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A New Approach to Control Running Fracture in Pipelines #141
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In this project, a new approach to control running fracture in pipelines is being investigated. Typical full-scale pipe burst tests being used in this investigation to quantify the relationship between pipe and pipeline properties and fracture behavior consist of a series of pipe segments. A running fracture was initiated in a center segment that in most tests propagates toward each end of the experimentally simulated pipeline. Crack position versus time was measured using trip-wires placed at known locations along the pipeline. These data are used to estimate the velocity of the cracks. The velocity versus position data have been used to quantify and contrast the observed rates of crack deceleration and acceleration with crack velocity trends predicted by the Battelle two-curve method. All of these tests were conducted previously.

One potential approach to quantify pipe fracture resistance is the J integral. A common problem in J-integral fracture toughness testing is obtaining a measure of the crack length. A recently proposed energy-based crack extension test methodology has been under review in this project in an effort to enhance current practices used to experimentally characterize the fracture resistance of ductile materials. The methodology attempts to estimate fracture toughness using a single specimen without the need to estimate the crack length during the test. Typically, the crack length is estimated by periodically unloading the specimen or is measured using the electric potential drop method or some other method. If the methodology being reviewed is applicable to pipe steels, or can be modified to be applicable to pipe steels, it could provide a means to assess the J-integral fracture toughness under more realistic running fracture conditions. We are currently gathering data for pipeline steels to complete our assessment of the methodology.