

Introduction to System Instabilities

One of the characteristics of multiphase flows with which the engineer has to contend is that they often manifest instabilities that have no equivalent in single phase flow (see, for example, Boure *et al.* 1973, Ishii 1982, Gouesbet and Berlemont 1993). Often the result is the occurrence of large pressure, flow rate or volume fraction oscillations that, at best, disrupt the expected behavior of the multiphase flow system (and thus decrease the reliability and life of the components, Makay and Szamody 1978) and, at worst, can lead to serious flow stoppage or structural failure (see, for example, NASA 1970, Wade 1974). Moreover, in many systems (such as pump and turbine installations) the trend toward higher rotational speeds and higher power densities increases the severity of the problem because higher flow velocities increase the potential for fluid/structure interaction problems. This chapter will focus on internal flow systems and the multiphase flow instabilities that occur in them.