On a Problem of Vibration of the Biofilm

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A biofilm is a complex gel-like aggregation of microorganisms like bacteria, cyanobacteria, algae, protozoa and fungi, embedded in an extracellular matrix polymeric substances (EPS). EPS develops resistance to antibiotics, to our immune system, to disinfectants or cleaning fluids. Biofilms can develop on surfaces which are in permanent contact with water, i.e. solid/liquid interfaces, but the growth of microorganisms also occurs in different types of interfaces such as air/solid, liquid/liquid or air/liquid. Biofilms are found everywhere: in industrial process, on medical devices, but also on the surface of monuments. We are interested on the formation and evolution of biofilms on fountains walls, i.e.: on stone substrates and under a water layer. These biofilms cause much damage, such as unaesthetic biological patinas, decoesion and loss of substrate-material from the surface of monuments or degradation of the internal structure.

Since the topic is huge and of great interest, some mathematical models have already been proposed. At the beginning, mathematical modeling of biofilm was mainly focused on predicting growth balance, sometimes with practical applications in mind, as inWanner et al. (2006) and Wanner and Gujer (1984, 1986). These are generally 1D models with reaction–diffusion equations for nutrients and other substrates, sometimes with a moving boundary.

The present talk is devoted to a vibration problem within the framework of a linearised (Ozeen's type) 2D model of the boifilm occupying a thin domain.

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