

Libya  
Ministry of Higher Education  
and Scientific Research  
AL-Asmarya Islamic University  
Faculty of Engineering



## **SIMULATION OF THE MIDREX REFORMING UNIT USING ASPEN PLUS**

A graduation project is submitted to the Chemical Engineering Department in partial fulfillment of the requirements for the degree of *B.Sc.* in Chemical Engineering

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**Zliten, Libya**

**September 2022**

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## ABSTRACT

The surfeit of CO<sub>2</sub> as a by-product during convert the iron ore (iron oxide) to pure iron triggered an alternative chemical process to convert CO<sub>2</sub> to a mixture of hydrogen and carbon monoxide using MIDREX reformer process. Unfortunately, there is a disadvantage to the MIDREX process, in spite of potentially attractive incentives with economical and environmental benefits. The principal reason for this is the carbon-forming reaction on catalyst active site. In order to reduce carbon deposition, the catalyst was loaded inside the reformer tube with three types of catalyst activity (Eneirt, Midactiv, Highacti).

The MIDREX reformer process has been simulated with the aid of ASPEN PLUS V8.8 in this project. The process of simulating the MIDREX reformer was carried out using three fixed bed reactor types in series. The kinetic based simulation was performed using ASPEN PLUS RPLUG model blocks with a rearranged power law. The result obtained revealed that the simulation with fixed-bed reactor was validated using actual plant data (The Libyan Iron and Steel Factory, the third unit of direct reduction). The model results were able to give a satisfactory value of reformed gas temperature and conversion of CH<sub>4</sub>, carbon dioxide for reforming and carbon monoxide and water vapor with maximum error not more than 8%.

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