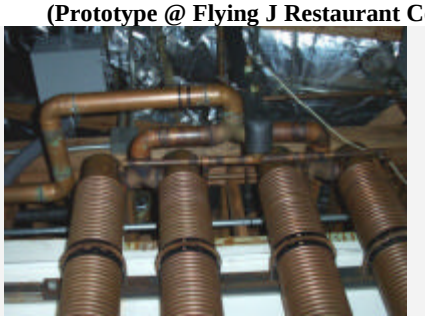
Improving Performance of Grease Traps & Interceptors

(Prototype @ Flying J Restaurant Cools Dishwasher Effluent -- Saving Energy, Water & Maintenance)*



(a) Upper section of M2P4-60

(b) Three speed Grundfos UP15-42F Circulator
(Circulates cold & preheated water between 4 GFX-coils & 3 85-gallon gas water heaters @ 4.7, 5.8 or 6.5 gpm)

(c) GFX Model M2P4-60
Effectiveness: 72% (4.5 gpm balanced); 85% (4.5/6.5 gpm)

(d) Hobart dishwasher Models C-44A/C-44AW
(Discharge: 5/2 gpm; capacity 203/126 racks/hr, respectively)

(e) Variable speed wastewater pump

(f) Wastewater holding tank with automatic bypass

Problems

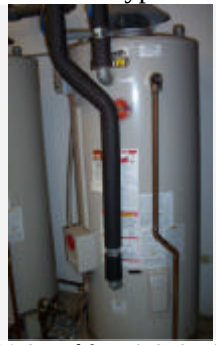
In 1884, Nathaniel Whiting patented the first grease trap in California; creating a new way to waste millions of Btu's protecting sewers from fats, oils and grease ("FOG"). Rather than foster conservation by improving his invention, some modern traps also waste water. Automatic interceptors called grease removal devices (GRD) waste additional energy re-heating trapped grease to 110°F to 140°F. (See "***Back to Basics: Grease Interceptors***", Ron George, CIPE, CPD; PM Engineer 11/04)

Flying J's Green Solution

Adding a GFX Drain Heat Recovery (DHR) system before a grease trap saves energy, enhances performance and eliminates the need to add cold water to solve the "Hot Trap" problem.

Single Loop System

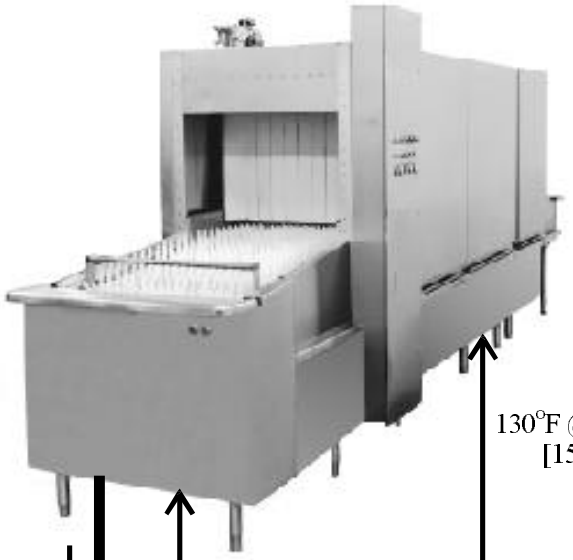
This GFX-system has an open wastewater loop and closed cold-water loop. Operating conditions are set by pump speeds and time-delay relays. In busy restaurants, for example, with 55° city water and a C-44A operating at 90% capacity, the GFX must handle an average drain rate of 4.5 gpm. With the lowest coil flow rate, 160°F effluent will be cooled to about 77°F before entering the trap; 71°F at the highest circulation rate. Water heater load reduction will be 54.8 & 58.7 kW-thermal, respectively. Up to 0.9 x 58.7 = 52.8 kWh (180,309 Btu) will go back to the water heater to boost its capacity rather than heat the grease trap. **NOTE**: Converting the Flying J prototype to a proprietary closed-loop system will reduce maintenance by promoting self-cleaning. (Adding a GFX after a GFD can save more energy.)



(g) One of three A.O. Smith MasterFit® induced draft tank-type commercial gas water heaters (Model BTR 500)

* Photos courtesy of Joshua Cardana, Restaurant Manager Flying J Truck Stop Restaurant, Ripon, CA (CA99, Exit @ Jack Tone Road); (GFX unit was shipped 3/17/03, photographed 12/6/04)

Case Study: DHR Energy & Demand Savings Estimates For Flight-Type Commercial Dishwasher Operating In Our Lady of Consolation Nursing Home



Hobart FT900
Flight-Type Conveyer Dishwasher
Pre-, Wash-, Rinse-, Final-Rinse-
Temperatures: 130/140/160/180°F

130°F @ 1.26 gpm
[15.8 kW]

Model M2P4-60 GFX
DHR Efficiency Ratings:
79% @ 4.5 GPM
72% @ 6.5 GPM

Winter Reach: 26°F
@ 72% Balanced Effectiveness
6 psi Pressure Drop
112°F@ 64.5 kW
6.5 gpm

180°F @ 5.24 gpm
Final Rinse
[105 kW]

Tankless W/H
36 kW Electric
123 kBtu/hr Gas

Tankless W/H
18 kW Electric
61 kBtu/hr Gas

Run-Dry
Centrifugal-Pump With
Clog-Resistant Impeller
Grainger [TEEL] #3P577
Self-Priming to 20 Feet

Drainwater
138°F @ 6.5 gpm

Strainer

City Water
45°F Winter
(55°F Avg)

71°F Winter
78°F Avg.
85°F Summer
To Grease Trap

Average Fuel Savings

@ 7 Hours Per Day Operation
Tankless All-Electric @ 100% Conversion
No Distribution Loss: 147,000 kWh/yr

Gas Storage Water Heating
@ 40% Conversion/Distribution Efficiency
1.26 Billion Btu = 12,600 Therm

Water Heater's Load Reduction

Winter: 64.4 kW = 220 kBtu/hr
Summer: 50.6 kW = 172 kBtu/hr
Average: 57.5 kW = 196 kBtu/hr

BAKERY
DRAIN HEAT RECOVERY SYSTEM
PROCESS FLOW DIAGRAM

The estimated gas bill savings at Plant 1 is between $5,363 - $9,880 per year, based on 10,000 gallons/day discharge. The estimated reduction in air pollutant emissions is approximately 1.46 tons of CO2 and 0.051 tons of NOx emissions per year from the Plant 1 Pan Washer natural gas water heating system.

DOUGLAS MODEL 3060
RACK, PAN, & UTENSIL
WASHING MACHINE

HOT SUPPLY WATER
160 ^{O}F @ 6.5 GPM

DRAIN WATER
138 ^{O}F @ 6.5 GPM

GFX MODEL
M2P4-60
HEAT
EXCHANGER

HOT WATER
112 ^{O}F @ 6.5 GPM

GAS FIRED
WATER
HEATER

DRAIN WATER
138 ^{O}F @ 6.5 GPM

STRAINER

CENTRIFUGAL
PUMP

CITY WATER
55 ^{O}F AVG.
45 ^{O}F WINTER

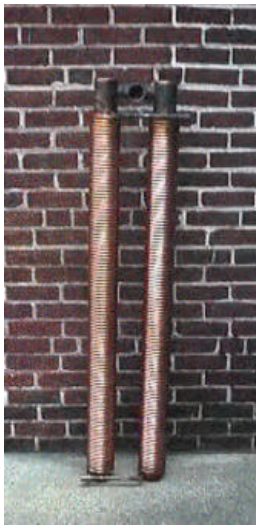
DRAIN WATER 78^{O}F
TO GREASE TRAP

Richard G. Marenco, P.E. (210) 844-5637 October 2010

GFX CASE STUDY: FLIGHT-TYPE DISHWASHERS

Return To GFX Store

Model P3-60 GFX



Application: Twenty gas water heaters (GWH) must supply hot water at or above 150^{O}F @ 4 gpm to 20 flight-type, conveyor dishwashers to remove mold release from injection molded plastic parts. Each washer demands an average of 2 GPM of 150^{O} water, 24 hours/day, 5 days/week.

Water Heater: Rheem Vanguard Model 6E743A, 199,900 Btu/hr input, 183 GPH @ 110 degree F rise, 170,000 Btu/hr output, 85% conversion efficiency.

Major Problems Solved: (1) Fouling of conventional heat exchangers; (2) Insufficient supply of water hot enough to meet process specifications.

Feedback (7/02)

"***We have used plate and frame, and shell and tube heat exchangers in our processing operation. These were high maintenance, plugging up constantly. We switched to GFX units to resolve the plugging problems. They work! Our water heating system no longer has any trouble keeping up with demand. The GFX units have never plugged. The GFXs have been in for over 11/2 years; they are doing so well I've Forgotten about them.***" -- says Jason Blankenship, Director of Engineering Meramec Group, Inc.; Missouri, USA; manufacturer of molded Polyurethane products. (Quote from www.gfxtechnology.com/testimonials.html)

Operating Parameters Without GFX

	68F Cold Supply	45F Cold Supply
Process Energy Demand:	19.68 Therm/day	25.20 Therm/day
GWH Load [See Notes]	19.68 Therm/day	25.20 Therm/day
Input Energy Demand:	23.15 Therm/day	29.65 Therm/day
Input Heat Demand @ 4gpm:	1.929 Therm/hr	2.471 Therm/hr
Drainwater Heat:	14.88 Therm/day	20.40 Therm/day

With GFX Model P3-60

Process Energy Demand:	19.68 Therm/day	25.20 Therm/day
Measured GFX-Performance:	Drain - 39F drop [130/ 91]	53.6F drop
	Coil - 39F rise [68/107]	53.6F rise
Measured Recycling Efficiency:	63%	63%
Heat Recovered:	9.36 Therm/day	12.85 Therm/day
GWH Load:	10.32 Therm/day	12.35 Therm/day
Input Energy Demand:	12.14 Therm/day	14.53 Therm/day
Input Heat Demand @ 4gpm:	1.012 Therm/hr	1.211 Therm/hr
Energy Savings:	47.6%	51.0%
Demand Savings:	47.6%	51.0%
Net Savings For 20 P3-60's:	48,672 Therm/yr	66,820 Therm/yr

NOTE 1: Distribution & Standby Loss Neglected
NOTE 2: 1 Therm = 100,000 Btu = 29.3 kWh
*GFX Measurements , Courtesy of Jason Blankenship, MERAMEC Group.

Return to GFX Home Page Return to Index Page

Dishwasher Performance Table

Model	GPM*	Cold Water EWT (F)	Cold Water LWT (F)	Hot Water EWT (F)	Hot Water LWT (F)	Heat Trans Btuh	Cold Water Pres. Drop
P3-60	4	55	101.3	130	83.7	92,586	6.8
P3-60	4	60	103.2	130	86.8	86,414	6.8
P3-60	4	65	105.1	130	89.9	80,241	6.8
P3-60	4	70	107.0	130	93.0	74,069	6.8
P3-60	4	75	108.9	130	96.1	67,896	6.8

* Basis: 4 GPM cold and 4 GPM waste water at 130F avg. temperature

Dishwasher Performance Table

Model	GPM*	Cold EWT (F)	Cold LWT (F)	Hot W EWT (F)	Hot W LWT (F)	Heat Trans Btuh	Cold Water Pres. Drop
P4-60	4	55	106.0	130	79.0	102,037	9.0
P4-60	4	60	107.6	130	82.4	95,234	9.0
P4-60	4	65	109.2	130	85.8	88,432	9.0
P4-60	4	70	110.8	130	89.2	81,629	9.0
P4-60	4	75	112.4	130	92.6	74,827	9.0

* Basis: 4 GPM cold and 4 GPM waste water at 130F avg. temperature

Cold Side Pressure Drop

GPM	G3-60	S3-60	P3-60	G4-60	S4-60	P4-60	PS4-60	M2P4-60
0.5	2.2	0.3		2.9	0.4			
1	3.6	0.5	2.2	4.8	0.7	2.9		
1.5	5.2	0.8	2.9	6.9	1.1	3.8		
2	6.8	1.2	3.6	9.0	1.6	4.8	0.7	2.9
2.25	7.9	1.3	4.0	10.4	1.7	5.3	0.8	3.1
2.5	9.4	1.5	4.4	12.4	2.0	5.8	1.0	3.4
3	12.6	1.9	5.2	16.6	2.5	6.9	1.1	3.8
3.5	15.8	2.6	6.0	20.9	3.4	7.9	1.4	4.3
4	19.8	2.6	6.8	26.1	3.4	9.0	1.6	4.8
5	34.0	4.9	9.4	44.9	6.5	12.4	2.2	5.8
6		7.7			10.2		2.5	6.9
7		10.5			13.9		3.0	8.0
8		13.6			18.0		3.4	9.0
9		16.3			21.5		5.0	10.7
10		19.3			25.5		6.5	12.4