Field Patent for Pipelines Scale Detection by Thermal Conductivity Principle

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Abstract
Scaling is a major challenge among oil and gas pipelines globally, where it is negatively impacting the production operations and usually leads to production shortages. In fact, there are no available efficient and cost effective techniques to identify the exact scale locations on pipelines. This uncertainty of scale locations causes delays in pipelines restoration time. The common practice to identify scale locations is by performing random cuts on scattered locations of any affected pipeline until the scaled portion is observed. This practice is very costly, time consuming and requires tremendous efforts to complete the inspection of one pipeline, it also leads to significant production losses in some cases due to the multiple unnecessary cutting and welding activities.

The invented method for identifying scale locations in pipelines is based on the thermal conductivity principle and properties for the scales and the metallic pipelines. There is a considerable difference in the thermal conductivity between metallic pipelines and accumulated scales, where it is much lower for the last. Stream fluid will transfer heat to the pipeline and the pipeline surface temperature will rise up. The difference in thermal conductivity results in changes in the pipeline surface temperatures. By conducting thermal scanning using the thermal camera or any other thermal device, low temperature profiles can be easily identified on the pipeline surface which represent the scaled portions.

By utilizing this invented method, the scale location identification time will be reduced from weeks and months to only few hours compared to the conventional scale exploration method. Moreover, it will reduce the maintenance cost by eliminating the unnecessary cutting and welding activities associated with scale location exploration. The pipeline restoration time will be significantly reduced which will lead to minimizing the production interruption and enlarging the production capacity.

This invented method was submitted to United States Patent and Trademark Office and was accepted and filed under application # 18/163,122. Moreover, this invented method was tested on scaled flowlines and the scaled locations were successfully identified.