



# Zenith Ultrasonics

## Waves at Work

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## The VORTEX

### Centrifugal Ultrasonic Cleaner for Stamped Metal and Small Parts

The VORTEX Centrifugal Ultrasonic Cleaning System is perhaps the most advanced, automated multi-stage ultrasonic cleaning system available. Its unique design includes both CROSSFIRE Multiple Frequency Ultrasonics to remove oils, coolants, particulate, and other contaminants, and the added benefit of centrifugal basket rotation, which accomplishes so many tasks that this entire brochure is required to describe its numerous benefits.



The cleaning of large batches of smaller components and metal stampings can be a difficult undertaking. These part loads tend to entrap liquids, which alone produces most of the problems encountered. Difficulties typically encountered when cleaning large batches of small parts include the following:

**Detergents Dragged Into the Rinse Water:** Each time a basket is transferred from the cleaning tank to the rinsing tank, a good amount of detergent is moved during each parts transfer. This will increase the consumption of expensive detergents and water to keep the rinse water quality in check, and eventually will lead to detergent spotting on parts as rinse water becomes more detergent-laden.

**Extended Drying Times:** This is perhaps the largest hurdle to overcome. Large volumes of small parts are difficult to dry quickly. The outside of the batch can be dried, but the inside remains wet since the heat and air flow used in the drying tank can not reach the inside of the parts batch. As a result, drying times are excessive, and a bottleneck occurs, thereby slowing the entire process. It does not matter if your cleaning time is only a few minutes if drying requires several minutes. Plastic parts pose an even greater challenge, since these parts can not be heated excessively.

**Imperfect Cleaning Results:** The parts on the outside of the batch are cleaned, but the inside is more difficult to clean. Parts entrap contaminants, preventing its release into the processing fluids.

Most competitive cleaning systems attempt to overcome the above by slowly rotating the baskets during all processes. However, this is not the answer to the problem. Slow rotation forces parts to continuously tumble onto one-another, which can produce scratches and other damage. Detergent



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drag-out still occurs, even if you tumble parts above the cleaning tank for several minutes. In addition, drying times are still extended, since slow rotation does not quickly remove excess liquids.

The VORTEX cleaning system includes centrifugal rotation to address the above listed difficulties. Centrifugal Rotation has the capability of drying parts over 90% in under 10 seconds, virtually eliminates detergent drag-out into the rinse, can provide zero-visible residues using tap water, and produces no parts damage, feats not possible using slow rotation tumbling-type parts washers.

### Vortex Operation:

Parts are first placed in cylindrical stainless steel baskets, which are then placed onto the included 3-position Load Conveyor. Operators then select one of several pre-programmed Operation Recipes for the particular parts being cleaned, using the Touch screen Operator Interface. The start button is then depressed.



The first basket of parts is indexed to the Ultrasonic Cleaning Tank with the included Multiple Basket Transfer Automation System, which transfers multiple baskets in under 20-30 seconds, another benefit of the VORTEX design. Slow tumbling systems move only 1 basket at a time, which drastically extends the required cleaning time per basket. The MBT system included on the VORTEX moves all baskets simultaneously for faster throughput.

Once the basket is positioned over the cleaning tank, a variable-speed drive motor is coupled to the basket, and the basket is lowered into the heated ultrasonic cleaning tank. Once submerged, the high-intensity, patented **CROSSFIRE Multiple Frequency Ultrasonic System** is activated, exposing the parts to 2 simultaneously-operating frequencies of ultrasonics, all operating at over 95% electrical efficiency. The ultrasonic action is capable of removing contaminants to microscopic levels, addressing blind holes and recessed part areas with ease.

Intermittently, the basket is also rotated, both clockwise, and counter-clockwise. This serves to flush loosened contaminants from within the layer of parts, and from within detailed part areas and holes. Folded metal areas are no longer a problem with the VORTEX design. While slow rotation systems fail to include the aggressive flushing action required to force fluid beneath these problem areas, the VORTEX centrifugal rotation cleans these areas with ease. Rotation speed, and ramping are user-adjustable. Should the parts be better processed using oscillation as well as rotation, the VORTEX



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includes the capability to add intermittent oscillation as well as rotation while baskets are submerged. In essence, parts are cleaned using 3 cleaning techniques; CROSSFIRE Dual Frequency Ultrasonics to loosen the contaminants, with rotation and oscillation to flush these loosened contaminants into the cleaning fluid and away from parts.

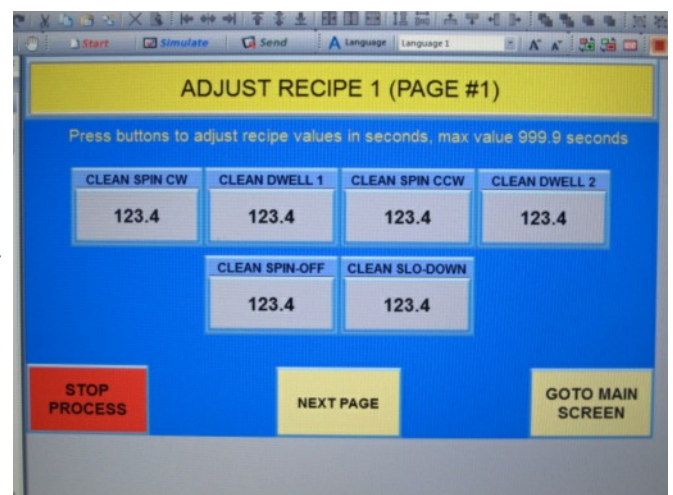
Upon completion of the submerged cleaning cycle, the basket is raised above the cleaning fluid, and rotated again, both clockwise and counterclockwise at elevated speeds. *Called the Extraction Cycle, this basket rotation sequence is the single most important detail which separates the VORTEX from competitive design.* By rotating parts above the cleaning tank, excess detergents are quickly extracted from the parts, preventing its transfer into the rinse fluid. This allows rinsewater to be used for extended periods, and can save thousands of dollars on deionized water costs if used in the rinse tanks.



During the rotation, parts shuffle gently to the edge of the basket, and are held in place by centrifugal force. There is no damaging parts as that which occurs with tumbling as used in competitive designs. Even the most sensitive components can be safely cleaned in the VORTEX.

After completion of the extraction cycle, the first basket is raised into Transfer Position, and is transferred to 1 of 2 rinse tanks. If additional baskets reside on the load conveyor, a 2 basket is transferred into the ultrasonic cleaning tank, while basket 1 enters the first rinse tank. Both baskets are locked to their respective drive motors, and submerged. Baskets are cleaned and rotated both clockwise and counterclockwise to clean and rinse as required.

Since each tank includes completely separate programmable controls, operators can program racks in different tanks to perform different tasks. For example, the Ultrasonic Cleaning Tank will require periods of time where baskets are stationary to allow ultrasonic action to clean the parts. However, the rinse tank can be oscillated nearly continuously, or extracted before the cleaning tank finishes its cleaning tasks to eliminate any bottlenecks. Once complete, both baskets raise above their liquids, and







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are rotated to extract liquids as previously described. Baskets are then raised, and transferred to the next tank. This sequence continues in all tanks.

Basket #1 eventually reaches the Drying Tank, where parts are continuously rotated at user-adjustable speeds while being exposed to warm air to dry parts quickly. A large batch of small parts can typically be dried in 3-5 minutes depending upon the design of the parts, thereby eliminating any bottleneck at the drying tank. Upon completion of the cycle, the basket is ejected onto the included 3-station Unload Conveyor, and can be handled immediately.

Tap water can typically be used in the rinse, while still providing near zero-residue performance. This is possible since water is REMOVED from the parts, and residues in the water never get a chance to dry on the parts.

Several options are available to enhance the VORTEX's design and operation. Filtered and non-filtered Process Area Enclosures, Cleanroom-grade components, Pump Fill and Drain Systems, Automatic Liquid Level Maintenance, detergent injection systems, additional processing tanks for rust preventative coatings or other processes, and other options are all available.

If you have a high-volume metal stamping or other parts cleaning application, contact Zenith Ultrasonics for additional details on the VORTEX, or another system style which may address your cleaning application.

### **SPECIFICATIONS:**

- **Basket Size:** 10", and 15" diameter, 5" basket height..
- **Maximum Load per Basket:** 15 pounds
- **Typical Basket Ejection Rate:** 5 minutes, varies depending upon part design.
- **Electrical Requirements:** 208/220 volt 1 or 3 phase, 480 volt available.
- **Compressed Air Requirements:** 10CFM, 85-100PSI for a VORTEX 1500
- **Programmable Controller:** Automation Direct (standard) Allen Bradley available.
- **System Construction:** Stainless steel support frame, stainless access panels, all 316L stainless steel processing tanks.
- **Ultrasonic System:** Zenith CROSSFIRE Multiple Frequency (pat 5,865,199 and 6,019,852)
- **Included Features:** All liquid tanks include digital heating system, filtration on ultrasonic cleaning tank, 5 recipes of operation (more are available if needed), light curtain safety device, digital input monitor for troubleshooting, light tower indicator,
- **Available Options:** Pump drain, automatic fill and liquid maintenance, detergent injection, deionized water controller, HEPA filtration, cleanroom and industrial grade enclosures, actuated exit and entrance doors, fixtured baskets, pump drain systems, closed-loop deionization systems, filtration system maintenance alerts, automatic rinse quality systems, and more.