

Interface Measurement in Chemical Plants and Refinery

New Method and device for the measurement of level heights of laminated liquids (patented in Germany)

Application description:

The invention concerns a method to the measuring of standard limits of stratified liquids in a container and/or to the determination of the boundary layers in increase phase mixtures of liquids in a container as well as a device to the execution of the method.

The containers occupy can closed its and among pressure stand or however also open pits.

Such boundary layer determinations are needed generally in the chemical production and the mineral oil processing to the product bursting. Definite products are selectively won by extraction means also at the pharmaceutical production from mixtures.

Task of the invention is, the creation of a method this made stratified liquids possible for this one independently of each other the observation of the standard heights. A further execution of the method of the invention allows the total amount of the liquids besides the observation of the standard heights of the liquids, also the measuring in the container independently of the construction. The measuring can, touching or be carried out contactlessly of above or below. These standard height determinations can be placed next to the disposal as measurable independent sizes to the further processing of a process control or process settlement.

Method principle:

Task of the invention is, the creation of a method this made stratified liquids possible for this one independently of each other the observation of the standard heights. A further execution of the method of the invention allows the total amount of the liquids besides the observation of the standard heights of the liquids, also the measuring in the container independently of the construction. The measuring can, touching or be carried out contactlessly of above or below. These standard height determinations can be placed next to the disposal as measurable independent sizes to the further processing of a process control or process settlement.

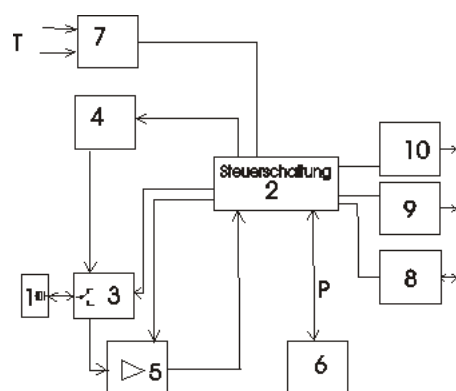


Fig. 1

This task is solved by the measures indicated in the patent claim 1 at a method of the above mentioned manner. An ultrasound sensor confessed to himself sends an ultrasound impulse into the liquid. After the run time-interval method the distance is intended for a reflector. Reflects become ultrasonic waves of every phase limit also of the liquid limits? Depending on size of the jump of the acoustic impedance a part of the ultrasound is reflected at the phase limit and the other part penetrates into the second phase. At the next phase limit reflection and a transmission are carried out in turn. At definite phase limits it can come to the total reflection.

The signal height of the reflected echoes is various. The first echo is of the phase limit liquid liquidly more weakly than

the second echo of the phase limit's liquid feast or liquid gas so.

With small reinforcements the echo becomes the phase limit's liquid feast includes first.

If the reinforcements increase, an echo is included with shorter running time. The reinforcements are changed cyclically to this after patent claim 2.

The change knows (e.g. ramp function) continuously or in steps is carried out. Several reception channel also can parallelly be processed with a signal processor.

All means of the reinforcements variation are suitable for the method appropriate extraction of the readings to this.

To the evaluation of the measurements these are organized after patent claim 3 in temporal order.

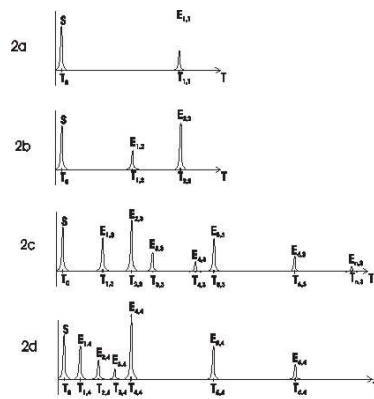


Fig. 2

4 multiple echoes can be recognized by comparison of the time intervals between sending impulse and echoes on the one hand and the time intervals between the echoes in accordance with patent claim on the other hand. In the evaluation the arguments of the single responses to possible whole multiples are also checked. If the running time should be equally great in the two liquids respectively, a double echo is excluded by comparison of the necessary reinforcements since the reflection is carried out at the upper phase limit at lower reinforcements as that one of the phase limit liquid liquidly.

fig. 2 a schematic representation the time diagrams to the operation of the device in accordance with the invention

The sound speeds put down apply to a temperature. Has to be calculated with variable temperatures, by the consideration of the temperature dependence of the sound speed the sound speed assigned to the respective liquid can be taken into account correctly (claim 5).

Application areas:

- **trap for by density differences' separable phases general at the at the mineral oil processing**
- **separating container for gasoline at the cracker**
- **supervision of the separation from liquefied gas at the distillation and refining**
- **supervision of the selective product bursting in the pharmaceutical industry**
- **separating average supervision in the chemistry**
- **new process gauges for till now mechanical solutions**

Advantages of the method:

- no mechanical components are necessary
- no container executions
- independent of the pressure
- low place need
- use of available Bypass
- refitting without sweat work

Applications:

Descriptions of explanation examples arise the invention further features and advantages with the drawings from the following.

1. Measuring of below with a sensor on the container wall:

An arranging of the order to the execution of the invention appropriate method shows fig. 3. The height of the gasoline parliamentary group 7 swimming above must be regulated at a separating container 1 to the separation from gasoline 7 and process water 6 of a cracker to the

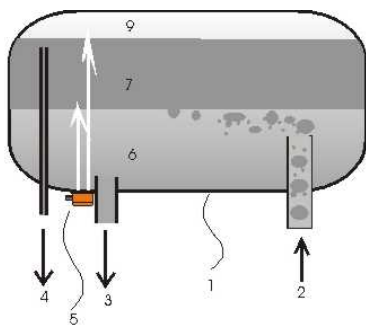


Fig. 3

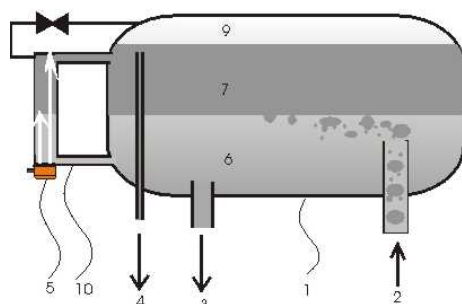


Fig. 4

optimal way of driving. Mixture to be separate of gasoline 7 and process water 6 stands this one up at the admission 2 into the separating container 1. Is in the other end of the separating container 1 this one selected 3 for the process water 6. at the upper part of the separating container 1 at the lower part is this one selected 4 and low of the standard of the gasoline 7 swimming above with the superimposed protective gas 9. on the way of this fed 2 with that to 3 and 4 would the select parts the liquid mixture of gasoline 7 and process water 6.

3 and 4 would select at the back end of the separating container 1 between the, is the ultrasound transducer of 5th these sends himself ultrasound impulses during a measuring cycle and with changing reinforcements the separating layer gasoline 7 and process water 6 and the phase limit receives ultrasound echoes between gasoline 7 and protective gas 9.

The place for the assembly of the ultrasonic oscillator should be voted so, for this echoes disturbing no-one or only some are included by gasoline particle of the

ultrasound transducer swimming in the water.

2. Measuring of below at a stand pipe:

Fig. 4 lets herself be seen the assembly of the ultrasound transducer 5 to for one stand pipe 10. about pipes to the separating container 1 connectedly puts one the same level of the separating layer like in the separating container 1. Gasoline particles dragged along cannot disrupt the measuring. This manner of the measurement extraction can be recommended at difficult measuring conditions in the separating container. Available stand pipes with swimmer or restrictor can be used so to the measuring with an ultrasound transducer. At the lower end the lower flange has to be modified to the assembly of the ultrasound transducer if necessary. Customary flanges have centrally a connection or opening cleaning usually. This must be put by disturbing echoes at the side to the avoidance.

The method appropriate determination of the standard heights of the stratified liquids can be carried out also at several stand pipes ordered about each other. As represented into fig. 4, only the standard height of the process water 6 or the height of the separating layer is determined between process water 6 and gasoline 7 with a stand pipe here. Stand pipes are manufactured only in definite lengths usually. The separating vessels know diameters of at cracker showing 4 m to 5 m. Show glasses or standard stand pipes aren't manufactured in this length.

3. Measuring of above at a stand pipe:

Fig. 5 lets herself be seen the assembly of the ultrasound transducer 5 adapts herself to the upper flange of a stand pipe connected to the separating container 1, 10., about pipes the same level of the separating layer like in the separating container 1. Gasoline particles dragged along cannot disrupt the measuring. This manner of the measurement extraction can be recommended at difficult measuring conditions in the separating container. Available stand pipes with swimmer or restrictor can be used so to the measuring with an ultrasound transducer. The measuring is carried out metrologically with same effort as into fig. 4.

No gas cushion may be available between ultrasound transducer and liquid. For the measuring one is necessarily filled stand pipe completely mandatorily with liquid.

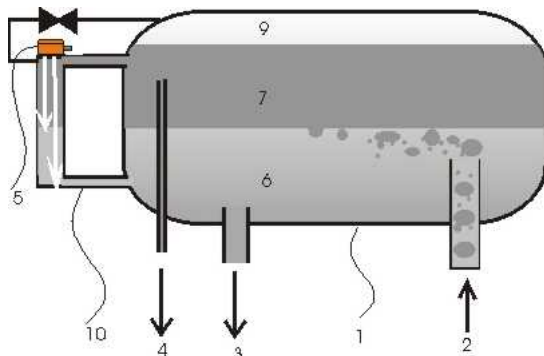


Fig. 5

4. Measuring with two measuring facilities of below at a container:

A further arranging of the order to the execution of the invention appropriate method shows fig. 6.

The height of the gasoline parliamentary group swimming above must be regulated at a separating container 1 to the separation from gasoline and process water of a cracker to the optimal way of driving. Mixture to be separate of gasoline 7 and process water 6 stands this one up at the admission 2 into the separating container 1. Is in the other end of the separating container 1 this one selected 3 for the process water 6. at the upper part of the separating container 1 at the lower part is this one selected 4 and low of the standard of the gasoline 7 swimming above with the superimposed protective gas 9. on the

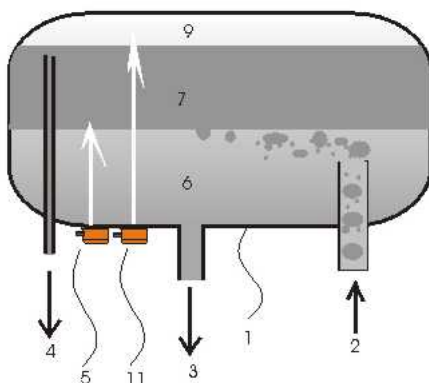


Fig. 6

way of this fed 2 with that to 3 and 4 would the select parts the liquid mixture of gasoline 7 and process water 6.

3 and 4 would select at the back end of the separating container 1 between the two conventional ultrasound transducers 5 are and 11th these during a measuring cycle ultrasound impulses send and receive with changing reinforcements ultrasound echoes of the separating layer gasoline 7 and process water 6 and the phase boundary between gasoline e7 and protective gas 9.

Working ultrasound transducers recommend themselves alternatly to the avoidance of being missing measuring.

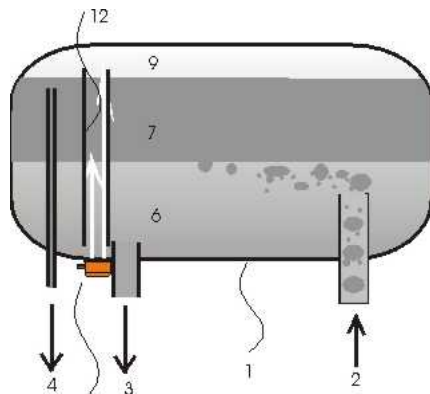


Fig. 7

5. Measuring of below at a container with flood pipe:

A further possibility of the reduction of disturbing influences on the arranging of the invention appropriate device shows the assembly of the ultrasound transducer 5 carried out built-in below one in the separating container 1 to fig. 7., above and below open protection tube's 12th gasoline particles dragged along cannot disrupt the measuring. This manner of the measurement extraction can be recommended at difficult measuring conditions in the separating container.

Arranged fittings can fulfill the same purpose in the separating container 1 also differently.