

# Unitherm<sup>®</sup> & Spiratherm<sup>®</sup> Tubular Aseptic Systems



# Unitherm® Tubular Aseptic Systems: For Aseptic/ UHT Processing

## Unitherm®: Integrated. Projectable.

Total, unitized system

- Heat exchange
- Pumps
- Valves
- Homogenizing valves
- Fittings
- Surge tanks
- Controls

Ready to work

- Pre-piped
- Pre-wired
- Pre-tested

Projectable: Unitherm® pilot plants accurately represent in microcosm the capabilities of a larger capacity system; capacities determined by tube size

Cost savings

- Installation
- Relocation
- Automated operation
- Lower energy costs from regeneration (up to 78%)
- Less downtime for cleaning

## Spiratherm® tubular heat exchanger

- High-pressure, high-velocity
- Aseptic integrity
- Extraordinary efficiency
- Heat, cool, and hold a wide range of liquid products
- Operating simplicity
- Heavy-duty construction
- Safer than plated systems

## Applications

Sterilizing, pasteurizing, ultra-pasteurizing

- Dairy specialty products
- Aseptic juices & other beverages
- Pharmaceutical injectables
- Tomato-based products
- Pudding
- Yogurt
- Fat free puddings and yogurts
- Cheese sauce
- Creamers
- Dressings/dips
- Nutritional drinks
- Shake mix
- Ice cream mix
- Weight loss drinks
- Baby food



# The Unitherm®

## 1 Complete systems control capability

A Unitherm® offers unmatched control flexibility. Depending upon your labor requirement, automation can be raised to the point where your operator need only turn it ON and turn it OFF.

Standard automatic controls are complete with temperature recorder/controller for controlling the product temperature at the heater, control stations for all pumps and valves, and multiple digital temperature indicators with alarm set-points for indicating temperatures between the various points in the system. "Touch-screen" computer controls can be specified.

An indicating proportional level control for automatic filling of the product surge tank is standard, along with a probe for automatic level control in the water tank. Included is a low-level alarm in the product tank, which will alarm and divert the system to water should the level in the product tank drop below a preset level.

Automatic final-temperature control is provided with a temperature recorder/controller and alarm for falling temperature. Included are six digital indicators for monitoring temperatures after the heater, holding tube, the raw regenerator, homogenizer, aseptic regenerator, and final cooler. Digital indicators have alarm setpoints for use as sterilization alarms during both initial sterilization and processing as well as product cooling alarms.

Automatic equipment sterilization can be specified, as well as automatic flow diversion which runs water into all lines during process or filter shut-downs to maintain sterility.

Also available is automatic product-to-water and water-to-product separation without breaks in system sterility. Controls can be interfaced to allow total production automation, including the filling system. All Unitherm® systems have variable-range operating capacities to accommodate the speeds of your filters.

## 2 More efficient heat exchange

The heart of the Unitherm® is the unique design of its tubular heat exchanger, the Spiratherm® HEs. Product is pumped from a supply tank through a progression of Spiratherm® HEs. The product passes at high velocity through tubular product channels, which are enveloped by hot water in the Spiratherm®, producing a faster, more even heat exchange without hot spots.

Each Spiratherm® is independently controlled to successively heat the product higher, reducing heat shock. From the final heater, the product enters a pre-timed Spiratherm® holding tube to complete sterilization. The product then enters a series of Spiratherm® or Corruflow™ corrugated tubular coolers for progressive cooling, again at high velocity, to the packaging temperature.

### Less downtime for cleaning cycles

The natural scrubbing action of the high-velocity product through the Spiratherm® heaters, combined with the reduced heat shock of progressive heating, cuts down on the product build-up common to conventional heat exchangers. Therefore, cleaning cycles are fewer and shorter, and run times are longer for greater productivity.



### 3 Unique homogenizing valves save money



Remote homogenization valves that save money in both maintenance and energy requirements are included as standard, unless specifically omitted.

APV Homogenizing valves are employed that are easily cleaned and assure sterile homogenization. The unique design of the valves eliminates potential air pockets, cracks, or crevices that might contaminate the product zone.

They feature replaceable, perforated valve caps, which absorb 98% of valve wear. These caps fit over the mating surfaces of the valve plug and seat, improving efficiency and uniformity of homogenization by extending the effective surface completely across the seating area. And, the valve design permits operation at lower pressures, reducing peak load demands. It also saves energy, since lower operating-pressure requirements reduce electrical consumption.

Following homogenization, product is further cooled in Spiratherm® HEs or corrugated tubular heat exchangers.

#### Save energy through regeneration

A surprising percentage of the heat transferred during heating and cooling stages can be captured and re-used to reduce energy requirements, further enhancing process efficiency. Regeneration as high as 78% is available as an option on all Unitherm® HEs.

### 4 Vacuum treatment protects product flavor

Also available with Unitherm® systems is an Aro-Vac vacuum-treatment system, which removes off-flavors, odors, and oxygen. In addition, it arrests enzymatic spoilage.



#### No gaskets to fail

All connections in the sterile zone of Unitherm® HEs are totally free of gaskets. Not only is the system free of gasket failure due to long-term exposure to high temperatures, but the danger of the product contamination is proportionately reduced.

## Spiratherm®: The Heart of Every Unitherm®

More efficient to operate than plate heat exchangers, or double- and triple-tube designs, Spiratherm® Tubular Heat Exchangers are comprised of trombone or spiral product channels sealed within media tubes. The heavy duty construction of these product channels eliminates potential product contamination due to stress cracking or gasket failure; they are all welded, 316, heavy-wall, seamless stainless steel; other high alloy materials are also available.

In Spiratherm® heaters, hot water envelops the trombone product channels for faster, more even heat exchange without hot spots. In Spiratherm® coolers, indirect coolants are applied in counter-current flow to coiled product channels to maximize heat exchange efficiency and protect product in the tubes from outside contaminants.



Product passes through Spiratherm® heat exchangers at a high velocity. Most products are non-Newtonian shear thinning and allow more efficient heat transfer. Increased heat transfer shortens the time product is exposed to high temperatures, which protects product flavor. The turbulence induced by the high velocity of the product produces a natural scrubbing action that reduces product build-up. This dramatically increases run

time and productivity, because fewer cleaning cycles are needed. Depending upon the nature of the product, uninterrupted runs of 6 to 12 hours are now possible, and, with some products, process cycles of 40 hours or more are common.

#### Higher volume capacities. Equal integrity.

For high-volume aseptic production, larger Spiratherm® tubular heat exchangers deliver the same extraordinary efficiency and aseptic integrity as smaller models used in the Unitherm®.

Completely sealed and pressurized, Spiratherm® HEs assure initial sterilization and protect against contamination during processing. All Spiratherm® HEs are designed to ASME and other leading pressure codes and are available in various diameters and lengths. Models with diameters of 6 inches or more carry "UM" certification as standard. "U" certification also is available as an extra.

### Easy operation. Low maintenance.

Spiratherm® HEs are easy to operate. Single-pass flow means you simply transfer product through the unit. All temperature conditions, including product sterilization, preheating, homogenizing (if required), and filling are monitored, so they can be recorded and/or automatically controlled.

Spiratherm® HEs have no moving parts and no gaskets for minimum maintenance.



### More efficient heat transfer

As with the Unitherm® HEs, product is passed through the Spiratherm® Tubular Heat Exchangers at a high velocity, thus increasing heat transfer

and shortening the time product is exposed to high temperatures. Product flavor is protected, and turbulence induced by the high-speed product holds down product build-up for longer production cycles.

Products can be heated from above-freezing temperatures up to appropriate sterilizing temperatures and back to desired packaging temperatures at rates from 20 GPH to 4,000 GPH, depending upon your system specifications.

### Total systems engineering capability

With APV, you have the option of purchasing a single piece of equipment to meet a specific need, a segment of a total system from which you may expand, or the equipment and technology for the installation of a total system.

We can design, manufacture and install an entire APV system to include Thermaflex®, Spiratherm®, Unitherm®, Votator®, Corruflow™ and/or Thermutator® heat exchangers; Aro-Vac® deaerators, homogenizers, valves, fittings and pumps.



# Factory Services

## Engineering

Research, design and application engineers at APV possess extensive backgrounds in their respective disciplines. You can draw on this experience to solve process problems or to counsel on process systems design. The imagination and resourcefulness of our engineers have often helped improve our customers' profits through production efficiencies.

## Testing

Ideas do not remain abstract long at APV. Application of our products to our customer's specific needs often requires practical testing using real-world parameters. Our experienced staff of applications 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. Product viscosity evaluations and rheological testing are available. Test components and sub-systems in our fully equipped, in-house plant facilities. A full aseptic system can be assembled in our testing facilities. Whatever form of pumping, dispersion, flow control or heat exchange you might require, you'll have working equipment ready for hands-on testing.



## Sales & service network

APV's trained sales and application engineers are always available for personal consultation to help solve any installation or operational problem. A large number of fully trained APV stocking distributors throughout the country and around the world provide quality APV replacement parts and service.



## Value that exceeds your expectations

Every process and flow control component or system from APV is backed by a commitment to making it contribute to your success.

# Unitherm<sup>®</sup> Tubular Basic Mechanical Specifications

## 1. DESIGN:

A comptonized sterilizing system for processing fluid products aseptically with the components mounted on one or more easily-connected bases. Includes up to 78% regeneration.

## 2. CAPACITY:

20 to 4,000 U.S. gallons per hour

## 3. SURGE TANKS:

The Surge Tanks are 304 stainless steel with a slow-speed agitator in the product tank. The tanks are complete with level controls, automatic valves, and drain valves.

## 4. BOOSTER PUMP:

Flexflo Centrifugal Pump

## 5. REGENERATION PUMP:

Industrial Centrifugal Pump

## 6. TIMING PUMP:

High Pressure Pump

## 7. RAW REGENERATOR:

Thermafex<sup>®</sup> Heat Exchanger

## 8. HOMOGENIZING VALVE:

A single-stage, APV homogenizing valve is provided. Steam seal media piping is supplied and piped to the valve stem bonnet. Two-stage valve available as an extra.

## 9. SPIRATHERM<sup>®</sup> TUBULAR HEAT EXCHANGERS:

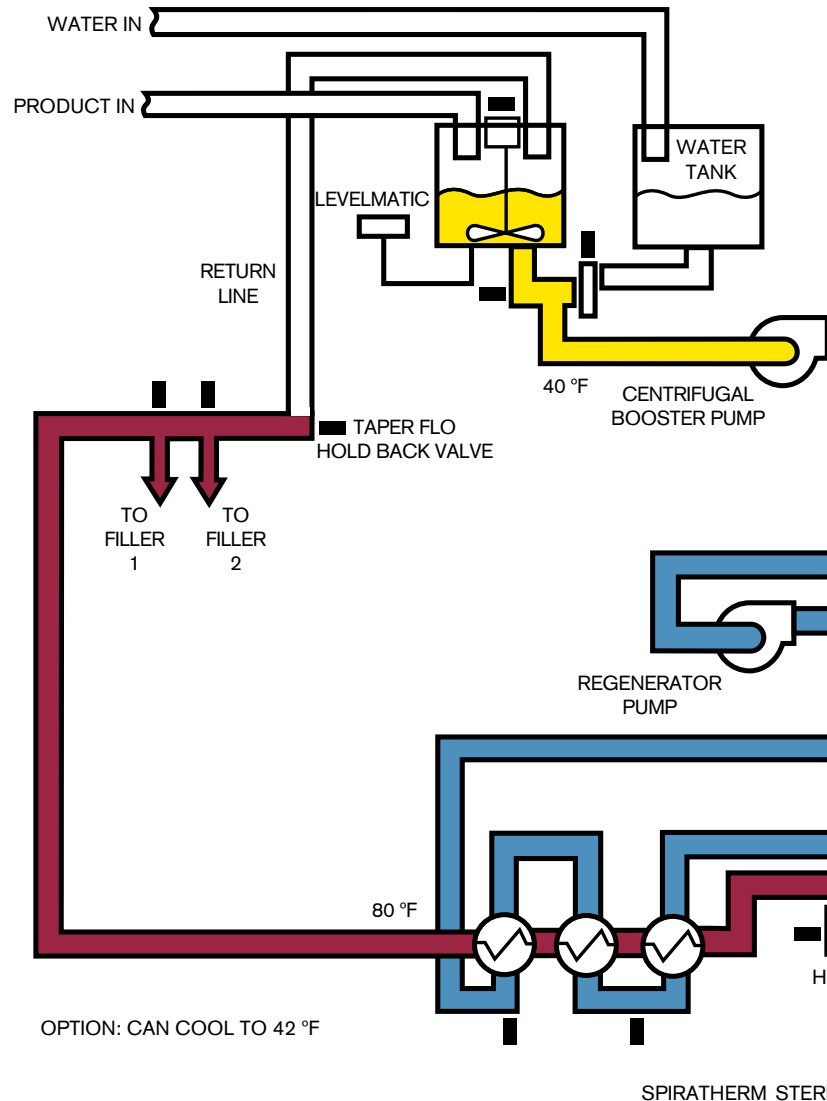
A. Hot water heaters: standard spiral design.

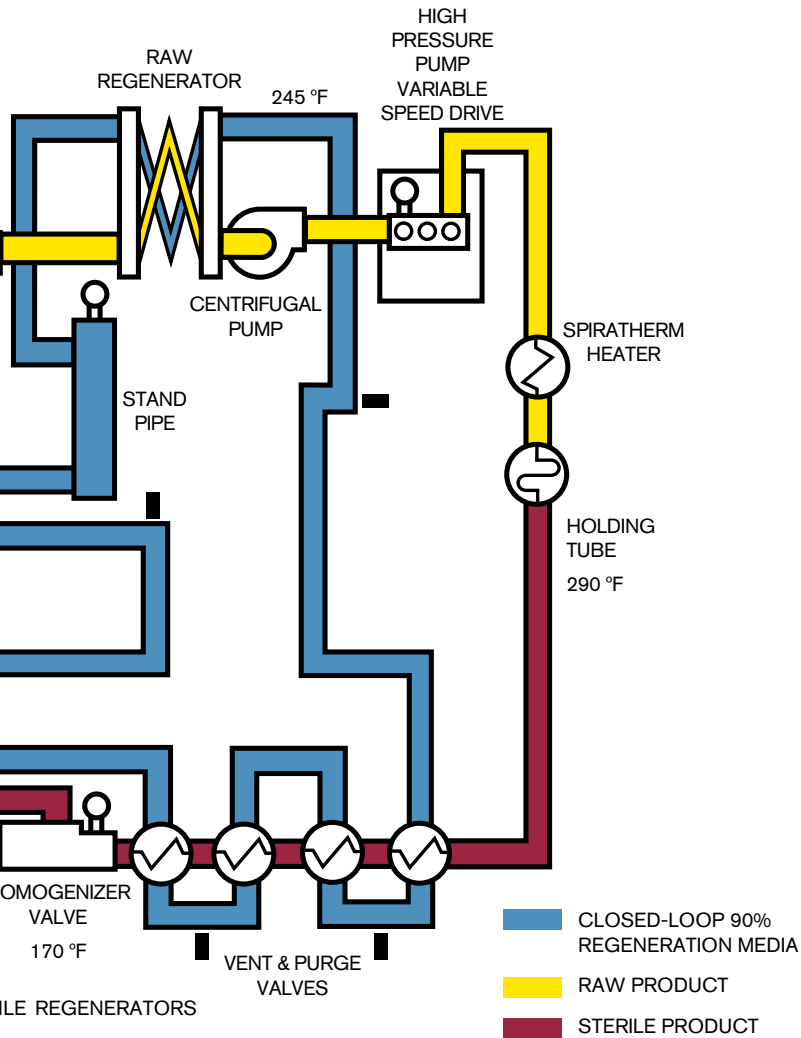
B. Holder: sized for holding times as calculated by the formula required by the U.S. Public Health Service.

C. Sterile Regenerators: liquid-media Spiratherm<sup>®</sup> HEs utilized with spiral design. Regeneration to 78%.

D. Tower Water Cooler: liquid-media Spiratherm<sup>®</sup> utilized. Design identical to sterile regenerator. (Not required on high-regeneration systems.)

E. Sweet Water Cooler: liquid-media Spiratherm<sup>®</sup> HEs utilized. Design identical to sterile regenerator. (Not required on high-regeneration systems.)





F. Condenser: a condenser is frame-mounted and used for cooling the sterilizing water before returning to the water surge tank.

10. **REGENERATION CIRCUIT MEDIA PIPING:**  
All media piping between pump, sterile regenerators, raw regenerator, and standpipe is pre-piped.
11. **COOLING MEDIA PIPING:**  
The cooling media piping is pre-piped and includes all necessary valving.
12. **UTILITY REQUIREMENTS:**  
Dependent on capacity and options selected
13. **MAIN FRAME DIMENSIONAL DATA ABOVE 450 GPH (Approximate):**  
Length: 17'6"  
Width: 6'6"  
Height: 7'3" min. to 8'8" max.
14. **STANDARD AUTOMATIC CONTROLS:**
  - A. Surge tank level controls
  - B. Heating temperature controls
  - C. Digital temperature indicators between heat exchange sections
  - D. Separate motor starter center
  - E. Operator stations for all process functions
15. **OPTIONAL AUTOMATIC CONTROLS**
  - A. Sterilization interlock
  - B. Filler infeed valve and back pressure control valve
  - C. Legal sterilization controls
  - D. Automatic product to water changeover
  - E. Timing pump tachometer
  - F. Cooling media valving
  - G. Start-up sequencing
  - H. Homogenizing valve control
  - I. Product Deaeration
  - J. Stainless steel frame and panels

## **We stand ready to respond to your needs:**

- RPF pump remanufacture
- Permanent equipment exchange
- Original equipment parts
- Re-honing
- Equipment loan & rental
- Proof testing
- Contracted service & testing
- Technical information

Our factory services are your assurance of continuing value and cost-effectiveness.



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For more information about our worldwide locations, approvals, certifications, and local representatives, please visit [www.apv.com](http://www.apv.com).

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