Abstract

PERTAMINA

Title: Factors to be considered for design of the H2S Abatement Unit in Liquified Natural Gas (LNG) Plant

By: Surya Armansyah, PT. PERTAMINA (Persero), Indonesia

==========

Background

Indonesia has 3 LNG plant complexes:

1. LNG Arun in Aceh Province has 6 LNG trains (total capacity of 10 million ton per annum-MTPA);
2. LNG Bontang in East Kalimantan has 8 LNG trains (total capacity of 22.5 MTPA);
3. LNG Tangguh in Papua has 2 LNG trains (total capacity of 7 MTPA).

The Indonesian Government, represented by PERTAMINA, has a majority share of both Arun and Bontang LNG Plants.

Topic

A few years ago, it was decided to expand one of the LNG plants by building a new LNG plant beside an existing plant. It was also planned to build a new H2S Abatement Unit to comply with the Indonesia Air Quality Standard, fixing the maximum H2S content in the emission gas at less than 35 mg/m3.

The major source of the H2S emission is the Amine Regenerator Overhead, where the H2S contained in the feed gas and absorbed by the amine solvent is released along with CO2.

Some factors to be considered in designing the H2 Abatement Unit:

- LNG Plant Feed Gas Composition (C1 to C6, CO2 and H2S).
  In this case the C1 to C6 content = 93.4%, CO2 content = 6.5% and H2S =s 0.0005 % mole (dry) or 4.4 kg/hr

- Acid Offgas composition/Inlet H2S Abatement Unit
  (Flow rate, temperature, pressure and composition) In this case the H2s content is 0.06 kmole/hr or 2 kg/hr
- Process Screening (type of Adsorption process selected which is related to the H2S content: high content, lower sulfur or very low sulfur to be removed in the offgas. (The use of Simple Non-regenerative Process for very low sulphur to be removed is assumed.)
- Use 2 alternative types of catalyst: Producer A and B or catalyst type A and B
- Alternative change out of adsorbent frequency: one change per year, maybe two
- Alternative of Process Flow: Case 1-full flow or partial flow case to H2S Removal Unit or Case 2
- Evaluation/Comparison of utilizing catalyst A and B and, based on alternative of Change out and Process Flow as mentioned above, in consideration of:
  a. Total H2S absorbed
  b. Required catalyst quantity
  c. Bed size
  d. Vessel sizing
  e. Equipment cost estimates: indirect cost, total capital cost, total yearly operating cost.
  f. Economic analysis including life cycle cost estimate
  g. Plant design lay out
  h. Change out/disposal procedure
  i. Construction material of H2S Adsorption vessel

Conclusion

Based on the above factors, it could be concluded or suggested which case and which change out adsorbent frequency best meets the criteria considerations of capital cost, life cycle cost, plant design lay out and the waste disposal that has less quantity and requires less disposal area.