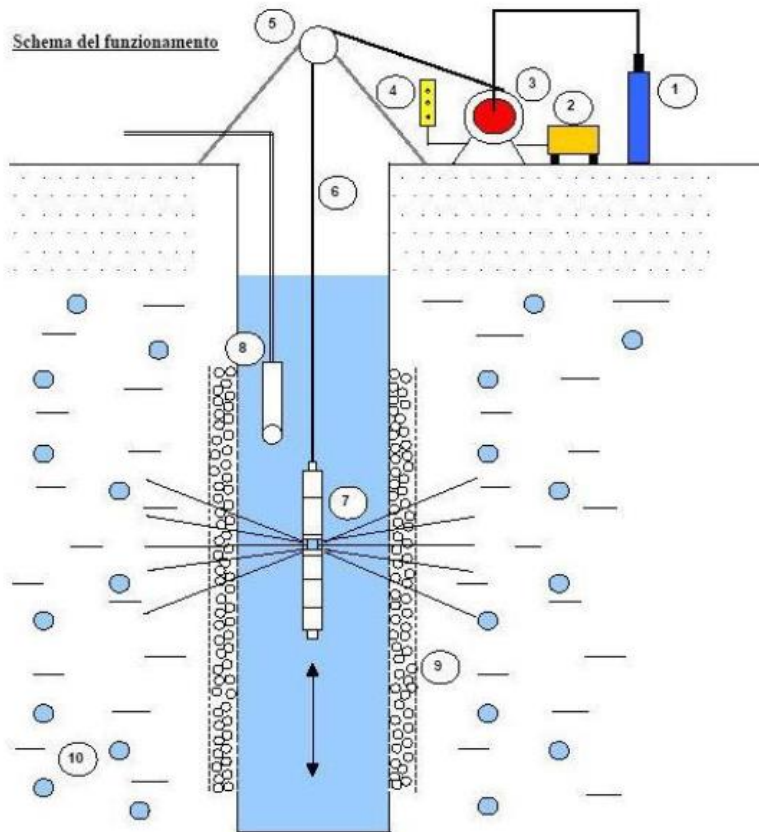




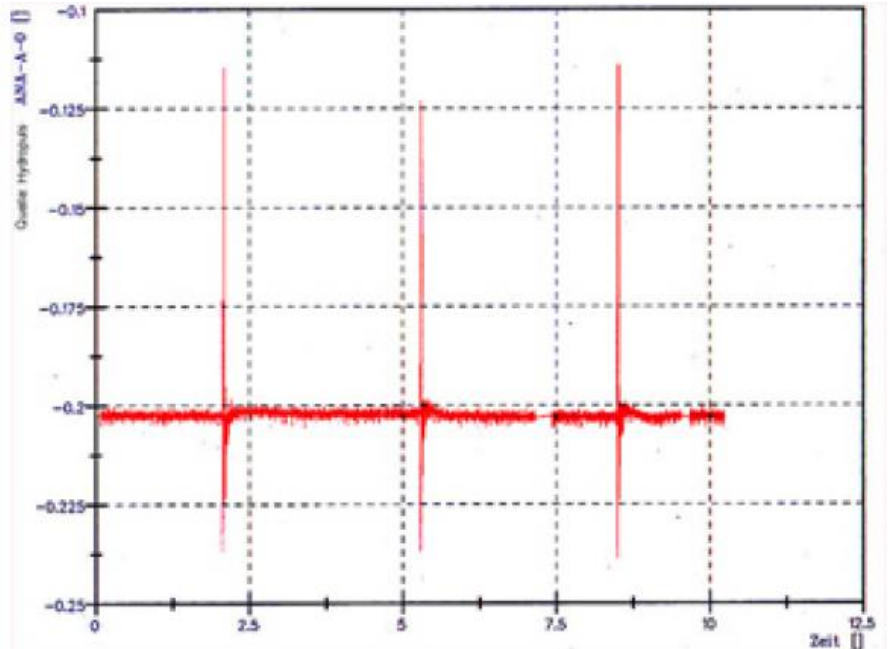
# HYDROPULS®

HYDROPULS® is a hydraulic impulse process to increase or restore hydraulic efficiency in water wells.



1. Compressed-air bottles
2. Electric generator
3. Electric hose reel
4. Control unit
5. Tripod with idler pulley and depth gauge
6. Compressed-air hose
7. Pulse generator
8. Underground pump / Airlift
9. Filter pipe with gravel filling
10. Filter pipe with gravel filling

The basic principle of pulse creation by the abrupt expansion of a highly compressed gas or liquid has been used in both the seismic exploration and the oil production with different tasks since the beginning of the fifties. At the beginning of the nineties, the first pulse technology modifications were developed to be used as well regeneration processes. The mode of action is that pressure pulse sequences are created by pulsing inputs of gas or water portions under high pressure using a pulse generator that is inserted in the well attached to the pressure hose. The pulse generator is provided with a valve system that is able to release the energy that is accumulated in the generator in the form of high-tension gas or water within a very short switching time (milliseconds) by opening large cross sections. This creates hydraulic shock waves. At the same time, a cavitation effect is caused by the sudden volume change leading to the formation of a “vacuum bubble” that subsequently collapses and thus creates a hydraulic “suction wave”. The alternating effect of the pressure load and the pressure relief loosens the fine grain portions, iron clogging, precipitations, etc. that have been inserted into the gravel layer and into the pore space of the water-bearing stratum. The “suction wave” transports the loosened congestion to the center of the well where it is pumped off. According to the DVGW leaflet W 130, this process is an approved process in Germany from 1997, and was used for the first time in 1999 by Berliner Wasser Betriebe. Afterwards was distributed on license in Spain, Portugal, Switzerland, Holland, USA, Canada and finally in Italy, where we were the first company to introduce this technique in 2006.



## Hydropuls® Features and benefits

- Simple, quick and cheap
- System of minimum encumbrance also applicable in wells that with difficult access or with artifacts above ground
- Often directly usable with the original pump of the well
- Pulse emission speed of about 2,000 m/s
- The pulse frequency can be changed, making the treatment "more intense " or "softer"
- The intensity of the outlet pressure can be changed from 20 to 100 Bar
- Applicable to wells with a diameter greater than 90 mm at any depth
- No environmental risk, no entry of foreign substances into the water well.
- Can be used in wells made of steel, PVC and HDPE pipes
- Highly effective on all types of filters: bridge, bushings, continuous spiral, micro-cracked, porous, etc.
- Excellent to remove biological sludge/iron bacteria
- Ideal for the regeneration of sanded or encrusted filters from limestone, iron or manganese.
- Very wide range of action and therefore excellent for wells barrier
- Very high energy input, easily measure out in based on the characteristics and to the state of the well.
- Easily combinable with other methods of regeneration.
- Available where surging is difficult, dangerous or not very effective (Johnson or spiral type filter)



## RESULTS

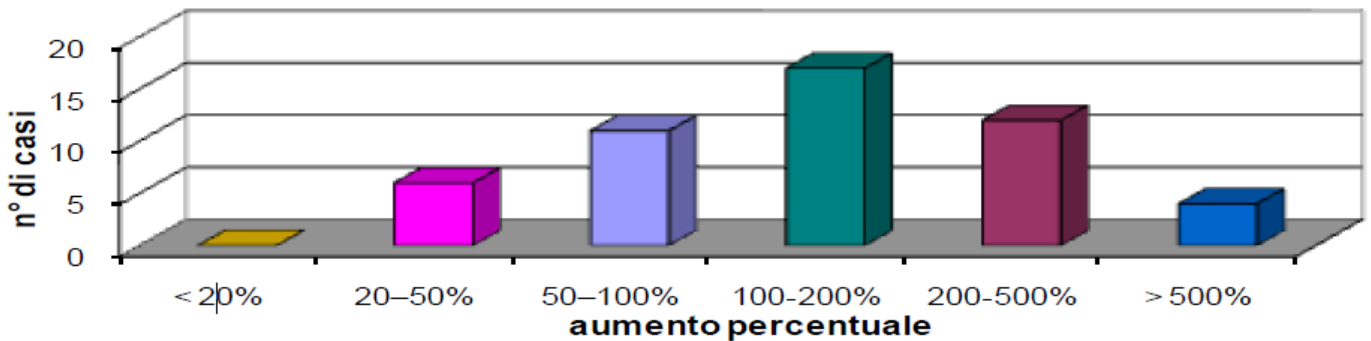
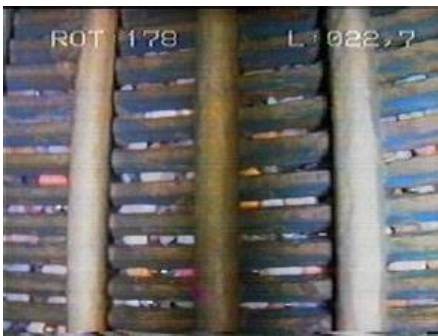


The Hydropuls® treatment has been introduced in Italy by our company in 2006 and has been used in several applications and with different purposes. It was therefore tested with all kinds of materials (steel, stainless steel, PVC, HDPE), with all types of filters (bridge, Johnson, passers-by, bushings with reps, micro-cracked, porous), with diameters

starting from DN 100 up to DN 1,000 and at depth up to 310 mt. The main scope of application is regeneration of wells that had decreased their yield. Other interventions have been successfully performed on new construction wells where the development using traditional methods had low effectiveness. In several cases it was used to clog the



drainage gravel and eliminate the dragging of sands or limo. Most of these were wells for drinking water, but interventions in wells for thermal water were successfully carried out, wells for extraction of carbon dioxide, drains horizontal reclamation, barrier wells.



In every intervention a visible increase in flow was found. Since 2006, over 300 wells have been treated with Hydropuls®. In the following graph, we represent, by percentage, the improvement reached in the first 50 interventions where it was possible to compare the data before and after treatment. The increase is based on calculation of the specific discharge (L/sec/mt) at operating discharge. The energy savings amount due to the increase in the well's yield, breakeven in no time the cost of the intervention (from a few months to a couple of years, according to the increase obtained and the daily use of the well).

**Hydropuls® is a modern development and ordinary maintenance intervention for water wells to improve the efficiency and reduce energy costs.**

