

## Analisis kegagalan peralatan dan optimasi proses sweetening di lapangan x = Equipment failure analysis and sweetening process optimization at field x / Rio Kurniawan

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### Abstrak

#### <b>ABSTRAK</b><br>

Lapangan X memiliki gas dengan kandungan CO<sub>2</sub> > 20% dan harus dikurangi menjadi 5% dikarenakan CO<sub>2</sub> mempengaruhi heating value gas, toxicity dan sangat korosif. Proses pemurnian gas yang dilakukan adalah absorpsi CO<sub>2</sub> dari gas alam menggunakan larutan activated methyldiethanolamine. Sejak beroperasinya unit CO<sub>2</sub> removal di Lapangan X tahun 2003, telah mengalami kegagalan, yaitu 3 kali kerusakan pada peralatan CO<sub>2</sub> removal, dimana terjadi penipisan pada dinding absorber dan kerusakan pada tray di low pressure flash, serta gas yang akan dijual masih di atas 5% sehingga dilakukan identifikasi terhadap kegagalan pada unit peralatan CO<sub>2</sub> dengan melakukan survey lapangan dan pengujian di laboratorium, serta analisis proses CO<sub>2</sub> menggunakan simulasi HYSYS. Hasil analisis data laboratorium menunjukkan kegagalan pada peralatan dapat disebabkan karena korosi CO<sub>2</sub>, Cl<sup>-</sup> dan beban mekanik, sedangkan pada simulasi, kegagalan disebabkan oleh tidak efektifnya proses absorpsi CO<sub>2</sub>, dimana sulitnya mengatur temperatur regenerasi amine yang berdampak pada temperatur lean amine sehingga regenerasi CO<sub>2</sub> tidak sempurna yang menyebabkan tingginya CO<sub>2</sub> pada outlet gas absorber, acid loading, dan loses amine & H<sub>2</sub>O. Oleh karena itu perlu dilakukan optimasi proses absorpsi CO<sub>2</sub> di Lapangan X, dengan penambahan cooler setelah LP flash sehingga temperatur regenerasi dapat mencapai 90 oC dengan tetap menjaga temperatur lean amine pada 50-60 oC. Konsentrasi amine yang dapat digunakan sekitar 40 ? 50 wt% dan flowrate amine sekitar 700 ? 1083 m<sup>3</sup>/h.

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#### <b>ABSTRACT</b><br>

Field X produces nature gas which content CO<sub>2</sub> more than 20% and should be reduced to be less than 5%. CO<sub>2</sub> very affects to the gas heating value, toxicity, and its corrosive level. Field X does absorption process to purify natural gas from CO<sub>2</sub> using activated methyldiethanolamine. Since the establishment of CO<sub>2</sub> removal unit at Field X, the equipment for CO<sub>2</sub> absorption process has been damaged three times, in example depletion of the absorber wall and damage to the tray at low pressure flash. Besides, the gas has not met the specification yet, which is CO<sub>2</sub> level above 5%. According to the situation described, we need to identify the cause of CO<sub>2</sub> equipment unit failure trough some field research, lab testing, and analysis CO<sub>2</sub> process using HYSYS simulation. Lab test result shows equipment failure can be caused by CO<sub>2</sub> corrosion, Cl<sup>-</sup> and mechanical load, while simulation result shows this failure can be caused by CO<sub>2</sub> absorption process. The difficulty to set amine regeneration temperature will impact to lean amine temperature so that CO<sub>2</sub> regeneration process not complete and cause the high value of CO<sub>2</sub> in absorber outlet gas, acid loading, and loses amine and H<sub>2</sub>O. Therefore we need to do optimization for CO<sub>2</sub> absorption process in Field X, such as adding a cooler after LP Flash so regeneration temperature reach 90&#730;C but still keep the lean amine temperature in 50 ? 60&#730;C. Amine concentration that can be used around 40-50 wt% and amine flowrate around 700 ? 1083 m<sup>3</sup>/h.;