

1. INTRODUCTION

South Australia has been proposed as a possible location for a uranium enrichment plant. The process considered most attractive for enrichment is the centrifuge process, which uses uranium hexafluoride, UF₆, as feed material. Existing technology requires that the 'tails' product from the enrichment plant, containing natural uranium and a depleted proportion of fissile uranium-235 is stored in cylinders as UF₆. The enrichment process therefore consumes considerable fluorine which is not available for recycle.

Uranium hexafluoride is produced by the successive reaction of hydrogen fluoride and elemental fluorine (produced from hydrogen fluoride) upon a purified uranium dioxide. The quantity of hydrogen fluoride required for the proposed enrichment complex would involve a major expansion by existing producers or the construction of a new plant.

On behalf of the South Australian Department of Mines, Amdel is investigating the feasibility of producing hydrogen fluoride from Australian resources. As Stage 1 of the investigation, Allen (1976)* reviewed the sources of fluorine in Australia and the various processes available for the recovery of fluorine. His study concluded that of the various alternatives available, the following processes were most likely to be competitive with the existing method, in which imported acid-grade fluorspar is reacted with sulphuric acid.

1. Production of an acid-grade fluorspar from Australian fluorite ores by physical beneficiation, followed by reaction with sulphuric acid.
2. Production of hydrogen fluoride from a fluorite ore via one of three processes which have been demonstrated at laboratory or pilot scale but not commercially.
3. Recovery of fluorine from the exhaust gases of a phosphate fertiliser plant via one of three processes which have been demonstrated at laboratory or pilot scale but not commercially.

The second stage of the investigation consists of an economic comparison of the following processes for producing hydrogen fluoride.

*ALLEN (1976). Amdel Report 1135.