Google Gemini was asked to review George's Master's Thesis:

1961-02-01 The Instability of Stratified Flow (Mittendorf M.S. Thesis, State University of Iowa, available on loan)

The M.S. thesis, **"The Instability of Stratified Flow,"** authored by George H. Mittendorf and published in February 1961 at the State University of Iowa, is a foundational document in the field of fluid dynamics and hydraulic engineering.

Context and Significance

At the time of its publication, the State University of Iowa (home to the renowned Iowa Institute of Hydraulic Research) was a primary hub for studying fluid mechanics. Mittendorf's work addressed the transition between laminar and turbulent states in fluids with varying densities—a critical challenge in predicting how different layers of fluid interact.

In hydraulics and turbine engineering, understanding stratified flow—where fluids of different densities (often due to temperature or salinity) form distinct layers—is essential for analyzing internal waves and mixing processes.

Core Focus

The thesis explores the conditions under which these stratified layers become unstable. When the velocity difference between layers becomes sufficiently large relative to the stabilizing effect of density stratification (measured by the Richardson number), the flow creates shearing instabilities.

This research is highly relevant to our work on **Kaplan turbine optimization** and the NOAA Fisheries' "1% Efficiency Envelope." In hydraulic machinery, minimizing turbulence and optimizing flow profiles—essentially controlling the stability of fluid transitions across the runner blades—is the key to achieving peak operational efficiency and minimizing structural cavitation or fish mortality.

Availability

As noted in the citation, the document is archived as a technical publication (often cited in NIST and historical hydraulic research registries). Because it predates widespread digital repositories, it is typically accessed through university library archives or interlibrary loan services specializing in civil and hydraulic engineering collections.