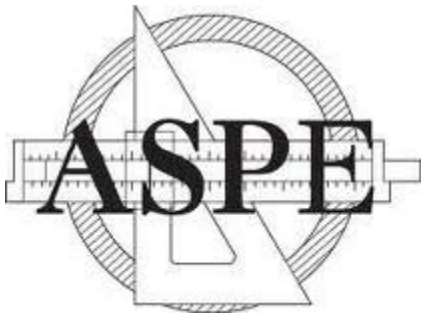
If it's a

Grease Interceptor

then why not size by grease production?

Presented by: Sean Duffy



9500 Woodend Road
Edwardsville, KS 66111
1-800-827-7119
www.schierproducts.com

Brief History of Grease Interceptors

Late 1800's

- The first gravity grease interceptor was patented.

1949

- The PDI-G101 Standard is first issued, rating grease interceptors up to 50 GPM

1949-Present

- Performance Standards: ASME A112.14.3, PDI-G101, CSA B481
  - Defined today as *hydro mechanical grease interceptors*
- Design Standards: ASTM F2649-08, IAPMO Z1001, All of the local standards
  - Defined today as *gravity grease interceptors* – ***modified septic tank***

1973

- The EPA Clean Water Act establishes regulatory framework to limit what commercial building's discharge to the local treatment plant, among other things.
- Opens the door for EPA to fine municipalities for Sanitary Sewer Overflows (SSO's).

Brief History of Grease Interceptors continued

Late 1970s

- Pretreatment managers continue to have problems with SSO's (sanitary sewer overflows) even though the plumbing codes require grease interceptors that are supposed to protect our sewers.
- In light of this perceived failure of the plumbing code, pretreatment and sewer authorities develop local requirements for grease interceptors.
- Size of required grease interceptors increases dramatically, typical size for new buildings is 1,000 gallons regardless of restaurant type and size. *Bigger is better* thinking begins.

1980s-Present

- Failure of large units. The *bigger is better* mentality has its own unique set of problems, including access, pump-out Cost, Buildup of H2S Gases from extended pump-out frequencies, corrosion resistance, cost, required footprint, etc.

Summer of 2008

- 2 dead, 1 permanently disabled following inhalation of noxious H2S gasses from a large Grease trap at the Orleans Hotel & Casino in Las Vegas: http://articles.latimes.com/2008/jul/28/nation/na-vegas28

Today

- Confusion for the competing code officials…
- Confusion for the engineer and contractor…
- **And most of all, confusion for the end user!!!**

Question 1

How are grease interceptors currently sized?

Answer: By Flow Rate

The typical flow rate sizing methods are:

1. **Flow rate expressed in GPM (typical for hydro mechanical grease interceptors)**
   - Flow rate is calculated to figure the possible peak flow producible by the drainage fixtures and equipment in the food prep area.
   - This is the method typically used for units that have been certified to the Performance Standards: ASME A112.14.3, PDI-G101, CSA B481

2. **Flow rate & retention time formula for the sizing of a tank by volume in gallons (typical for gravity grease interceptors)**
   - Flow rate is calculated to figure the possible peak flow producible by the drainage fixtures and equipment in the food prep area then multiplied by a retention time (usually determined by the municipality) to produce the liquid volume (in gallons) needed for the grease interceptor.
   - This is the method typically used for units that have been built to comply with the Design Standards: ASTM F2649-08, IAPMO Z1001, All of the local standards

Question 2

But WHY do we size by flow rate?

Answer

Because after "*exhaustive laboratory testing at the Iowa Institute of Hydraulic Research*" PDI decided to test grease interceptors for performance by a range of different flow rates (GPM) with a minimum grease capacity requirement of double the flow rate in grease lbs.

Today, testable sizes per PDI, ASME and CSA are:

- 4 GPM, 8 lbs.
- 7 GPM, 14 lbs.
- 10 GPM, 20 lbs.
- 15 GPM, 30 lbs.
- 20 GPM, 40 lbs.
- 25 GPM, 40 lbs.
- 35 GPM, 70 lbs.
- 50 GPM, 100 lbs.
- 75 GPM, 150 lbs.
- 100 GPM, 200 lbs.

Question 3

Okay, so if I size by flow rate, am I still "covered" for grease production?

Answer

Maybe / Maybe not… Unfortunately, when we size by flow rate we can require a grease interceptor that may or not be right for the application.

Example

- A Mexican restaurant with a 4" drain line can be sized to roughly 50 GPM
- A Subway with a 4" drain line can also be sized to roughly 50 GPM.

Summary

- In other words, two restaurants with very different meal types and number of customers served can end up with the exact same code compliant grease interceptor!
- And there's still no assurance that it's the right product for either application!

Question 4

So what is the typical flow rate a real kitchen drain line?

Answer

According to the *Assessment of Grease Interceptor Performance* report published by the Water Environment Research Foundation (WERF) in 2008, the average restaurant flow rate is…

See complete flow study here:

http://www.ndwrcdp.org/documents/03-CTS-16T/03CTS16TAweb.pdf

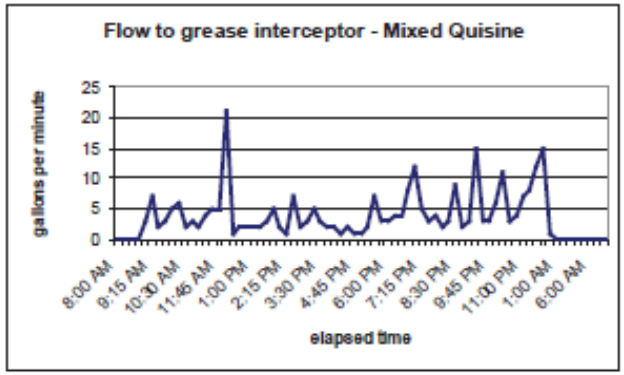
2.8 gallons per minute!

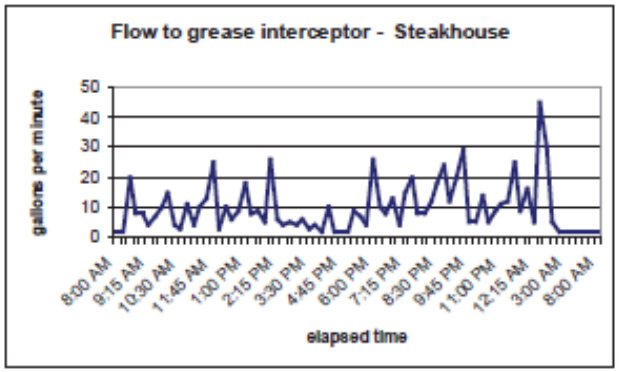
WERF Flow Studies of Several Real Restaurants

FSE NAME	Total Flow to GI gpd	Max Flow gpm	Avg Flow gpm	Std. Dev gpm	GI Size market	Min HRT minute	Avg HRT hr	Seating #
full fare steakhouse	2,512	9	1.2	1.8	1000	111	14	250
grocery store	2,078	20	2.6	4.1	1200	60	7.8	5
fast food - burgers	1,421	10	1.4	2.0	1000	100	11.9	85
full service pizza	1,599	5	1.5	1.3	1000	200	11.1	90
full service - mixed cuisine	1,650	21	3.8	4.0	1000	48	4.4	320
full service steak house	6,326	45	9.8	8.4	1500	33	2.5	365
full service - mixed cuisine	1,643	12	3.0	2.3	1000	83	5.6	345
fast food - burgers	951	16	3.2	3.8	1000	63	5.2	84
full fare - Italian	4,310	35	9.4	8.0	1500	43	2.7	300
full service cafeteria	2,944	29	3.2	5.8	2000	69	10.4	300
full service pizzeria	1,235	28	4.2	6.3	1500	54	5.9	156
Single service - sandwiches	995	15	3.0	3.7	1000	67	5.6	140
full service - Mexican	1,810	33	5.0	7.4	1000	30	3.3	200
full service - meats featured	2,657	20	2.3	3.1	1000	50	7.2	172
grocery store	389	4	1.2	0.8	1000	250	13.6	1
Single service - Japanese	654	21	2.6	4.2	1000	48	6.5	44
Single service - mixed cuisine	629	5	0.5	0.9	1000	200	32	117
full service pizzeria	1,423	23	3.9	4.3	1000	44	4.3	82
full service - mixed cuisine	1,213	11	1.1	1.8	1000	91	14.7	142
elementary school cafeteria	339	8	0.5	1.3	1500	188	55.6	300
high school cafeteria	677	24	0.6	2.7	1500	63	39	450
cafeteria, corporate office	1,113	12	1.0	2.2	1500	125	26	530
full service restaurant, hotel	1,244	8	0.5	1.2	1500	188	50	101
full service meats	2,769	15	2.8	3.8	1500	100	8.9	276

WERF Flow Studies of Several Real Restaurants

Mixed Cuisine
Peak 21 GPM
Avg 3.8 GPM

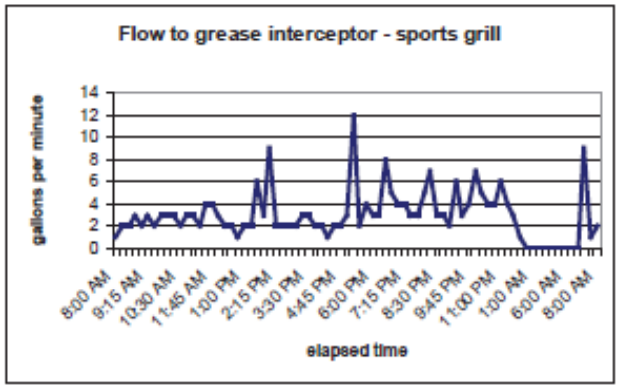


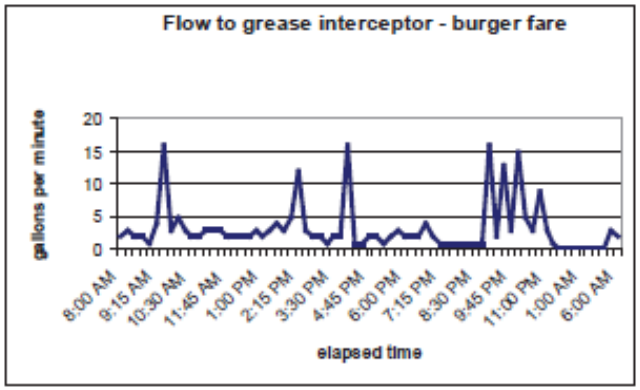


Steakhouse
Peak 45 GPM
Avg. 9.8 GPM:

the outlier and largest flow rate tested.

Sports Grill
Peak 12 GPM
Avg 3 GPM

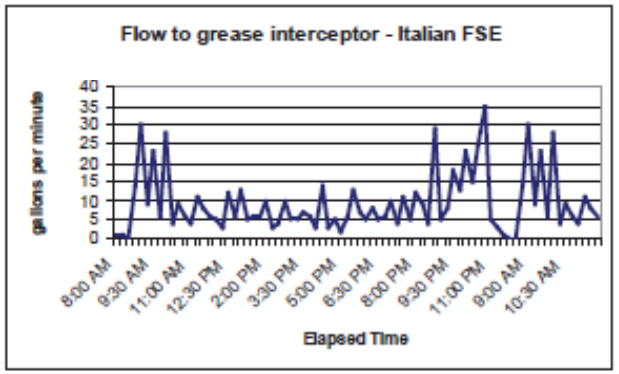


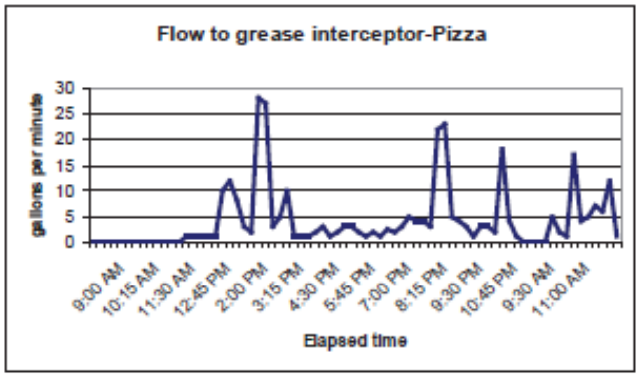


Burger Fare
Peak 16 GPM
Avg 3.2 GPM

Italian
Peak 35 GPM
Avg 9.4 GPM:

the second largest flow rate tested

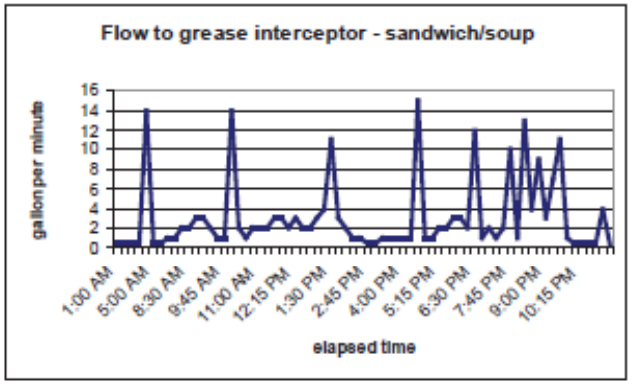


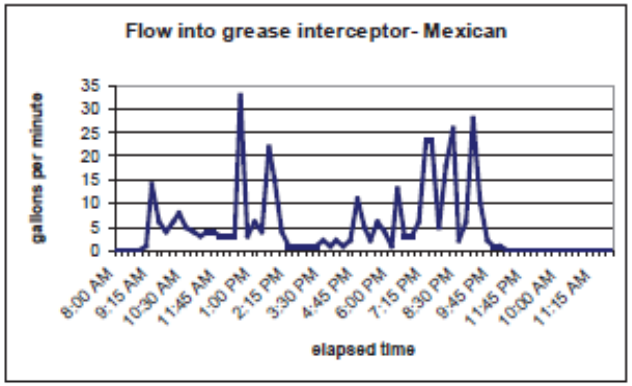


Pizza
Peak 28 GPM
Avg 4.2 GPM

WERF Flow Studies of Several Real Restaurants

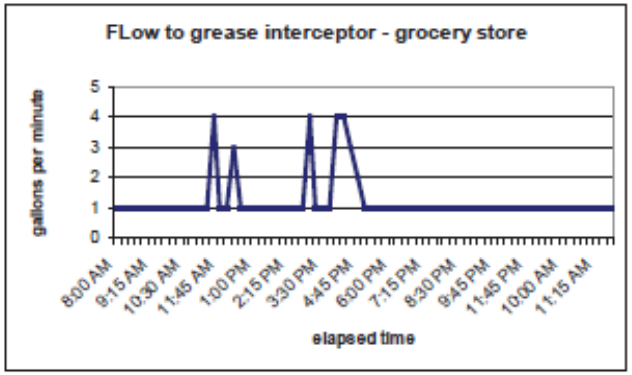
Sandwich/Soup
Peak 15 GPM
Avg 3.0 GPM

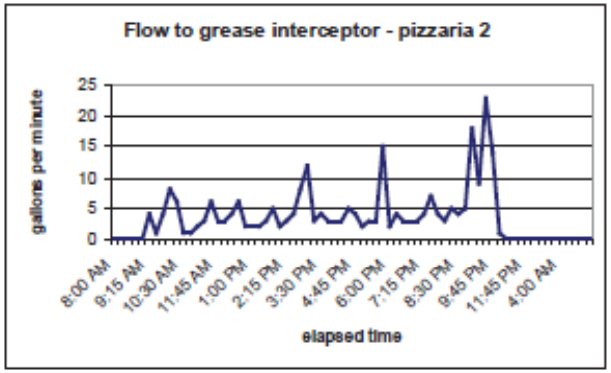




Mexican
Peak 33 GPM
Avg 5 GPM

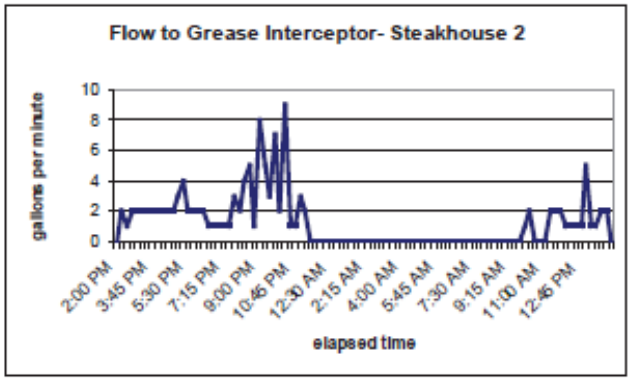
Grocery Store
Peak 4 GPM
Avg 1.2 GPM

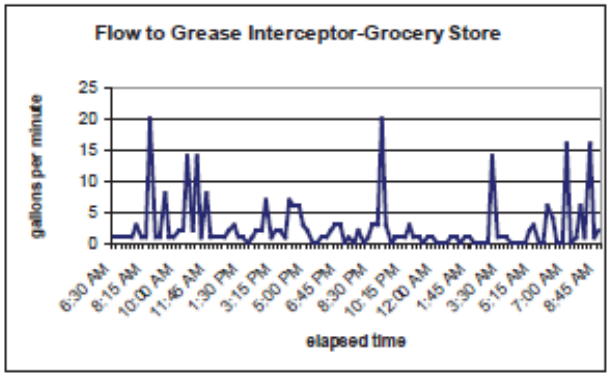




Pizzeria
Peak 23 GPM
3.9 GPM

Steakhouse
Peak 9 GPM
Avg 1.2 GPM

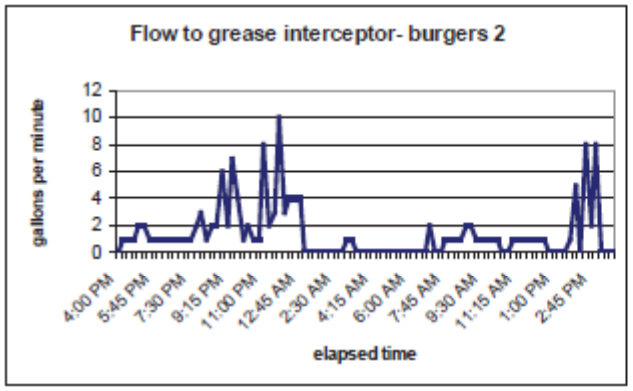


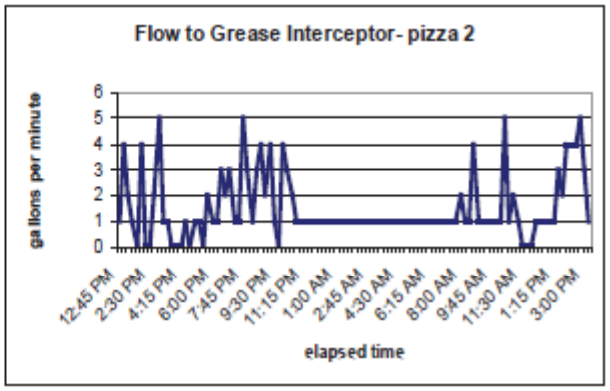


← *Grocery Store*
Peak 20 GPM
Avg 2.6 GPM

WERF Flow Studies of Several Real Restaurants

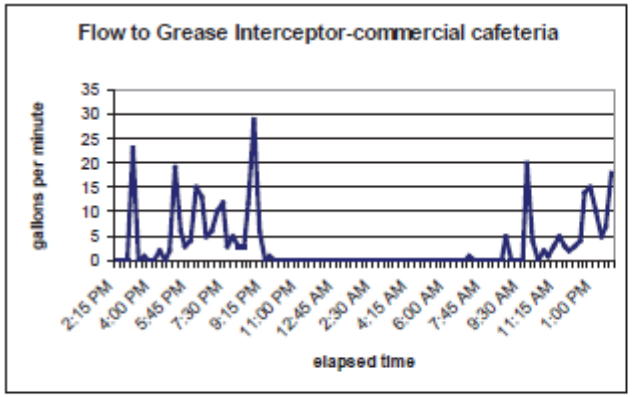
Burgers
Peak 10 GPM
Avg 1 .4 GPM

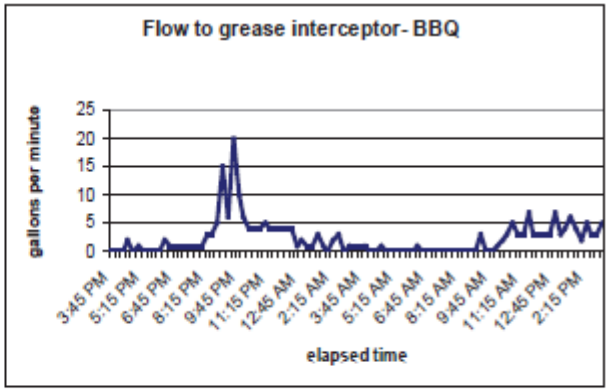




Pizza
Peak 5 GPM
Avg 1.5 GPM

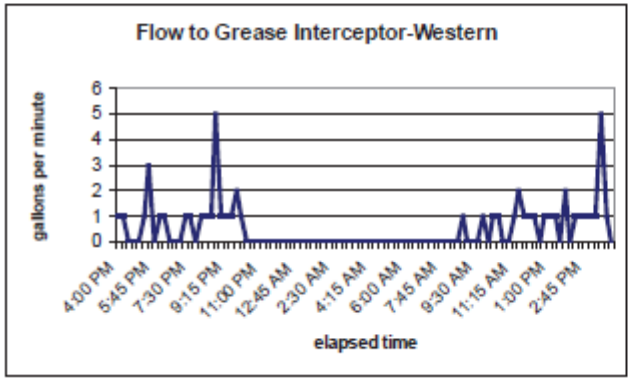
Commercial Cafeteria
Peak 29 GPM
Avg 3.2 GPM

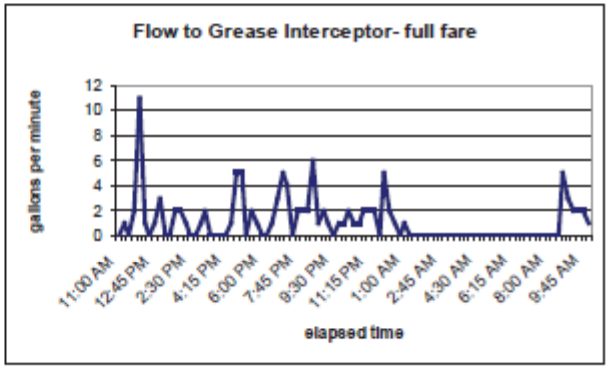




BBQ
Peak 20 GPM
Avg 2.3 GPM

Western
Peak 5 GPM
Avg 0.5 GPM

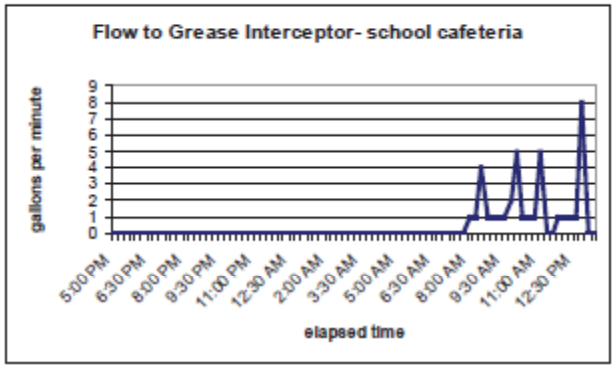


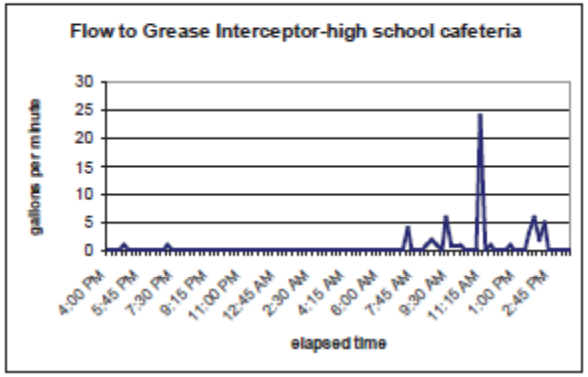


Full Fare
Peak 11 GPM
Avg 1.1 GPM

WERF Flow Studies of Several Real Restaurants

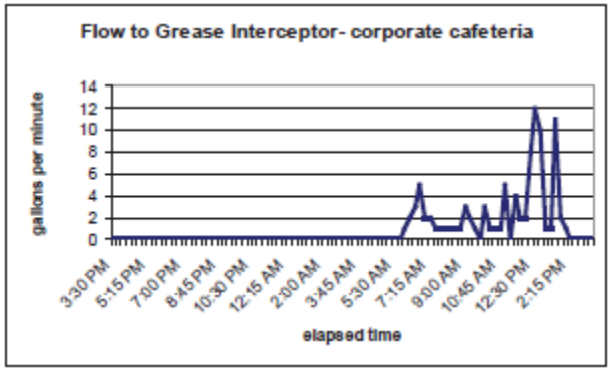
School Cafeteria
Peak 8 GPM
Avg 0.5 GPM

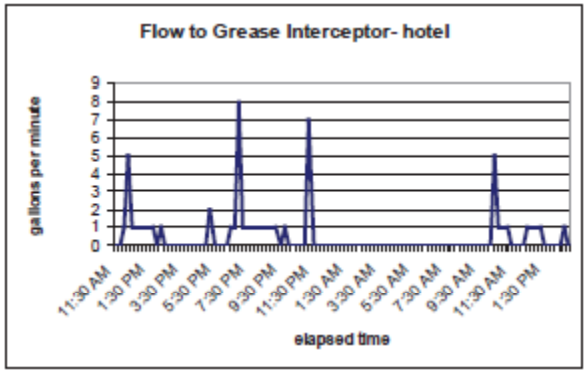




High School Cafeteria
Peak 24 GPM
Avg 0.6 GPM

Corporate Cafeteria
Peak 12 GPM
Avg 1 GPM





Hotel
Peak 8 GPM
Avg 0.5 GPM

If not flow rate, then what is the most important sizing factor for **grease interceptors**?

Well, Grease Production!

Grease Production Sizing Method

Schier Products has developed a way to estimate grease production using actual field data.

Using this 2-step tool, you can size a grease interceptor to provide enough grease capacity for an appropriate pump schedule.

Grease Production Sizing Method

Step 1: Satisfy local plumbing code as required.

Indiana is currently under the 1999 Indiana State Code *(which is the same as 1997 UPC)*

Indiana is in the process of adopting the 2006 IPC

2009 International Plumbing Code (IPC) Digest

Grease interceptors shall be tested and sized in accordance to ASME A112.14.3, ASME A112.14.4, or PDI G101. Exterior interceptors greater than 500 gallons are exempt from those requirements. Food waste grinders must connect to a solids interceptor before connecting to a grease interceptor. The solids interceptor shall be sized and rated for the discharge of the grinder. Emulsifiers, chemicals and enzymes shall not discharge to the grease interceptor.

Sizing

Garbage disposals are required to tie into the grease interceptor. In this situation, Schier recommends a solids interceptor for initial pretreatment prior to the grease interceptor (see page 27 for solids interceptors). There are no stated guidelines for sizing grease interceptors in the IPC, although it does list minimum performance efficiencies for grease storage (lbs) based on flow rate (GPM). Qualifying flow rates range from 4 GPM up to 100 GPM. See sizing by flow rate on the following page.

Grease Production Sizing Method

Step 1: Satisfy local plumbing code as required.

When flow rate based sizing is required as is with the UPC, see below, then proceed to Step 2.

If flow rate based sizing is not required as is with the IPC, proceed directly to Step 2.

1a. By Pipe Size (Recommended) – drainage system flow rate (GPM) should be determined based on pipe size. Schier recommends calculating based on half-pipe flows as is standard practice for engineered plumbing systems.

FLOW RATES (GPM) BY PIPE SIZE (AT 1/4" PITCH) G4

Pipe Size (nominal)	†ASPE Full Pipe Flows	ASPE 2/3 Pipe Flows	ASPE 1/2 Pipe Flows	UPC HGI for 1 Minute Drain Time	UPC HGI for 2 Minute Drain Time
2	18	14	9	20	10
3	51	41	26	75	35
4	110	87	55	150	75
6	314	248	157	500	250

Typical drain line piping is sized for 1/2 pipe flow. ▲

† ASPE: American Society of Plumbing Engineers

1b. Or By Fixtures – where fixture dimensions and flow rates of all connected fixtures and equipment are known, HGI interceptors may be sized as follows:

$$\frac{\left(\left[\frac{\text{Volume of All Sink Bowls in Food Prep Area in Inches}^3}{231}\right] \times \text{0.75 (loading factor)}\right)}{\text{1 minute}} + \text{Flow Rate of All Other Fixtures in Food Prep Area in GPM (i.e. dishwasher, wok range, soup kettle, etc.)} = \textbf{Max Flow Rate (GPM) to Interceptor}$$

Grease Production Sizing Method (with all grease laden fixtures draining to the GI)

Step 2: Adjust for pump-out cycle.

Size for grease production based on restaurant type and number of customers.

Customers or Meals Per Day × Grease (lbs.) Per Meal *(see A, B, C, D, E, or F below)* × 90 Days = **Grease Output Per Quarter**

3-MONTH GREASE-OUTPUT (IN LBS.) & INTERCEPTOR SELECTION G5

Customers or Meals per Day	LOW GREASE OUTPUT: Sandwich Shop, Convenience Store, Fresh, Bar, Sushi Bar, Delicatessen, Snack Bar, Ice Cream Parlor, Hotel Breakfast Bar, Residential				MEDIUM GREASE OUTPUT: Coffee House, Pizza, Grocery Store (no fryer), Cafeteria (no food prep), Japanese, Fast Food, Drive-In, Greek, Indian, Low Grease Output FSE (w/fryer)				HIGH GREASE OUTPUT: Cafeteria, Family Restaurant, Italian, Steak House, Bakery/Donut Shop, Chinese, Buffet, Mexican, Seafood, Fried Chicken, Grocery Store (w/fryer), Barbecue			
	A No Flatware 0.005 lbs./meal		B With Flatware 0.0065 lbs./meal		C No Flatware 0.025 lbs./meal		D With Flatware 0.0325 lbs./meal		E No Flatware 0.035 lbs./meal		F With Flatware 0.0455 lbs./meal	
	Pounds per Quarter	Schier Model	Pounds per Quarter	Schier Model	Pounds per Quarter	Schier Model	Pounds per Quarter	Schier Model	Pounds per Quarter	Schier Model	Pounds per Quarter	Schier Model
100	45	GB-15	59	GB-15	225	GB-50	293	GB-75	315	GB-75	410	GB-75
200	90	GB-20	117	GB-20	450	GB-75	585	GB-75	630	GB-75	819	GB-250
300	135	GB-35	176	GB-50	675	GB-75	878	GB-250	945	GB-250	1,229	GB-75 (2)
400	180	GB-50	234	GB-50	900	GB-250	1,170	GB-250	1,260	GB-75 (2)	1,638	GB-75 (3)
500	225	GB-50	293	GB-75	1,125	GB-250	1,463	GB-75 (3)	1,575	GB-75 (3)	2,048	GB-250 (2)
750	338	GB-75	439	GB-75	1,688	GB-75 (3)	2,194	GB-250 (2)	2,363	GB-250 (2)	3,071	GB-250 (3)
1,000	450	GB-75	585	GB-75	2,250	GB-250 (2)	2,925	GB-250 (3)	3,150	GB-250 (3)	4,095	GB-250 (4)
1,250	563	GB-75	731	GB-250	2,813	GB-250 (3)	3,656	GB-250 (4)	3,938	GB-250 (4)	5,119	GB-250 (5)
1,500	675	GB-250	878	GB-250	3,375	GB-250 (3)	4,388	GB-250 (4)	4,725	GB-250 (4)	6,143	GB-250 (6)

The Grease production values are based on actual data obtained from the study of 20 restaurants monitored over a 9 month period, municipal pre-treatment officials, pumper contractors, and two independent research reports. Actual grease production is independent to every restaurant and will vary by menu type and kitchen practices .

The grease production sizing method is independent of grease interceptor brand.

Use it for any grease interceptor!

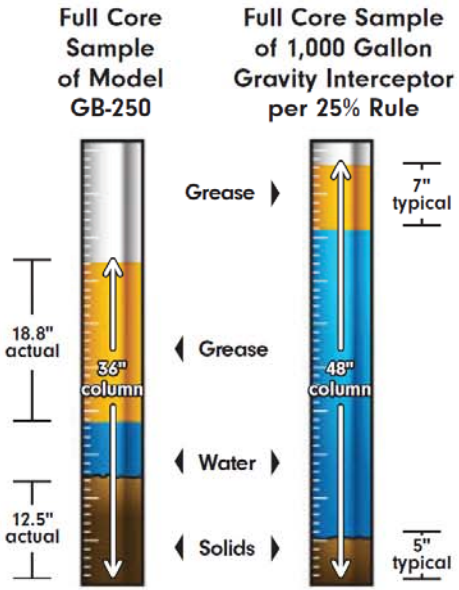
Choose grease interceptor with appropriate grease storage.

1. When 3rd party certified to ASME, PDI or CSA, use the known grease capacity.
2. When uncertified, use the 25% pump-out rule (below):

How Do I Know When to Pump it Out?

Because most gravity interceptors are not tested for performance, pretreatment authorities typically apply the 25% pump-out rule. This requires food service establishments to fully pump out their interceptor after 25% of the liquid volume has been filled with grease, solids or a combination of the two.

Schier's Diffusion Flow™ interceptors are not subject to the 25% pump-out rule as they have been certified to greatly outperform those levels. The images to the right show comparison core samples of a full Great Basin™ model # GB-250 versus a full 1,000 gallon gravity interceptor. For more information see table G3.



Choose grease Interceptor with appropriate grease storage.

1. When 3rd party certified to ASME, PDI or CSA, use the known grease capacity.
2. When uncertified, use the 25% pump-out rule below:

GRAVITY GREASE INTERCEPTORS G3

Gravity Unit (gal.)	Efficiencies Based on 25% Pump-Out Rule					
	70% Grease / 30% Solids		60% Grease / 40% Solids		50% Grease / 50% Solids	
	Grease (lbs.)	Solids (gal.)	Grease (lbs.)	Solids (gal.)	Grease (lbs.)	Solids (gal.)
300	357	23	306	30	255	38
500	595	38	510	50	425	63
750	893	56	765	75	638	94
1,000	1,190	75	1,020	100	850	125
1,250	1,488	94	1,275	125	1,063	156
1,500	1,785	113	1,530	150	1,275	188
2,000	2,380	150	2,040	200	1,700	250
2,500	2,975	188	2,550	250	2,125	313
3,000	3,570	225	3,060	300	2,550	375
4,000	4,760	300	4,080	400	3,400	500
5,000	5,950	375	5,100	500	4,250	625

Application of grease production sizing method

Example 1: KFC, Beaverton, Oregon

500 meals per day X 0.035 lbs per meal x 90 days = 1,575 lbs per quarter

That's nearly four 55 gallon drums of pure grease per quarter!

Helpful Conversion Tip: 1 gallon of grease weighs approximately 7.2 lbs.

When flow rate sizing is used

Example 1: KFC, Beaverton, Oregon

What Interceptor was originally installed ?

A 20 GPM, 40 lb hydro mechanical grease interceptor

At 1,575 grease lbs. production per quarter, that 40 lb grease trap would have to be pumped out every two days to maintain efficiency. Without this, there would have been significant pass-through, regular snaking of drain lines downstream of grease interceptor and fines from the local pre-treatment authority for non-compliance.

Application of grease production sizing method

Example 1: KFC, Beaverton, Oregon

Schier Solution*: in order to accommodate the existing footprint, Schier sized a Great Basin™ GB-75 grease interceptor which has a 3rd party proven grease storage capacity of 616 grease lbs . Giving the KFC an efficient 35 day pump-out cycle.*

Application of grease production sizing method

Example 2: McDonalds, Lees Summit, Missouri

500 meals per day X 0.025 lbs per meal x 90 days = 1,125 lbs per quarter

That's nearly three 55 gallon drums of pure grease per quarter!

Helpful Conversion Tip: 1 gallon of grease weighs approximately 7.2 lbs.

Application of grease production sizing method

Example 2: McDonalds, Lees Summit, Missouri

500 meals per day X 0.025 lbs per meal x 90 days = 1,125 lbs per quarter

***Schier Solution**: Schier sized a Great Basin™ GB-250 grease interceptor which has a 3rd party proven grease storage capacity of 1,076 grease lbs . This was installed in place of the original 1,000 gallon gravity grease interceptor and provided McDonalds with an efficient quarterly pump-out cycle.*

Application of grease production sizing method

Example 2: McDonalds, Lees Summit, Missouri

Did You Notice?
A Schier GB-250 was installed inside the failed concrete grease interceptor. Contractor cut nearly two days off another concrete unit!

A 1,000 gallon, estimated 1,020 lbs gravity grease interceptor

At 1,125 grease lbs. production per quarter, and years of corrosion, extreme grease pass-through led to regular snaking of drain lines downstream of grease interceptor and fines from the local pre-treatment authority for non-compliance.

What happens when you select the right size grease interceptor for your project?

Happiness for all stakeholders!

Code Authorities

With a grease production sizing method you satisfy plumbing code officials and pre-treatment officials by providing a sizing method that's enforceable, but which also provides the efficiencies needed to keep the sewers running clear…

Engineer & Contractor

With a grease production sizing method the plumbing engineer can specify a grease interceptor that will satisfy code, that will work well for the contractor and that will ultimately keep his customer (the end user) happy by providing a product with an acceptable pump-out frequency.

The End User

With a grease interceptor that has been sized for the grease production of his restaurant, the end user and operator can worry less about his grease interceptor and more about running a successful restaurant!

Thank you!

For more, log on to:
www.schierproducts.com

Or call:
1-800-827-7119