Complete Skid Packages for Ethanol and Biodiesel Blending

THE ULTIMATE BLENDING SYSTEM

Blend+ Plus
With the rising cost of energy and the increased focus on environmental issues within the global market, today's oil companies are seeking to capitalize on the expansion of blended biofuels at the road loading terminal. By utilizing biofuels at the load rack level, companies can become less dependant on multiple storage tanks while maximizing load rack flexibility by creating variable product load arms.

SRS' Biodiesel Blending Skid Technology allows biodiesel to be blended with petroleum diesel and with diesel additives to increase the storage life of the blended product. These blending skids take into consideration the biggest issue in adding biodiesel blending capabilities to the load rack. This small footprint biodiesel blender facilitates:

* The accurate specification of static and dynamic seals
* The special requirements for accurate volume measurement of the materials being blended
* The varied communication interfaces into the existing load rack
* The flexibility of varying blend ratios

SRS' Biodiesel Blending Technology offers:

* Advanced cavitation technology
* Up to 10 stages of cavitation
* Mixing to submicron levels
* Reduction in reaction time
* Improved product stability
* Increased shelf life and quality
* Reduction in bacteria levels
* No moving parts (eliminates vibration and maintenance)
* Reduction in fouling leads to higher thermal efficiency
* Reduction in operating costs (and maintenance)
* Improvements with cold flow properties
* Water droplets encapsulated in the diesel fuel
* Instant emulsions with micro to nano particle sizes
* Decrease in viscosity, Increase in cetane number
* Small footprint
* Available in all stainless steel

Our unique system is a continuous flow, nano-technology-based reactor. This reactor contains no moving parts and can be held in the palm of your hand. The system is also fully automated allowing the user to produce quality blends on demand with the touch of a button and interact with existing control systems.
CTI is a turn-key provider of custom-designed blending and homogenizing equipment based on its proprietary NANO cavitation process.

ABOUT CAVITATION TECHNOLOGY

Flow-Through NANO Cavitation (the formation, growth, and implosive collapse of gas or vapor-filled bubbles in liquids) can have substantial chemical and physical effects. While the chemical effects of acoustic cavitation (i.e., sonochemistry and sonoluminescence) have been extensively investigated during recent years, little is known about the chemical consequences of hydrodynamic cavitation created during turbulent flow of liquids.

HydroDynamic Technology Inc., developed new innovative patent pending single stage plasma cavitation process to make biodiesel. NANO reactor is a multi stage flow-through cavitation process is a component mix in the NANO reactor on the molecular level. All components inside of reactor are influenced with high pressure impulses and advanced controlled by NANO flow-through cavitation.

In the heterogeneous liquid–liquid reactions, cavitation collapse at or near the interface will cause disruption and mixing, resulting in the formation of very fine emulsions. When such emulsions are formed, the surface area available for the reaction between the two phases is significantly increased, thus increasing the rates of reaction.
Blend + Plus System Advantages

ADVANTAGES

- Advanced multistage cavitation technology
- Up to ten stages cavitation
- Each unit in the reactor acts as independent cavitator
- Homogenising to submicron levels
- Substantionaly reducing reaction time
- Improves product stability
- Increases shelf-life, stability and quality
- Reduces bacteria levels and its formation
- No moving parts and eliminates vibration
- Reducing maintenance and operatig cost
- Reducing fouling leads to higher thermal efficiency
- Cold flow properties of biodiesel & diesel are improved
- Water droplets encapsulated in ethanol or diesel fuel
- Instant emulsions with micro to nano particle sizes
- Resulting in viscosity decrease, certain number increase
- Small footprint

ONBOARD BLENDING

Today's highly competitive trading environment demands a flexible approach to contractual and physical limitations of oil commodities. The ability to react quickly and positively to an adverse commercial situation, and ensuring that the outcome is still profitable, is of paramount importance.

Petroleum Product blending is one of the most important steps in order to make the best use of the available stocks on the market produced from the various refining processes and to utilize them in such a way as to be able to meet product demand and specifications at the least cost and best added value. In other words blending allows the trader to make the most profitable use of the raw material available.

Most blending is performed in shore tanks as the greatest degree of accuracy can be achieved when entire shipments are pre-mixed in shore tanks prior to being transferred.

However, onboard blending is a recognized means by which a cargo may be prepared to specification in the vessels tanks, by volumetrically blending individual components.

Onboard blending offers compelling advantages to suppliers, particularly to trading organizations to do business at less cost.
### Ethanol and Gasoline Blending Requirements

Ethanol plant (production facility or "biorefinery") produces pure fuel-grade ethanol, and then that ethanol is blended in a percentage with gasoline to create a finished motor fuel. A small amount of gasoline is blended into the ethanol at the plant to denature it, or make it unfit for human consumption.

Ethanol can be blended into varying percentages in gasoline, the two most common blends being 10% and 85%. E10 - 10% ethanol and 90% unleaded gasoline - is the most common way ethanol is available to motorists. Ethanol can absorb ten times as much water as MTBE can and carry it through the engine to be burned away. However, if the concentration exceeds the fuel's saturation point (about 0.5 percent by volume), the process reverses: The water pulls the ethanol out of the E10. Engineers call this phase separation. The ethanol-water mix sinks under the pure gasoline, which is now of slightly lower octane (ethanol boosts the octane of E10 about three points higher than the gasoline alone). Low octane could cause the engine to run poorly, burn more gasoline, and emit more pollutants. If enough of the ethanol-water mix collects under the gasoline, it can be drawn into the engine. We all know engines don't run so well on water, but pure ethanol can also be damaging.

Ethanol consumption and production worldwide is a substantial growth industry. The ethanol production industry has developed based on two distinct models. The first is the Brazilian model where production is from very large sugar plantations and also peasant farmers. The Brazilian industry is relatively mature, having developed over the past 40 years. The second model is that developed in the United States of America, where production is from grain supplied by localized grower groups. A breakdown of the industry in global terms is as follows:

#### Brazil
Brazil is the largest global producer of ethanol. The 2003/2004 cane harvest is expected to produce 12.6 bL of ethanol. The Brazilian government has mandated for 25% ethanol content in gasoline.

#### United States of America
In the United States of America, there are ethanol plants with a capacity to produce 10.8 bL/year of high grade ethanol. In many States, ethanol use in transport fuel is mandated at 10%.

#### Japan
Japan is a signatory to and has ratified the Kyoto Protocol. The Japanese government is currently trialling E10. Japan has no local production. The government has indicated the possibility of a mandate of 10% in petrol and 15% in diesel for use in transport by 2008.

#### Canada
Canada is a signatory to and has ratified the Kyoto Protocol. The Canadian government has stated a plan for 35% of petrol to contain 10% ethanol by 2010.

#### China
China is the third largest international ethanol producer. Annual production is reported at 3 bL/year. Growth is reported at 8-10% a year.

#### Europe
A number of European countries have signed and ratified the Kyoto Protocol. In November 2002, the Council of the European Union legislated so that Member States should ensure that a minimum proportion of biofuels and other renewable fuels is placed on their markets, and, to that effect, shall set national indicative targets. A reference value for these targets shall be 5.75% by 31 December 2010.

#### India
Currently, nine Indian States and four union territories are phasing in a 5% ethanol blend in petrol. Later in 2004, this program will be expanded nationally to all States and all territories. Plans are in place for the program to increase to 10% ethanol.
Biodiesel has become a valuable blending component with diesel fuel at low percentage blends because of biodiesel’s “premium” aspects. Pure biodiesel has high lubricity, high cetane, and a high flash point. “Low blend” can be defined as blends of 5% and below. Even low blends of biodiesel are highly effective at enhancing the lubricity of diesel fuel. The typical blend used for lubricity enhancement is 2% biodiesel mixed with 98% diesel (B2).

Several commercial “premium diesel” products have incorporated the positive benefits of biodiesel as a component of their multi-functional additive packages. These products typically claim that biodiesel serves as the carrier for the additive and delivers the lubricity properties, making up half of the total additive volume. These types of marketing messages often confuse the customer about the percentage volume of biodiesel in the finished blend. Generally, dosing rates for these types of additives is a maximum .25%. If biodiesel (methyl esters) makes up approximately half of the additive package, a customer could reasonably expect the finished blend to contain .10 - .15% biodiesel (or one-tenth of one percent).

Blends of up to 5% biodiesel are considered additive volumes. B5 meets the ASTM specification for diesel fuel, D 975. (Blends of up to B20 can meet D 975, however, as blend concentrations increase, there is a higher chance for distortion of some of the test method results which were designed for diesel fuel rather than biodiesel. Hence, all biodiesel (B100) should meet ASTM’s biodiesel standard, D 6751, prior to blending with diesel fuel at any level.)
With energy costs increasing and the elevation of environmental issues on the global agenda, the majority of the world’s oil companies are now seeking to capitalize on the expansion of blended bio-fuels at the road loading terminal.

The benefits of blending products at the load rack are numerous, and include reducing the dependency on multiple storage tanks and maximizing load rack flexibility by creating variable product load arms.

The design of BLEND+ PLUS blending skids takes into consideration the biggest issues for adding an ethanol or bio-diesel blending capability to the load rack. The small footprint blender facilitates:

- The accurate specification of static and dynamic seals
- The special requirements for accurate volume measurement of ethanol and bio-diesel
- The volume growth factor when you mix ethanol into petroleum
- The varied communication interfaces into the existing load rack
- The flexibility of varying blend ratios
Our unique **BLEND +PLUS** systems contains the proprietary, patent pending, continuous flow, hydrodynamic, *Plasma 2000* nano-technology-based reactor which contains no moving parts and can be held in the palm of your hand.

The *System* is fully-automated which allows the user to produce superior quality blends on demand with the touch of a button.

The CTI’s blending applications are the continuous combining of two or more products to a predetermined specification during a standard flow process.

That process could be a ship feed to storage tank process, an aircraft refueling process or a load rack to road tanker filing process.

**MORE THEN A BLENDER**

- Up to 10 Stages Cavitation Reactor

**CTI’ Blend + Plus system it also has ratio blending equipment to allow the biodiesel to be blended with petroleum diesel fuel at the rack instead of splash blending in the tanker truck.**

- Saving shore tanks investments, leases.
- No blending installation.
- Freedom to choose suppliers over a wide geographic area.
- "Just-in-time" preparation of cargo.
- Limited Inventory - saving of interest on working capital
Simultaneous Metered Blending combines the high volume production capacity of the Blend+Plus systems. It adapts the flow measuring techniques, but instead of blending in a kettle, the components are sent through the cavitation reactors. In this respect, the CTI systems is the simplest means of blending, and is most appropriate for less automated plants.

The Blend+Plus is designed to simultaneously measure liquids with a flow meter and moves these known quantities, in the correct ratio, through a cavitator.

**SIMULTANEOUS METERED BLENDING ADVANTAGES**

- Mass flow measurement
- Efficient for any blend size—limited only to size of destination tank
- Accuracy not limited by batch size
- Minimum contamination with pigging and purging
- Short set-up time—only drum line set-up time is required
- Simultaneous product loading speeds blends
- No cocktailing
- Can be operated as an in-line blender with some formulas

**In-Line Blending**

Based on real time measuring of liquid components, the Blend+Plus system is an effective approach to high-throughput production. Components are mixed at the blend header and routed to specific destinations within the plant. This unique in-line mixing capability eliminates the need for bulk storage tanks and speeds up the rate of production, minimizing inventory, reducing capital cost, and making on-spec finished products ready to package or ship.

With this in-line mixer, the output of the blend header is homogenous and on-spec from start to finish.
OTHER APPLICATIONS

- Ethanol Blending Systems
- Gasoline Blending Systems
- Biodiesel Blending Systems
- Fuel (Oil) Blending Systems
- Oil Blending Systems
- Cutting Oil Blending Systems
- Pains Blending Systems
- Chemicals Blending Systems
- Oil and Water Emulsions

**Blend + Plus Advantages by Industry**

**Biodiesel Industry**

Blending biodiesel with diesel and with diesel additives through our proprietary blending system will help activation of Biodiesel after storage and increases its storage life.

It also results in viscosity decrease, cetane number increase as well as power parameters of produced fuel improve. The velocity and quality of new blend also increase significantly.

After emulsification is completed via our proprietary cavitation reactor, the water droplets encapsulated in a diesel/biodiesel blend fuel.

Cold flow properties of biodiesel are also improved. Reduces use of additives, due to formation of very fine emulsions. When such emulsions are formed, the surface area available for the reaction between the two phases is significantly increased, thus increasing the rates of reaction.

CTI’s Blend Plus also has ratio blending equipment to allow the biodiesel to be blended with petroleum diesel fuel at the rack instead of splash blending in the tanker truck.
Blend + Plus Advantages by Industry

**Ethanol and Gasoline Industry**

Blending ethanol and gasoline with CTI cavitation blending system will cause ethanol molecules to surrounds the water droplets and will prevent the water from separating out of the mixture.

The encapsulation prevents the water from contacting any metal engine parts, thereby allowing the fuel to perform in a similar fashion to conventional fuel. After emulsification is completed via our proprietary cavitation reactor, the water droplets encapsulated in an ethanol fuel.

**Petroleum Industry**

- Viscosity breaking & oil-freezing point decreasing in the case of oil pipelines & oil tankage transportation;
- Water-residual b Nulla quis nibh. lends & water-bitumen mixtures preparation for oil transportation and associated heavy oil product handling;
- Blending light with heavy crude oil to increase pipeline capacity.

**Lubricants Industry**

Reduced additive quantities. The intense cavitation action ensures intimate contact between the oil and any additives allowing a smaller quantity of additive to treat a larger quantity of oil.

- Decreased processing times. Utilizing innovative CTI designs and up to ten distinct stages of cavitation, CTI cavitator systems ensure that all components are intimately blended together. This allows additives to work more rapidly and a higher purity oil is produced more quickly.
- The modular concept of the CTI Mix Plus Series Mixers allows a single unit to be adapted to a wide range process requirements.
**Chemical Industry**

Our equipment produce emulsions with small, uniform droplet size. This leads to increased shelf-life, stability and quality.

- Wax emulsions
- Paper sizing emulsions
- Coatings
- Paints
- Sealants (e.g., Wood Products)
- polymer emulsions
- emulsion polymerization precursors
- anti-foam emulsions
- monomer emulsions
- Incorporate low-HLB surfactants into aqueous systems

Our equipment can be used extensively to process silicones, resins, waxes, textile fibers, lubricants, and much more. Innovative Cavitation System design can feed multiple streams of raw materials into our cavitator reactor and create instant emulsions with small particle sizes and tight distributions. Many powders such as fumed silicas, zinc oxides, etc. can be dispersed with amazing results.

**Paints Industry**

Designed as a high speed, high shear mixer and emulsifier for continuous processing, the CTI reactor sets the standard for what in-line mechanical mixers should provide. It is constructed completely of 316SS provide greater throughput and flow, and the mix rates generated insure droplet and particle size reduction down to 3-1 microns (depending on viscosity) nano size particles with excellent distribution.
**Soap Industry**

Blend + Plus serves the growing needs of soap and detergent producers around the world by providing technologically sound engineering designs to meet today's tough demands of increased production rate, tight control, and minimal product loss.

With proven expertise in all areas of plant design from raw material receiving and storage to finished product packaging, CTI Blending & Transfer can be your single source for projects ranging from process improvement to completely new facilities.

**Detergents Industry**

Detergents include the products we use to clean most everything we own. The applications for high shear mixers or homoginisers in the manufacturing process commonly involve the dilution of a high active surfactant (the compound that "does the cleaning") and the following neutralization step. CTI’s cavitators can speed process time and greatly improve process efficiency when compared to conventional methods.

**Personal Care Industry**

Cavitation systems can be used to process lotions, creams, shampoos, conditioners, body washes, deodorants, and much more. Innovative system designs allow companies the opportunity to feed multiple phases of material and water into our mixing device to create instant emulsions with small particle sizes, improved shelf life and enhanced stability and appearance.
Our powerful NANO cavitation systems can be used to process sauces, purees, soup bases, beverage emulsions, dressings, and much more. Can work extremely well with mayonnaise and dressing manufacturers. Cavitation systems have been designed to meet the often stringent demands of the food & beverage industry.

We would welcome an opportunity to meet with you to discuss your upcoming projects and to prepare a detailed proposal uncovering the BLEND + PLUS solution.

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