

Please fill in the name of the event you are preparing this manuscript for.	2020 International Petroleum Technology Conference	
Please fill in your 5-digit IPTC manuscript number.	IPTC-20143-Abstract	
Please fill in your manuscript title.	Advance Dynamic Quench Control for a Propane Refrigeration System	
Please fill in your author name(s) and company affiliation.		
Given Name	Surname	Company
Firas Saleh	Alrashed	Saudi Aramco
Fahad A.	Alshamrani	Saudi Aramco
Muhammed	Hausawi	Saudi Aramco
Abdullah Ahmed	Alsowayan	Saudi Aramco
Abdulaziz M.	Bashammakh	Saudi Aramco

Abstract

Objectives/Scope:

The focus of this paper is to present an innovative control idea that will enhance propane refrigeration reliability. The proposed dynamic control depends on theoretical equations that relate saturated pressure with temperature.

Methods, Procedures, Process:

As part of the propane refrigeration compressor process, part of the hot discharge gas is recycled to the compressor suction to maintain the minimum required propane flow. A liquid quench controller is used to cool-down the recycled gas to maintain the temperature in the compressor suction. The liquid quench flow is regulated by a temperature controller at a fixed set point, despite the fluctuation of the inlet pressure. It sometimes opens and cools down the propane to a temperature lower than the saturation, into the sub-cooling stage, resulting in liquid propane accumulation in the inlet drum, which results in a compressor trip, and disturbing the natural gas liquids (NGL) process.

Results, Observations, Conclusions:

To overcome propane compressors' frequent trips, due to a high liquid level on the propane suction drums, a dynamic set point was developed to be deployed at the Khursaniyah Gas Plant. Basically, since the saturation temperature corresponding to the actual pressure can be estimated by the Antoine equation, the dynamic quench controller is configured to continuously establish a new temperature set point equal to the calculated saturation temperature by using the Antoine equation plus margin temperature to ensure propane is always in the vapor phase. By implementing a dynamic set point for the quench controller, no accumulation of propane was observed in the inlet propane suction drums, and the target temperature in the compressor suction was maintained. That resulted in ending the frequent trips of the compressor.

Novel/Additive Information:

The repetitive issue of sudden accumulated propane in the suction drum at the Khursaniyah Gas Plant was solved by implementing the dynamic control set point. This was accomplished by identifying the root causes and combining both theoretical and practical knowledge to solve it.