

# Water Clarification

## High-Tech Designs that Work for You

### SETTING THE BAR (HIGH) IN 2014

At HTC we set the bar high. Our plants recover more oil, lots more! Our plants generate higher water quality too. Higher water quality translates to fewer dollars spent in costly injection or disposal well cleanouts, stimulations, workovers, and re-drills. The results? You make more money, lots more!

At HTC we promote 21<sup>st</sup> century technologies. Please read on to learn how this can put more money in your bank account in 2014.

### BREAKING THE MOLD

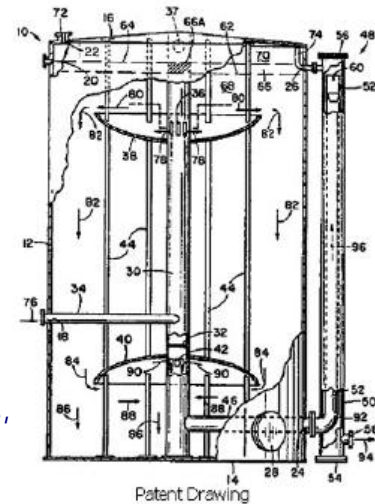
In 2104 water treating and water chemistry are still considered a “black art” in our industry. It is so little understood! A few bright people spend their days perfecting frac gels and gel breakers for use in horizontal well completions and massive frac jobs, but beyond that there is a huge technology gap.

Few operators have the luxury of a staff with enough time to fully comprehend the subject. And so, water quality is rarely adequately addressed. This costs the industry hundreds of millions each year in plugged disposal and injection wells, fouled pipelines, inefficient process vessels, and in lost productivity.

Oilfield water management is a complex issue. From well to well, and field to field, water chemistry is ever changing. A treatment cocktail that works here may not work there. The key is to find and apply the common denominators.

HTC finds, recommends, and develops the common denominators for you!

HTC developed the HWSB™ (Hydrodynamic Water Separation Breakthrough) Skim Tank as one of the much-needed common denominators. It's a replacement for the oilfield Gunbarrel. Gunbarrels were developed over 100 years ago to separate small amounts of water from large volumes of produced crude oil. Gunbarrels do that job admirably, but struggle to do the opposite (removing a little oil from a lot of water). The HWSB™ Skim Tank separates small amounts of water from huge volumes of water. It produces high quality water regardless of the changing water chemistry. It is widely applicable ... a common denominator for use in all oilfield water treating facilities.

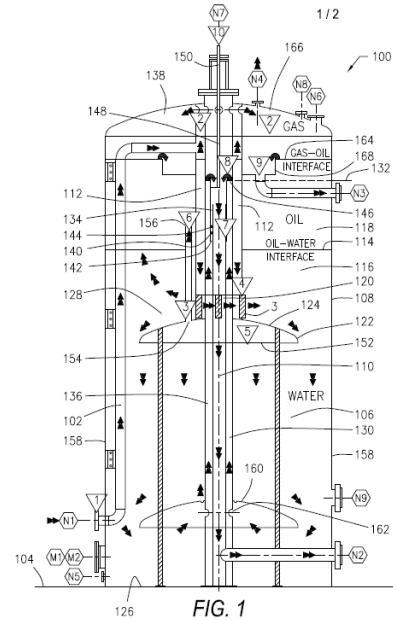


## COLD WEATHER HWSB™

The current oil boom has resulted in many important finds in cold weather areas. So, HTC developed a hydraulically efficient Cold Weather HWSB™ with the water leg in the center of the vessel where it occupies otherwise wasted space, and doesn't disrupt the critical flow path of the water or the hydraulic efficiency of the overall design.

The HWSB™ is so innovative HTC has been granted several patents in the US and Canada, the latest issued on July 30, 2013 for the Cold Weather HWSB™. This HWSB™ is suitable for water clarification applications in Canada, Wyoming, Colorado, Utah, the Baaken in North Dakota, and the Utica and Marcellus in the Northeast.

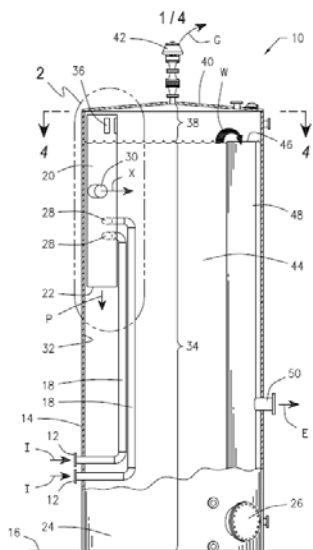
The HWSB™ is extremely efficient compared to all other oil-water separation systems. The HWSB™ is over 70% hydraulically efficient. This compares with 3% for the typical Gunbarrel.



IN 2014 over 500 HWSB™s and Cold Weather HWSB™s are in service worldwide, outperforming the expectations of their owners.

## FLOWBACK WATER TREATMENT

The subject of treating "Flowback Water" for re-use, deep well disposal, or re-injection is in the forefront of our interests in 2014. HTC's technologies are aligned to the many challenges faced in flowback water processing.



A key element is flowback related frac sand. HTC's DFSD™ (De-sanding, Flow Splitting, and De-gassing) was designed as the common denominator for most such applications. As its name implies, its inlet cyclone separates particulates down to 120 microns to de-sand the inlet fluid. This concentrates the majority of solids in one vessel, keeping the rest of the facility and its process equipment free of any large solids loading. Since this fluid is likely to have periodic slugs of gas, this vessel is also designed to de-gas the inlet fluid. Gas provides enough mixing energy to defeat oil-water separation, so eliminating it is quite beneficial. Finally, the DFSD™ is a hydraulic flow splitter. It can be designed with multiple splits, each one identical to the others for ideal flow division into multiple downstream systems for further processing. The DFSD™ is another of HTC's patented systems.

Where sand and solids loading is very high, HTC developed the ISST™ (Intermediate Sand Settling Tank). The ISST™ is designed to separate tons of sand every day. The ISST™ is portable. It can be moved from well site to well site to de-sand flowback water. This minimizes the need to truck multiple loads of wet sand to landfills daily. The ISST™ is designed to be easily cleaned between jobs. With multiple 24" x 36" manways on each side, it can be cleaned in one day, ready for use in the next application. The ISST™ can be configured in a frac tank for maximum convenience and roadability.



ISST™ designs range from 15,000 b/d to 80,000 b/d to meet every application. For larger flow rates, multiple ISST™s are ganged together just like frac tanks.

### **SWD PLANT DESIGN**

HTC is an industry leader in SWD Plant designs. Each of the hundreds of HTC SWD Plant designs has been unique and specific to the individual requirements of its owner. Nevertheless, each plant has many common denominators.

Salt water disposal plants must accept oilfield water from any source, and at widely varying rates. This is often at odds with efficient processing and disposal well management, where flows should be constant and uniform. Most petroleum geologists specializing in water disposal and injection well completions agree that well life is significantly extended if water is continuously injected. Most process engineers agree that steady-state flow always produces more efficient processing. And yet, most SWD plants are not designed with either of these caveats in mind!

HTC's SWD Plant designs break the mold ... again. We design for steady state. We recommend automation systems that avoid the use of the typical on-again, off-again Murphy switch control logic. HTC recommends automation systems that the use of 21<sup>st</sup> century Guided Wave Radar level transmitters and sophisticated system management and control systems with feed-forward logic to keep the plant processing smoothly 24/7 without routinely shutting down disposal pumps. Buffer tanks absorb the highs and lows of water receipts. The control logic automatically manages flow on a time-averaged basis to approach steady state as closely as possible. Rates vary within tightly controlled parameters ... and operating efficiency is maximized automatically.

This helps SWD Plant owners. Employees are tasked to make fewer critical decisions, and to do less physical work. They are more technically adept, and spend more time in preventive maintenance than in operations, since HTC's SWD Plant systems operate themselves.

Most SWD Plants need have to stimulate their disposal wells often, workover the wells every few years, and re-drill their disposal wells at least once in the life of the facility. HTC designed plants avoid most of these issues altogether by paying attention to the details.

In all projects the devil is in the details. HTC designs in the details that avoid most problems. Modulating controls take the place of on-off controls. Tank internals increase separation efficiencies up to and beyond 800%. Slop tanks fitted with sidewall mixers process waste oil into saleable oil. Charge pumps eliminate cavitation on HP pumping systems, extending their life by up to ten times. Filters keep solids from going down hole. And owners who take the same care in building their plants reap the benefits.

The results are astounding! While a typical SWD Plant recovers about 0.25-0.3% oil, HTC designed SWD Plants often recover 0.5 to over 3% oil, increasing annual cash flows by millions of dollars for the owners.

