KOLLOQUIUM ÜBER NEUERE ARBEITEN AUF DEM GEBIETE
DER MECHANIK UND STRÖMUNGSLEHRE
an der Technischen Universität Wien

EINLADUNG

zum Vortrag von Herrn

Prof. Samir ZIADA

McMaster University, Canada

über

"Flow-Excited Acoustic Resonance in Industry"

Zeit: Donnerstag, 22. Oktober 2009, 15:00 Uhr c.t.

Ort: SEM 322
Institut f. Strömungsmechanik und Wärmeübertragung,
Resselg. 3, Stiege 2, 1. Stock, 1040 Wien

"Flow-Excited Acoustic Resonance in Industry"

Prof. Samir Ziada

The excitation mechanism of acoustic resonances has long been recognized, but industry continues to be plagued by their undesirable consequences, manifested in severe vibration and noise problems in a wide range of situations, such as nuclear and conventional power plants, aerospace applications, and the oil and gas industries. The talk will focus primarily on two recent examples of these industrial problems.

After a brief introduction of the excitation mechanism and its various flow-sound interaction patterns, the case of acoustic resonance in closed-side branches is considered. The aeroacoustic source at the branch opening, which results from the shear layer-sound interaction, is characterized experimentally. This source is shown to be highly nonlinear and to depend not only on the Strouhal number and the amplitude of the acoustic particle velocity at the branch opening, but also on the flow-sound interaction pattern. The usage of this source to predict the onset of resonance and its intensity is also illustrated for a resonant piping system containing multiple side branches.

Two industrial examples involving flow-excited acoustic resonance of closed side-branches are presented. The first example deals with acoustic fatigue failure of the steam dryer in a boiling water reactor (BWR) due to acoustic resonance in the main steam piping system whereas the second example considers acoustic resonances in the roll posts of the STOVL Joint Strike Fighter (JSF). In both examples, effective means to alleviate the acoustic resonance mechanism are discussed.