

Studi komparasi tekno-ekonomi sulphur recovery unit untuk konversi gas asam membentuk sulfur dan asam sulfat pada LPG Recovery Unit = Study comparative techno-economic of SRU Technology to forming sulfur and sulfuric acid in LPG Recovery Unit

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Abstrak

Dalam industri pengolahan gas bumi, proses penyingkiran gas asam seperti H₂S diperlukan untuk memenuhi spesifikasi gas jual pada LPG Recovery. Beberapa unit pengolahan gas bumi di Indonesia memiliki konsentrasi H₂S dalam gas asam yaitu > 50%-mol. Gas asam ini kemudian diolah di unit pengubahan gas asam yang disebut Sulfur Recovery Unit. Sudah ada beberapa teknologi SRU yang dikembangkan baik industri di dunia maupun di Indonesia, namun yang sudah terbukti secara komersial diaplikasikan adalah teknologi Claus dan teknologi WSA (Wet Sulfuric Acid). Software Aspen HYSYS V.12 digunakan untuk simulasi kedua teknologi tersebut. Hasil simulasi dengan kapasitas umpan gas asam 250-500 kgmole/hr dengan komposisi H₂S >50%-mol didapatkan hasil untuk teknologi Claus Selectox menghasilkan laju alir produk sulfur = 96-115.5 ton/day; komposisi SO₂ produk gas buang = 1396 – 1862 mg/Nm³; total konversi keseluruhan reaktor 75%; efisiensi termal dari sistem boiler yaitu 46.2-50.8%; pemanfaatan listrik dari steam yang dihasilkan yaitu 26,064-29,664 MW, sedangkan teknologi WSA menghasilkan laju alir produk asam sulfat = 123.9-133.6 ton/day; SO₂ produk gas buang = 1369 – 1396 mg/Nm³; total konversi keseluruhan reaktor 82%; efisiensi termal dari sistem boiler yaitu 78-83%; pemanfaatan listrik dari steam yang dihasilkan yaitu 3,973-4,068 MW. Analisa keekonomian dari Teknologi Claus Selectox IRR = 5.5%; NPV = 12,802 USD juta; POT = 9 tahun, sedangkan Teknologi WSA IRR = 13.7%; NPV = 31,029 USD juta; POT = 8 tahun. Hasil analisa teknis dengan simulasi serta analisis keekonomian, maka teknologi WSA dipilih sebagai teknologi yang lebih baik untuk proses sulfur recovery di LPG unit.....In the oil and gas processing industry, acid gas removal processes such as H₂S are required to meet the sales gas specifications for LPG Recovery. Several natural gas processing units in Indonesia have a concentration of H₂S in acid gas, namely > 50-% mol. This acid gas is then treated in acid gas conversion unit called the Sulfur Recovery Unit. There have been several SRU technologies developed by both industry in the world and in Indonesia, but what has been proven to be commercially applied is Claus technology and WSA technology (Wet Sulfuric Acid). Aspen HYSYS V.12 software is used to simulate the two technologies. The simulation results with acid gas feed capacity of 250-500 kgmole/hr with composition of H₂S > 50%-mol obtained results for the Claus Selectox technology resulting in flow rate of sulfur products = 96-115.5 ton/day; composition of exhaust gas product SO₂ = 1396-1862 mg/Nm³; the total conversion of the reactor 75%; the thermal efficiency of the boiler is 46.2-50.8%; electricity utilization from steam produced is 26,064-29,664 MW while the WSA technology produces sulfuric acid product flow rate = 123.9-133.6 ton/day; SO₂ exhaust gas products = 1369-1396 mg/Nm³; total conversion of the reaktor 82%; the thermal efficiency of the boiler is 78-83%; electricity utilization from steam produced is 3,973-4,068 MW. Economic analysis obtained from Claus Selectox Technology IRR = 5.5%; NPV = 12,802 USD million; POT = 9 years, while WSA Technology IRR = 13.7%; NPV = 31,029 USD million; POT = 8 years. The result of technical analysis with simulation and economic analysis, the WSA technology was chosen as

a better technology for the sulfur recovery process at the LPG plant.