2.0 INTRODUCTION

As in any other commercial chemical or petrochemical process, the heart of the coal liquefaction process is the reactor, in this case, the preheater and dissolver system. Most of the coal dissolution reactions occur in the preheater, but further hydrocracking reactions leading to sulfur removal and distillate production take place in the dissolver.

There are currently three major processes for achieving liquefaction of coal: SRC, EDS, and H-Coal. In each case, the dissolver consists of a vertical tubular vessel and contains some form of three-phase flow. Thus, an understanding of the nature of three-phase flow systems is a major requirement for the development of a feasible, optimum design.

While technology involving two-phase flow of liquid and gas has existed for some time and the behavior of such systems for small columns is fairly well documented, less substantive information is available in the literature on three-phase flow behavior, particulary in large bubble columns. Thus, work to develop the background and confidence upon which sound design decisions can be based is justified.

The behavior of solids in a three-phase flow reactor is particularly important. The particle size and fluidization behavior is a key factor in determining the extent of reaction, especially in the SRC process where ash particles have a catalytic effect. Furthermore, large particles that will settle under commercial operating conditions pose a serious problem to the successful, long-term operation of the dissolver. Thus, the design of a solids withdrawal system to remove settled solids may prove to be a key factor in determining the effectiveness and operating cycle of the dissolver and the success of the process in general.