ADVANTAGES OF BLUE PLANET MODULAR UNITS

Sheer Optimization: The high shear flow that is responsible for the mixing within the BLUE PLANET MODULAR System creates a greater shear energy vortex than conventional volume-based reactors, resulting more rapid blending at the molecular level. This faster reaction time creates higher production yields. In addition, our system will also reduce solvent and catalyst requirements.

Process Optimization: The BLUE PLANET MODULAR creates an unprecedented level of control of the reaction chamber. The operating parameters of the BLUE PLANET MODULAR control the stokeometry (the reaction rate) of the reaction by allowing the proper introduction of reactants and automatically adjusting the flow pattern of the reactants. Additionally, the BLUE PLANET MODULAR is able to control the residence time and balancing the heat transfer characteristics of the system and isothermal reaction.

Precise Temperature Control: The two dimensional format of the BLUE PLANET MODULAR System enables precise temperature control. This differs from a conventional, three dimensional environment of a volume-based system where considerable temperature variations between one part of the mixing vessel and another may exist due to distance from the heating source. Precise temperature control increases yield and leads to better product quality control.

SHEER RATE

This is responsible for the improved reaction rate. Shear Rate and Residence Time are independent. Shear Rate is measured in s-1. Typical shear rate values are 30,000/sec to 70,000/sec but higher or lower values are possible.

RESIDENCE TIME

Residence Time is controlled by reactor gap size, reactor working volume, and feed rate of reactants. Again, Residence Time is independent of Shear Rate.

TEMPERATURE

The BLUE PLANET MODULAR is able to maintain temperature as well as to rapidly add or remove large amounts of heat to control the temperature of the reaction.

PRESSURE

The BLUE PLANET MODULAR can be run under pressure (up to 600 PSIG depending on the configuration and choice of seals), open to the atmosphere, or under vacuum. There is some flexibility in where gasses are added or removed from the reaction stream

FEED RATE

The BLUE PLANET MODULAR permits easy metering of multiple feeds into the system with varying miscibility and phases (solid, liquid, gas, slurries) – more so than could be tolerated in a traditional stirred tank reactor (STR) or plug flow reactor (PFR) system. For example, one can ensure that a particular hydrogen or oxygen to reactant ratio is obtained so the reaction is not run reagent rich or lean versus the desired stoichiometry. This capability has broad implications in selectivity. Another advantage is the ease of mixing or blending of components with great differences in viscosity where other technologies struggle to achieve homogeneity under these conditions

WORKING VOLUME

The working volume is the volume between the rotor and stator where the reaction actually occurs. It is determined from the last feed entry port to the product exit port. This is distinguished from the total volume of the BLUE PLANET MODULAR System cavity which includes the volume from where the first reactant enters the reactor to the last reactant port (this can be as little as a few milliliters) and the space that exists between the product exit port and the seal (minor volume). The working and total volumes are a function of the gap size (or annulus) and change as the size of the rotor is changed.

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Blue Planet Energies
Advancing the Future of Alternative Energy

Blue Planet Modular Bio-Fuel Reactor

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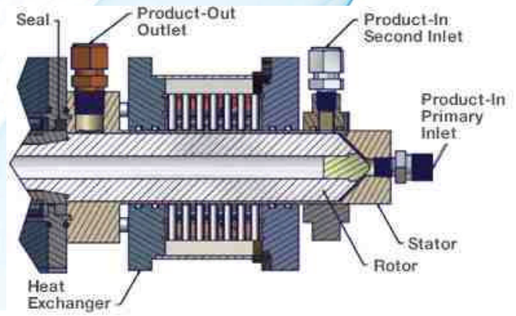
INNOVATIVE SOLUTIONS TO KEY ENERGY ISSUES BASED ON ADVANCED ANALYTICS AND STRATEGIC THINKI NG.

Blue Plant Energies is committed to advancing alternative sources of energy and energy efficacy so that tomorrow will be a better place.

Waves of change

Blue Planet Energies
Advancing the Future of Alternative Energy



The Unique Rotor-Stator Capacitor of the: BLUE PLANET Modular Production Unit

BLUE PLANET Modular Production Units – 11 Million gallons (36,000 metric tons) per year unit

BLUE PLANET ENERGIES modular bio-diesel reactor BLUE PLANET system is built around unique German engineered processing equipment that is designed to maximize through put of methyl ester flow through a series of channeled reaction. The reactor is designed for large to mid size scale production and processing optimization. The BLUE PLANET modular unit replaces standard size full scale production facilities and allows the users to manufacture at on site locations located where renewable resources are stored.

The BLUE PLANET minimizes the amounts of intermediate chemicals used in the reactor at any given time, so as to minimize the users' exposure to hazardous or explosive materials. The BLUE PLANET modular unit is designed around a small footprint so that it is easily portable and maneuverable to on site locations. Even though the reactor is small, it is uniquely constructed using the similar design capabilities found in larger scale commercial reactor. The BLUE PLANET modular unit is unique because of its size; although it is small it still has the same production capabilities as larger scale commercial sized production plant reactors. Additionally, because the BLUE PLANET modular unit is designed to maximize through put it by passes the standard water wash step allowing for reduced production time of up to 48 hours.

Typical Seal Parameters

Standard Seal
Triple Lip
- 45-50 PSIG
- 130°C
- 5,000 RPM

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

Gas Mechanical
- 600 PSIG
- 160°C
- 5,000 RPM

OUR ENGINEARS HAVE DESIGNED A COMPREHENSIVE BIO-FUEL REACTOR THAT CAN EFFECTIVELY PRODUCE BIO-DIESEL FROM RENEWABLE RESOURCES.

"Unique Engineering You Can Trust"

BLUE PLANET ENERGIES has spent numerous years and millions of dollars in developing the uniquely engineered technologies of the **BLUE PLANET** Modular Bio-Diesel unit. The **BLUE PLANET** technology represents a dramatic paradigm shift from traditional chemical esterfication processing. The **BLUE PLANET bio**-diesel system produces significant time and cost savings over traditional chemical processing methods making our technology the most cost effective way to produce bio-diesel from a variety of renewable resources.

BLUE PLANET ENERGIES technological advantage is centered on the engineering and design of modular unit itself which reduces manufacturing inefficiencies, increase conversions and yields, streamlines modular controls, including online monitoring of product quality during production in real-time. The **BLUE PLANET** lowers costs by dramatically decreasing the time required for manufacturing scale-up. Our modular unit creates significant increases in reaction rates of up to three times the magnitude of traditional chemical reactors; additionally, our broad application and flexibility allows our customers to choice between many core natural renewable resources. This in turn translates to higher yields that significantly lower production time and operating costs.

SYSTEM OVERVIEW

Rotor-Stator Inner Diameter (ID)	2.114", 49.82 mm			
Rotor Working Length	8.138", 16.99 cm			
Typical Rotor Outer Diameters (OD)	1.840" 46.74 mm	1.845" 46.86 mm	1.850" 46.99 mm	1.855" 47.12mm
Gap	0.0175" 0.44mm	0.0150" 0.38mm	0.0125" 0.32mm	0.0100" 0.25mm
Resulting Total Cavity Volume	16.7 ml	14.9 ml	13.1 ml	11.9 ml
Resulting Working Volume (e)	12.4 ml	10.6 ml	8.7 ml	6.8 ml
Entry Port Configuration	2 ports standard, 1 at tip of rotor and 1 on flat of rotor			
Exit Port Placement	Standard as illustrated			

SYSTEMS DESIGN

Operational Specifications	
Rotation Rate	Maximum of 5,000 RPM
Heat Exchanger – Required Pumping Volume	10 GPM (18.9 LPM) minimum at 20 PSIG

CONSTRUCTION OVERVIEW

316L SS Titanium	Customizable Construction Available

ELECTRICAL SPECIFICATION

Power Requirements	208-230 V, 3 Phase, 30 A (c)
Motor Ratings	3, 5, 7.5 and 10 HP motor options (c)
Motor Classification	Explosion Proof, Class 1 Group D, Class II Groups F & G
Control Panel	Intrinsically Safe (d)

EQUIPMENT DIMENSIONS

Dimensions (Foot Print):	W x L x H
1000M Model – Vertical (a)	24" x 30" x 62" 61 cm x 76 cm x 157 cm
1000M Model – Horizontal (b)	24" x 30" x 56" 61 cm x 76 cm x 142 cm
Lab Model (b)	21" x 21" x 36" 53 cm x 53 cm x 91 cm
Weight:	450-700 lb