



Case Study – Pipe Joint Monitoring During Leak Repair

Problem

AESL were contracted to fit leak clamps to four badly leaking pipe joints in twin 24” diameter, grey iron pipelines, which cross a major river within a bridge structure. The bridge, which carries a very busy road, has three sets of bridge deck expansion joints across its road deck. The leaking pipe joints were located close to the expansion joints. Both pipelines have thrust blocks installed where they leave the bridge structure and also have three sliding joints each, installed towards the bridge centre. Both pipelines are tied by structural members to the bridge structure at each end of the bridge, inwards of the thrust blocks. This arrangement meets the water flow forces against the thrust blocks, and the pipeline sliding joints should limit pipeline stress levels due to the bridge structure expansion and contraction.

Investigations indicated that there appeared to be very little sliding joint movement and that, as well as general deterioration the joints had suffered mechanical damage, possibly related to differential movement with the bridge structure. As the joints were in poor condition with some metal loss it was decided to fabricate and fit a fully sealed repair clamp over each leaking joint. The fitting of these seals was complicated by:

- The limited available space to position the circumferential repair clamp seal on one side of the leaking joints,
- The need to temporarily remove the pipe to bridge restraint structures to fit the leak clamps.
- The requirement not to modify or drill the listed bridge structure, which prevented repositioning of the pipe to bridge restraint structures.

Solution

The wrap around steel leak clamps were designed to seal against the pipe wall and fully enclose the leaking joints, and were to be installed with the pipeline operating. However, in order to fit the leak clamps, the pipe to bridge restraint structures would need to be temporarily removed. Removing this restraint was not considered acceptable unless it could be confirmed that no significant pipeline movement would result. Such pipeline movement could occur if the sliding joints were not functioning and the bridge movement was stressing the pipeline.



leak clamp being fitted



Linear transducer on sliding pipe joint



Vibrating wire strain gauges either side of joint

Thus monitoring instruments were installed, vibrating wire strain gauges on the pipelines close to the leaking joints, linear movement transducers at the sliding joints, and pipe wall and ambient temperature measurement. This data was recorded at the bridge over a two-month period, and automatically transferred by mobile phone to the AESL offices daily for analysis. The limited sliding joint movement for the temperature variation recorded indicated that the sliding joints required adjusting to provide more longitudinal freedom, and two joints were freed accordingly. The strain gauges were then monitored as the pipe to bridge restraint was temporarily removed.

The joint and pipe monitoring allowed the leak clamps to be safely and successfully installed.