7th Quarterly Status Report

Project Title: EXTERNAL PIPELINE COATING INTEGRITY		
DOT PHMSA Advances Coatings R&D Contract # DTPH56-06-T-000022		
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Executive Summary

FEM numerical simulations were performed to address the PE adhesive layer effect on the residual stress build-up. While the thickness and Young's modulus of PE adhesive layer have little effect, the yielding of soft PE adhesive layer helps to relax the residual stress caused by the thick PE top-coat layer. Optimization of the PE adhesive layer mechanical properties that minimizes the influence of PE topcoat on residual stress build-up is possible. Experimental efforts have been placed on continuing the pull-off adhesion tests, gathering physical and thermal property data (tensile properties, T_g, water uptake) and observing the stress relaxation by water immersion. The first few months of pull-off tests will be rerun with new samples to reduce standard deviation. The data for the physical and thermal properties show that the amount of water absorbed by the FBE free film appears to reach a maximum after three months immersion time. The other data (modulus, tensile strength and strain at failure) show a degradation as immersion continues. When the residual stress of an FBE-coated stainless steel strip (1LFBE) is relaxed by immersion in 60°C water, it appears that the stress relaxes rather quickly, in that the radius of curvature increases substantially after one day and changes little thereafter. When the relaxation behavior of a 1LFBE specimen is compared to that of a 3LPE specimen, it is evident that the presence of the extra layers significantly affects the specimen's relaxation behavior. Correlation between FEM model results and experimental findings will be carried out in the next quarter.