sonic technologies

Sonic Information No. E-5

Guidelines for Equipment and Procedure of Well Rehabilitation with high energetic Ultrasound

A highly efficient, economical, environmentally friendly and material-preserving method of rehabilitation of water wells.

Contents:

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1 General Information

Well aging is a result of complex water-chemical, geologic and hydrologic processes, thus, most wells show a reduction of their performance within years of operation.

Well aging means in general a reduction of water-flow by blockages

- In the pore space in the gravel
- In the intake of the submersible pump
- Inside the tubes
- Inside the filter slits

The intake of the submersible pump, the tubes and the filter slits are mechanical accessible, so you can treat these places with mechanical means.

The problem is the cleaning of the gravel, here you have no possibility of mechanical access.

To avoid using chemical substances or to avoid mechanical stress by high pressure or explosions, the application of high-energetic ultrasound has been developed.

Ultrasound treatment means cleaning the filter gravel

2 Equipment

Well cleaning requires the following equipment:

- For pre-cleaning the tubes and the filter slits you need **brushes**
- For cleaning the gravel you need an **ultrasound device** and you need in addition a **submersible pump** to flush out the dirt from the gravel. The dirt is transported in **tubes** to the surface.
- To transport and to handle the tools and equipment you need a **crane** and a **truck**

For Inspection the well before, during and after the measurements you have a variety of possibilities like:

- Submersible TV Camera for visual inspection
- Flow meter
- Pumping test
- Geophysical inspection (executed by special trained staff)

3 Well Regeneration with Ultrasound – necessary and optional Steps:

Step	Remarks	Necessary equipment
1. Dismantling of tubes and submersible pump		Crane, tools
2. test of performance	Necessary if you want to check the result of the regeneration	Pump and devices for measurement, Flow-meter
3. geophysical test	Optional - GG Tests are executed by special staff	Special equipment (nuclear material)
4. TV-Inspection of well	This step is necessary to see the state of the well tube and filter If you see damaged parts in the filter (e.g. holes, cracks or fissures) don't continue the rehabilitation works	Submersible TV Camera
5. Cleaning of filter slits (pre-cleaning)		Brushes or (in extreme cases) "middle" pressure
6. TV-Inspection of well	Recommended to see the result of pre-cleaning. Filter-slits have to be open.	Submersible TV Camera
7. test of performance	Only necessary if you want to check the result of pre-cleaning	Pump and devices for measurement, Flow-meter
8. Cleaning of gravel (Separation of coating)	From up to down	Ultrasound device
9. Extraction of solved dirt from the gravel	Extraction should not be stopped before the outflow is clear. (to be executed shortly after ultrasound treatment)	Submersible pump, tubes with quick-coupling)
10. TV-Inspection of well	Final check	Submersible TV Camera
11. test of performance	Necessary to check the result of rehabilitation	Pump and devices for measurement, Flow-meter
12. geophysical test	Optional - GG Tests are executed by special staff	Special equipment (nuclear material)
13. Cleaning of the well sump	necessary	Special equipment
14. Disinfections of the well		
15. Re-assembling pump and tubes		Crane, tools

4 Pre-Cleaning of the Filter Screen with Brushes

For pre-cleaning the filter-tubes and the filter-slits commonly plastic brushes are used.

For each diameter of wells you need a brush. Brushes consist of plastic bristles, mounted on a PE body. The diameter of the brush exceeds the diameter of the well of about 10 - 20 mm. The brush is moved as quick as possible vertical up and down in the well. The brush has to be combined with a dead load in order to go down fast.

Brush

Brush entering into the well with deadload (blue)

Brushes are effective only at the inner surface of the tubes and within the slits, not in the gravel

5 The Ultrasonic procedure

The treatment with ultrasound starts at the upper filter-slits. You lower the probe in steps of the length of the ultrasound emitters. The time of treatment of one segment is about 10 to 15 minutes.

Over the ultrasonic probe you have mounted a submersible pump which is equipped with packers, so it's effective only between the two packers.

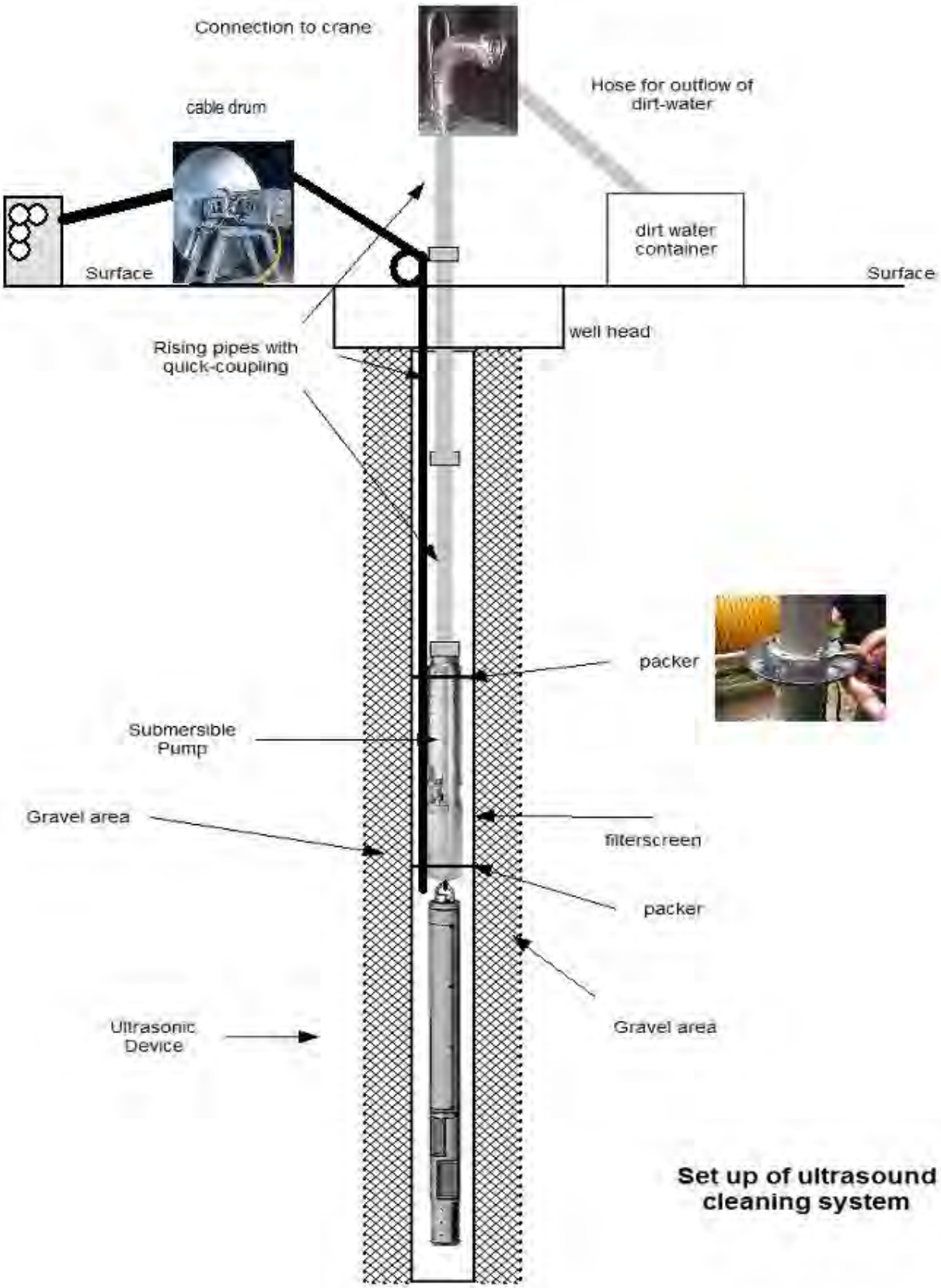
The pump is hanging on rising pipes. We recommend pipes with quick-coupling.

By lowering the system, the pump flushes the water from the well-segment which was treated by ultrasound before. At first the water is dirty and gets clearer and clearer.

The dirty water is led to the surface by tubes with a quick-coupling-system (or in a dirt-water container).

The schematic set-up is shown on the next page.

The dimensions of the ultrasonic system, of the pump and of the rising pipes depend on the dimensions of the well.



Set up of ultrasound cleaning system