Level Control trough the wall for difficult Liquids with Solids and Gas

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IBJ Technology developed new contactless level control with ultrasonic trough the wall. The disadvantages of well-known procedures, how pulse response or wall decaying becomes eliminated. Pulse response needs a reflector for the ultrasonic waves. The procedure with wall oscillations requires certain characteristics of the liquid. The new procedure with acoustic surface waves is applicable with all metallic containers. In a flexible body, in our case it is the container wall, to essentially two different kinds of waves with different speeds will spread. From interest here the longitudinal p-waves and the transversals are s-waves. Further still Rayleigh-waves spread to the internal and outside container wall on the delimitation surface. One proceeds from a homogeneous body, can be proceeded from a constant wave velocity. For container walls thereby the frequency response of the speed, the so-called dispersion is ignored. The speed of the Rayleigh-waves corresponds in approximately from transverse waves. Exactly taken the speed of the Rayleigh-waves is somewhat smaller than those of the transverse waves. The particles of the surface implement two-dimensional oscillations on elliptical courses around its rest position, so that the Rayleigh-waves is compound from a longitudinal and transversals component. Since only the upper atom layers are involved, thus a phase change at the boundary layer must be to fixed-liquid instrumentation provable fixed gas. Only the upper atom layers are generally affected, so that in a depth of a wavelength in the material no disturbances are more noticeable already. Rayleigh-waves are less in principle well suitable for the measurement in liquid leading, since a component of its particle deflection is arranged perpendicularly to the surface, i.e. into the liquid. Thus a substantial absorption of the wave would adjust itself. From an ultrasonic sensor applied on the container wall waves proceed after all directions. During the use of the Rayleigh-waves to level the control the sensors are attached laterally at the container wall. The horizontal running waves have with standing containers shorten ways. The vertically rotating waves are practically not provable with technical containers. The waves spreading with round ultrasonic oscillators (thickness oscillators) after all sides are practically no variable disturbances. Diagonally running waves are reflected at welding seams and continued to strew. Their energy content contributes thus only to the background noise. By centrically arranged in and discharges these are instrumentation not disturbing and/or not demonstrably. If residues of liquid are in the container, these are dampened thereby also up to the detection limit. The information signal of the horizontal rotating wave is substantially larger (practically 50 - 60 dB). Application is likewise very well possible at pipings, if these can run empty. Of the different waveform-shaping Rayleigh-waves with the largest amplitude reproduce themselves. The receipt of these waves causes therefore instrumentation also no difficulties. The advantage of Rayleigh-waves is their independence from installations in the container. Since the absorption of the Rayleigh-waves on the internal container wall is sufficient for the detection of the liquid, the outside container wall can be pasted also with absorbing isolation material (e.g. foam material). The absorption of the Rayleigh-waves takes place already with reaching the sensor (approx. 50 % of the sensor surface). Gas bubbles and turbulences by the propeller do not affect the measurement. The presence of difficult liquids with solid can be recognized problem-free.

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