

# AESCO/MADSEN®

## **ECOFOAM-II**



## **Static Inline Vortex Mixer**

# AESCO/MADSEN'S

## Eco-Foam II Static Inline Vortex Mixer

The **AESCO/Madsen Static Inline Vortex Mixer**, known as the **Eco-Foam II**, is a motionless static mixer in which fluids are injected and rapidly mixed by a combination of alternate vortex shedding and shear-induced turbulence, which produces superior fluid mixing.

### Advantages of the Static Vortex Eco-Foam II Mixer

- Low Cost
- No Maintenance Required
- No Moving Parts
- Integral Injection Fittings
- Long Service Life
- Predictable Mixing
- Hot Oil Jacketed Pipe
- Easy Installation & Hook-up
- Stainless Steel Additive Check Valve
- 316 Stainless Steel

### Applications

- Anti-Strip & Additives
- Warm Mix Asphalt
  - Water Injection
  - Chemical Injection

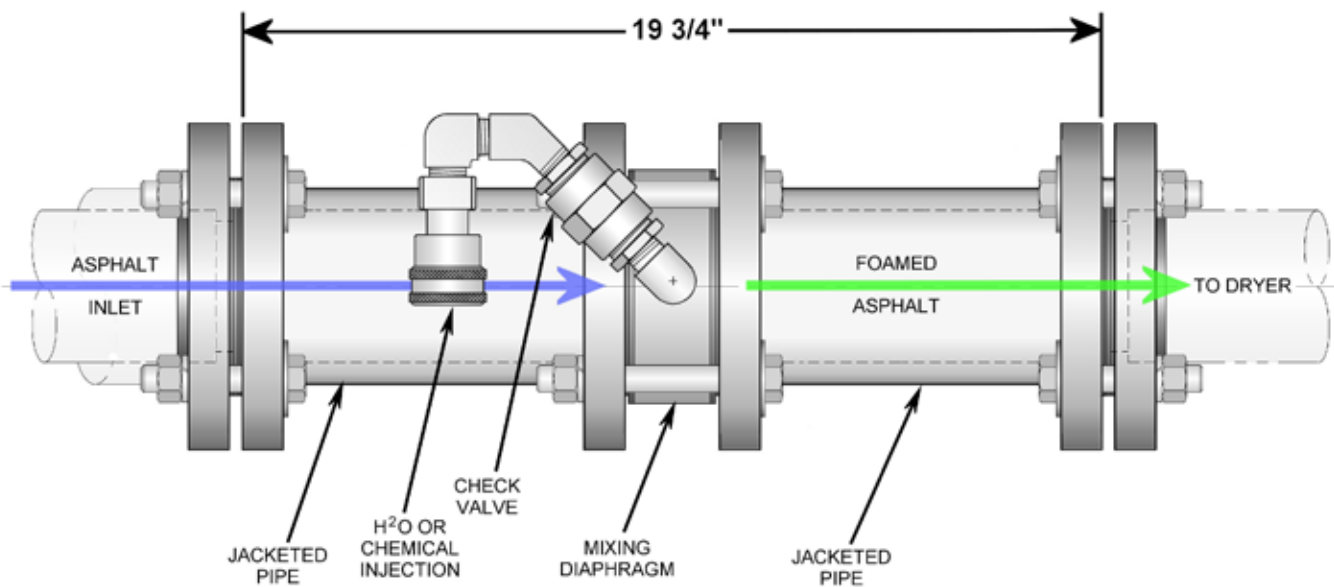
In the **AESCO/Madsen Static Inline Vortex Eco-Foam II Mixer**, unmixed asphalt flows to the static mixer and is forced through the mixer restriction to form a high-speed flow. The water/additive is injected into the low-speed reversed flow region downstream of the mixer tabs.

This effectively speeds the mixing of the asphalt and water/additive by increasing the contact area between the high-speed asphalt and the low-speed water/additive.

The **AESCO/MADSEN Static Inline Eco-Foam II Vortex Mixer** makes use of shear zone turbulence. With a unique orifice plate design, this mixer causes great turbulence that also enhances the mixing process. Vortex shedding happens when a fluid passes an object, or obstruction, and an oscillation occurs. The oscillations, or swirls, downstream create alternating low-pressure zones, which also help in the mixing process.



**The EcoFoam II Warm Mix pump skid, mixer and control system.**



### AESCO/MADSEN'S Static Inline Vortex Eco-Foam II Mixer.

- The dominant feature in the **AESCO/MADSEN Eco-Foam II Mixer** is the production of two very strong jets emanating from the open areas in the cut-out plate. Velocities in the cores of these jets reach five times that of the upstream asphalt flow. Large reverse flow regions surround these jets and very high amplitude shear layers exist in between the jet and the reversed flow. The effective area where high shear layers exist is largely due to the dual jet structure and the non-circular nature of the plate cut-outs.
- The **AESCO/MADSEN Eco-Foam II Mixer** makes effective use of shear layers. The **AESCO/MADSEN** mixer design has effectively enhanced and increased these shear layers by using a unique orifice plate design and interactions of the flow with the pipe walls.
- Because the tabs in the **AESCO/MADSEN Eco-Foam II Mixer** are slightly swept back in the direction of the flow, the jets of asphalt emerge at an angle with respect to the flow axis toward the walls of the pipe. The velocity contours track the core of the jet as it grows closer and closer to the pipe wall. Eventually being contorted into a very thin layer near the wall. This contortion of the jet shape further enhances the mixer performance because the jet surface area increases drastically.



**Eco-Foam II Mixer showing the reverse flow regions.**

## Water as a Foaming Agent in "Warm Mix" Asphalt

Injecting water directly into the center of the liquid asphalt causes the water to instantly turn to steam in the form of small bubbles. When combined with the hot asphalt, the result is a "foamed asphalt" mixture. This foamed asphalt temporarily reduces the viscosity of the asphalt oil during the mixing process. This allows the aggregate in the dryer to efficiently coat at temperatures that are in some cases 50-60 degrees Fahrenheit lower than normal HMA asphalt. This results in asphalt mix temperatures at the discharge of the aggregate mixer in the 240-280 degrees Fahrenheit range, while still maintaining good workability during the laydown process.

### Benefits from Lowering Plant Mixing Temperatures Include:

- Fuel savings of approximately 2.5 to 3 percent for every 10 degrees Fahrenheit reduction in final mix temperature.
- Reduced smoke and odor at the plant and paving operation.
- Reduced overall plant emissions.
- Reduces liquid asphalt oxidation during the mixing process.
- Enhances final product workability and compaction during laydown process.
- Increases RAP production capability due to lower plant exhaust temperatures and emissions.

### AESCO/Madsen's "Warm Mix" Asphalt Control Systems

The **Eco-Foam II** can be easily retrofitted to any asphalt plant. The Warm Mix System includes an Eco-Foam II Mixer. The water is injected and rapidly mixed with the hot liquid asphalt by a combination of alternate vortex shedding, and shear-induced turbulence. (This produces superior fluid mixing.) The Eco-Foam II Mixer's double swirl pattern guarantees that the injected water will be rapidly mixed downstream of the mixer resulting in a homogeneous "foamed asphalt" mix. In addition, this system includes a variable speed high-pressure water pumping and metering system with stand alone computerized controls. When interlocked to existing plant controls, **AESCO/Madsen's Warm Mix System** provides a fully automatic or manual operation of the injection process at a pre-determined set point.



**AESCO/  
MADSEN'S  
Static  
Inline  
Vortex  
Eco-Foam  
II Mixer  
lined  
up and  
ready for  
delivery.**



**Warm Mix pump skid with optional mass flow meter.**

**Call or Email Your AESCO/MADSEN Sales Rep Today  
253-939-4150 • [sales@aescomadsen.com](mailto:sales@aescomadsen.com)**



**[www.aescomadsen.com](http://www.aescomadsen.com)  
1531 20th Street Northwest • Auburn, Washington 98001-3422**