Abstract: The alumina digestion process in the Bayer overall process like the other hydrometallurgical processes is under the effect of various factors and the control and optimization of quality and efficiency of the process and also reducing the energy consumption are of prime importance. Process simulation provides the possibility to investigate the impact of various factors and study the optimum conditions for obtaining the desired quality and reducing the energy consumption and environmental impact. In the digestion unit, the high pressure diasporic bauxite slurry, a mixture of ground bauxite, lime and caustic liquor, is decomposed. The bauxite slurry is preheated in the high pressure tube pre-heater and then is heated up to the decomposition temperature in the furnace. The dissolution takes place in the tubular digesters and resulting product, aluminate slurry, passes through the expanding stage, including 11 flash tanks to recover the thermal energy.

In this paper the thermodynamic simulation consecutive stages of the digestion unit process including the property methods and the evaluation and verifying the simulation results against their accordance with the real conditions are studied. The obtained results showed that the outputs of the simulation have good and acceptable accordance with the empirical data. Using the simulation program; the results of some case studies showed that in the current situation, less than 70% of the energy generated in the dissolution process is directed to the pre-heaters. Also more than 30% of vapor generated in the dissolution process is dissipated and wasted. By using the vapor generated in the last two flash tanks, the efficiency of energy recycling will be increased and thus the water waste and environmental pollution will be decreased considerably.

Keywords: Bauxite, Diaspore, Slurry, Alumina digestion, Process Simulation, Electrolyte NRTL