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Case Study: Consequential Fatigue Failure of Above Ground Terminal Piping

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Abstract

To address improved inspection of pipeline systems, regulators have requested pipeline operators to make piping systems more accessible. To respond to this, owners have revised their long established design practices to relocate below grade piping services to above ground, these being located on pipe racks.

A case study will be presented which illustrates the unexpected consequences of this change in engineering practice. Whereas piping systems were implicitly protected from dynamic loading events when they were located underground, the above ground location exposes the system to dynamic loads from the normal cyclic operation of the pipeline systems. A consequence has been damage to piping supports and supporting steel structures impacting the reliability of facility operations.

The response of designers to address cyclic loading has not been fully proven leaving facilities at risk of future damage events and impact on asset integrity and operational reliability.