

Integration of Process Simulation and Metaheuristic Optimization for Economic Enhancement in Oil and Gas Processing Systems

While the integration of process simulation and metaheuristic optimization is not novel, this study demonstrates its effective application for economic enhancement in oil and gas processing. Aspen HYSYS was used to simulate baseline process configurations, and optimization was performed using Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) coded in MATLAB. Two case studies validate the approach. For Platform X, GA optimization improved daily profit from USD 4,081,242.4 to USD 4,102,197.8. At the Dinh Co Gas Processing Plant, PSO increased profit from USD 106,000 to USD 112,600 per day. The results confirm that even well-established optimization frameworks can yield substantial economic benefits when applied to real-world hydrocarbon processing systems.