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Requirement of Dispersion Studies for Ignition Sources

Mojtaba Habibi

Process Engineer at Petroleum Engineering and Development Company (PEDEC)

Top Contributor

Dears,

Based on appendix C of API 521:

"The height and location of the flare stack should be considered, based on gas dispersion if the flame is extinguished"

As you know for flare stack sizing this is common practice to perform two kinds of studies which are radiation and dispersion studies. First case refers to hot flaring and second case refers to the case described at appendix C of API 521 as mentioned above.

My question is that should we follow the same procedure for other ignition sources such as stack of fired heaters or gas turbine generators? On the other hand do we need dispersion study for other ignition sources and the height and location of the stack should be considered, based on gas dispersion if the flame is extinguished?

Let me know your idea and experiences.

Many thanks for your time.

Best,
Mojtaba

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Vijay Prasad K

Principal HSE Engineer at PDO FEED Office

Vijay Prasad

The difference between Flare Stack and other stacks you had mentioned is that if there is a flame out situation in case of Flare Stack you can not stop the gas flow and however in case of fired heaters and other fired equipment you generally have a robust BMS which will detect flame out condition and stop all fuel flow to the fired equipment. Blindly applying the clause from API 521 could lead to conservatism (disproportional Capex with no significant risk reduction) in case of fired equipment (with robust BMS) in my opinion.

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Vyankatesh Belapurkar

Process Head

Vyankatesh

I feel the basic difference between flare stack and fired heater stack is that : In flares stack, ignition takes place at tip of the stack, and no heat transfer to equipment, hence here temperatures are high. In fired heaters, the fuel is burnt at base, and after heat transfer to coil medium, the gases leave at low temperatures-up to 160C.

I feel API 521 is applicable to both cases of stacks.

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S M Kumar
 Process Design Consultant
 Top Contributor

S M

Dear Mojtaba:

Vijay has said it well. In a flare, pilots are monitored; if pilots fail, it will take a planned shutdown to replace the pilots and at times it might be necessary to continue to flare to take the shutdown or continue to run the plant without pilots for other reasons. The flare pilots could have also failed latently – that is not detected by the thermocouples or thermocouple failure. It becomes necessary to check what happens if there is a flame-out as you can't stop what's going out of the flare tip.

In a fired heater multiple burners with multiple pilots are provided. The red hot burner refractories can reignite a momentary flame-out. Flame out is monitored by BMS and the heater is tripped. Firebox and stack temperature alarms, stack HC detectors and process coil outlet temperature alarms – multiple redundancy - etc will bring the issue to the operators attention. And the fuel can be stopped at will.

It is more common for fired heaters and gas turbine stacks to perform acid gas SO2/SO3 dispersion studies. For GTs with short stacks you also do a dispersion study to ensure that exhaust does not get into air intakes – flue gas recirculation.

Regards
 Kumar

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