Cavitation erosion
Cavitation erosion in ultrasonic baths

Cavitation
Ultrasonic transducers installed on the ultrasonic oscillating tank convert electronic high-frequency energy into mechanical oscillations and cause the liquid in the bath to oscillate at a defined frequency (from 20 to 50 kHz). This causes underpressure zones in the liquid, in which smallest vacuum bubbles are formed and then implode again. This process is known as cavitation.

Erosion via cavitation
Generally, cavitation attacks all materials: On the boundary surface – solid/liquid – the cavitation bubbles attack the surface at the weak points on the solid (for example, the grain boundary of the crystalline metallic structure). This is known as cavitation erosion and the effect differs in strength depending on the respective material.

Parts exposed to ultrasound are subject to the cavitation influence during the short sonication time. This then achieves the required positive effect without any aggressive consequences to the surface of the goods to be treated. The surface of the oscillating tank (especially the sound-emitting surface) on the other hand is exposed to the cavitation for a longer period of time. Cavitation erosion can become visible after just a few hours of operation.

To prevent the rapid wear of the oscillating tank, BANDELIN only uses stainless steel in the production of its ultrasonic oscillating tanks. This has been proven to have the most advantageous properties for resisting the cavitation attack. Stainless steel is a steel alloyed with at least 12% chrome and other metallic additives such as nickel and molybdenum amongst others. The chrome alloy protects against premature cavitation attack and the service life of the sound-emitting surfaces is considerably extended.

Other factors influencing the cavitation erosion on the surfaces of the oscillating tank include:

- Properties of the employed liquid
  - Aggressive bath liquid (e.g., saline solutions, certain acids and alkalis in different concentrations)
  - Completely demineralised water with no additives

- Concentration of preparation (observe the specified dosage specified by the manufacturer!)

- Temperature and gas content of the liquid

- Pollution from transported metal chips, grains of sand, grinding materials or metal dust or chemical substances such as oils and greases among other things.

- Aggressive pollutants such as acids, salts and chloride ions

- Chemicals which contain or release chloride ions (some disinfectants, household cleaners and washing-up liquid)

- Sonication method
  Use accessories which are suitable for the application, avoid direct contact with the bottom of the tank.

Literature:
/1/ Prof. Dr. R. Pohlmann u. a.: Über Ultraschall-Kavitationsvorgänge an Festkörperflächen. Forschungsberichte des Landes Nordrhein-Westfalen Nr. 1444, (1965).

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