

Investigation of butt fusion & electro socket fusion joints of high density polyethylene pipes using ultrasonic & microwave NDT methods

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Plastic piping is a mechanical structural material with good mechanical properties, excellent wear resistance and chemical resistance, ensuring long-term durability. There is increasing use in various industries including gas, water, sewer and telecommunications protection pipes for pressure and non-pressure applications. Although many studies have been conducted on the method of evaluating the integrity of the material itself for the variously used plastic pipes, the methods for evaluating the integrity of the fusion joints have not yet been clearly established. It is very urgently needed to procure the non-destructive testing technology for the fusion joints, which is a weak part of the plastic piping system. In this study, the suitability and effectiveness of the phased array ultrasonic testing(PAUT), time of flight diffraction(TOFD) and microwave technology(MW) were investigated for the non-destructive testing for butt fusion & electro socket fusion joints in high density polyethylene(HDPE) pressure pipes. And different non-destructive testing techniques were simultaneously applied to the HDPE pipe butt and electro-socket fusion zone using an integrated NDT system, and the test results were compared. Defects such as voids, deposits, lack of fusion, misalignment, particulate contamination, wire breakage, dimensional inconsistency, and cold fusion can be generated in fusion joint of HDPE pressure pipes. Each testing technique showed excellent characteristics for detecting of specific defects. It is suggested that complementary use of PAUT, TOFD and MW together would be advantageous in describing state of defects in polyethylene pipe fusion joints.