



Composite Materials in Piping Applications: Design, Analysis and Optimization of Subsea and Onshore Pipelines from FRP Materials

Dimitris Pavlou

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Complete and unified account of composite materials in oil, gas & water piping Critical calculations for pipe design and above-ground supports under varied loading conditions Theoretical tools enable evaluation of design parameters, costs and performance over time Includes CD-ROM containing algorithms for pipe design and analysis for use with Mathematica software

----- Applying materials science theory and engineering to an important infrastructure use, this book explains the design, analysis, and performance of composite materials in oil, gas, water and wastewater piping. Part one presents critical composites calculations with a special emphasis on failure analysis, dynamic responses due to pulsed and sudden loading, as well as pressure vibration. Part two offers theoretical tools for evaluating the design and lifetime performance of aboveground, underground and underwater FRP piping. The text furnishes design information for pipe and its supports, damage analysis prediction and corrosion, as well as in-service temperature and pressure gradients to carry out loading calculations. Optimization methods are presented for cost analysis. Pre- and in-service quality control and maintenance are discussed. Book is accompanied by a CD-ROM containing algorithms for pipe design and analysis using Mathematica software, which includes equations for calculating joint design, hanger widths, expansion loops, as well as safe depths for pipes under highways and railroads.

THEORETICAL TOOLS FOUND IN THIS BOOK: Mechanical design methodologies, including stress and stability analysis for FRP pipelines * Flow-pipe interaction modeling to prevent flow-induced vibration * Wave propagation modeling under hydraulic hammer conditions * Models for sizing joints, expansion loops, safe depth * Creep and fatigue behavior and damage analysis for lifetime prediction * Optimization of material cost.

QUESTIONS THE THEORETICAL TOOLS CAN HELP ANSWER: Is the dynamic behavior in flow-induced vibrations in FRP pipeline superior to similar behavior in steel pipe? * How does fiber orientation influence the mechanical behavior of pipe in installation and service? * Are the values of critical loads that cause buckling higher in FRP pipelines? * How do the strength and specific weight of FRPs influence cost?

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