WEBER ULTRASONICS

CLEANING WITH ULTRASOUND

USER REPORT

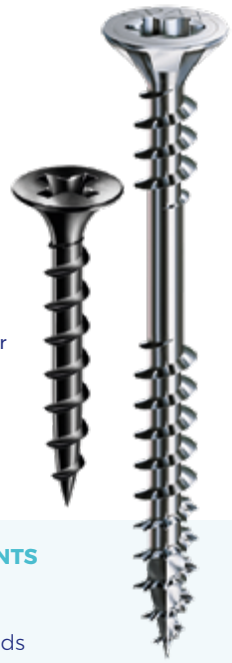
# INLINE BULK WARE CLEANING

The first system for individual parts cleaning during a continuous conveyor process

# INNOVATIVE CLEANING SYSTEM FOR SPAX SCREW PRODUCTION

## INCREASED PRODUCTIVITY, QUALITY & EFFICIENCY THROUGH INDIVIDUAL PARTS CLEANING IN A CONTINUOUS PRODUCTION PROCESS

**Mass products such as screws are typically cleaned as bulk materials in batch processes. With up to 50 million screws being produced every day by Spax International GmbH & Co. KG in Ennepetal for customers throughout the world, this type of component cleaning can quickly become a bottleneck in production. Transferring the screws into cleaning baskets, their subsequent removal for heat treatment, as well as the batch cleaning process itself all take a great deal of time, lead to stoppages in the production process, and reduce the profitability of the manufacturing process.**



Screws with a diameter of 3-6 mm and a max. length of 120 mm are cleaned

### REQUIREMENT – CLEANING SYSTEM

Spax International was looking for a solution that would facilitate fast cleaning of the screws "inline" in the manufacturing cycle. The treatment time should be no more than 50 seconds. The key was also to completely avoid any mixing of different screw types – an issue that was repeatedly encountered in the past during batch cleaning. The cleaning quality and profitability of the overall process were also to be improved.

### SOLUTION APPROACH – CONTINUOUS INDIVIDUAL PARTS CLEANING

The solution is continuous cleaning of individual screws in the manufacturing cycle. Yet none of the cleaning units available in the market were capable of this. In collaboration with conveyor and process engineering system specialists Maschinenfabrik Dr. Ing. Gössling, Weber Ultrasonics developed an ultrasonic cleaning concept that cleans the screws individually in a continuous process.

### PROCESS DEVELOPMENT THROUGH CLEANING TESTS

The process was developed through cleaning tests in the Weber Ultrasonics application lab with the defined concentration of the stipulated neutral detergent. During this testing, the process parameters such as temperature, ultrasonic frequency, and output, as well as treatment time were all specified for the various screws to be cleaned. The best cleaning results within the specified treatment time were achieved by a set-up in which the screws were blasted directly with ultrasound from above.

### OVERVIEW OF REQUIREMENTS

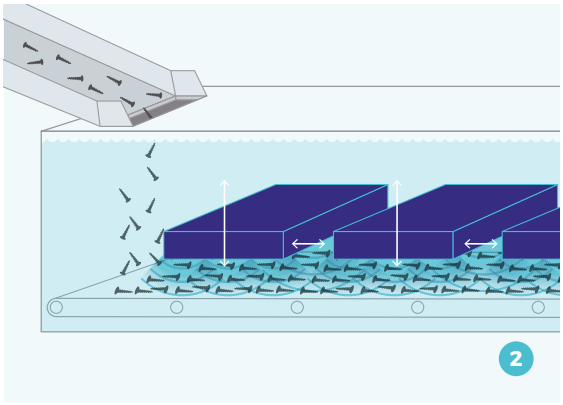
- **TIME**
  Cleaning time max. 50 seconds
- **VARIETAL PURITY**
  No mixing of different screws
- **QUALITY**
  Improvement in cleaning quality
- **SERVICE LIFE/RELIABILITY**
  Long service life of the transducers due to continuous 24-hour shift operation
- **PROFITABILITY**
  Great profitability thanks to shorter production time

### STEP 01 – SEPARATION & CONTINUOUS CONVEYING

A system comprising multiple vibrating units separates the screws and spreads them over the 800 mm-wide conveyor belt to create an even "carpet" of screws. The screws drop individually into the cleaning chamber that is filled with around 3,800 liters of detergent solution and then onto another conveyor belt. From here, they pass through the chamber at the predefined speed.

### STEP 02 – ULTRASONIC CLEANING

This is where the ultrasonic cleaning is performed. Three laser-welded, and thereby particularly durable, Sonosub submersible transducers with a frequency of 25 kHz transmit the sound waves generated by three digital DIN rail generators (each with 1,000 W power output) into the detergent solution.
This reliably removes all impurities such as press oil,



cooling lubricant and dust. As the ultrasound is applied to the screws from above, it can develop its full effect without restriction. The particulate soiling falls downward and the submersible transducers remain clean.
When addressing particularly heavy soiling, the submersible transducers can temporarily be lowered and their spacing relative to one another adjusted. This provides a higher power density at the parts to remove stubborn production residues without the need to change system settings.

> The adjustable arrangement of the submersible transducers at the top of the cleaning chamber not only facilitates optimum and constant sonic yield, but also contributes to the long service life of the transducers, as no particulate soiling matter can be deposited on the membrane.

### STEP 03 – RINSING & DRYING

The cleaning belt is followed by an ascending encapsulated conveyor belt with integrated spray nozzles for rinsing. After a multi-stage drying process that employs an air stream, tumbler belt and hot air fans, the screws are transported onward for subsequent tempering. The system not only facilitates efficient inline cleaning of bulk ware for the first time, it also effectively prevents any risk of different screw types getting mixed up, since the screws are treated as individual parts.

Thanks to optimum matching of all process parameters, it was possible to reduce the specified treatment time from 50 seconds to a maximum of 30 seconds. With some screws, a cleaning time of just 15 seconds is enough to achieve the cleanliness required for heat treatment. This allows an additional increase in productivity. ▼▼

### CUSTOMER BENEFITS

- **FASTER TREATMENT**
  50 seconds stipulated, 15-30 seconds achieved
- **GUARANTEED VARIETAL PURITY**
  Thanks to individual parts cleaning
- **GREATER CLEANING QUALITY**
  Optimum utilisation of the ultrasonic energy thanks to application from above and use of submersible transducers whose height and spacing can be adjusted.
  No carry-over of cleaning medium or dirt particles
- **RELIABILITY**
  Continuous operation secured through long service life of the transducers with laser-welded stainless steel capsules
- **EFFICIENT PRODUCTION**
  Shorter cleaning time, greater system capacity utilisation, flexible matching to the degree of soiling and better cleaning quality

**1**
For cleaning, the screws are separated in a vibrating container and then fed onto the conveyor belt.

**2**
The cleaning system with three adjustable submersible transducers facilitates continuous inline cleaning of the screws in the manufacturing cycle.

**3**
Three digital HS2 ultrasonic cleaning generators from Weber Ultrasonics supply the power for the transducers in the tank.

# THE ULTRASONIC SYSTEM

## DIGITALLY CONTROLLED ULTRASONIC COMPONENTS ARE INTEGRATED INTO THE EXISTING PRODUCTION SOFTWARE

**3 x 1,000 W**
POWER OUTPUT

**25 kHz**
FREQUENCY

**Laser-welded**
EXTREME SEALING STRENGTH

Three Sonic Digital HS2 ultrasonic generators, DIN rail installation

Sonosub submersible transducers are particularly durable and robust thanks to their laser-welded stainless steel capsule

WEBER ULTRASONICS

Im Hinteracker 7
76307 Karlsbad, Germany
T +49 (0)7248 9207-0 F +49 (0)7248 9207-11
mail@weber-ultrasonics.com
**weber-ultrasonics.com**

Version 01 / September 2018