# NEW Heat Recovery Grease Trap Filter

###### Description

A heat recovery grease trap filter combines grease filters and a heat exchanger to recover heat leaving kitchen hoods. As a direct replacement for conventional hood mounted filters in commercial kitchens, they are plumbed to the domestic hot water system to provide preheating energy to incoming water.

This measure was developed to be applicable to the following program types: TOS and RF. If applied to other program types, the measure savings should be verified. For NC projects, this measure may be applicable if code requirements are otherwise satisfied.

###### Definition of Efficient Equipment

Grease filters with heat exchangers carrying domestic hot water in kitchen exhaust air ducts.

###### Definition of Baseline Equipment

Kitchen exhaust air duct with constant air flow[[1]](#footnote-1) and no heat recovery.

###### Deemed Lifetime of Efficient Equipment

###### The expected measure life is assumed to be 15 years.[[2]](#footnote-2)

###### Deemed Measure Cost

###### Full installation costs, including plumbing materials, labor and any associated contols, should be used for screening purposes.

###### Loadshape

Loadshape C01 - Commercial Electric Cooking

###### Coincidence Factor

Summer Peak Coincidence Factor for measure is provided below for different building type[[3]](#footnote-3):

|  |  |
| --- | --- |
| Location | CF  CF |
| Fast Food Limited Menu | 0.32 |
| Fast Food Expanded Menu | 0.41 |
| Pizza | 0.46 |
| Full Service Limited Menu | 0.51 |
| Full Service Expanded Menu | 0.36 |
| Cafeteria | 0.36 |
| Unknown | 0.40 |

Algorithm

###### Calculation of Energy Savings

###### Electric Energy Savings

ΔkWh =[(Meal/Day\*HW/Meal\*Days/Year)\*8.3BTU/gal.°F\*(ΔT/filter\*Qty\_Filter)\*0.00293]/(ηHeaterElec)

Where:

Meal/Day = Average number of meals served per day. If not directly available, see Table 1.

HW/Meal = Hot water required per meal

= 3 gal/meal[[4]](#footnote-4)

Days/Year = Number of days kitchen operates per year. If not directly available, see Table 1.

ΔT/filter = Temperature difference of domestic water across each filter

= 5.8°F/filter[[5]](#footnote-5)

Qty\_Filter = Number of heat recovery grease trap filters installed. If not directly available, see Table 1.

Table 1: Commercial Kitchen Load based on Building Type

|  |  |  |  |
| --- | --- | --- | --- |
| **Building Type** | **Meals/Day[[6]](#footnote-6)** | **Assumed days/Year** | **Number of Filters[[7]](#footnote-7)** |
| Primary School | 400 | 312 | 2 |
| Secondary School | 600 | 312 | 3 |
| Quick Service Restaurant | 800 | 312 | 5 |
| Full Service Restaurant | 780 | 312 | 4 |
| Large Hotel | 780 | 356 | 4 |
| Hospital | 800 | 356 | 4 |

ηHeaterElec = Efficiency of the Electric water heater.

= Actual. If unknown, use the table C404.2 in IECC 2012 (or IECC 2015 if through new construction) to assume values based on code estimates

###### Summer Coincident Peak Demand Savings

ΔkW = ΔkWh/Hours \* CF

Where:

Hours = Hours of operation of kitchen exhaust air fan. If not directly available use:

|  |  |
| --- | --- |
| **Building Type** | **Kitchen Exhaust Fan Annual Operating Hours[[8]](#footnote-8)** |
| Primary School | 4,056 |
| Secondary School | 4,056 |
| Quick Service Restaurant | 5,616 |
| Full Service Restaurant | 5,616 |
| Large Hotel | 5,340 |
| Hospital | 3,916 |

CF = Summer Peak Coincidence Factor for measure[[9]](#footnote-9):

|  |  |
| --- | --- |
| Location | CF  CF |
| Fast Food Limited Menu | 0.32 |
| Fast Food Expanded Menu | 0.41 |
| Pizza | 0.46 |
| Full Service Limited Menu | 0.51 |
| Full Service Expanded Menu | 0.36 |
| Cafeteria | 0.36 |
| Unknown | 0.40 |

###### Natural Gas Savings

ΔTherm = [(Meal/Day\*HW/Meal\*Days/Year)\*8.3BTU/gal.°F\*(ΔT/filter\*Qty\_Filter]/(ηHeaterGas\*100,000)

Where:

ηHeaterGas = Efficiency of the Gas water heater. If not directly available, use:

= Actual. If unknown, use the table C404.2 in IECC 2012 (or IECC 2015 if through new construction) to assume values based on code estimates

Other variables as above

###### Water and Other Non-Energy Impact Descriptions and Calculation

N/A

###### Deemed O&M Cost Adjustment Calculation

O&M savings may result from reduced filter and hood cleaning frequencies. More research should be done to understand any potnential savings and the associated value.

###### Measure Code: CI-MSC-GRTF-V01-160601

1. Savings methodology factors are for a constant speed fan. [↑](#footnote-ref-1)
2. Professional judgement, consistent with expected lifetime of kitchen demand ventilation controls and other kitchen equipment. [↑](#footnote-ref-2)
3. Minnesota 2012 Technical Reference Manual, [Electric Food Service\_v03.2.xls](http://205.254.135.7/consumption/residential/data/2009/xls/HC7.1%20Air%20Conditioning%20by%20Housing%20Unit%20Type.xls), http://mn.gov/commerce/energy/topics/conservation/Design-Resources/Deemed-Savings.jspech [↑](#footnote-ref-3)
4. Average dishwashing and faucet water usage taken from Chapter 8, Table 8.3.3 Normalized Annual End Uses of Water in Select Restaurants in Western United States. [↑](#footnote-ref-4)
5. Average value based on case studies. Northwinds Sailing, Inc. and North Shore Sustainable Energy, LLC. *Angry Trout Café Kitchen Exhaust Heat Recovery.* Minnesota Department of Commerce, Division of Energy Resources, 2012. NEED CLEAResult reference [↑](#footnote-ref-5)
6. Commercial Kitchen Loads for listed buildings in U.S. Department of Energy Commercial Reference Building Models of the National Building Stock, NREL [↑](#footnote-ref-6)
7. Each filter is 20 X 20 inches. [↑](#footnote-ref-7)
8. Exhaust Fan Schedules for listed buildings in U.S. Department of Energy Commercial Reference Building Models of the National Building Stock, NREL [↑](#footnote-ref-8)
9. Minnesota 2012 Technical Reference Manual, [Electric Food Service\_v03.2.xls](http://205.254.135.7/consumption/residential/data/2009/xls/HC7.1%20Air%20Conditioning%20by%20Housing%20Unit%20Type.xls), http://mn.gov/commerce/energy/topics/conservation/Design-Resources/Deemed-Savings.jspech [↑](#footnote-ref-9)