Accepted Manuscript

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PII: S1359-8368(16)32241-7

DOI: 10.1016/j.compositesb.2016.11.059

Reference: JCOMB 4752

To appear in: *Composites Part B*

Received Date: 9 October 2016

Revised Date: 18 November 2016

Accepted Date: 23 November 2016

Please cite this article as: Zhou XQ, Yu DY, Shao XY, Zhang CY, Wang S, Dynamics characteristic of steady fluid conveying in the periodical partially viscoelastic composite pipeline, *Composites Part B* (2016), doi: 10.1016/j.compositesb.2016.11.059.

Dynamics characteristic of steady fluid conveying in the periodical partially viscoelastic composite pipeline

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Abstract: In this paper, the dynamic stability of the fluid-conveying in the periodically composite pipeline (FCPCP) is researched, and the FCPCP system is divided into two parts: pipeline with partial viscoelastic composite part and the conveying-fluid part. The in-plane variables of the first part are calculated by the Zig-Zag laminated shell theory, and the equilibrium equations are obtained by Hamilton's principle. Meanwhile, the equilibrium equations of the fluid part are mainly obtained by Newton's Second law. The govern equations of the FCPCP system can be determined by combining the equations obtained of the two parts, and considering the boundary conditions, and the instability of the current structure can be obtained by solve the govern equation system. The factors (Such as the thickness ratio of the pipeline, the thickness of viscoelastic damping layer and the viscoelastic composite fraction, etc.) which affected the instability of FCPCP is thoroughly examined, and validate is performed finally.

Keyword: Fluid conveying pipeline; Viscoelastic damping material; Divergence velocity; Flutter velocity

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