$$QPCI_n = \sum_{i=1}^{N} \sum_{i=1}^{M} \propto (i,j) \qquad (16)$$

where $\propto (i,j) = 1, \quad b_c^2(f_i, f_j) \geq n$

$0, \quad b_c^2(f_i, f_j) < n$

where N & M are the no. of discrete frequency ranges in the cross-bicoherence spectra, n is the cross-bicoherence threshold below which the uncertainties may clutter the analysis. The purpose of introducing this metric is to examine if the single blade non-linearity offers any clues about the other blades participating simultaneously despite they are operating at different hydrostatic pressures as they rotate from one point to another.

Another metric proposed is Interaction density (I_c) it is the no. of peaks in the auto- and cross- bicoherence spectrum above a threshold value. I_c can be estimated for different speeds of the propeller. As the propeller reaches from non-cavitation stage to cavitation stage, the Ic will vary indicating different types of non-linear interactions that exist as a function of propeller RPM in the cavitation noise generation process. Ic will peak wherever there exists phase coupling between two source regions in the cavitation zone.

The third metric proposed to be used is the 'average Ic'whose value peaks when the non-linear interaction is dominant due to phase coupling of spatial regions.

6. Conclusions

The three metrics proposed can be used to quantify the magnitude of cavitation inception above certain threshold values. They have been proposed in the anticipation that these indices will give better insight than "noise level"which is being used at present to identify cavitation inception.

REFERENCES

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