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Dear all, In a recent project, N2 consumption for continous purge of vent boom during startup was considered from vent header to tip of boom (full volume) with a pressure of say 3.5 barg.

Jaganathan B
Asst. Manager (Process) at Larsen & Toubro Limited

In my opinion, N2 continous purge requirrment to full fill the following basis;
1. Supply of N2 during startup to remove air inside the cold vent header to avoid explosion mixture. Only vent header volume to be considered for calc.
2. Add leak margin (via flange in headers)of say 15percent to the final N2 consumption
3. consider higher pressure say 10barg to remove air inside the vent header(say for 1/2 hour), uptill fuel gas purge. This will reduce N2 consumption.
Readers please give your view on this..

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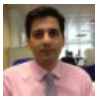

Saeid Rahimi Mofrad
Senior Specialty Process Engineer at Fluor
Top Contributor

Dear Jaganathan,

I have few questions before giving any response.

1. You have mentioned about “only vent header volume to be considered for calc.” so it seems you are excluding part of the system’s volume, what is that?

2. When the purging is done, all connections to the flare are in place and fully functional, ready for start up. The only open nozzle/flange in the whole flare system is the stack exit and therefore the nitrogen should not leak otherwise how you want to start a plant where flanges are still leaking?

3. You are talking about 10barg inside the system, but during purging the system will remain always at about atmospheric condition as you cannot pressurize such a system (open to atmosphere) with purging flow. You can pressurize the system if you use huff and puff purging (pressurized purging). This needs a valve at flare header close to the stack which is not normally available. Furthermore, you are talking about continuous purging for ½ hour which contradicts the pressurized purging concepts.

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Jaganathan B likes this

Jaganathan

Jaganathan B
Asst. Manager (Process) at Larsen & Toubro Limited

Dear Saeid, Thanks for giving thought to my query. In my above discussion I have some open ended statement, you have rightly pointed out. My answer are provided below;

1. Considered full vent system including header and stack
2. Leak considered as 15% at conservative side at feed stage to avoid any growth in piping at DD phase and flange leaks if any. I also had similar doubt and thought of reducing the percentage leak !
3. As you rightly said in point no.2, all system already pressure purged with N2 to reduce the

Oxygen to say 2% vol. In this discussion, I am talking about continuous N2 purge to avoid air ingress and to maintain positive pressure in the vent system.

Normally for pressurized purging 3.5 barg shall be used to pressurize and depressurize the system f 3 torimes with N2 to bring the Oxygen content to 2 or 3 % vol. Let me know any further clarifications required.

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Saeid Rahimi Mofrad
Senior Specialty Process Engineer at Fluor
Top Contributor

During the design stage, the main flare header, sub-headers and large branches are provided with provisions for purging. Furthermore, there might be other purging connections on the flare network for:

• sweeping the acid gas from the flare network,
• making up the gas if the released gas can condense and generate vacuum in the flare network
• assisting the heat of combustion of low LHV gases

They can be continuous/intermittent or automatic/manual. They can be just upstream of stack or at specific location on the flare network but they will be all available for purging operation. Therefore, I would calculate the volume of all flare pipes downstream of such connections for calculating nitrogen requirement for purging during start up.

Remember that almost all pressure vessels are also purged to the flare system (using their UC connections and bypassing the relief valve). Therefore, if due to any reason the process equipment are purged before flare header commissioning, most probably the concentration of air in the system will be much lower than 21% which reduces the actual amount of nitrogen required for this operation. On the other hand, most probably operators will not purge the system in such a controlled and measured manner which can end up using 50% more than the calculated figure!

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Jaganathan

Jaganathan B
Asst. Manager (Process) at Larsen & Toubro Limited

Thanks for your view. One more query related to vent header purging. How to calculate purge gas flow. Pls explain.

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Lutfhi

Lutfhi L
Offshore Operation Engineer at Pertamina Hulu Energi ONWJ Ltd

Normally, we will use HUSA correlation to calculate requirement of the purge gas injection rate. This formula shows that purge gas rate is depends on diameter of vent/flare tip and molecular weight of the purge gas injection

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Saeid Rahimi Mofrad
Senior Specialty Process Engineer at Fluor
Top Contributor

Luthfi,

The method you have named is one the various methods that can be used to estimate the amount of continuous purging gases required to prevent air ingress through the stack tip when vendor information is not available.

Jaganathan,

The volume of purging gas required during flare system commissioning is mainly function of system volume, initial and final oxygen concentrations and assumed mixing efficiency. See below link:

http://en.wikipedia.org/wiki/Dilution_(equation)

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