

HEATEC PRODUCT LINES & SERVICES

ASPHALT EMULSION PLANTS



Astec provides equipment and services to build emulsion plants. We can build your emulsion plant to meet your exact needs. Accordingly, the size of your plant and its components may be significantly different from other plants we have built. We do not try to make "one size fit all."

We can also retrofit an existing plant for a variety of needs. You may want to replace old or unreliable controls and equipment with new products. You may need to expand your plant to increase production volume. Or you may need to add equipment for production of polymer products. We can help.

Our unique position

Astec occupies a unique position for building emulsion plants. We are virtually the only company that provides a full range of services*, including plant planning, manufacturing, setup, startup, maintenance, etc.

This provides significant advantages for you, the plant buyer. You only have to work with a single source for the widely diverse products and services involved. And it greatly reduces the likelihood of costly reworks due to incompatibility and miscommunication.

We provided major equipment for emulsion plants long before we decided to expand our services. We had provided numerous heaters, tanks and other products for emulsion plants for many years. So expanding our role to do entire plants was an easy step forward.

A 30 TPH asphalt emulsion plant for BCI in Charlotte, NC was the first new emulsion facility where Astec provided a full range of services. It was built in 2011. Several of the photos herein show this plant and its equipment.

Source of products

Many of the products for an emulsion plant are manufactured in our factory in Chattanooga, Tennessee. In addition to products we make, we include products made by other reputable manufacturers, enabling us to provide a facility *ready for operation*.

Do it yourself options

Our customers usually do their own site preparation work and building structures. But we recommend that you engage Astec to do plant design work first. This significantly reduces the likelihood of oversights and costly remedies.

Even if you want your own people to do some of the work or use others, we can still provide equipment and services for major portions of the work. The choice is yours.

Small plants

Anyone considering a new emulsion plant needs to be aware that you can start with a small plant and expand it as the need arises. It can also be integrated with a polymer blending system. A typical emulsion system is illustrated on the next page.

And of course, possible addition of storage tanks in the future should be always be considered in the early planning stages. Addition of a polymer blending system is also a consideration for future expansion. Astec has experience with all those options and can help plan for such expansions.

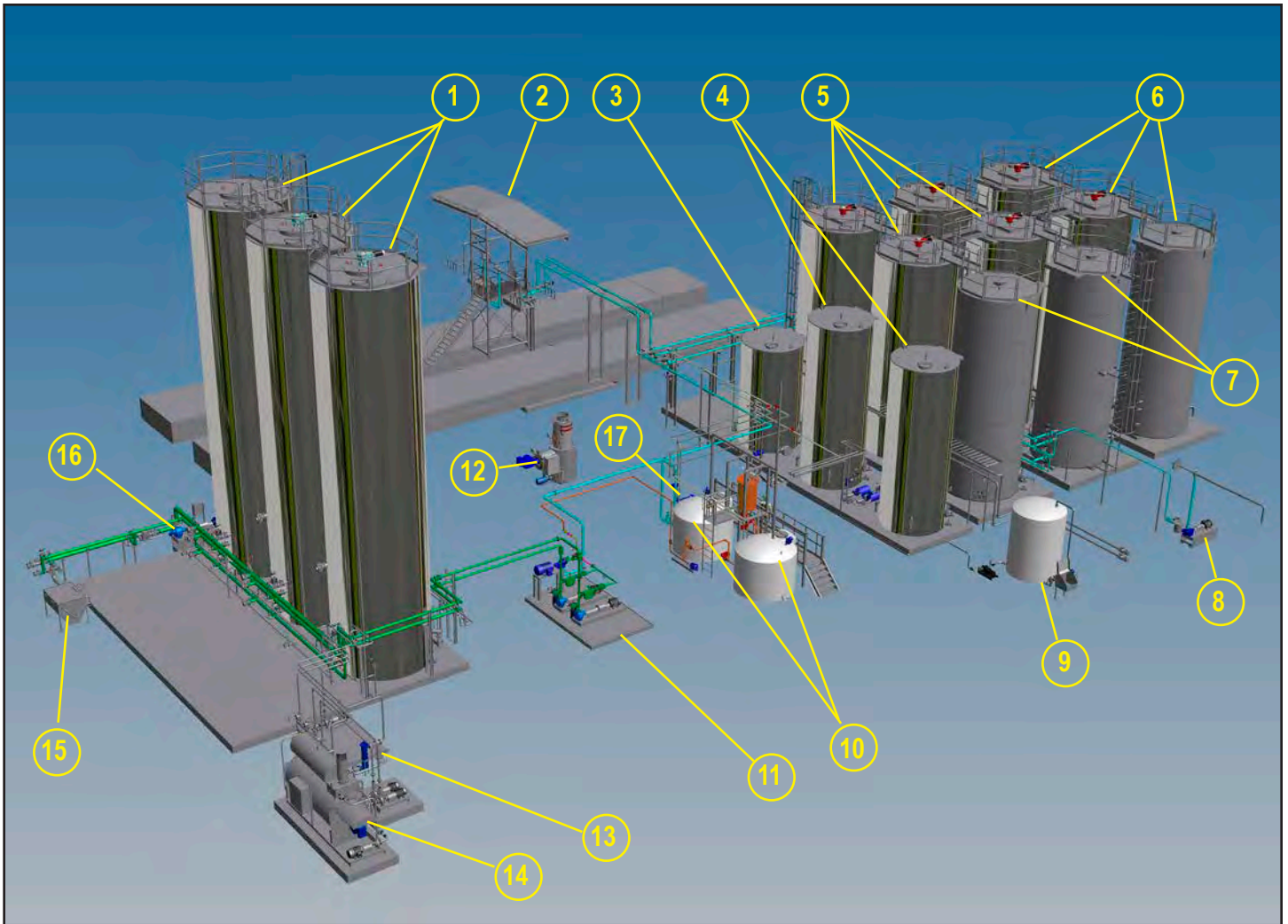
Astec factory-made products

- Hot oil heaters
- Water heaters
- Emulsion mills and mill skids
- Storage tanks (base and finished products)
- Emulsifier tanks
- Pump skids
- Loading racks
- Motor control system
- Plant controls
- Automated load-out controls
- PLC controls for tank farm management

On Site Services by Astec personnel

- Installation of all Astec equipment
- Installation of piping
- Start-up of Astec equipment and systems
- Training of plant personnel for operation of Astec equipment and systems
- Troubleshooting and maintenance of plant equipment

*Should the scope of services require professional licensure, Heatec will perform those services to the extent allowed by applicable laws and regulations. Otherwise, these professional services will be performed by qualified, licensed professionals retained by Heatec.



Typical production equipment at an emulsion plant

1. **Base asphalt tanks.**
2. **Load-out rack.** Includes scales.
3. **Water tank.** For storage of heated water, an ingredient of the emulsion. The tank is insulated and has electric heating elements. A pump is provided.
4. **Two surfactant tanks.** For storage of amino, an ingredient of the emulsion. Each tank is insulated. A pump is provided for each tank.
5. **Four (original) tanks for finished emulsion.** Insulated and electrically heated.
6. **Three (additional) tanks for finished emulsion tanks.** Insulated and electrically heated.
7. **Two emulsion tanks.** Non-insulated. Electrically heated.
8. **Load-out pump for distributor trucks.**
9. **Acid tank.** Stores hydrochloric acid, an ingredient of the emulsion. It has two pumps. One is used to fill the tank. The other is used to transfer acid to the solution tanks.
10. **Two chemical tanks.** For storing chemical solutions. One pump serves both tanks.
11. **Emulsion Skid.** Has an emulsion mill, a flux oil pump and two virgin AC pumps. All pumps have mass flow metering packages.
12. **Firestorm water heater.** Heats mix water for emulsion.
13. **Warm oil skid.** Blends hot oil (supply and return) to reduce its temperature for special use.
14. **Hot oil heater.** Heatec HC-200 helical coil heater. Has output of 2 million Btu/hour. It uses side pumps for independent hot oil circuits.
15. **Hot box.** Melts lab samples for reuse.
16. **Unloading Pump.** For transferring base asphalt to the base asphalt tanks.
17. **Heat exchanger.** (not visible) Used to cool emulsion and to heat water.

EQUIPMENT AND SERVICES

Manufacturing equipment for heating and storing asphalt has been an important part of our business since we started in 1977. We design, build and service most products we offer. Our products are used extensively at hot mix asphalt plants, emulsion plants and asphalt terminals.

Heaters

Our oil-fired and gas-fired heaters use thermal fluid to heat tanks and piping. They have capacities ranging up to 30 million Btu/hour.

They incorporate helical coils heated by hot gases from their burners. Thermal fluid is pumped through the helical coils and carries the heat to heating coils in the storage tanks. Thermal fluid is also an ideal way to heat piping for liquid asphalt materials. *(Please see our separate brochures on thermal fluid heaters.)*

Our Firestorm heaters heat water (on demand) for use in producing emulsion. *(Please see our separate brochure on Firestorm heaters.)*

Storage tanks

A wide variety of storage tanks are fabricated at the Astec factory. They include tanks for asphalt, emulsions, additives, fuel and hot water. Tanks for heated materials have heating coils and are insulated.

Tanks for emulsions have mixers to keep blended materials from separating.

Fuel tanks are available with built-in containment walls and fuel preheaters.

Tank capacities range up to 50,000 gallons. We can build our tanks to UL 142 and API standards when needed.

(Please see our separate brochures on storage tanks.)

Emulsion mill skids

Astec is producing a new skid for production of asphalt emulsions. The skid contains Astec's new Barracuda colloid mill and related systems. The skid and the mill are featured later herein.

(Please see our separate brochures on the Barracuda mill and mill skid.)

Loading racks & scales

Astec can provide loading racks and truck scales. We can customize them to suit your requirements.

Automated load-out controls

We offer a tank truck load-out system designed so that drivers can safely load the tank truck they are driving without help from others. It can fill two trucks simultaneously with liquid asphalt products.

The load-out system incorporates a computer, computer-automated controls, truck scales, and automated data recording. The load-out controls for each load-out boom incorporates lockouts to prevent operation of the pumps unless the boom is properly positioned and valves are properly set.

Motor control system

We can provide a control center that centralizes all electrical power for the plant and for the motor controls. The controls are housed in a series of electrical racks and panels.

Our motor control center is housed in a steel structure, enclosed with metal walls, ceiling and floor. It is designed to rest on a concrete foundation and remain separate from other buildings. It has HVAC (heating, ventilating and air conditioning).

Plant controls

We provide conventional PC computers set up to monitor and control plant equipment. The controls include interlocks to minimize the possibility of operator error.

A single monitor on a single computer can show a series of screens that display the status of the various plant operations and components. For example, status of the load-out system can be shown on one screen. Levels and temperatures of storage tanks can be shown on another screen. The status of valves and pumps can be shown on another screen.

Multiple monitors can be included to eliminate the need to switch between screens on a single monitor. Each monitor can display a different screen.

Polymer blending systems

Astec offers polymer blending systems with a wide variety of options. We can include the system in a new plant or retrofit one to an existing plant. *(Please see our separate brochure on these systems.)*



BCI emulsion plant, Charlotte, NC

This 30 TPH asphalt emulsion plant for BCI is the first new emulsion facility that Heatec built. It is also the largest emulsion project undertaken by Eurovia, the parent company of BCI. It was completed in 2011. The three tanks in the foreground were added recently.

Heatec designed major systems for the BCI emulsion plant and installed virtually all of the equipment at the plant. The equipment included major components built by Heatec at the company's manufacturing facility in Chattanooga, TN and shipped to the plant site for installation and testing. Heatec provided the following systems and components:

- Hot oil and warm oil systems
- Instant hot water heating system using Firestorm heater
- Hot oil piping systems
- Motor control system
- Tank truck load-out station with scales
- Load-out system for small trailers
- Emulsion blending system
- Heater and tank controls
- Asphalt storage tanks
- Emulsion tanks
- Surfactant tanks
- Hot water tank
- Melter for residual asphalt and emulsion used for testing



Emulsion plants typically use a thermal fluid heater rated at either 1, 2, 3 or 4 million Btu/hour, depending on plant size. They provide heat for storage tanks, jacketed asphalt piping and the emulsion mill. The Heatec heater shown here is rated at three million Btu/hour. It has side pumps with independent circuits that provide fast heating and maximum flexibility.

We offer a wide variety of hot oil (thermal fluid) heaters that are unmatched by others. They are unmatched in thermal efficiency, reliability and long life. They can achieve 90% thermal efficiency when equipped with our Stackpack heat exchanger. High thermal efficiency provides significant fuel savings.

The burner management controls we use on our heaters are the most advanced controls available. They provide high reliability and are vastly superior to controls others use. There are no complicated codes for the operator to decipher. Instead, they use precise text messages that track operating events as they happen. They pinpoint any abnormal condition that causes a lockout or shutdown.

The heater coil is protected from overheating. This is achieved by our advanced differential pressure switch. It detects inadequate flow of thermal fluid and shuts down the heater before the coil overheats. Consequently, the heater has an unusually long life expectancy.

HEATEC HC THERMAL FLUID HEATERS

| BASIC MODEL | MAXIMUM OUTPUT | FUEL USED PER HOUR | |
|-------------|----------------|------------------------|-----------------------------|
| | Btu/Hour | No. 2 Fuel Oil Gallons | Natural Gas Cubic feet/hour |
| HC-120 | 1,200,000 | 11 | 1560 |
| HC-200 | 2,000,000 | 18 | 2600 |
| HC-300 | 3,000,000 | 27 | 3,900 |
| HC-400 | 4,000,000 | 36 | 5,200 |



Our Firestorm® water heaters are used at several emulsion plants, including BCI. The heater provides direct contact heating. This a significant advantage when heating water to make emulsions because it heats water on demand (as it is used).

This eliminates the need for a large hot water storage tank heated separately. Sometimes the supply of hot water from hot water tanks

cannot keep up with demand. Using larger tanks can overcome that problem, but increases operating costs.

Emulsion plants typically use a Firestorm heater rated at either 2.3, 4 or 6 million Btu/hour. The thermal efficiency of Firestorm heaters is 99 percent. This provides major savings in fuel costs compared to heating water storage tanks.

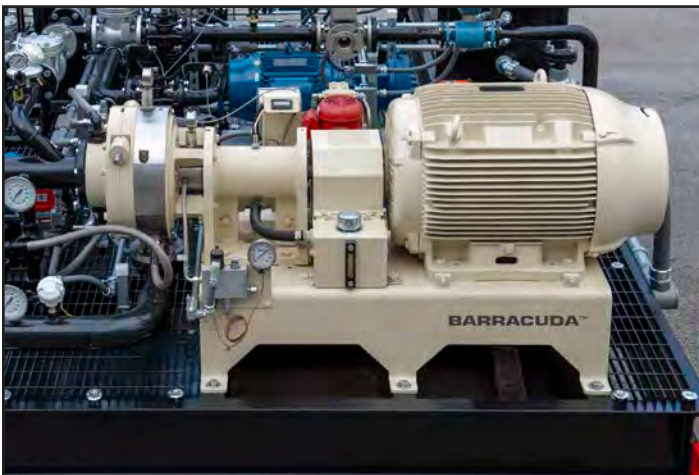


This is a mill skid for production of asphalt emulsions. It contains Astec's Barracuda colloid mill and related systems. It has an automated PLC control system with touch screens.

The mill is heated by hot oil from an external source. It emulsifies a mixture of asphalt, latex and a chemical solution. Ingredients of the mixture are precisely metered.

A conventional Astec metering package, which consists of a pump pushing a pump, meters the hot liquid asphalt. The asphalt is filtered through a strainer and controlled by a variable frequency drive.

The latex and solutions systems include an actuated valve and Siemens flow meter. A variety of touch-screen controls are available for the skid.



The Barracuda colloid mill is a new mill from Heatec. It has an advanced lubrication system and its mill plates are easily adjusted.

This control panel connects power to the tank's electric heating elements, which heat emulsion stored in the tank. Below the panel is a thermocouple that provides signals for control of the heating elements.





The warm oil skid blends some of the oil from the main supply line of the hot oil system with cooler oil. This lowers its temperature for pumps and asphalt piping heat-traced with hot oil.



Plant personnel operate the load-out system to fill two tanker trucks simultaneously. Key features are PLC controls, two truck scales, loading arms, overflow protection and two walkout bridges with fall protection.



The hot box re-melts buckets of solidified asphalt that have been collected from samples used for testing. It has hot oil heating coils in its bottom and sides.



The motor control center centralizes all electrical power for the terminal and for the motor controls. The controls are housed in racks and panels. Power is sub-divided into independent control sections based on the location of the equipment.



Overhead pipe routing allows easy access to other components. Hot oil piping is sized for fast heating. Unfortunately, we see many plants where these important features were overlooked. If you want it done right, let us design and install your piping.



Two surfactant tanks, each with a capacity of 8,500 gallons. The tanks are insulated and heated electrically. They have pressure transmitters for level indications and have sampling valves.



Heated 30,000 gallon tanks store base asphalt for emulsions. Two have mixers for PMAC. Interior walls have multiple coats of corrosion-resistant paint. Bridges interconnect the tanks.



Actuated valves in asphalt piping are controlled by PLC. Valves and piping may be either jacketed and heated by hot oil or heat traced.



Astec provides controls for emulsion plants both new and old. We can upgrade your old controls to automated systems similar to the

one shown here. We customize each control system to meet your needs.

Process Overview (Run Sheet) 5/30/2015
6:08:27 PM

Current Recipe In Production: **test** Target Gallons: **4000** Galls Remain: **4000** Accept New Recipe Recipe Waiting: **Test 2** Target Gallons: **12000**

| Manual Start | Manual Stop | AC Pump | AC Valve | Target Gallons | Actual Gallons | Target Rate | Actual Rate | Selected Tank | Start Capacity | Cap. Remain | Inlet Temperature |
|--------------|-------------|----------------|-----------------|----------------|----------------|-------------|-------------|---------------|----------------|-------------|--------------------|
| Manual Start | Manual Stop | Soap Pump | Soap Valve | 11494 | 11494 | 100.0 | 0.0 | 24 | 7000 | 7000 | +192.7 |
| Manual Start | Manual Stop | Oil Pump | Oil Valve | 75.00 | 70.32 | 0.0 | 0.0 | | | | Working Pressure |
| Manual Start | Manual Stop | Injection Pump | Injection Valve | 3831 | 4850 | 0.0 | 0.0 | | | | +0.0 |
| Manual Start | Manual Stop | | | 25.00 | 29.67 | 0.0 | 0.0 | | | | Outlet Temperature |
| Manual Start | Manual Stop | | | 0.00 | 0.02 | 0.0 | 0.0 | | | | +87.8 |
| Manual Start | Manual Stop | | | 175 | 0 | +0.0 | +0.0 | | | | Back Pressure |
| | | | | 0.00 | 0.00 | | | | | | +0.3 |

Mill Run Time: **15743.2** (sec)

Process Control: **AUTOMATIC**

85 Tank 2 High High Level - System Shutdown Eminent

Silence Alarm | Main | AC | Soap | Additive | Fuel | Alarms | Temp Trends | Rate Trends | Recipes | Tanks 1-25 | Run Tank | INTERLOCK BYPASS | **AUTO** | ALL STOP

This screen and the next are samples of those operators use to control and monitor emulsion production equipment. Other screens are used too, depending on how many tanks and what other

equipment you have in operation. These screens can be accessed from additional monitors connected to the computer that controls the equipment.

Virgin Liquid Asphalt Cement Details 5/30/2015
6:10:16 PM

Flow Rate (gpm):

Target: 130 Actual: 130

+100.0 +0.0

Pump Control

Auto Interlock OK

Start READY TO RUN

Stop Control Mode: **AUTOMATIC**

PUMP OFF

Tolerance:

| Parameter | Status | Setpt: |
|--------------|--------|--------|
| High Alarm | OK | 5.0 |
| High Warning | OK | 2.5 |
| Low Alarm | OK | 5.0 |
| Low Warning | OK | 2.5 |

Alarms:

| | |
|--------------------|-------|
| General Alarm | ALARM |
| Calibration Alarm | ALARM |
| Feedback Alarm | ALARM |
| PID (Output) Alarm | OK |

Valve Control

Auto/Man

Output: 40-80 Feedback: 40-80

Close Open Closed Eminent

% 4..20 mA % 4..20 mA

0 11043 ### #####

Totals:

Current: 11494.3 Reset

Daily: 45868.9 Reset

PTD: 45868.9 Reset

MTD: 45868.9 Reset

YTD: 45868.9 Reset

Startup/Shutdown Status

Not in Startup Mode

Output: 0.0 % Output: 0.0 %

Target: 55.0 gpm

Deadband: 10.0 gpm

Stability Time: +3000 ms

Elapsed Stab. Time: +0 ms

Startup Stable:

Output Switch Time: +3000 ms

Elapsed Switch Time: +0 ms

Mill Inlet Pressure: Pressure not in range

Startup OK: Startup not complete

85 Tank 2 High High Level - System Shutdown Eminent

Silence Alarm | Main | AC | Soap | Additive | Fuel | Alarms | Temp Trends | Rate Trends | Recipes | Tanks 1-25 | Run Tank | INTERLOCK BYPASS | **AUTO** | ALL STOP



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