



Dallas, Texas
April 27 – May 2, 2008

Paper A-1-05

3D MODELING OF PIPE LINERS WITH LOCAL DEFECTS

Wei (Zack) Zhao Ph.D.¹

¹ Research Director, Ultraliner Inc., Oxford, AL

ABSTRACT: Pipe liners are installed inside deteriorated existing pipelines for functional and/or structural rehabilitation purposes. Due to the condition of the existing pipe, and many construction issues, in most cases, imperfections are inevitable with liner applications. Some imperfections, such as the ovality of the tight-fitting liner and the annular gap between the host-pipe and the liner, have been well-studied by multiple groups of researchers. This paper will address local defects, which include lifts, dry spots, delaminations, etc. Local defects normally are induced to the liner as a result of incomplete cleaning, off-set joints, broken pipe sections, and other abnormalities of existing pipe shape.

A 3D finite element model has been constructed to study the influence of local defects on the critical buckling pressure of pipe liners. In this paper, local defects are simulated by reducing the thickness and modulus of elasticity in certain areas on the liner. Three aspects of local defects are of interest: (1) the distribution and spacing of defects, (2) the magnitude of the defects (maximum thickness variation or reduction of flexural modulus), and (3) the size of the defects. Simulation results show the minimum distance between adjacent defects which ensure they do not interact with one another. Then, the magnitude and size of the local defects are studied. The critical buckling pressures of liners with defects are compared with those of liners with no defects. The comparison outcomes are listed in tables and figures to facilitate application to liner design. How to accommodate in the design process for the influence of the researched defects is also discussed.