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EFFICIENCY CRITERIA FOR OPTIMIZATION OF SEPARATION CASCADES FOR URANIUM ENRICHMENT

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Abstract

As is known, uranium enrichment is carried out on industrial scale by means of multistage separation facilities, i.e. separation cascades in which gas centrifuges (GCs) are connected in series and parallel. Design and construction of these facilities require significant investment. So, the problem of calculation and optimization of cascade working parameters is still relevant today. At the same time, in many cases, the minimum unit cost of a product is related to the cascade having the smallest possible number of separation elements/GCs. Also, in theoretical studies it is often acceptable to apply as an efficiency criterion the minimum total flow to supply cascade stages instead of the abovementioned minimum unit cost or the number of separation elements. In this paper, cascades with working parameter of a single GC changing from stage to stage are optimized by two the abovementioned performance criteria and compared. The results obtained allow us to make a conclusion about their differences.

Introduction

Despite the upcoming transition to fast-breeder reactors for fuel consumption of the ^{238}U isotope as well as the increasing use of blended fuels (such as uranium-plutonium), both existing and soon-to-be-implemented nuclear power reactors will remain in use for some time to come. As such, there will be ongoing demand for uranium enrichment technology that produces low enriched uranium (i.e., up to 5 % of ^{235}U).

At an industrial level, multistage separation facilities (cascades), consisting of serial-parallel combinations of GCs, are used for uranium enrichment (Borisevich et al., 2013). The design and construction of such separation plants requires significant financial investment that