

含硫天然气净化厂硫化氢泄漏分析及对策

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Title: Study of hydrogen sulfide leakage and dispersion in sour gas purification plants and countermeasures

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摘要: 以川东北某含硫天然气净化厂为对象, 通过分析该净化厂的处理工艺及可能造成泄漏的各种原因, 确定了硫化氢泄漏危险较高的生产单元。通过工艺压力、流量、物料组分的比对, 选取了脱硫单元原料气和硫磺回收单元酸性气作为模拟泄漏物料。对该厂所在地的气象条件和厂区的地形地貌进行了调查, 净化厂当地近5年风速、云量统计表明低风速和多云为主导天气, 将D1 5m/s作为模拟硫化氢泄漏扩散的典型气象条件。采用了美国石油学会(API)推荐地面粗糙度长度。运用PHAST软件计算了在典型气象条件下通过3种不同孔径泄漏1 min, 5min和30min, 形成的立即危及生命或健康(IDLH)范围。在典型气象条件下IDLH的下风向边界距离在41m至1190m范围内, 以硫磺回收单元的大孔径泄漏为最远。以小孔泄漏为例模拟并讨论了风速、大气稳定度对硫化氢扩散的影响。为降低H₂S泄漏风险提出了在线监测及连锁系统设置的要求, 对避免和减少硫化氢中毒伤亡事故具有指导意义。

Abstract: Processing facilities with higher risk of H₂S leakage were determined through analyzing purifying process and various causes that may result in leakage from one of the sour gas plants in Northeastern Sichuan. The feed gas in the desulphurization units and acid gas in the sulfur recovery units, mainly consisting of H₂S and CO₂, were selected for the simulation through comparing the process pressures, flow rates and material compositions. Weather conditions and terrains around the plant were studied. According to the statistics of local meteorological data during the last 5 years, low wind speed and cloudy weather were typical weather conditions, and D1 5m/s was selected for calculation of hydrogen sulfide dispersion at the plant. Surface roughness length recommended for small refineries by American Petroleum Institute was adopted. The Immediately Dangerous to Life or Health (IDLH) zones resulted from the hazardous gas dispersions were calculated with PHAST based on three different leakage holes with 1min, 5min and 30min. The IDLH downwind distances range from 41m to 1190m with the farthest one resulting from the large hole release of feed gas from the desulphurization units under the typical weather. The effects of wind

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speeds and atmospheric stabilities on the H₂S dispersion were also simulated and discussed with small hole release. Some suggestions were made for setting online leak detection and interlock systems in order to reduce the risk of H₂S leakage It has instructive meanings in avoiding or reducing casualties due to hydrogen sulfide poisoning.

参考文献/REFERENCES

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备注/Memo: -

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