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Power transmission through the long coaxial cable for the underwater pulsed spark discharge

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Underwater pulsed spark discharge has been proposed to rehabilitate the clogged wells in the ground water intake system in recent years. It has been proved that the shock wave developed in the surrounding water by the rapid expansion of the spark channel efficiently eliminates incrustations on the well screen. Of the various well structures, horizontal wells are practically important as they have no way of cleaning up to now. In order to accommodate this technical application, a simple capacitive discharge system is constructed with a capacitor bank, and electrode assembly, and the coaxial cable has been extended to 110 meters. Prior to the field application, the effect of the extended coaxial cable has been analyzed by the integrated simulations of the underwater spark discharge process. This paper presents the numerical model which describes the electrical power transmission thorough the transmission line. This model enables us to consider the pulse forming action of the coaxial cable in the non-linear interaction of the spark channel and capacitor bank. From the numerical analysis, it has been revealed that if the initial conditions of the spark channel are the same, no further reduction of the peak value of the pressure wave at the position of the well screen occurs even if the cable length is increased to more than 50 meters. Parametric study demonstrates that the degraded peak pressure at longer cable is mainly due to the reduction of the initial density of the spark channel.

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