# South Texas Units 3 & 4 Flow Induced Vibration Analyses on RPV Reactor Internal Components

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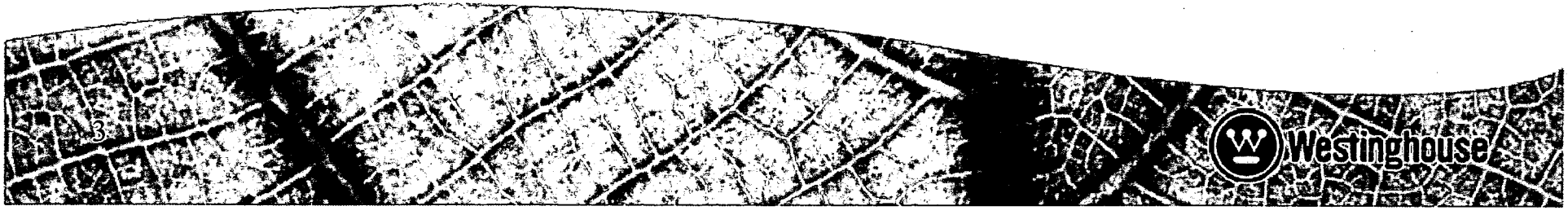
# Outline

- Acoustically-Induced Steam Dryer Loads

[ a,c ]

- Flow Induced Vibration Loads on RVI Components
  - Approach

# Flow-Induced Vibration Analysis of Steam Dryer Acoustic Loads



# Approach

- Westinghouse approach is based on a acoustic/structural methodology which has been applied to several plants and accepted by NRC for their EPU applications
  - methodology includes the prediction and evaluation of steam dryer acoustic loads
  - Combination of testing, special purpose computer programs, and finite element models

- All computer programs under configuration control consistent with Westinghouse quality assurance program

# Analysis Criteria

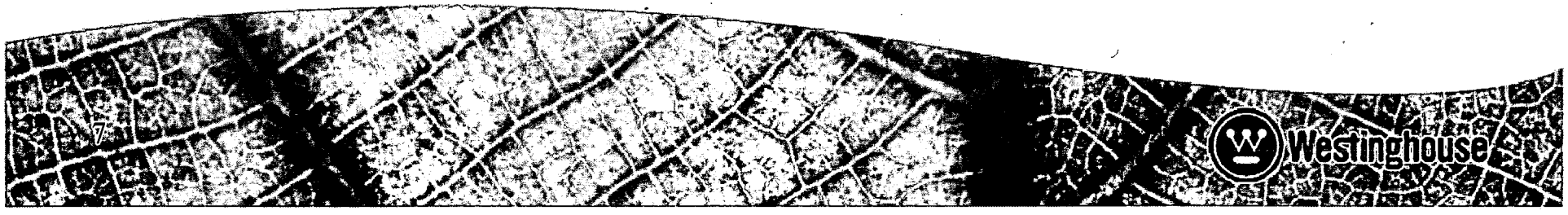
a, c

# Steam Dryer Phase 1 Evaluation

a, c

# Steam Dryer Phase 1 Evaluation (Continued)

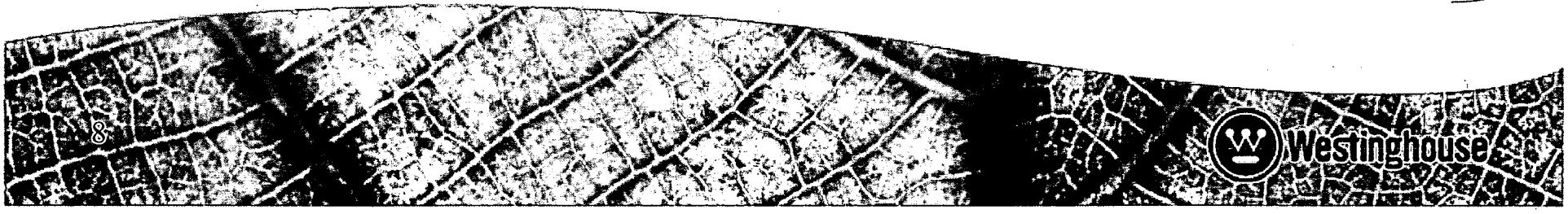
a, c



# Phase 2 Confirmatory Evaluation

a, c

[redacted]



# Flow-Induced Vibration Analysis of RVI Components Not Affected by Main Steam Line Acoustics



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# Flow-Induced Vibration Analysis for RVI Components Not Affected by Main Steam Line Acoustics

- Two categories of FIV loads considered:
  - a. Those caused directly by fluid flow excitation
  - b. Those caused by pump-induced pulsations
- Fluid flow excitation can be either discrete frequency or random turbulent, depending on the Reynolds Number of the flow.
- Pump-induced pulsations are transmitted to the fluid system and interact with the system acoustics.

# Fluid Flow-Excited Load Approach

a, c

# Crossflow Loads-Reynolds Number Dependence

a,b, c

# Defining the Type of Crossflow Load for a Component in Crossflow

- Determination of crossflow loads involves the following steps: a, c

# Defining the Type of Crossflow Load for a Component in Crossflow

- **If turbulence is dominant**, the crossflow lift and drag forces are expressed in terms of turbulent spectra: a, c

# Turbulent Spectra for Components With Parallel Flow Excitation

- **If turbulence is dominant but is not associated with crossflow**, the available turbulent spectra typically have the form:

a, c

[ ]

# Pump-Induced Acoustic Loads

- Pumps with rotating impellers can generate one-per-revolution and vane-passing pulsations. Fluid system acoustics transmit these pulsations to the system and, in some cases, can generate significant loads on system components.

a, b, c

[ ]

Questions?