
KKS
Ultrasonic technology & Surface refinement
Mold and
die cleaning systems
Swiss Quality

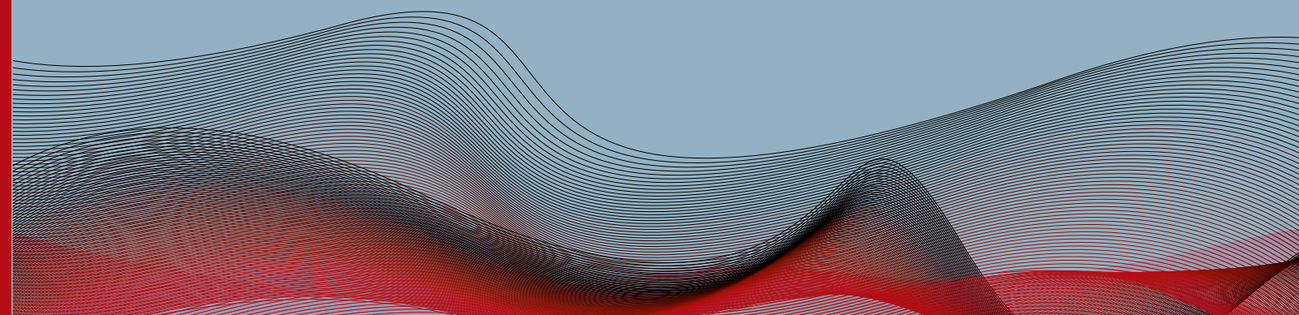
Further information at:
www.kks-ultraschall.ch

Purity as a vision

Purity is in the life-blood of Switzerland. Since 1982 an epicentre for ultrasound-based cleaning has been established here in the form of KKS. It is motivation and the power to innovate that move us. Along with technical knowledge and control of our actions. Above all it is our ability to perceive vibrations. This means: we listen to our customers. We address their needs and explore their applications. We consider it our mission to create technologically leading solutions for ultrasound-based cleaning and surface finishing processes for our customers. In this way we provide greater performance, cost-effectiveness and flexibility. And we create significant added value for our customers. Together with you we want to be successful as an internationally renowned specialist in these niche markets and to make an effective contribution to further development.

KKS markets a complete range of systems built for mold and die cleaning. Leading businesses from these sectors of industries have chosen us as their technology partner due to the quality of our systems, as well as their durability and excellent performance. The KKS SINGLE, DUAL and MIX frequency technology combined with our cleaning solutions, make ultrasonic cleaning an efficient and at the same time environmentally sound method, capable of cleaning products of all types.

We provide a small insight in the world of purity on the following pages. If you should have any questions about our products and the possibilities to clean your molds and dies, we will be pleased to be of assistance at any time.



Purity through ultrasound

The advantages of ultrasonic cleaning

- Pore-deep clean surfaces without scratching, brushing or scraping – also on porous or open-pored structures, complex geometry, small gaps or blind holes in the item to be cleaned
- Short cleaning times from a few seconds to minutes
- Straightforward and quick to apply
- Can be used for practically all types of contamination and materials
- Prevention of tedious and expensive manual work – the cleaning becomes a successful experience
- Significantly fewer chemicals additives are required than for many conventional cleaning processes
- The cleaning process can be automated and provides reproducible results

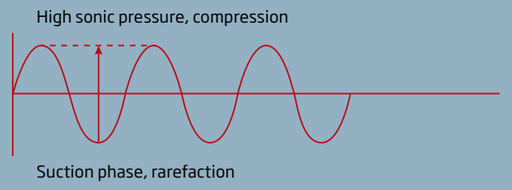
Gentle and cost-effective care for your valuable molds and dies

A thorough cleaning is essential in the maintenance of rubber, plastic and aluminum molds and dies. If the cleaning process is insufficient, the molds have to be replaced more frequently, which ultimately results in financial losses. Rubber- and plastic molds, as well as core boxes often are still cleaned by hand, which is a tedious process and removes debris insufficiently. In addition, the time-consuming and high-effort manual removal procedure of persistent residue may permanently damage the molds.
KKS's leading ultrasonic and process technology offers an economical, gentle and reproducible solution for cleaning your valuable molds and dies, customized to your individual needs and requirements.

Ultrasonic cleaning

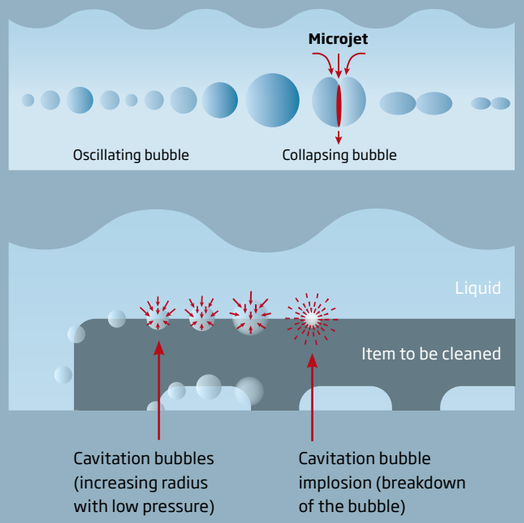
The ultrasonic generator creates an alternating electrical field whose energy is transformed into mechanical energy by piezoelectric transducers and transmitted into the cleaning solution. This creates pressure changes in the liquid.

Compression/expansion



Liquids are held together by bonding forces, so called cohesive forces. These act among the individual atoms and molecules of a substance and thus determine the tensile strength of a liquid. The pressure changes caused by ultrasonic waves (Expansion and Compression) tear apart the liquid's intermolecular bonds, creating transient and bubble-like cavities (bubbles), which are instantly filled with vapor due to vaporization of the liquid at the boundary of the cavity. During the compression phase, this vapor condensates again. This creates millions of microscopic cavitation bubbles with oscillating sizes. If a sufficient level of ultrasonic energy is applied, the cavitation bubble can no longer oscillate in a stable fashion and collapses during the following compression phase ("transient cavitation"), creating millions of smaller bubbles or disappearing into the liquid. This creates immense localized pressures (shock waves) as well as turbulences and currents. These phenomena are what actually causes the removal of dirt particles from the surface of the component.

Collapsing bubble near to a boundary with microjet



During this process cavitation bubble implosions occur mainly at the boundary areas between the liquid and the component. The microjets created by the sudden influx of liquid are directed to the surface – precisely where they are required for effective cleaning.

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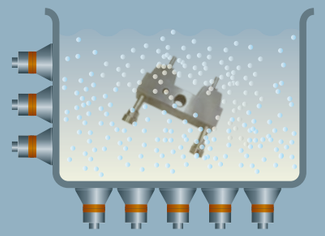
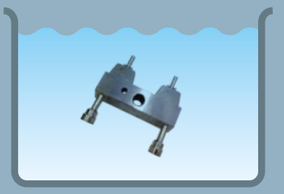
Proven technology is indispensable for mold cleaning as well

The technology of aqueous ultrasonic cleaning has been implemented for quite a while and is successfully used in numerous industries. Ultrasonic mold and die cleaning systems, whether operating manually or automatically, usually consist of at least one cleaning tank, one rinsing tank and one blowing off station. Depending on the required ultrasonic performance, the tanks feature multiple ultrasonic transducers on the bottom and/or its side.



The cleaning process is also supported by a cleaning medium adaptable to the contamination level, which together with the cavitation bubbles generated in the bath by ultrasound, achieves excellent cleaning results. The cleaning effect can therefore be compared to the use of countless micro-brushes that are also able to reach places difficult to access.
Since ultrasound is transferred by putting the metal into vibration, even the smallest drillings, such as cooling channels and runners are cleaned thoroughly.

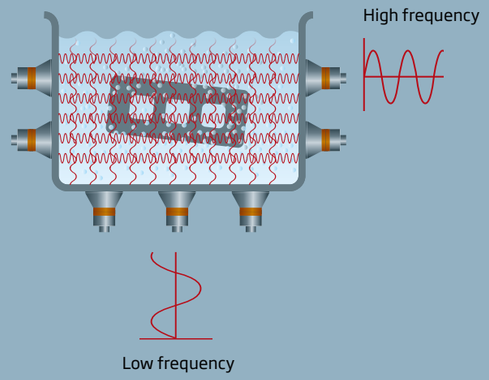


After the ultrasonic cleaning process is completed, the molds and dies are rinsed in water dosed with a corrosion protection medium. This prevents the residual transfer of e.g. cleaning media or loose particles in subsequent processes.

The process is finalized by blowing off or drying the molds.

SINGLE, DUAL or MIX frequency technology

All systems can be equipped with SINGLE, DUAL or MIX frequency technology. This enables a most effective and flexible cleaning process for diverse materials at various contamination levels.



The ultrasonic frequency plays an important role: at low frequencies large cavitation bubbles are produced that produce shock waves with high power as they implode. At high frequencies on the other hand the radius of the bubbles is smaller and the implosion forces are therefore lower. For this reason tenaciously adhering contamination most effectively removed at low ultrasonic frequencies.

Time and again the DUAL or MIX frequency technology proves itself to be one of the most efficient and effective ultrasonic cleaning processes. Comparisons and experiments have confirmed that the combination of coarse and fine cleaning in the same process increases flexibility and it is possible to achieve excellent cleaning results not obtained previously.

Purest technology
KKS provides technologically leading solutions for every application area.

Technology	Meaning
SINGLE frequency	The generator operates at one frequency.
DUAL frequency	The generator can be operated at two frequencies, either of which can be selected for cleaning.
MIX frequency	If two transducers with two generators are installed in an ultrasonic tank, it is possible to clean items in the relevant bath using both frequencies simultaneously.

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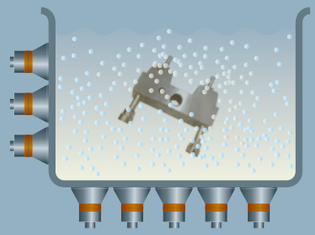
KKS Mold and die cleaning systems

Thanks to our extensive knowledge in developing cleaning processes and surface refinement equipment, we have an eye for appropriate solutions for every requirement. Led by advanced project management methods (we are ISO 9001 and ISO 13485 certified), using carefully selected components, and driven by the passion for our craft, we transform your specifications into durable high-quality systems. With the utmost precision.

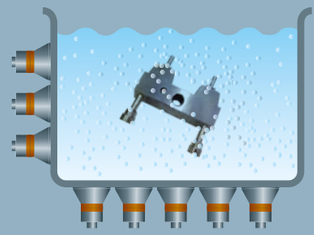
Solutions without Limitations
Our services include manufacturing standard components as well as individual, customer-specific systems.

Possible process steps

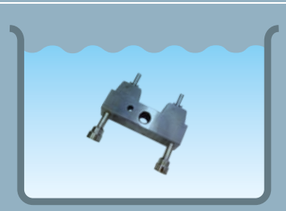
The following process steps can be individually combined to fulfill specific requirements.



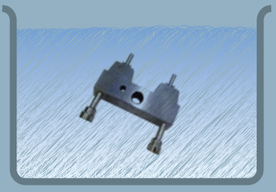
Ultrasonic Cleaning
- Powerful ultrasonic cleaning module
- SINGLE, DUAL or MIX frequency-technology
- Application-specific arrangement of the transducers



Ultrasonic Rinsing
- Ultrasonic rinsing module



Rinsing
- Flow-Rinsing



Conserving
- Prevention of corrosion of the cleaned molds
- Short or long-term corrosion protection of the complete surface

Conservation options:
- High-performance suction and blow gun or compressed air gun
- Transferring the cleaning solution from the ultrasonic bath to the rinsing tank
- Corrosion protector
- Dewatering-fluid
- Lubrication

Blowing-off
- High-performance suction and blow gun or compressed air gun

Drying
- Hot air or vacuum dryer

Drying options:
- Hot air drying: the well prooved and cost-efficient method
- Vacuum-drying: the molds – even the capillaries – are completely dry and ready for use immediately. The ideal drying solution for blind holes.

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Key factors for mold and die cleaning

Ultrasonics: the arrangement of the ultrasonic transducers, their performance and operation frequency are key factors for the cleaning results. We equip all systems based on customer-specific requirements.

Ultrasonic tank with immersible transducers on two sides, grid floor

Pump-filter circuit: an accurately arranged pump – filter circulation process retains debris from the tank. It must be adapted to the size of the system and the items to be cleaned.

Filter circuit to increase the operating life of the cleaning medium

Level of the tank: at different work piece volumes, excess water drains into an overflow pocket. Therefore the tank maintains a consistent liquid level. In addition, the accurately measured overflow pocket ensures that the work pieces are rinsed adequately.

Overflow pocket, coarse filter and integrated exhausting

Oil skimmer/band skimmer: oil and grease separates from the molds and dies during the cleaning process. The residuals float on the surface and drain into an overflow tank/reservoir by passing a weir where they are continuously removed. The interaction of the overflow tank/reservoir and the oil separator ensures that oil which could adhere to the work pieces during removing the items from the tank floats on the surface.

Oil skimmer/band skimmer for effective removal of oil and grease

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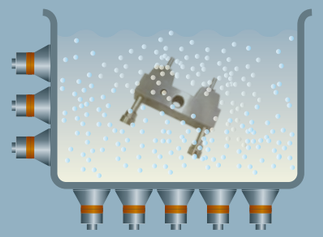
Your advantages

- **Efficiency** – KKS ultrasonic cleaning systems reduce time consuming and expensive manual cleaning processes. Your molds and dies are clean within a few minutes.
- **Increase in production** – the fast cleaning processes guarantee a high availability of your molds and dies.
- **Increased lifetime** – gentle cleaning processes prevent damages to surfaces and salient edges.
- **Improved cleanliness** – complicated and delicate geometries, recesses, grooves, cooling channels etc. are relieved from all residual contamination.
- **Improved quality** – transfer of residuals and contamination is prevented.

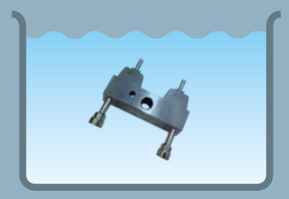
Our factors of success

- **Consulting** – KKS relies on years of established experience, which will contribute to your success. We also conduct trials to meet your specific requirements.
- **Process media** – KKS is familiar with the process technology and provides adequate specific chemicals for cleaning-, conserving- or dewatering processes.
- **Ultrasonic technology** – our core competency. KKS has developed ultrasonic generators and transducers for decades. They are known for their high energy- and power density.
- **The system concept** – KKS systems are reliable and durable; they are built of corrosion-resistant stainless steel. The size and equipment is adapted to your specific requirements.
- **Training and assistance** – KKS trains and assists the operators of the systems. This is how we ensure reproducible cleaning results.

Injection molds - before and after cleaning
Contamination: plastic- and rubber residuals



Ultrasonic cleaning
- Highly alkaline cleaning solution
- Ultrasonic equipment on the bottom and on one side
- Vertical movement of the molds



Rinsing
- Tap water
- Vertical movement of the molds

Blowing off
- Compressed air gun

Detailed view before cleaning

Detailed view after cleaning

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KKS – Solutions without Limitations

Our services include manufacturing standard components as well as individual, customer-specific systems. As a dynamic, innovative and solution-oriented company, we offer to our customers environmentally sound, economically valuable and technologically advanced solutions. This, our application know-how and more than 30 years of experience make us the ideal partner for your development and production projects.

- **Comprehensive solutions for cleaning molds and dies of all sizes and shapes**
  Whether complicated geometries or a wide range of dimensions – KKS cleaning processes guarantee highest cleaning efficiency!
- **Standard units as well as customer-specific solutions**
  Individual combination of process steps such as ultrasonic cleaning, ultrasonic rinsing, DI-rinsing, conserving, and drying. Implemented according your cleaning requirements!
- **Manual, semi-automatic and fully automatic systems**
  Integrated vertical and/or horizontal movement of goods, fully automated processes, integration of the unit into existing production processes and control centers. The wide range of different tank sizes, ultrasonic frequencies and optional integrated functions ensure maximum flexibility and efficiency!
- **Leading edge ultrasonic technology**
  We consider it our mission to create technologically leading solutions for ultrasonic cleaning processes for our customers. In this way we provide greater performance, cost-effectiveness and flexibility. And we create significant added value for!

Thanks to our extensive knowledge in developing cleaning processes we have an eye for appropriate solutions for every requirement. Led by advanced project management methods, using carefully selected components and driven by the passion for our craft, we transform your specifications into durable high-quality systems. With the utmost precision.

Typical solutions for mold and die cleaning

Manual systems type "Poly" - for smaller molds and dies

The system type "Poly" is built of polished stainless steel or chemical-resistant "polymer". It is designed for cleaning smaller dies and molds. Equipped with an oil separator and oil skimmer, it adequately removes residuals, grease, oil or general contaminants. The baskets for/dies/molds/mold inserts are exchanged manually.

Process layout:

Cleaning system with automatic lifting device including vertical movement of goods

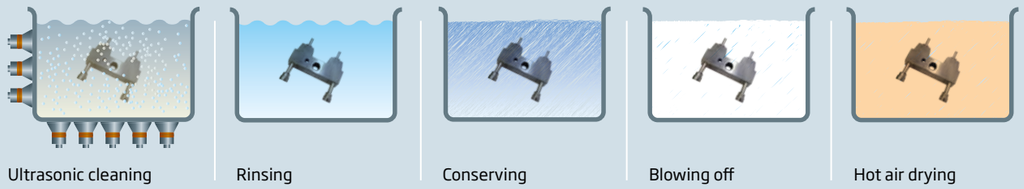
The semi-automatic mold cleaning process enables automatic immersing and lifting, as well as the movement of molds and dies during the cleaning process. The transfer from one tank to another is performed on rollers manually. Depending on the cleaning requirements, a function for vertical movement can be integrated. The system can be equipped with an overflow chamber featuring integrated pump- and filter circulation, oil separator and oil skimmer, as well as an integrated hot air dryer.

Process layout:

Manual cleaning systems type "NW" with separate hot air dryer - for medium-sized molds and dies

The manual system type "NW" is designed to clean medium-sized to larger dies and molds. Based on customer request it is available with a separate hot air dryer up to 200°C - or with an integrated unit as a component system. An operation panel placed on an ergonimical position simplifies system operation and monitoring of process data.

Process layout:



Automatic linear systems type "Lift-Shift"

The molds/dies are cleaned in a fully automated process, which is operated by using an SPS control unit. This enables consistent process parameters and the highest level of reproduction potential and productivity of your mold and die cleaning process.
This system is equipped with an overflow chamber featuring integrated pump- and filter circulation, oil separator and oil skimmer. The blowing off station (image on the right) is operated manually.

Process layout:

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KKS Ultraschall AG
Frauholzring 29
P.O. Box 168
CH-6422 Steinen

Phone +41 41 833 87 87
Fax +41 41 832 25 50

info@kks-ultraschall.ch
www.kks-ultraschall.ch

Swiss Quality

www.kks-ultraschall.ch