

YIELD ENHANCEMENT OF TUBE WELLS BY HYDROFRACTURING TECHNIQUE: A CASESTUDY IN SRILANKAN HARDROCKS

**A.M.R. BANDARA¹, H.A.DHARMAGUNAWARDHANE*² AND
UDENI AMARASINGHE²**

¹National Water Supply and Drainage Board, Colombo.

²Department of Geology, University of Peradeniya, Peradeniya

Over the last few decades, more than 20,000 tube wells have been constructed in the hardrock terrain of Sri Lanka for drinking water supply purposes. However, about twenty percent of these tube wells have failed due to inadequate yields.

The design of a tube well in hard rock areas consists of two main components; a) A comparatively large diameter (165mm to 205mm) vertical drill hole, cased with a PVC casing in the weathered overburden from ground level to the rock, and b) A comparatively smaller diameter (104mm to 165mm) and unlined drill hole in the rock below the casing. The depth of tube wells in hard rocks of Sri Lanka usually varies between 30 to about 100m with an average depth of 45m. Groundwater enters the tube well through the discontinuity planes such as joints, faults, lithological contacts or fractures that have been penetrated by the unlined drill hole. The yield of the tube well depends on the amount of groundwater percolating into the borehole through these structural discontinuities which in turn depends on their openness, intensity, interconnection and lateral extent. Filling of weathered materials in these joints and fractures some times reduce the flow of water in to the borehole.

The hydro fracturing technique firstly involves isolation of a low yielding discontinuity plane in the rock within the un-lined hole using one or two inflatable packers. Then a very high pressure is applied by pumping water into the isolated joint or fracture zone using a high pressure water pump (600 l/minute at 100bars). When the pressure is increased gradually, it abruptly expands the openness of the joints and also develops new interconnections of previously non connected discontinuity planes. This is indicated at the surface as a sudden drop of the pressure in the gauges connected to the high pressure water pump.

Under the present study, hydro fracturing technique was applied in 16 low yielding tube wells where the original yield was less than 17 l/minute. In 14 of these wells, the yield was less than 5 l/minute and eight were completely dry. The study revealed that the application of hydro fracturing for enhancing the yield was successful in more than 85% of the tube wells. Yield of the wells had improved to levels that they could be put into use as community water supply wells with hand pumps. Considering the cost of construction of a new tube well to replace an unsuccessful tube well in community water supply programs, it became evident that the vast majority of already drilled and failed tube wells in the country can be rehabilitated with the help of hydro fracturing technique.

The present study is the first attempt of this type applied in the hard rock tube wells in Sri Lanka.