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Effect of Steam/Hot Oil Supply Temperature on Design Temperature of the Distillation Column

Mojtaba Habibi

Process Engineer at Wood Group

Dears,

For a distillation column equipped with reboiler which is feeding by steam/hot oil, I have seen:

First Procedure: Some companies select design temperature of the column same as supply temperature of the steam/hot oil (some of them also apply a design margin to this steam/hot oil supply temperature)

But

Second Procedure: some other compnies select the column design temperature based on maximum operating temperature obtained from simulation which is lower than steam/hot oil supply temperature.

I suppose same procedure should also be used for reboiler and overhead condenser.

1. Based on your idea and experience which procedure should be used?
2. In case of second procedure can we rely on high high temperature shutdown which is usually considered for column?

Best,
Mojtaba

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Khaled

Khaled Atwa

DCS Controller at Methanex Corporation

Dear Mojtaba, I checked for my plant (petrochemical using steam) we have the First procedure with all of the H.Ex's, and I think this is more logic and simple.

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Saeid Rahimi Mofrad

Senior Specialty Process Engineer at Fluor
Top Contributor

Dear Mojataba,

It makes difference if the hot medium is in tube or shell. I don't see any reason why to design the reboiler shell (and the column) for the heating medium design temperature if it is in tube.

It makes difference if the heating medium pressure is higher than the column pressure or not. I don't see why to design the reboiler shell side (and the column) for the heating medium design temperature, If heating medium is at lower pressure and cannot leak (tube rupture) to the high pressure side.

It makes difference if you use hot oil or steam as heating medium. I don't see any reason to design the reboiler shell side (and the column) for steam design temperature as steam temperature drops when its pressure falls to the low pressure system's relief valve set/relieving

pressure. But hot oil temperature remains constant when it leaks to the low pressure side.
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Mojtaba Habibi
Process Engineer at Wood Group

Mojtaba

Dear Saeid,

Let me clarify that:

1. As I explained above the first procedure consider design temperature of tower and connected piping, instrumentation and equipment same as supply (operating) temperature and not design temperature of steam/hot oil. This scenario involves any failure at tower temperature control loop. Then control valve on steam/hot oil supply line may go wide open and keep heating the tower contents. Then designer may not be so confident about reliability of TSHH loop to shut close the ESDV on steam/hot oil supply line and finally select the design temperature of tower same as operating temperature of steam/hot oil.
2. The concern is neither tube rupture case nor my preferred and credible scenario to select design temperature. Why? because based on what is explained at API 521, complete tube rupture is a remote case and to me this is not fair to consider tube rupture case to set design temperature of low pressure side.

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