Flexibility study for an MSF desalination plant

Enrique E. Tarifa[a]*, Samuel Franco[a], Demetrio Humana[a], Sergio Mussati[b]

[a]*Universidad Nacional de Jujuy — CONICET, Gorriti 237, 4600 San Salvador de Jujuy, Argentina*
Tel. +54 (388) 4221587; Fax +54 (388) 4221581; email: eetarifa@arnet.com.ar
[b]*INGAR – CONICET, Avellaneda 3657, 3000 Santa Fe, Argentina*
Tel. +54 (342) 4534451; Fax +54 (342) 4553439; email: mussati@ceride.gov.ar

ABSTRACT

This work addresses a flexibility study on a multi-stage flash (MSF) desalination plant. When any plant is designed, the engineers define the design for reaching optimal operation under nominal conditions. However, uncertain variables or disturbance cannot be handled to obtain those nominal conditions. For this reason, the design contains control elements for compensating the disturbance effects. This compensation is only possible into a region defined by the characteristics of the process and the control elements. When the actual conditions are out of that region, the compensation is not enough, and the plant is not operable. A flexibility study determines the region into which the process is operable. This information can be useful for determining design modifications to improve the process flexibility. A flexibility study involves a complex mathematical model, which is even more complex for a MSF plant. To perform the task, in this work, a stationary simulator was developed for a real-world case study, and the region exploration was performed by Monte Carlo simulation. Results show, in terms of both robustness and speed of computation, that this approach can be a useful tool.

Keywords: Flexibility; Simulation; Monte Carlo; MSF

* Corresponding author.