



SIZING OF REMNANT THICKNESS IN PIPES AND PLATES USING CUT-OFF PROPERTIES BY WIDENING EXCITATION BANDS OF FREQUENCY AND WAVELENGTH

IITM Technology Available for Licensing

Problem Statement

- Wall thinning is a major **concern** in petrochemical & aerospace industries, & **corrosion & erosion** are a few of main reasons.
- Further, major drawbacks are observed in the range of detectable remnant wall thickness.
- The main problem discussed in said invention, is *how to provide a simplified method of non-destructive evaluation and structural health/integrity monitoring* for efficiently determining **remnant thickness** of a **structure/component**.
- Hence, said invention provides the solution in efficient manner.

Technology Category/ Market

Technology: method for detecting a defect in a thickness in pipes and plates using cut-off properties ;

Industry & Application: Oil & Gas, Chemical Industry, NDE/NDT industries;

Market: The global waveguide market is projected to grow at a **CAGR** of **6.4%** during the forecast period **(2024-32)**.

Technology

- Present patent disclosed a method for **detecting a defect**, in a **thickness of an object**, occurring due to corrosion and/or erosion.
- The cut-off property is used to **determine the remnant thickness of structures**.
- The **cut-off thickness** of a particular mode is the **minimum thickness** required for that mode to travel through the guided medium.
- For a particular mode, at **one specific frequency**, the **cut-off thickness** is constant. When cut-off frequency **increases** cut-off thickness **decreases**.
- The input excitation is coded to generate a mode in such a way that it contains a range of

desired wavelengths & frequencies in it. The **cut-off thickness** acts as a **filter** allowing only the frequencies above the **cut-off frequency** to pass through.

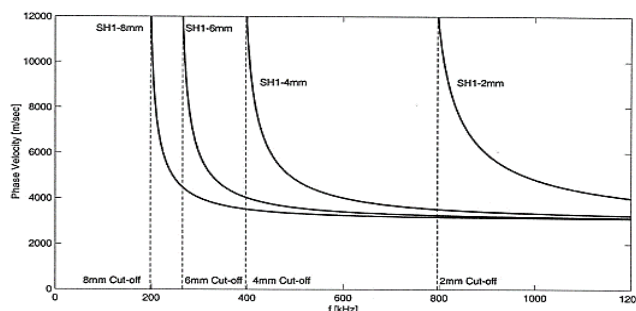


Fig.1 depicts a phase velocity dispersion curve for SH1 mode alone in aluminum plates at 4 different thickness.

- The **frequencies** below the cut-off frequency undergo **reflection to the original thickness** & one cut-off frequency value is corresponding to one thickness reduction value. Cutoff frequency can be identified by measuring **the lower frequency limit** of the particular mode transmitted through the inspection area or by measuring the **higher frequency** limit reflected from the inspection area.

Intellectual Property

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UK Patent No. GB2596966

TRL (Technology Readiness Level)

TRL-4, Technology validated in Lab

Research Lab

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Images

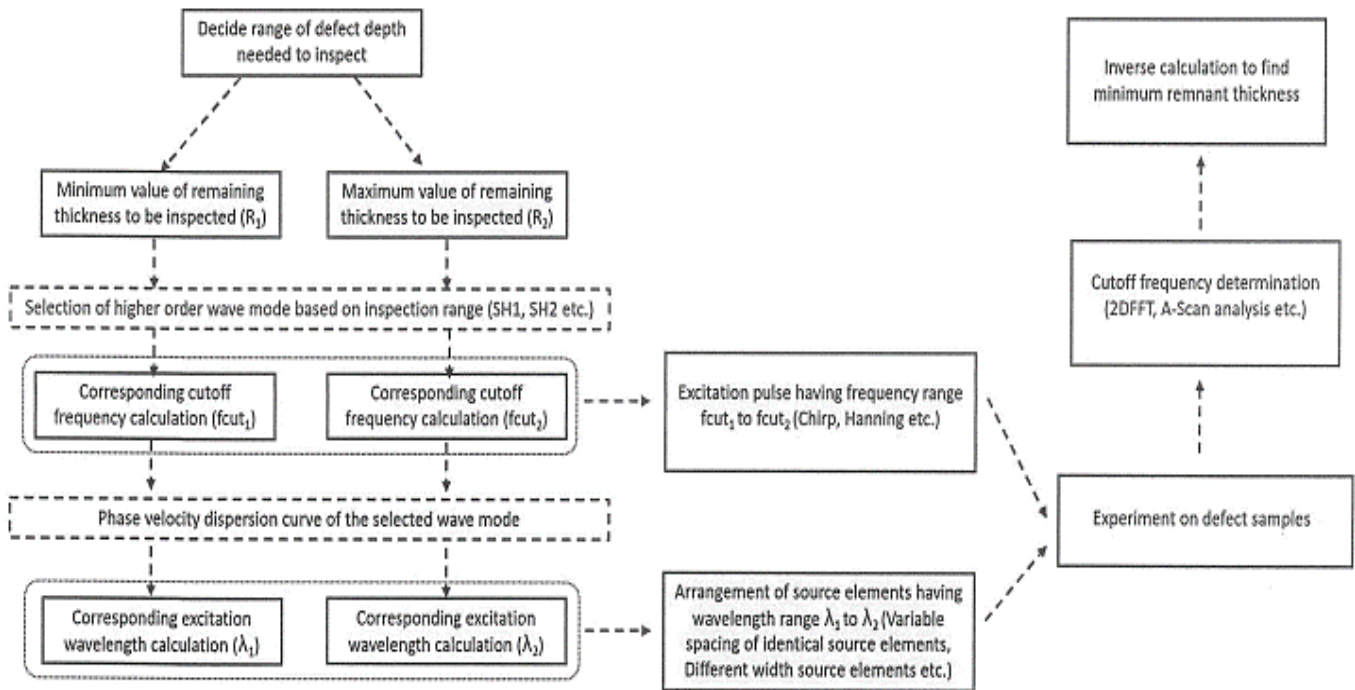


Fig. 2 shows process flow diagram of remnant thickness evaluation using cut-off properties by widening excitation bands of frequency and wavelength.

Key Features / Value Proposition

- Facilitates a **simplified method** of non-destructive evaluation & structural health and integrity monitoring which precisely evaluates/determines **remnant thickness** of a structure/component in a single testing.
- Provide an evaluating method in the areas where the remaining thickness of a structure/component needs to be precisely and quantitatively evaluated.
- Implements excitation of a **particular mode** in a wide range of frequencies and uses cut-off property to determine the remnant thickness of structures.

Input Excitation:

- The input excitation is coded in such a way that it contains a range of desired **wavelengths** and **frequencies** in it.
- The range of **wavelengths** is achieved by varying the spacing between the excitation sources in comb transduction.
- The range of **frequencies** is obtained using methods such as **chirp excitation, spike excitation or low cycle Hanning pulse**.

Utility:

- Efficiently applicable in the oil & gas industries, NDE/NDT industries and others.

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