

New Technology for Heating, Evaporating and Dynamic Mixing

The new PYROS™ Heating, Evaporation and Dynamic Mixing Systems from Total Separation Solutions, incorporate ShockWave Power™ Reactor (SPR)* technology for heating, dehydrating heavy processing and completion fluids, and non-shear mixing, without the use of flame.

How does the Shockwave Power™ Reactor Work?

A drive source spins the shaft and rotor. Specific geometry of the SPR creates a pressure differential within the liquid, causing cavitation bubbles to form and collapse. These collapsing bubbles generate shock waves that are used to heat, concentrate and mix. When designed and operated properly, the Shockwave Power™ Reactor does not experience cavitation damage. The force of the collapsing bubbles does not go toward the metal, but transfers into the liquid.

Shaft work is converted to heat energy when the cavitation bubbles collapse and the shock wave is released.

- Safe, Reliable, Flameless Heat
- Hot Water
- High-Pressure, Superheated Point Source Steam without Pre-treatment
- Safe Hot Oil Heating without Vapor Loss
- Densification of Expensive Fluids

Because there are no heat transfer surfaces, uniform heating is achieved and scale is eliminated. The SPR mixes similar or dissimilar fluids at the molecular level for better hydration of oilfield polymers, and an increase in the mass transfer rate for other chemical reactions. With non-shear mixing, you can mix similar and dissimilar fluids, or gas into fluids.

Efficiency is measured by the nominal motor efficiency. The rotor width dictates the number of holes in the rotor. A smaller, wider rotor will provide better mixing, while a larger, narrow rotor provides the best heating. The speed at which the rotor is spinning is the most important parameter to consider. The total volume of the cavities in the rotor of a commercial-sized SPR is approximately one gallon. This one gallon of fluid is divided evenly over a minimum of two-hundred fifty holes. Therefore, it is safe to say that the SPR uniformly mixes fluids 1/250 gallon at a time versus the conventional tank.

The SPR's versatile technology can be utilized for:

- Continuous, problem-free steam
- Densification of heavy brines
- Concentration of drilling mud, glycols & other fluids
- Oil/Water separation
- Upgrading of heavy oil
- Stack gas scrubbing
- Emulsification/separation
- Gas/liquid mixing

Clean Water from Produced Water

Fresh water from produced water is possible when SPR technology is combined with recycled steam. Utilizing a closed system, the recovery of the latent heat in the evaporated steam is used to drive the evaporation process. The by-products are fresh water and concentrated salt water, which reduce brine handling and disposal costs.

The Technology

- Controlled Cavitation plus Heat Recovery
 - Spinning disk with closed boreholes around the circumference creates low pressure areas
 - Tiny bubbles form and collapse inside of the closed bores
 - Cavitation efficiently converts mechanical energy into heat
 - Maintaining the cavitation inside the closed boreholes prevents damage to the unit
- Diesel exhaust heat recovery boosts efficiency and performance of the package
- High Efficiency in a Compact Design
 - Diesel Powered
 - Small Footprint

Total Separation Solutions specializes in optimizing filtration, and fluid processing, blending, and reclamation through innovative technologies. To learn more about how you can benefit from the PYROS Systems and SPR technology, call TSS today.

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* Total Separation Solutions is the exclusive licensee for the worldwide oil & gas markets of the ShockWave Power™ Reactor, manufactured and sold under license from Hydro Dynamics, Inc.



TOTAL SEPARATION SOLUTIONS, LLC

Innovative Technologies in Fluid Filtration, Processing and Reclamation

6650 W. Sam Houston Parkway N. • Suite 450 • Houston, Texas 77041 • Fax: 832-467-4800