Your *BEST* Solution For Heat Exchanger Cleaning

FIN FOAM

A DIVISION OF Thompson Industrial Services

IMPROVED Cooling Performance & Heat Transfer Efficiency · **INCREASED** Production · **PROLONGED** Unit Life · **REDUCED** Maintenance Costs · **WORLDW**

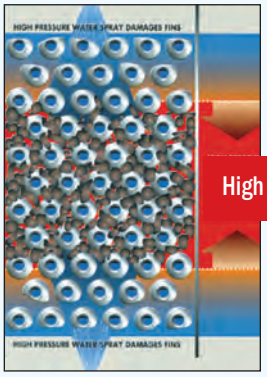
The rate at which your heat exchangers cool can have a dramatic effect on your production capability and on your company's bottom-line. Finfoam, a service by Thompson Industrial Services, understands heat transfer economics and WILL maximize your return. We bring your heat exchangers to their highest possible performance, allowing you to produce at your maximum rate. We've redefined the method many major refinery and petrochemical plants use to clean their air-cooled heat exchangers.

The *Finfoam* cleaning method is safer, more cost effective, and more efficient

than ANY other method including, but not limited to, high pressure cleaning, air blowing, and CO_2 blasting.

Brief Overview - Traditional Method

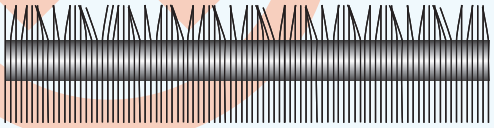
Dirt and grime clog fins costing you time and money!



High pressure water can flatten and damage fragile cooling fins and will compact the dirt and debris toward the center of the heat exchanger. Over time, these conditions contribute to the breakdown of the cooling process, long term damage, reduced production, and increased cost.

High pressure cleaning from above & below compacts debris towards the center of heat exchanger

COSTLY FIN DAMAGE



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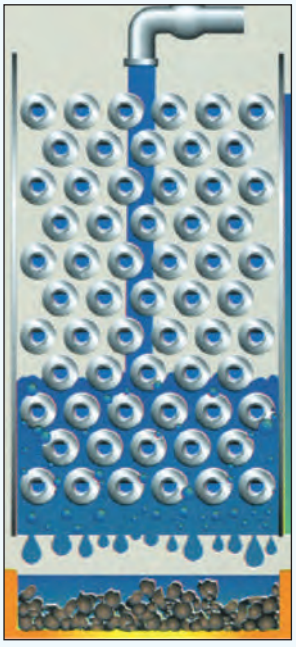
* Biodegradable | Non-Toxic | Non-Hazardous

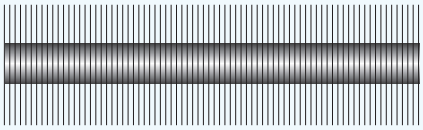
The visible foam, clean and evenly distributed, allows the ***Finfoam*** technician to confirm a "top quality" job.

Clean fins SAVE you time and money!



The ***Finfoam*** process is engineered to surround and contact 100% of the surface area of the heat transfer surface in a gentle bath while providing the most powerful cleaning solution* available.

Finfoam's soaking action goes to work, breaking the bond between the fins and the air-flow restricting & heat transfer impairing dirt and debris. Low pressure water is then used to rinse away the foam residue, removing the dirt and debris without damaging the fins. This environmentally safe residue can then be completely captured for disposal, if required.



NO FIN DAMAGE

Examine the Before and After Data:

- **INCREASED** refinery throughput by 11.9% to 17.4%
- **IMPROVED** heat transfer coefficients of 54% to 145%
- **REDUCED** electrical energy ~10 day payback on the cost of cleaning!

OVEN Track Record · **ZERO DAMAGE** To Fins · **NO LOSS OF PRODUCTION** On-Stream Cleaning · **DEBRIS COLLECTED** and Disposed · **ENVIRONMENTALLY SAFE**

Rinsing the fans after foaming

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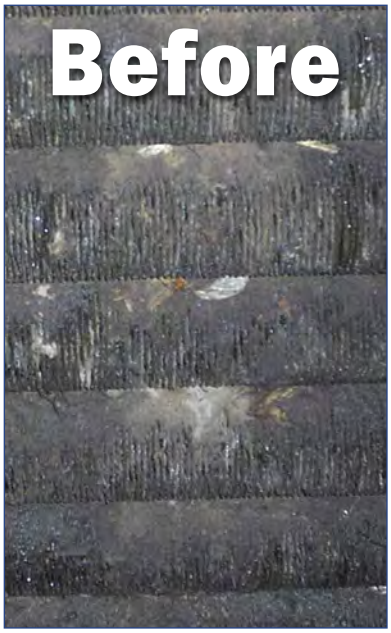
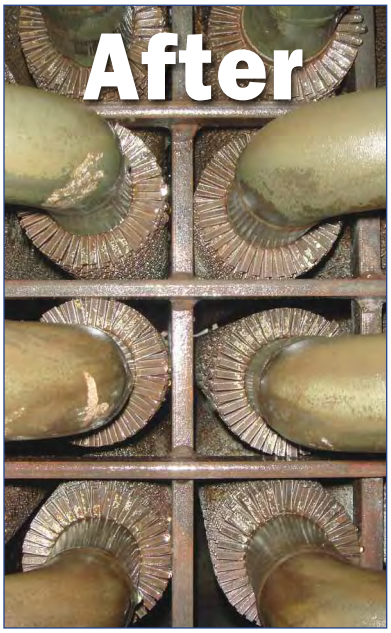
FIN FANS



BOILERS/FURNACES



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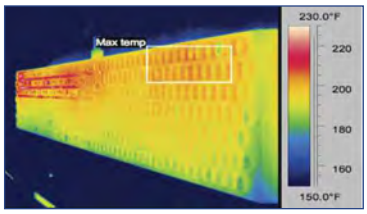
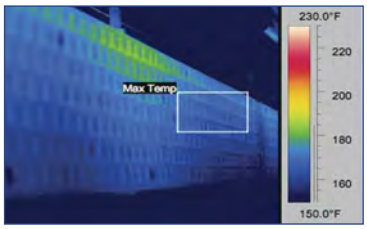
Thorough cleaning - What is it really worth?

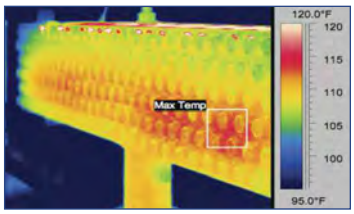
Cost vs Payback · Competent Workers · Potential Damage to your Equipment · Safety



Before Cleaning
210 F

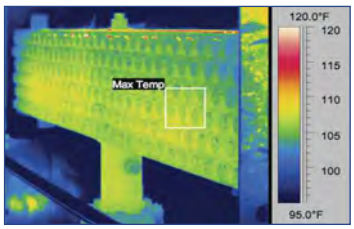


After Cleaning
175 F



115F

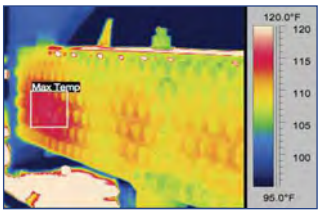
Just "cleaned" by a competitor



104F

FINFOAM cleaned the same exchanger 2 weeks later.

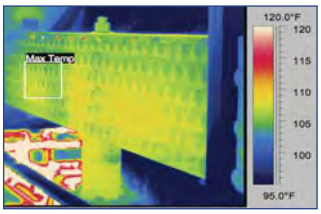
Internal Vs. External Fouling



Originally this area was thought to be an internal plug.

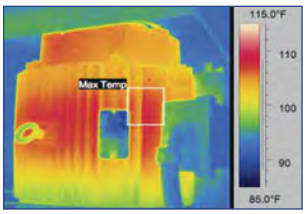
117F

The cleaning process was concentrated in this area and was revealed to be external fouling.

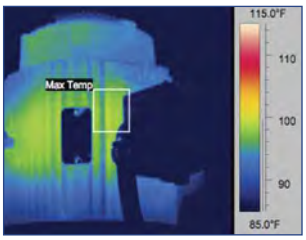


After cleaning temp was
104F

Variable Speed Motors



Before Cleaning
117 F



After Cleaning
96 F

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TESTIMONIALS

"During the summer of 2005 we cleaned the fin fans by three different methods. .... Far and away the best results were achieved with Finfoam in August. .... We achieved 80% of design in August with Finfoam, which I believe is as good as we can get given the age of the fans and amount of mineral build up on the fins from years of washing.
Please feel free to use my name as a customer reference as I feel that you guys have done an outstanding job for us. The data speaks for itself. I was also impressed by the level of professionalism and awareness for our safety culture by both you and your staff. I would recommend your services to anyone considering cleaning fin fans."
Darin Foote
Process Engineer, Flint Hills Resources - Alaska

"The Finfoam cleaning worked very well in our plant. The foam was able to reach between the tubes very well. As for cost it was more expensive to stage the fans than it was to wash them. The crews saw as much as 25 - 30 degrees increase in delta T. We are planning another wash in May of this year."
William Schmidt
Coker Operations, Chevron El Segundo Refinery

"We have exclusively used GPD - Finfoam to clean our Air Cooled Heat Exchangers for the past 3 years. They have always been flexible to meet our needs and promptly get the job completed to our satisfaction.
Operations see Finfoam's results averaging a 10% increase in delta T. Finfoam takes safety seriously as well. We have never had a safety issue. I would strongly recommend them to anyone that has needs as we do in cleaning our Fin Fan Exchangers."
Richard McCoy
Planning and Scheduling, Placid Refining Co. LLC

"Finfoam is the company that has shown us the best results, time and time again."
Landon Lunsford
Planning Analyst, Chevron Pascagoula, MS

"Over the past three years I have used Fin Foam to clean the fin fans through-out our refinery. Fin Foam has come to the facility and completed their work in expedient, professional, and safe manner. They have never refused to go that extra mile when asked to do so. I am very pleased and will continue to use their services in the future."
Steven Guess
Valero Energy Corp.

"The Finfoam worked great. The amount of dirt that came off the fins was amazing. Since we were on-line, I did not do a visual inspection of the cleanliness of the fins other than what could be seen from the side. However, the process data showed a great improvement in the performance in the fans. I had calculated that the savings from process improvements paid out the cost of the chemical cleaning in approximately 2 weeks.
Finfoam was a top notch company as far as safety and performance."
Angela Somerville
Chevron Salt Lake City

"I wanted to pass on this information as a lesson learned. If you think that your fin fans are really dirty, and are in need of more than just a water wash, I would HIGHLY RECOMMEND using a company by the name of Finfoam to help clean your fin fans. Multiple Chevron locations have used Finfoam in the past, and we have seen the same GREAT results at the Coker. (This type of finfan chemical wash is a Coker best practice as a result of the severe operating environment that the Coker creates.) Finfoam is the company that has shown us the best results, time and time again.
Sincerely,"
Matthew E Lynch, SOG Planning Analyst
Supply Optimization Group, Americas
Chevron Products Company

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ACTUAL DATA FROM A WEST COAST REFINER

South Exchanger Bank (16 exchangers)

	1000's bbl/day
BEFORE ***FINFOAM*** cleaning	408
AFTER ***FINFOAM*** cleaning	467
% INCREASE	**14**

Assumption: refinery margin = $10.00/bbl (467 - 408) x $10./bbl x 350 days/year = 206500

206500 x 1000 = $206,500,000.00 per year in increased production

Economics Analysis for Heat Transfer Efficiency for WATER & AIR systems

ESTIMATED

red = input area

Surface Area for Exchanger = 500 ft^2 get information from exchanger data sheets

Before

Hot Fluid (water)		**Cold Fluid (Air)**			
mh (mass flow hot fluid) =	50000 lb/h	mc (mass flow cold air) =	40000 lb/h	DTlm =	221.7394937
Cph (heat capacity) =	0.2501283 Btu/lb F	Cph (heat capacity) =	1.002 Btu /lb F		
T1 (inlet) =	350 F	t1 (ambient air) =	85 F		
T2 (outlet) =	330 F	t2 (outlet) =	150 F		
				U Before	**2.256 Btu/(hr.ft^2)**

After FINFOAM

Hot Fluid (water)		**Cold Fluid (Air)**			
mh (mass flow hot fluid) =	50000 lb/h	mc (mass flow cold air) =	40000 lb/h	DTlm	207.0070955
Cph (heat capacity) =	0.2501283 Btu/lb F	Cph (heat capacity) =	1.002 Btu /lb F		
T1 (inlet) =	350 F	t1 (ambient air) =	85 F		
T2 (outlet) =	310 F	t2 (outlet) =	160 F		
				U After Finfoam	**4.833 Btu/(hr.ft^2)**

Heat Transfer Equations:

DTlm log mean temperature difference

= [(T2 - t1) - (T1 - t2)] / ln[(T2 - t1) / (T1 - t2)] , F

Q E-100 = mh * Cph * (T1 - T2)

Q E-100 = U * A * DTlm

U = [mh * Cph * (T2 - T1)] / [A * DTln]

Estimated Increased Efficiency = 114.2% GAIN

Savings of energy related costs:

Note: model estimates potential savings due to more efficient cooling on exchangers. If we assume that we can **shut down or reduce fan speed** of electric motor(s), we would have some significant savings on annual basis above savings associated with increase

Equation:

Operating Cost = 0.746KW/ehp * ehp per motor * #of motors* $/KW-hr * 8,760hr/yr

Assumptions:

Factor for KW / ehp =	**0.746**	
Hours per year =	**8760**	

***eph** = electrical horsepower*

***KW** = kilowatt*

red = input area

INPUTS

$ per KW-hr (From Energy Provider) =	$ **0.110**	
ehp per motor =	**20**	horse power

CURRENT STATE:

Total fan motors RUNNING full TIME =	**100**	total motors
total ehp currently used =	2000	horse power
Current cost to operate motors =	$ 1,437,691	annually

AFTER FINFOAM:

(reduction of ehp usage or based on heat transfer increase efficiency)

Estimate Increase efficiency by =	**114.2%**	
Reduction of total fans equivalent motors RUNNING full TIME =	**47**	motors less
After CLEANING cost to operate motors =	$ (671,085)	

Estimated ANNUAL Electrical Motor Energy Savings $ 766,606

We Guarantee Results!

WORLDWIDE PROVEN TRACK RECORD

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