

RICE UNIVERSITY



AN ANALYSIS OF THE MOTION OF  
PIGS THROUGH NATURAL GAS PIPELINES

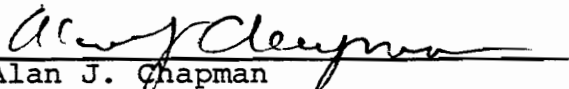
by


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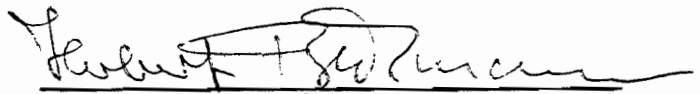
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## ABSTRACT

### AN ANALYSIS OF THE MOTION OF PIGS THROUGH NATURAL GAS PIPELINES

by

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The dynamics of propelling a pig through a natural gas pipeline, using the gas being transported, are analyzed. The gas flow is assumed to be isothermal, quasi-steady, and one-dimensional. The pig is modeled as a cylinder. For the cases considered, the pig may either obstruct the pipe and allow no gas to flow past it, or may permit gas to flow through a concentric hole in the pig, through an annulus formed by the pig and the inside of the pipe, or through both. The governing equations which describe the motion of the pig and the flow of gas in the pipe are developed. These equations form a system of nonlinear differential equations which must be solved numerically. Time derivatives are replaced by backward differences, and at each time step a system of nonlinear algebraic equations is solved. A FORTRAN program is included which solves for the important gas flow parameters and the position, velocity, and acceleration of the pig as it moves through the line.

Such a quantitative analysis provides a basis for pig design which could be applied to regulate pig velocities or to increase gas flow rates while the pig is in the line.

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