

Plate Heat Exchangers



Corrugated Tubular Heat Exchangers



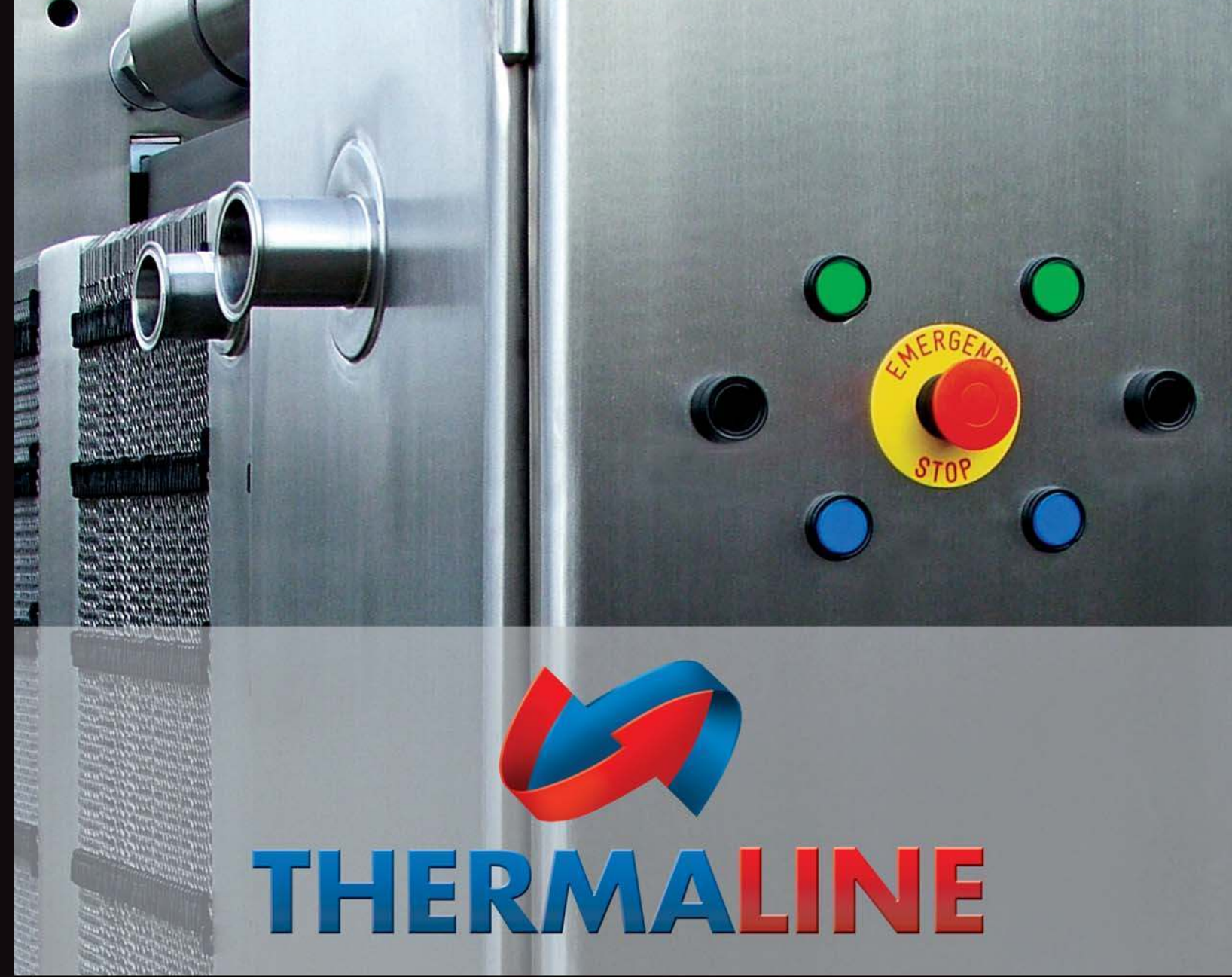
Shell & Tube Heat Exchangers



Hot Water Sets



Reconditioning Services & Gaskets



THERMALINE

INNOVATIVE HEAT TRANSFER SOLUTIONS



THERMALINE

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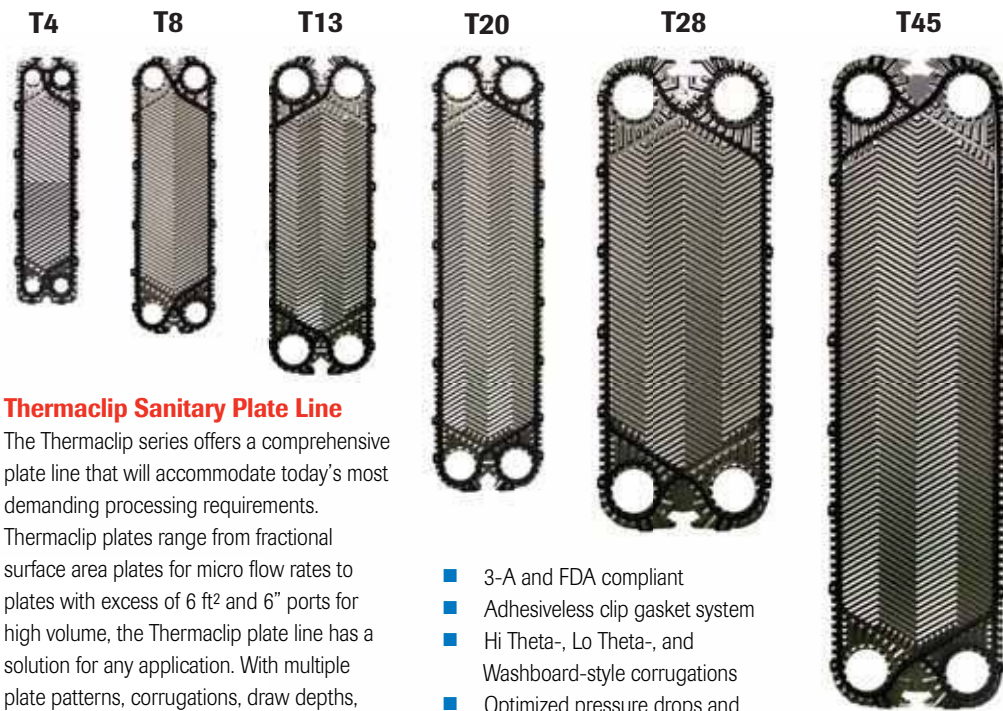
www.thermaline.com



INNOVATIVE HEAT TRANSFER SOLUTIONS

Thermaline Inc. is an innovative heat transfer solution provider for the food, beverage, and pharmaceutical industries. Processors worldwide have come to depend upon Thermaline's quality product line, solid customer support, and practical industry knowledge to meet all of their heat transfer needs.

Thermaline's relentless pursuit of operational excellence is evident in every piece of equipment we manufacture. Our passion for this achievement ultimately gives our customers the competitive edge in their industry by providing intelligent, well-informed, and energy-conscious decisions in the equipment they purchase.



Thermaclip Sanitary Plate Line

The Thermaclip series offers a comprehensive plate line that will accommodate today's most demanding processing requirements.

Thermaclip plates range from fractional surface area plates for micro flow rates to plates with excess of 6 ft² and 6" ports for high volume, the Thermaclip plate line has a solution for any application. With multiple plate patterns, corrugations, draw depths, and materials, we can optimize each unit to operate at peak efficiency, lowering the cost of ownership, but more importantly providing long-term energy savings.

- 3-A and FDA compliant
- Adhesiveless clip gasket system
- Hi Theta-, Lo Theta-, and Washboard-style corrugations
- Optimized pressure drops and efficiency
- Multi-section capable
- Standard plate material is 316 stainless steel (other materials are available upon request)

Comprehensive Plate Line

Model No.	Area Per Plate Ft ² (m ²)	Max Design Pressure PSI	Max. Conn. in. O.D.	Approximate Frame Dimensions Tie-Bolt Style in. (mm)			Approximate Weights lbs. (kg)		
				W	H	L Max.	Min. Frame	Max. Frame	Plate & Gasket
T4	.46 (.04)	200	1.5	7 (178)	26 (660)	29 (737)	75 (34)	95 (43)	0.63 (.29)
T8	.81 (.07)	200	2	11 (279)	32 (813)	34 (864)	215 (97)	290 (132)	1.84 (.83)
T13	1.40 (.13)	200	2	13 (330)	40 (1016)	46 (1168)	315 (142)	520 (236)	2.58 (1.17)
T20	2.15 (.19)	200	3	13 (330)	50 (1270)	46 (1168)	350 (159)	600 (272)	2.85 (1.29)
T28	3.01 (.27)	200	4	20 (508)	61 (1549)	100 (2540)	875 (395)	1800 (816)	4.34 (1.97)
T45	4.84 (.45)	200	4	20 (508)	80 (2032)	144 (3700)	1000 (454)	1900 (861)	6.98 (3.17)

Performance Guaranteed

Thermaline Inc. is dedicated to providing the customer with quality plate heat exchangers and systems that offer optimum performance. Each heat exchanger carries our trademark Performance Guarantee and is individually designed, certified, and tested prior to delivery.

Thermaclip Adhesiveless Gaskets

Thermaclip gaskets are designed to withstand the rigors of extended processing times and the harsh chemical wash of a CIP system. Over-the-plate clip gasket system allows for easy field removal and replacement of the gasket. Heavy duty clips ensure the gasket stays in place during handling and assembly.

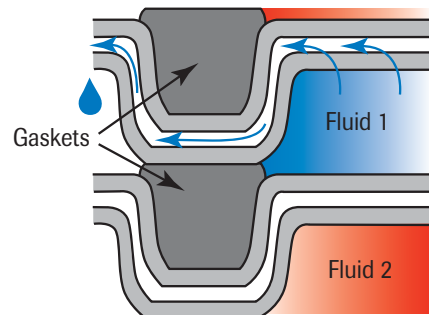
- 3-A and FDA compliant
- Available in Nitrile, EPDM, and Viton
- Operating temperatures up to 350°F



Double Wall Plates

Thermaline's double wall plate technology provides added security of an additional safety barrier. If a pinhole or crack develops in a plate, the fluid is forced to leak into the atmosphere rather than into the other fluid stream.

- Eliminates product and media intermixing
- Leaks are vented externally, allowing the operator to quickly identify a problem
- Laser-welded port area



Sanitary Frames

Thermaline offers a durable tie-bolt style frame line with a focus on sanitary design, simplicity, and dependability. Most frames are precision machined from solid 300 series stainless steel. High pressure frames are carbon steel clad with 300 series stainless steel and seal welded. We also offer an economical epoxy-painted carbon steel option.

- Available in PMO high port
- 304 or 316 stainless steel product contact surfaces
- Sanitary S-line, I-line, NPT, or flange connections

Real World Testing Facilities

Application of our products to our customer's specific needs often requires practical testing using real world parameters. Our experienced staff of application engineers and their extensive testing facilities stand ready to help. Test process concepts by means of a thorough theoretical study, using computer analysis and in-depth knowledge of process technologies.



Automated Frames

Thermaline has unleashed the power of innovation and automation to make your processing days safer and easier. Thermaline's new EZ series frames set new standards in heat exchanger automation for tomorrow's food and beverage processors.

- Fully-automated and semi-automated frames
- Simple and dependable operation
- Reduces downtime for cleaning and inspection
- Promotes plant personnel safety

Upgrade your existing PHE frame to the new EZ automated frame. The EZ frame is sold separately to accommodate your existing plate pack. Thermaline can easily adapt semi- or fully-automated frames to fit the plate that you are currently using.

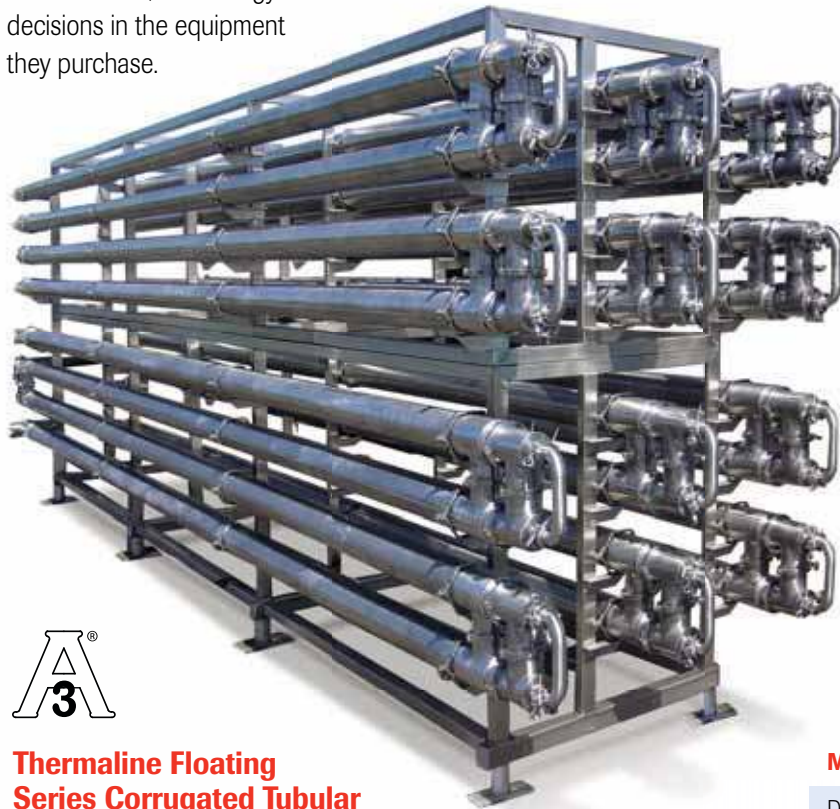
- Enjoy the benefits of the automation
- Re-use existing plate pack



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Thermaline Floating Series Corrugated Tubular Heat Exchangers

Floating: The innovative design allows the tubes to freely expand and contract independently which diminishes material fatigue and failure. Thermaline's Floating Series completely eliminates failure-prone expansion bellows and rigid welds on all models.

Operational Simplicity: The product flow and heating/cooling media flow are separated in concentric lengths of sanitary tubing. The unit has no moving parts, is easy to clean, easy to inspect, and easy to maintain. Tube ends, with their sanitary clamp design, can be easily removed for QC inspections and maintenance.

Go Green: Tubes can be arranged in either direct or indirect regeneration. Direct product regeneration can yield more than 80% in energy savings. Indirect product regeneration can recover energy from thermal waste streams in other areas of your facility, reducing thermal pollution and increasing energy savings.



Corrugation: The heat exchanger surface is shaped into turbulence-inducing, alternating parallel grooves and ridges to increase heat transfer efficiency. Inducing turbulent flow results in less total surface area required to achieve the desired thermal results. Turbulent flow promotes thorough mixing of the product and even thermal disbursement without compromising product integrity.

Sanitary: Thermaline's Floating Series tubular heat exchangers meet or exceed 3-A tubular heat exchanger design requirements.

Safe: The strategically-positioned elastomers eliminate the possibility of product intermixing. If a leak were to develop from an elastomer failure, the fluid would be vented to the atmosphere so it can be quickly identified and repaired. The Floating Series eliminates blind, internally-positioned elastomers that can lead to cross contamination.

Model Specifications

Model	Tube	Size	Pressure
Double Tube	Inner	1 to 4 inches 25.4 to 101.6 mm	1100 to 525 psi 75 to 35.7 Bar
	Outer	1.5 to 6 inches 38.1 to 152.5 mm	850 to 180 psi 57.8 to 12.2 Bar
Triple Tube	Inner	1 to 3 inches 25.4 to 76.2 mm	1100 to 550 psi 75 to 37.4 Bar
	Middle	2 to 4 inches 50.8 to 101.6 mm	830 to 185 psi 56.5 to 12.6 Bar
	Outer	2.5 to 5 inches 63.5 to 127 mm	320 to 180 psi 21.8 to 12.2 Bar
Multi Tube	Inner	0.5 to 1 inches 12.7 to 25.4 mm	830 to 515 psi 56.6 to 35.1 Bar
	Outer	2.5 to 6 inches 63.5 to 152.5 mm	250 to 125 psi 17 to 8.5 Bar

Tube Materials: 304, 316, AL6XN, other materials available upon request
Elastomers: NBR, EPDM, Viton **Lengths:** 10' - 20' - 30'



TriFloat

Sanitary corrugated floating triple-tube heat exchanger. Three concentric tubes of varying size are positioned so the media flows inside and outside of a product zone.

- Ideal for higher viscosity fluids with medium to small particulates and fluids with large viscosity changes
- Proficient for direct or indirect product regeneration
- Tubes float independently of each other, greatly increasing equipment life

DuoFloat

Sanitary corrugated floating double-tube heat exchanger. Simplistic by design, two concentric tubes of varying size are positioned one inside the other.

- Excels at processing fluids of moderate viscosity with medium to large particulates
- Proficient for direct product regeneration
- Tubes float independently of each other, greatly increasing equipment life
- Superior product identity



Versatility

Adding the DuoFloat inline mixer to your double-tube heat exchanger enables you to tune your processing needs to a variety of products. When processing fluids with large particulates, remove the DuoFloat inline mixer to maintain product integrity and then easily reinstall the mixers to ensure thorough heat transfer on your other viscous products.



MultiFloat

Sanitary corrugated floating multi-tube heat exchanger. Multiple product tubes within a common media tube.

- Ultimate solution for thin fluid processing
- Large heat transfer area in a smaller space
- Tube bundle floats independently of the shell
- Tube bundle can be easily removed for inspection and maintenance



MultiSafe

When product integrity is an absolute necessity, Thermaline offers a Sanitary corrugated floating multi-tube heat exchanger with additional safety features. The product tube face is separated from the media tube face, eliminating the possibility of product cross contamination. Includes all of the benefits of a Multifloat plus the following:

- Media and product leaks are vented to atmosphere
- High performance plastic baffles extend tube life



Thermaline HygenX™ Series Shell and Tube Heat Exchangers brings your processing back to basics.

Shell and tube style heat exchangers are the most recognized and widespread form of heat transfer equipment used in the process industry today. They are the preferred method of transferring heat from one source to another and especially when there is a large Delta T (temperature differential) between the product and media. Processors, over many years, have depended on these workhorses for a variety of benefits, such as:

- Mechanically rugged; U-tube style heat exchangers are designed to freely expand and contract, eliminating fatigue
- Compact; provides a large ratio of heat transfer area to volume
- Dependable; shell and tubes use minimal elastomers and gaskets
- Cleanability; can be easily cleaned on both the shell side and inner tubes
- Serviceability; gaskets and tubes can be easily replaced if needed

Thermaline's HygenX™ series shell and tube heat exchangers utilize all of these benefits and more.

Hygienic by Design

HygenX™ series are constructed of all non-corrosive materials. Shell and tube heat exchangers are typically subjected to extreme temperatures that will destroy most coatings over time, leaving your facility tainted with unsightly, unsanitary carbon deposits and rust trails. HygenX™ utilizes non-corrosive materials for prolonged equipment life and dependability in order to promote food plant safety.

HygenX™ is available in 304L/316L Stainless Steel, Duplex Stainless Steel, AL-6XN and Titanium.

Manufacturing Specifications

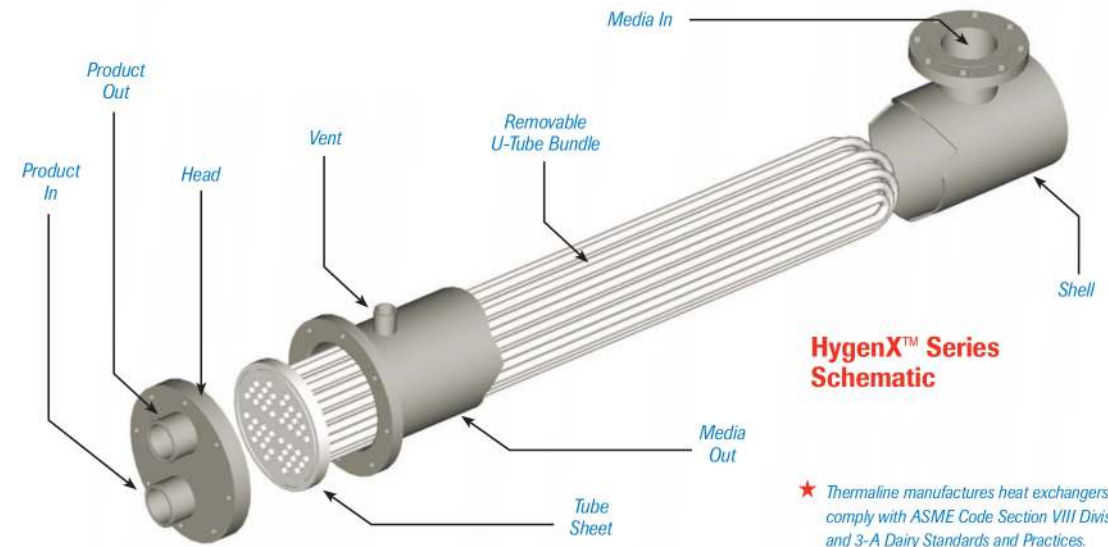
HygenX™ Series is manufactured in accordance with TEMA and 3-A sanitary heat exchanger specs. Each unit is fully drainable, promoting a hygienic environment inside the process area. HygenX™ can be used to heat or cool in a variety of applications such as:

- Process water
- Viscous food and non-food products
- CIP solutions
- Pet food products and by-products
- Closed water loops

Available Models: HygenX™ standard models and custom units are also available.

Model	Shell Size	Inner Tubes	Lengths	Max. GPM (1 Pass Water)	Max. GPM (2 Pass Water)	Max. GPM (4 Pass Water)
HYGX-1-4*	4"	1/4-1/2"	24-112"	100 GPM	50 GPM	25 GPM
HYGX-1-6*	6"	3/8-3/4"	24-112"	180 GPM	90 GPM	45 GPM
HYGX-1-8*	8"	1/2-1"	24-112"	300 GPM	180 GPM	90 GPM
HYGX-1-10*	10"	1/2-1"	24-112"	500 GPM	300 GPM	150 GPM
HYGX-1-12*	12"	1/2-1"	24-112"	700 GPM	450 GPM	225 GPM

*HYG-1 straight tube single pass, HYG-2 "U" tube 2 pass, HYG-4 "U" tube 4 pass
Ratings and dimensions are approximate and can change without notice.



HygenX™ Series Schematic

★ Thermaline manufactures heat exchangers that comply with ASME Code Section VIII Division 1 and 3-A Dairy Standards and Practices.

HygenS™ and PWS Pre-Engineered Closed Loop and Process Water Heater Packages

Preassembled process water heater packages from Thermaline eliminates all of the engineering guesswork and makes installation simple, fast and easy. The HygenS™ series has been engineered to fit through a standard doorway so you won't have to "big deal" the install. Just hook up your steam, process water and water make up and you're done!

Hygienic by Design

HygenS™ series is available with piping and most major components made of non-corrosive materials, upholding the high standards you have for your processing plant.

Economical PWS Series

The PWS series is engineered and designed with the same performance and standards as HygenS™. The primary difference is most major components are coated in lieu of non-corrosive materials. PWS is the budget-minded choice.

Go Green

Condensate recovery packages are available to send your condensate back to the boiler, saving water and energy.

Electronic Loop Controls

Add a PLC simple programmable loop controller to the package for accurate temperature control or integrate the system into your central control station. Either way, RTD installation points are in place so you can get the most accurate readings needed for your process.

Model	Max. GPM (2 Pass Water)	Max. BTU
HYGS-4*	50 GPM	473,000
HYGS-6*	90 GPM	987,000
HYGS-8*	180 GPM	2,150,000
HYGS-10*	300 GPM	4,630,000
HYGS-12*	450 GPM	6,500,000

*Model PWS for coated carbon piping and components
Ratings and dimensions are approximate and can change without notice.



Heat exchangers are essential to many critical operations. Due to their difficulty in maintenance, they are often neglected. Their propensity for fouling significantly increases the risk of unplanned shutdown and catastrophic failure. In addition to complete failure, the time leading up to the failure can cost you thousands of dollars in wasted energy consumption. Protect your investment and stop wasting money. Inspection and upkeep is the only way to protect your equipment and reduce operating cost. Thermaline offers preventive maintenance, on-site services and complete rebuild services to ensure that your heat exchanger is operating at peak efficiency.

In-shop Services PHE:

- Plate pack refurbishment or replacement
- Re-gasketing
- Comprehensive plate cleaning services
- NDT Dye testing for cracks and defects
- Frame refurbishment
- Performance testing
- Entire unit refurbishment (sandblasting, repainting, assembly and hydro test of unit)

Onsite Services:

- Plate pack installation
- Pressure washing
- Re-gasketing

Customer Support Services:

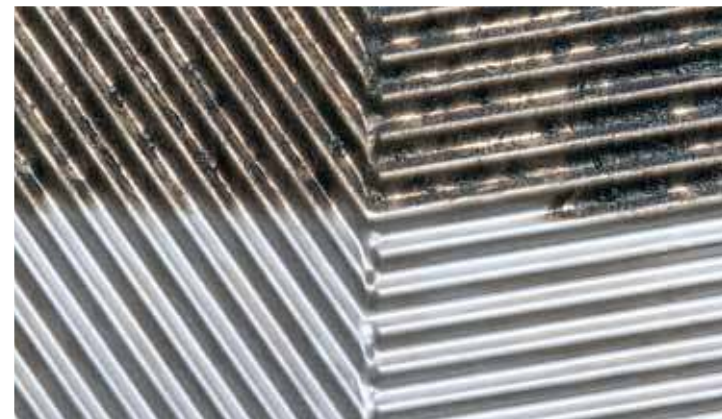
- **Parts and Service Specialists** - available to assist with operational and maintenance training as well as answer general questions
- **Technical Specialists** - available to assist with design, testing, development, and implementation of an effective preventive maintenance program



Specializing in restoring your system to "like-new" condition.



An example of plate fouling that can waste energy and slow production.



Before and after cleaning.

Internal Leak (Cross Contamination) Detection Service:

Cross contamination occurs when a crack or pinhole develops, allowing fluids on side 1 to pass through the plate into the other side and mix with the fluids on side 2. Because a heat exchanger typically does not operate with equal pressure on both sides, the side with the higher pressure will push fluid through the hole into the side with the lower pressure. The result is product in your utility circuit, or worse yet - utility media in your product. Thermaline provides several new, all encompassing, on-site tests that improve test speed and accuracy of any possible cross-contamination issues.

Leak Detection (Integrity Testing)

These tests are recommended annually or bi-annually as part of your preventive maintenance program.

1. Pneumatic leak-down test (General integrity test to sense a problem*)
2. Helium test (Ultra sensitive general integrity test*)
*General integrity test will identify a problem but will not pinpoint its location

Further testing: Tests 3 and 4 are used to locate the problem.

3. Flooded NDT test. Circulate a bio-degradable fluorescent dye through one side of the unit followed by a flush. Unit is opened and each plate is viewed with a UV light to locate the problem.
4. Misted NDT test works similar to flooded tests and is typically used on larger units consuming less dye.

Clean in Place (CIP)

CIP is used to clean biological, calcium or other foulants from plates without disassembling the unit.

- Circulate cleaning solutions to remove foulants
- Scheduled preventive maintenance CIP

Tubular Heat Exchanger Services

Thermaline also offers tubular specific heat exchanger services that include:

- Vacuum testing
- Tube sheet re-facing
- Tube plugging
- Pressurized integrity testing
- Mechanical & CIP cleaning



In-shop servicing



Servicing for Tube Heat Exchangers

Gaskets

Thermaline offers a wide range of gaskets and materials to fit most major makes and models of plate heat exchangers.

Materials:

- Nitrile
- EPDM
- TEFC
- Viton

Manufacturers:

- APV
- Alfa Laval
- Tranter
- ITT
- Sondex
- GEA
- SWEP
- Paul Mueller
- API Schmid Bretton
- And many more

Our competitors may use inferior gaskets subject to drying out and cracking, leading to early failure.

Thermaline uses only top-of-the-line OEM-spec gaskets to ensure long-life and high-performance, leading to fewer incidences of failure and repair.



Thermaline's CCT2.0 Test System

Recommended and Patented

FDA, 3A, USDA, PMO, EHDGE and most HACCP plans state that it is your responsibility to test your plate style heat exchanger at least once a year to safeguard against cross contamination. Thermaline introduces the most comprehensive testing procedure and plan on the market today that meets or exceeds the regulatory requirements.

The CCT (Cross Contamination Testing) is a patented test process that is easy to use, easy to understand and the results are invaluable.



PMO, FDA USDA Adoption of 3-A Practices and Recommendation for Frequent Testing and Documentation



New 3-A Sanitary Standards 11-09

J. PLATE HEAT EXCHANGER LEAK TESTING AND VISUAL INSPECTION

J1. It is recommended that leak detection and visual inspection of all plate heat exchangers be performed at least once every 12 months and a record of the inspection results maintained. More frequent testing and inspection may be appropriate when process conditions cause additional stress on plate surfaces. Tests and inspection should be performed by a qualified technician who is knowledgeable in the field and who is capable of interpreting the results.

J2. Methods used for leak testing should be capable of detecting any leakage within the heat exchanger irrespective of the size of the unit and should also incorporate a visual inspection of the plate surfaces for pin-holes, corrosion, excess wear, gasket conditions, correct plate installation, proper flow, and cleaning response. The frame and frame components (terminals, dividers and ports) should also be checked for structural integrity.

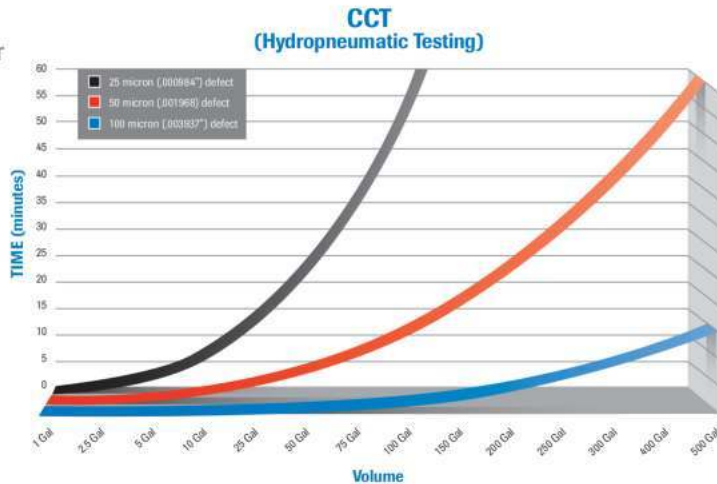
J3. All materials which contact plate surfaces during leak testing procedures are to be capable of rinsing clean from the plate surfaces and not damage or discolor the plates which are returned to service.

J4. Corrective and preventative action(s) should be immediate and appropriate upon discovery of any deficiencies.

Customized for Your Specific Needs

Not every plant is the same therefore the CCT program is based on your needs.

- CCT 2.0 factory trained technician performs the test and the results are automatically uploaded and easily accessible
- QR codes unique to each heat exchanger so you can instantly review testing, maintenance and inspection history along with test schedules and diagrams
- Committed CCT customers receive priority testing, onsite CCT 1.0 visual tester, discounts on spares, QR code quick check, automated scheduling and documentation.
- Quarterly, semiannual, annual testing intervals
- Inspection service meeting 3-A recommended standard 11-09 J2.
- CCT 1.0 visual tester and training for your in house established maintenance program



Test intervals shown for various defect sizes. A PHE operating at a P of 50PSI will pass water from one side to the other at the following rates:

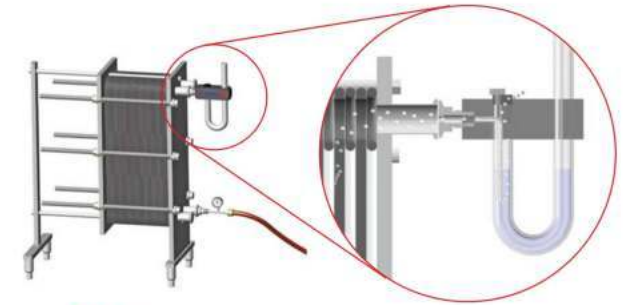
- 25 micron = 32 gallons/year (vapor droplet in fog)
- 50 micron = 127 gallons/year (width of a human hair)
- 100 micron = 509 gallons/year (thickness of printer paper)

For comparison, the human eye cannot see objects smaller than 50 microns.

(Operational year calculations assume 16-hours of equipment operation per day over 205 work days.)

How Does it Work?

Both the CCT 1.0 and 2.0 are patented primary testers that operate on the same basic hydro-pneumatic principle. Pressurized air is introduced on one side of the PHE if there is an internal defect pressure builds in the ambient side and is sensed with the CCT. Primary testing tests the plate pack as a whole for defects, not the individual plate.

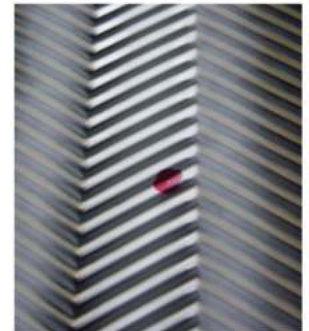


- **CCT 1.0** is a visual test method that can be performed by your technicians or QA personnel. A defect is immediately sensed by the CCT and is visually seen as a bubble in the downdraft tube.



- **CCT 2.0** calculates the relationship between volume, pressure, temperature and time to determine if a defect exists and defines the severity so you can make an informed decision on an action plan.
 - Documents the test and surrounding environment, creates a report, sends you a copy and automatically adds the report to the history of the unit accessible with the QR program or accessed on line.
 - Operates on Android, Apple and Microsoft platforms.

Defective plate identified through use of Thermaline's patented CCT Test System™



Secondary Testing Services

Secondary testing services are available to locate and repair a defect detected by the CCT. Secondary testing utilizes either NDT dye testing or the CCT elimination process.

- Improve your Quality Assurance program
- Most any make or model



INNOVATIVE HEAT TRANSFER SOLUTIONS

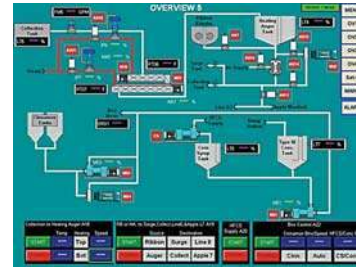
Our Technology is the Heart and Mind of your Process System

Thermaline, a leading manufacturer of sanitary heat transfer equipment, takes that extra step to put the complete processing package together. With our technical and practical knowledge of processing, we are able to optimize a packaged system custom tailored to fit your needs. Thermaline knows our success is based on yours; therefore, we work closely with your team to design a system that incorporates your high standards in product integrity, texture, taste and appearance while using today's most advanced procedures and automation to simplify operation on the production floor.

Thermaline process systems are factory tested and wholly supported during start up and production with both on and off-site technical assistance. From basic loop water systems to PLC-controlled Aseptic processing, you can expect the same level of support and commitment to ensure your success.

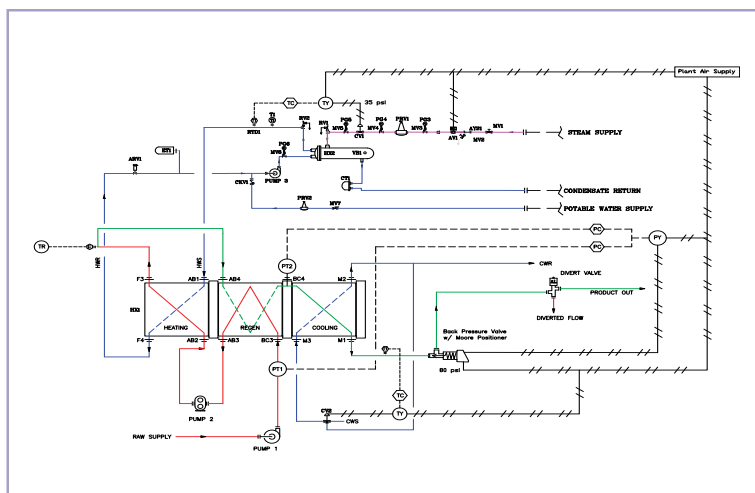
A Keen Mind

Thermaline has partnered with an industry leader in controls and automation to form a reliable HMI and control system that your production team can easily operate. With a combined 50 plus years of programming and knowledge of processing you can rest assured your entire system will perform exactly as you have envisioned. From single loop control to full PLC touch-screen automation, Thermaline has the solution to synchronize and harmonize your processing equipment. Each system is designed with as little or as much automation to match your budget, goals and process requirements.



HMI Human Machine Interface

PLC



Monitoring:
 - System Pressure
 - System Temperature
 - Power Requirements
 - Residence Time
 - Run Times
 - Energy Recovery

A Solid Core

Thermaline systems are built on a solid core. The core of your processing concepts and ideas are put onto paper and reviewed with you and your team to ensure you have a complete understanding of the system before production begins. Our CAD and engineering departments work closely together to exercise the design and create a solid core. Exercising the design eliminates bulk in your process, further enhancing performance and product quality.

Industry-leading electrical components

- Allen Bradley
- Spirax-Sarco
- Siemens
- Endress + Hauser

Processing solutions for every product

- Dairy – milk, cheese, eggs
- Juices – fruit, pulp, concentrates
- Condiments – ketchup, BBQ, mayonnaise, mustards
- Dips – hummus, dairy-based, cheese sauces
- Purées – fruits and vegetables
- Soups and gravies



10 GPM Juice Concentrate HTST

20 GPM Cheese Milk HTST



20 GPM Juice HTST



5 GPM Condiment Cooker



40 GPM Juice HTST



15 GPM Fruit Purée HTST

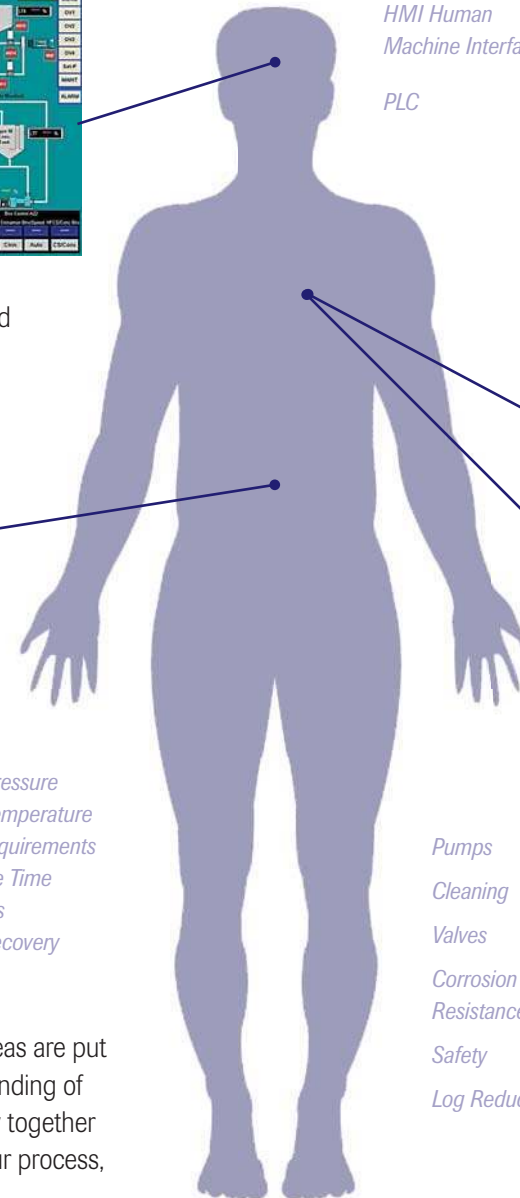
Equipment for every application

- Product heating
- Product cooling
- Heat treating
- Hot water makers
- HTST (pasteurizers)
- UHT (extended shelf life)
- Aseptic

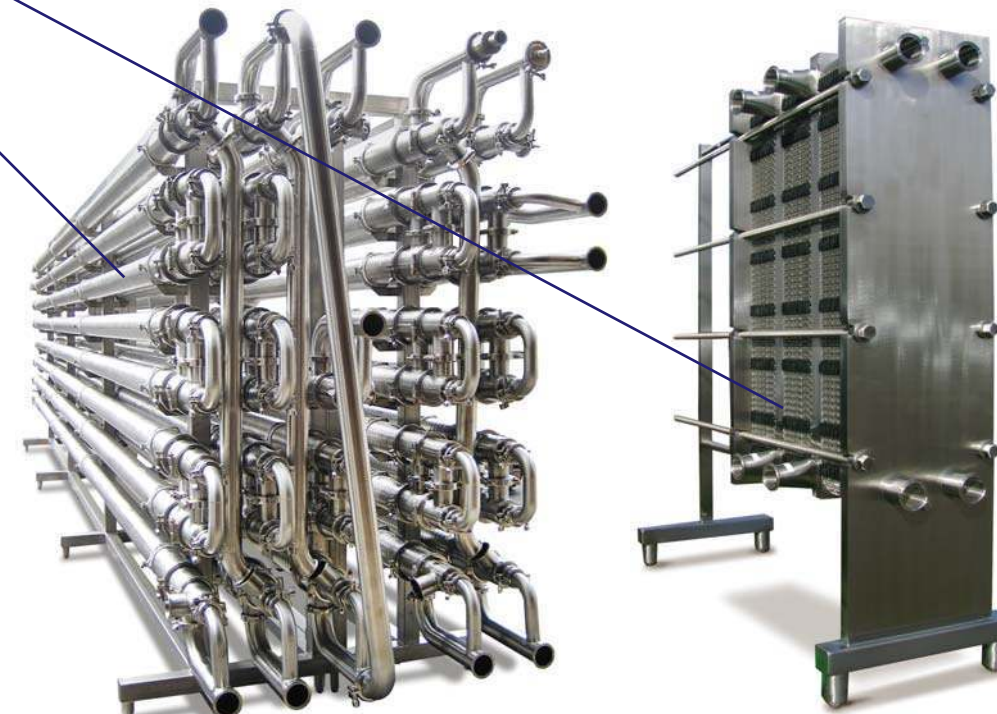
Certified to the highest standard

Process systems are made in accordance with 3-A sanitary piping guidelines and 3-A processing guidelines.

- 3-A
- ASME
- UL
- PMO



- Pumps
- Cleaning
- Valves
- Corrosion Resistance
- Safety
- Log Reduction



A Strong Heart

With Thermaline's wide range of heat transfer equipment, we are able to build a system around your product rather than force your product through a one-size-fits-all solution. Thermaline offers both tubular and plate style heat exchangers to maximize energy efficiency and minimize your capital investment. Once the heart of the system is designed, we carefully engineer the peripheral equipment to complement the heart. Finally the HMI Human Machine Interface and controls are added to make it come alive. With a strong mind and healthy heart you can expect years of reliable performance.