exterior view)	N/A	N/A	N/A			0387/92	N/A	N/A

9. Exhaust Fan Blades and Casing	N/A	N/A	N/A	0265	0317	0396/97	N/A	N/A
10. Exhaust Fan Grease Drain & Cup	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11. Roof Surrounding the Fan	N/A	N/A	N/A	N/A	N/A	0387/92	N/A	N/A
12. Rooftop Equip.	N/A	N/A	N/A	N/A	N/A	0392	N/A	N/A
13. Exhaust fan Energy Measurement	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14. GF Cleaning Process	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Appendix D1

Pilot for the Grease Lock Filter Savings

Data taken before the pilot begins

Pilot Location

Restaurant: Twisted Root, Bedford, TX

Item #	Information / Data	Hood 1	Hood 2
Sec. 1 Existing Kitchen Exhaust System (KES) Conditions			
1.	Type of Hood (canopy, island, eyebrow, etc.)	Island, v-bank	
2.	Hood Size (L" x W" x H")	100"x53"x24"	100"x53"x24"
3.	Baffle Grease Filter (Stainless Steel, Aluminum, or Galvanized)	SS, Captrate Solo by Captive Aire	SS, Captrate Solo by Captive Aire
4.	Baffle Grease Filter Size (Qty-H" x W")	5-20x20	5-20x20
5.	# of Baffle Grease Filters	5	5
6.	***Cooking Appliances & Size (L" x W")***		
	#1 :	Flat top (72"x30")	Fryers (60"x30")
7.	Exhaust Duct Size (L" x W" or Diameter")	12"x24"	
8.	Duct Length (Feet)	8'	
9.	Exhaust Fan Spec (Type & Drive) Type: Up-blast, Inline, Wall mounted Drive: Direct or Belt Driven)	Upblast-belt	
10.	Grease Accumulation* in the Duct (<.002" or <.078" or <.125")	<.002"	<.002"
11.	Grease Accumulation* in Hood (<.002" or <.078" or <.125")	<.002"	<.002"
12.	Grease Accumulation* in Exhaust Fan (<.002" or <.078" or <.125")	<.002"	<.002"
13.	Grease Accumulation* on Rooftop (RT) Near Exhaust Fan (<.002" or <.078" or <.125")	<.002"	<.002"
14.	Grease Accumulation* on RT Eqip. (<.002" or <.078" or <.125")	<.002"	<.002"
15.	Last Cleaning Date	10/23/2012**	
Sec. 2 Baffle Grease Filter (GF) Cleaning			
1.	Freq. of Baffle Grease Filter (GF) Cleanings (How often?)	Nightly	Nightly
2.	How are the GF Cleaned (Manually Scrubbed or Dish Washer?)	Sprayed & soaked	Sprayed & soaked
3.	Amount of Water Used to Clean All GF	30 gallons	
4.	Name of Chemical Used in GF Cleaning	Ecolab Orange force	Ecolab Orange force
5.	Amount of Chemical Used in Cleaning the GF	0.38 gal. (6 cups) per night	
6.	Cost of Chemical Used to Clean All of the GF	$65 for a 2.5 gallon jug ($9.75/night)	

7.	Number of Persons Used to Clean All GF	1	
8.	Time taken to clean all GF (hrs)	0.75 hr	
9.	Avg. Labor Rate per GF Cleaner, $	9.00	
Sec. 3 Exhaust Fan Energy			
Instrument to be used for Amps (A), Volts (V), and Energy (kWh) readings Name: 3-phase wattmeter Manufacturer: N/A Model #: N/A			
1.	Exhaust Fan Size (HP)	3 HP	
2.	Energy Used (kWh)	N/A	N/A
3.	Amps (average)	N/A	N/A
4.	Volts (average)	N/A	N/A
Sec. 4 Kitchen exhaust System (KES) Cleaning			
1.	Cleaning Company Name	Facilitec SW	
2.	Contact Person (Name and Phone #)	Jeff Raulston	
3.	Amount of Water Used in Cleaning and Water Temp., gal. and °F	256 gallons @ 160°F	
4.	Name of Chemical Used in KES Cleaning	Grease Beast ($49.57/gallon)	
5.	Amount of Chemical Used in KES Cleaning, lb. or gal.	0.16 gal. (2.5 cups)	
6.	Cost of Chemical Used to Clean the KES	$7.74	
7.	Number of Persons Used to Clean KES	2	
8.	Total time taken to clean KES, hrs	1.33 hrs	
9.	Total Cost of KES Cleaning (once/quarter), $	$350	
10.	Pressure Wash [PW] Energy Source (Electric/Gasoline/Diesel)	Gasoline	
11.	Amount of Energy (kWh or gallons) and Energy Cost per Unit to run the PW, $	1 gallon per cleaning ; $3.69 per gallon of gas	
12.	Time taken for PW Cleaning, hrs	1.33 hrs	
13.	Total Cost to Operate PW for Cleaning, $	$3.69	
14.	PW's Water Pressure, psi	3200 psi ; 3.1 gal per min	
15.	Brief Description of Cleaning Process	Scrap heavy build up, spray degreaser, and then power wash all parts of the exhaust system.	
Sec. 5 GLF Installation			
1.	Grease Lock Filter [GLF] Size (H" x W")	19"x20"	19"x20"
2.	Number of GLFs Installed	4	4
3.	Bracket Types & Install Method (A, B or C Style ; Welded or 1"baffles)	A ; Welded	A ; Welded
4.	Cost of GLF	$130/case of 20 filters	
5.	Cost of GLF Install	$325	$325
Sec. 6 Utility Costs			
1.	Water Cost (per 100 gallons)	$.289	
2.	Energy Cost (per kWh)	$0.086	
3.	Wastewater Cost ($/1,000 gallon)	$1.72	
4.	City, County , State	Bedford, Texas	
Sec. 7 Photo Documentation – insert image number into the appropriate field below for each hood			
1.	Restaurant from Street	0695	

2.	Overall Cook Appliance Line	0671	N/A
3.	GF	N/A	N/A
4.	GF in its channel	0659	0669
5.	Hood and Plenum	0656	0666
6.	Fire Suppression System Linkage	0661	0665
7.	Duct Collar	0658	0666
8.	Duct (view up)	0663	0670
9.	Duct (view down)	0680	
10.	Exhaust Fan (exterior view)	0673	
11.	Exhaust Fan Blades and Casing	0679	
12.	Exhaust Fan Grease Drain & Cup	0672	
13.	Roof Surrounding the Fan	0672	
14.	Rooftop Equip.	0683	
15.	Exhaust fan Energy Measurement	N/A	N/A
16.	GF Cleaning Process	N/A	N/A
17.	KES Cleaning Process	N/A	N/A
18.	Pressure Washer	N/A	N/A

* All grease accumulation measurements were made using a grease depth gauge comb specified in section A.11.6.2 in NFPA–96, 2011.

** Data/photos for this data sheet were taken from a Twisted Roots location different than the one at the address above. Sales volume, type of cooking, cooking appliances, kitchen layout, and exhaust system specs are the same for both locations.

Appendix D2

Pilot for the Grease Lock Filter Savings

Data taken during the pilot

Pilot Location

Restaurant: Twisted Root, Bedford, TX

Sec.1 GLF Replacement – When a filter is replaced, write the date (ex. 2/18 means Feb 18th) when filter was changed in the field below for that week.								
	1st week	**2nd week**	**3rd week**	**4th week**	**5th week**	**6th week**	**7th week**	**8th week**
Date data taken on:	**3/19**	**3/26**	**4/3**	**4/10**	**4/18**	**4/25**	**5/1**	**5/9**
Hood #1								
Filter 1 (Furthest Left)	3/17	3/22	3/27, 4/1	4/6	4/12, 4/15	4/24	4/29	5/3,5/8
Filter 2	3/17	3/22	3/27, 4/1	4/6	4/12, 4/15	4/24	4/29	5/3,5/8
Filter 3	3/17	3/22	3/27, 4/1	4/6	4/12, 4/15	4/24	4/29	5/3,5/8
Filter 4 (Furthest Right)	3/17	3/22	3/27, 4/1	4/6	4/12, 4/15	4/24	4/29	5/3,5/8
Hood #2								
Filter 1 (Furthest Left)	None	3/22	4/1	4/10	None	4/20	4/30	None
Filter 2	None	3/22	4/1	4/10	None	4/20	4/30	None
Filter 3	None	3/22	4/1	4/10	None	4/20	4/30	None
Filter 4 (Furthest Right)	None	3/22	4/1	4/10	None	4/20	4/30	None

Sec. 2 Exhaust Fan Energy (use 3-phase wattmeter)								
	1st week	**2nd week**	**3rd week**	**4th week**	**5th week**	**6th week**	**7th week**	**8th week**
Fan Energy Used (kWh)	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Amp (A) & Volts (V)	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Sec. 3 Baffle Grease Filter (GF) Cleaning

	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week
Freq. of Baffle Grease Filter (GF) Cleanings (How often?)	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs
How are the GF Cleaned (Manually Scrubbed or Dish Washer?)								
Amount of Water Used to Clean All GF								
Name of Chemical Used in GF Cleaning								
Amount of Chemical Used in Cleaning the GF								
Cost of Chemical Used to Clean All of the GF								
Number of Persons Used to Clean All GF	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs	Did not Clean Any of the GFs
Time taken to clean all GF (hrs)								
Avg. Labor Rate per GF Cleaner								

Sec. 4 Photo Documentation – insert image number into the appropriate field below for each week

	1st week		2nd week		3rd week		4th week		5th week		6th week		7th week		8th week	
	Hood #1	Hood #2	Hood #1	Hood #2	Hood #1	Hood #2	Hood #1	Hood #2	Hood #1	Hood #2	Hood #1	Hood #2	Hood #1	Hood #2	Hood #1	Hood #2
1. Overall Cooking Appliance Line	699	0697	N/A	N/A	0726	0751	N/A	0776	2259	N/A	0798	0804	0833	0846	0855	N/A
2. GF	N/A	0706	N/A	N/A	0731	0744	0774	N/A	2261	2273	0794	0807	0836	0845	0858	0869
3. GF in its channel	N/A	N/A	N/A	N/A	N/A	0749	0773	0777	2266	2272	0802	0813	0838	0847	0861	0870
4. Hood and Plenum	N/A	0704	N/A	N/A	0740	0742	0765	0778	2264	2275	0796	0811	0837	0846	0867	0871
5. Fire Suppression System Linkage	N/A	0708	N/A	N/A	0738	0746	0767	0779	2267	2277	0800	0815	0841	0848	0864	0873
6. Duct Collar	N/A	0705	N/A	N/A	0737	0745	0765	0778	2264	2276	0799	0814	0840	0849	0867	0871
7. Duct (view up)	N/A	0709	N/A	N/A	0739	0748	0770	0782	2269	2278	0801	0816	0843	0849	0865	0874
8. Duct (view down)	0720		N/A		0761		0790		2285		0825		N/A		0883	
9. Exhaust Fan (exterior view)	0713		N/A		0756		0784		2279		0819		N/A		0876	
10. xhaust Fan Blades and Casing	0721		N/A		0760		0791		2284		0816		N/A		0880	
11. Exhaust Fan Grease Drain & Cup	0713		N/A		0758		0788		2280		0822		N/A		0879	
12. Roof Surrounding the Fan	0712		N/A		0754		0785		2289		0832		N/A		0885	
13. Rooftop Equip.	0715		N/A		0762		0787		2287		0827		N/A		0884	
14. GF Cleaning Process	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	

Appendix E

Photo Documentation for Pilots

Photos – KFC

1. Restaurant (# 0332)

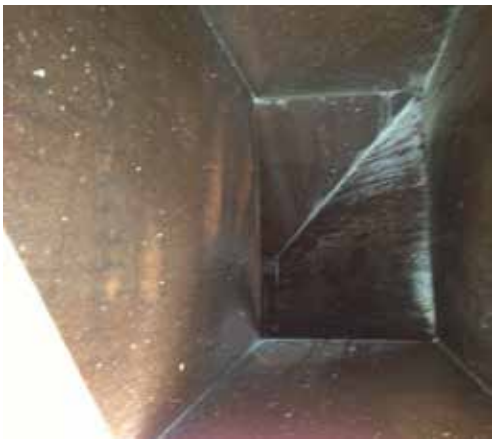
2. Hood # 1 and Baffle Grease Filters (# 0338)

3. Fire Suppression System Linkage (# 0355)

4. Duct – View Up (# 0359)

5. Baffle GF & GLFs (# 0278)

6. GLFs in Hood (# 0275)



7. Duct – View Down (# 0336)

10. Duct – View Up (# 0613)

Photos – Pei Wei

8. Restaurant (# 0625)

11. Duct – View Down (# 0581)

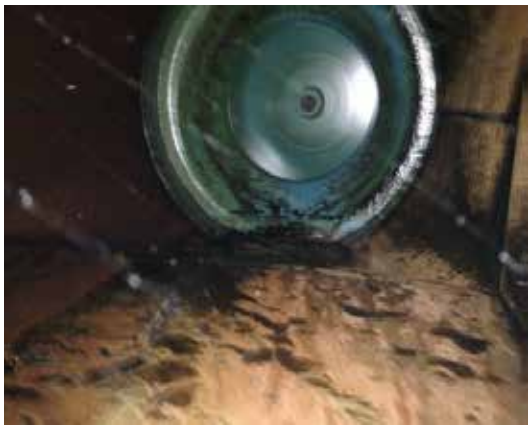
9. Fire Suppression System Linkage (# 0610)

12. Exhaust Fan Blades & Casing (# 0591)

Photos – Twisted Root

13. Baffle GF & GLF (# 0259)

14. Fire Suppression System Linkage (# 0385)



15. Exhaust Fan Blades & Casing (# 0397)

16. Restaurant (# 0695)

17. Duct – View Up & FSS Linkage (# 0670)

18. Duct – View Down (# 0680)

19. Baffle GF (# 0731)

22. Exhaust Fan Blades & Casing (# 0791)

20. Duct – View Up (# 0739)

21. Duct – View Up (# 0770)