SHEARFORCE LLC

DAF Whitewater Systems

The **DAF Whitewater System** technology was developed by Water Resources utilizing the Patented Shearforce technology. The heart of the system is the ability of the Shearforce Pumps to pump gas/air which has been injected into the suction of the pumps. The unique Shearforce design allows the pump to pump gas/air without concern for solids or cavitation found in other pumps capable of pumping gas.

Treatment chemicals are injected into the Pipe Flocculator through multiple ports to achieve maximum liquid / solids separation under easily controlled process conditions.

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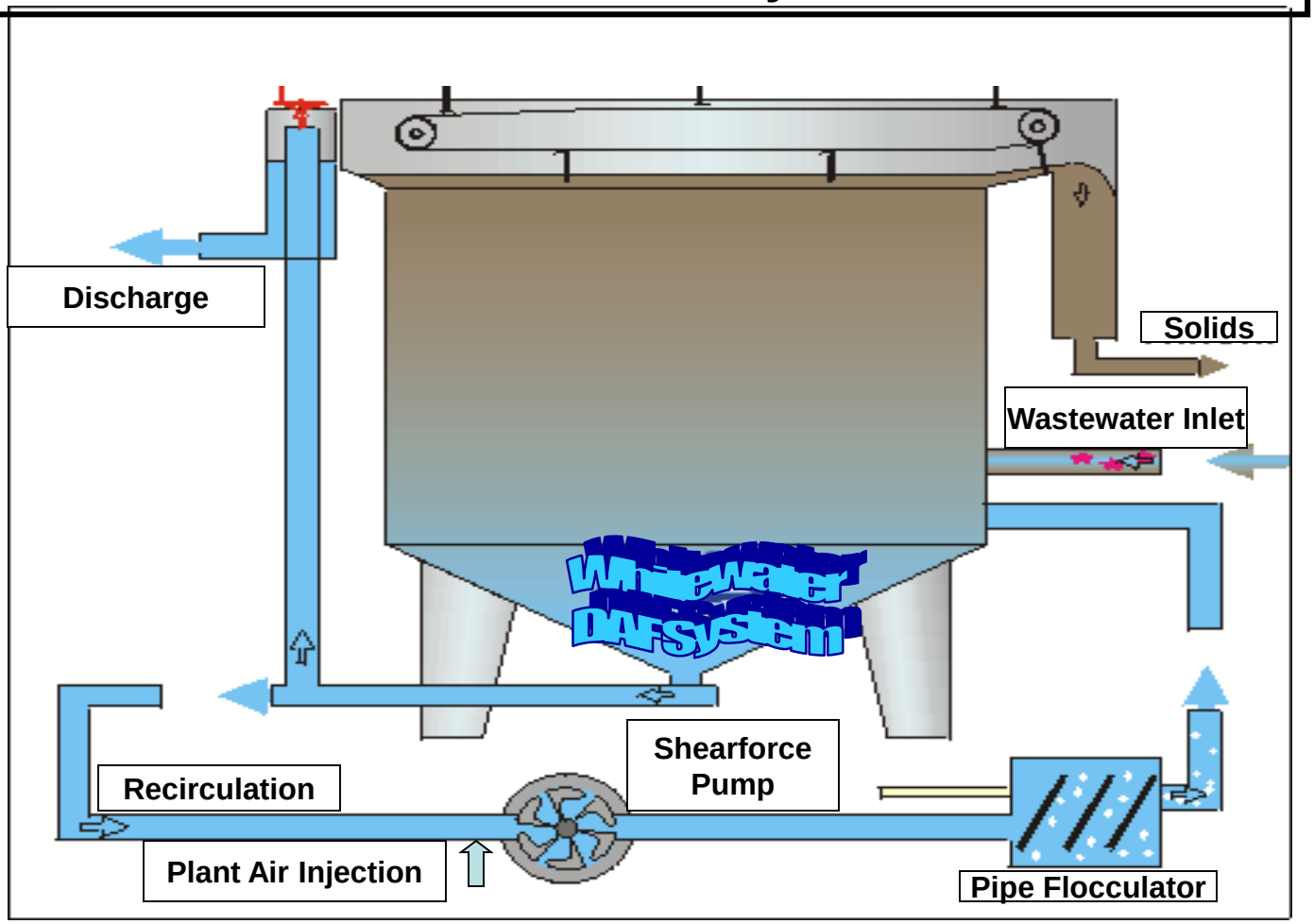

Shearforce Ltd. Co., Houston Texas

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DAF Whitewater Systems

The injection of air results in Whitewater which is pumped through the innovative Pipe Flocculator. The Whitewater contains millions of microscopic tiny air bubbles. Extensive laboratory evaluation on the size of the air bubble and effective liquid-solid separation, overwhelming demonstrate that the smaller the air bubble, the more efficient the separation.

The Patented Shearforce Pumps can pump up to 35 % gas/air producing 93 – 100% solubility with air bubbles less then 30 microns in size.

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In the Pipe Flocculator, the microscopic air bubbles attached themselves to the chemically flocculated waste particles, making them strongly buoyant. The Pipe Flocculator inlet distribution header provides a uniform flow of the flocculated wastewater into the DAF Whitewater System flotation cell.

The buoyant floc particles rise rapidly to the surface and are skimmed into the float solids sump, ready to dewater. The clean treated water is discharged.

Because of the rapid rise velocity of the buoyant floc particles the required surface area of the flotation cell is greatly reduced. Flow rates of 4-6 gpm per square foot surface area are easily achieved.

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DAF Whitewater Systems

The highly effective mixing energy created by the injection of **Whitewater** into the Pipe Flocculator greatly reduces the time required for flocculation of the wastewater. This highly innovative process reduces chemical usage and eliminates the need for chemical reaction tanks and mixers which results in 1/3 the foot print of other systems.

Because the DAF Whitewater system treated water is of a higher quality then normally obtained from conventional flotation systems, the water can be polished and reused in the plant process.

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Most conventional floatation systems can be upgraded to a DAF Whitewater System process by installing a Shearforce Pump, air injection system, and a Pipe Flocculator to replace chemical reaction thanks and mixers. Results are high flow rates, high quality treated water and low chemical costs.

Typical Results of Whitewater DAF System

Characteristic	Untreated (mg/L)	Treated (mg/L)
ph	11.2	8.9
TSS	1672	18
Oil & Grease	2480	16
BOD	432	124
COD	1120	312
Cadmium	0.18	<0.02
Chromium	0.24	<0.02
Copper	1.16	<0.10
Lead	0.87	<0.10
Nickel	0.48	<0.05
Zinc	1.93	<0.03

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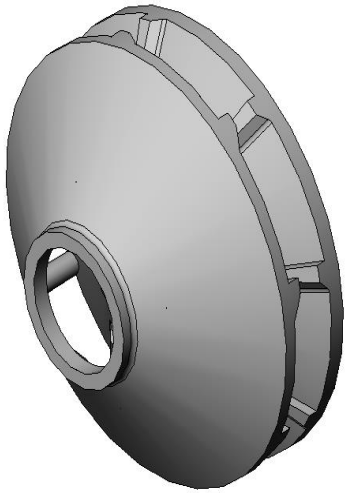
Shearforce Pumps – w/ Patented Shearforce Rotors



Patented “Shearforce” Rotors

Patent No. US 6,752,597 B2

Shearforce rotors do not have vanes and thus have specific advantages over conventional impellers and are better suited for certain applications.

These applications include entrained gas (air induced fluids), high viscosity fluids and fluids with high solid content.

The rotor utilizes the fluid viscosity to generate the necessary forces required to sustain a pressure differential and corresponding flow.

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Application	Uses & Products Removed
Vehicle Wash Racks	Removal of gasoline, diesel fuel, motor oils, transmission fluids, hydraulic fluids, jet fuels, aircraft fuels and lubricants when washing jets, cars, trucks, heavy equipment, railroad locomotives and equipment.
Animal Processing Plants	Poultry, pork, beef, fish processing plant wastewater.
Military Wash Racks	Field equipment, jet wash, tracked equipment wash uses for typical fuels and oils removal. Complete emulsion cracking treatment systems are offered.
Industrial Process Water	Hydraulic fluids, machining coolant/cutting fluid tramp oil removal, compressor condensate, machined parts rinse water
Steel Mills	Rolling mill hydraulic oil/water extraction, compressor condensate, stormwater runoff, drain water.
Shipping	Ballast & bilge water treatment. Off-loading of water to shore based treatment system, bunker & diesel fuels removal.
Tank Farms	Fuel, oil storage tank farms for removal of water from tank bottoms. Stationary and mobile systems are offered.
Petro-Chemical	Refineries, chemical compounding companies, hydrocarbon based chemical bases such as cumene and other materials.

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OZONE WATER CLEAING SYSTEM

The Shearforce Water Cleaning System is based on the use of Injection of Ozone into the contaminated Water Stream.

As illustrated above the injection of Gas into the suction of the Shearforce Rotor will produce millions of bubbles in increase the efficiency of the DAF units. In a similar manner the Injection of Ozone Gas will produce a higher dilution rate of Ozone into the Contaminated Water Stream.

The unit below is designed where there is limited power using the static head of the source of the water to disinfect the harmful biological contaminates.