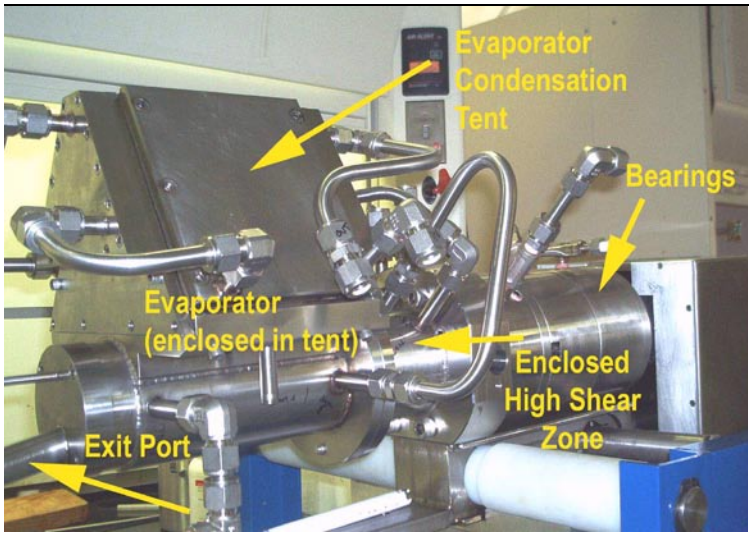
STT® Reactor Data Sheet

Innovator® Series

Innovator® - 3000

PILOT SCALE – REACTOR AND EVAPORATOR

Developed specifically for esterification and other reactions where efficient water removal improves yields, selectivity, conversion and energy efficiency. This unit can also be utilized for stripping off water and other undesired components.



The STT® system is a combination of patented processes and equipment for the manufacture of specialty chemicals, generic and branded pharmaceuticals, and a broad range of difficult chemistries where mass transfer is an issue. The Innovator® Series of reactors is well suited for pilot scale production and commercial process optimization.

The Innovator® 3000 type reactor integrates an evaporator into the STT® design so that product/byproduct can be removed while still providing for continuous high shear. The first half of the unit is a conventional STT® closed configuration for laminar high shear and reaction acceleration. The second half of the unit consists of one rotor with two stator halves. The lower stator half is the conventional enclosed gap for high shear. The upper stator half is open on the top section to provide for the evaporation of water or other product/byproduct while providing for extreme surface renewal of the working material.

Fins located above the open top section maintain stability in flow thickness and 'smooth out' any perturbations, thus keeping the reaction flow material in contact with the rapidly spinning rotor. The spinning rotor feeds material back into the narrow gap between the enclosed rotor and stator on the bottom half of the second stator section, where the material re-encounters the high shear to advance the reaction.

Even though the reactor is small, it has been constructed using the same design principles that would be used for a commercial reactor, and processes can be easily scaled to commercial sized production output.

Dimensions (Foot Print):	**W x L x H**
Floor Model – Horizontal [a]	24" x 30" x 57" 61 cm x 76 cm x 145 cm
Weight:	350-500 lb 136-227 Kg

Electrical Components Specifications	
Power Requirements:	208-230 V, 3 Phase, 30 A [b]
Motor Ratings:	5 HP (Standard) 7.5 &10 HP motor option [b]
Motor Classification:	Explosion Proof, Class 1 Group D, Class II Groups F &G
Control Panel:	Intrinsically Safe [c]

Materials of Construction Options (for wetted surfaces)	
316L SS	Hastelloy®C
Titanium	Client's choice

Contact Four Rivers regarding Heating & Cooling Requirements and support equipment. Working volumes are customized to each specific application.

For additional information, please contact:

Phil Lichtenberger
Tel: (+1) 805 443 5859

Email:
phillichtenberger@riv4ers.com

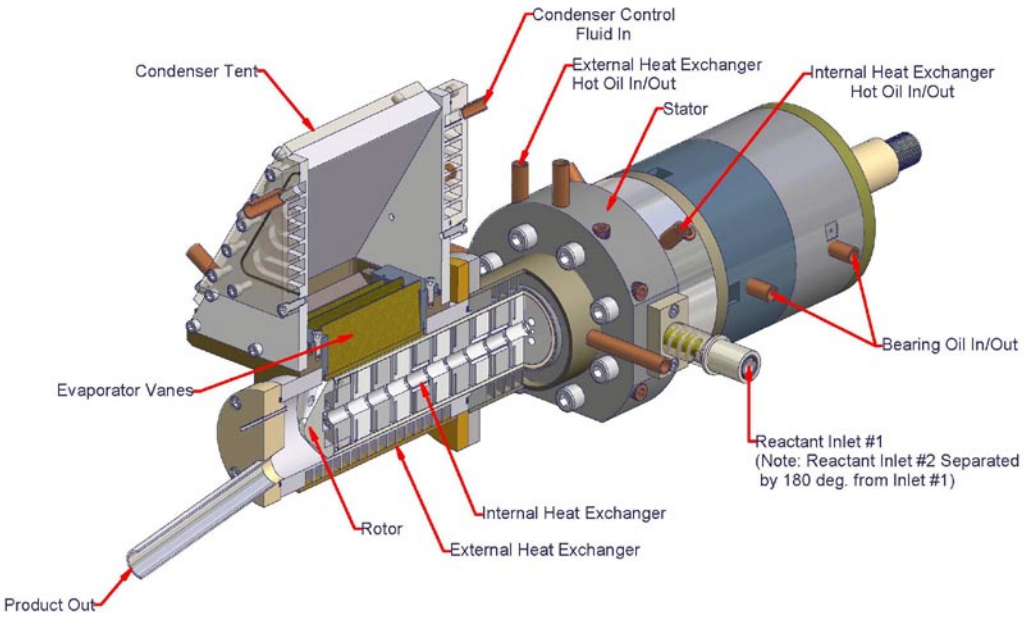
Skype: phil.lichtenberger

Four Rivers BioEnergy Company, Inc.

PO Box 1056
1637 Shar-Cal Road
Calvert City, Kentucky
42029 U.S.A.

Main Telephone (+1) 270 395 3687

Innovator® Series



Typical Seal Parameters

Gas Mechanical
600 PSIG
285°C
5,000 RPM

Double Mechanical Liquid
500 PSIG
275°C
5,000 RPM

The maximum temperature, pressure and rotor RPM values are interdependent.

The specifications provided here are general and Four Rivers should be contacted for application recommendations

Design Specifications	
Stator Inner Diameter (ID)	2.530” 6.43 cm
Rotor Working Length	12.0” 30.5 cm
Typical Rotor Outer Diameters (OD)	2.50” 6.35 cm
Gap	0.015” 0.38 mm
Resulting Total Cavity Volume	34.6 ml
Resulting Working Volume [(d)]	23.0 ml
Entry Port Configuration	2 inlets into stator flange separated by 180° (additional inlet ports and preheaters for inlets available)
Exit Port Placement	Standard as illustrated

Operation Specifications	
Rotation Rate	5,000 RPM maximum
Heat Exchanger – Required Pumping Volume	5 GPM (18.9 LPM) minimum at 20 PSIG

Notes:

(a) Floor models are on castors with screw jacks for easy movement, leveling and stabilization.
(b) Specific requirement will change based on seal design and application requirements. Specifications listed here are for a Gas Mechanical Seal.
(c) Explosion Proof construction (with nitrogen purge) can be provided as an additional option.
(d) Working Volume is based on the Rotor Working Length, the Rotor OD and the Gap where Gap = 1/2(Stator ID – Rotor OD). Custom Gap configurations can be provided but not with Gaps less than 0.010" or 0.25 mm.