

An Automated Portable Multiaxial Pressure Test Rig for Qualifications of Glass/Epoxy Composite Pipes

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Abstract

An automated multiaxial cyclic loading pressure testing rig was developed as an alternative to the existing short-term test procedure specified by ISO 14692 and ASTM D2992. Conventionally, 14 months are required to estimate the residual properties at the end of expected life (20–50 years). The test periods and costs associated with this long-term test are high. To resolve this, a novel rig was developed based on the Ultimate Elastic Wall Stress (UEWS) algorithm, allowing five multiaxial stress ratios to be used. The test involved the cyclic pressurizing of the pipe with 1-min of pressure and 1-min of zero pressure. The test rig was tested under five stress ratios using glass-epoxy composite pipes with winding angles of $[\pm 45^\circ]_4$, $[\pm 55^\circ]_4$ and $[\pm 63^\circ]_4$. The rig is capable of testing both static and cyclic pressure loading, thereby reducing the test period and related costs. The results provide a more realistic failure envelope.