

Proc. 446: Revamping Ammonia Plants: Case Histories of Capacity and Energy Improvements,

by: P Orphanides.

Discussion following the presentation of the paper:

Pan Orphanides:

One of the Figures you have in the booklet is not the right one. You will receive a copy of the corrected Figure 6; the one I will show you on the screen today will be the correct one.

Peter Baldwin, retired

I have a comment about Figure 4, where you have pointed out that the pigtailed go to these injection tubes which are circulating the gas inside the reformer but it's not shown on our diagram.

Pan Orphanides:

In the text you see that the original pigtail diameter was 38 mm, and these were increased to 60 mm. We have two levels of these nozzles which are arranged symmetrically on the circumference. The nozzles are not directed at the centre but at 60 degrees to create both a whirling and a mixing effect with the pre-reform gas. As you point out, the fact that they are at an angle of 60° is not stated in the paper. I apologise.

Theo Huurdeman, DSM Agro, Netherlands

The plant in Canada was revamped for capacity increase, was the specific energy consumption still the same after this revamp, or did you gain anything on energy consumption as well.

Pan Orphanides:

The consumption was slightly worse because we stretched the plant to its utmost, but insignificantly worse - less than one per cent more specific energy consumption.

Theo Huurdeman, DSM Agro, Netherlands

The second question is on the molecular sieve system. It is shown in the Figure that a gas-fired heater was used for regenerating the molecular sieves. To me that's rather unusual - normally you would use a steam heater or electric heaters. What was the basic reasoning behind using a gas-fired heater over there?

Pan Orphanides:

In that part of Canada, Saskatchewan, they have low quality shallow gas deposits and the gas is very cheap.

Theo Huurdeman, DSM Agro, Netherlands

Nevertheless with all the arrangements and interlocks on the gas side it is more complicated than for an electric or steam heater.

Pan Orphanides:

I agree with you but it's a reliable system as it's conceived. To my knowledge in the last five years there have been no failures.

Klaus Schübel, SKW Stickstoffwerke Piesteritz GmbH, Germany:

We are operating two large ammonia plants and I am very interested in your proposals and reconstruction measurements. One question about Figure 10 however, in the reconstruction or revamp of the ammonia synthesis group. How do you operate the cooling water chiller 124-C with an inlet temperature of about 194°C? I think it's a mistake in your Figure isn't it? I made a quick calculation - in the area of about 80°C I think.

Pan Orphanides:

It has to be wrong! (Laughter). Yes the pressure is for sure not 78 bar, that should be the temperature, 78°C.

Klaus Schübel, SKW Stickstoffwerke Piesteritz GmbH, Germany:

My question is about the revamp of the CO₂ removal system. Do you use the same concentration of the potash solution? What's the figure of this concentration - about 30%?

Pan Orphanides:

I don't have the figures in mind but if you like I can look in my file and give you the concentration. I don't remember exactly.

Klaus Schübel, SKW Stickstoffwerke Piesteritz GmbH, Germany:

And the second question; what kind of activator do you use in this CO₂ removal system?

Pan Orphanides:

We are now using LS10 from Mobil. This allows us to reduce the slip from 850, which was the design with the original activator, down to 400. However the volatility is higher and you have to compensate with greater consumption of activator, nevertheless the CO₂ slip has been improved dramatically from the original 850 down to 400, but it's not included in my presentation.

David Thompson, Consultant

Considering the process condensate being used for the gas saturation. Could you tell us what was happening to the process condensate before it was re-used for saturation purposes?

Pan Orphanides:

The Kellogg design uses a conventional low pressure saturator. We kept that system, but as the process condensate is deeply stripped in the saturator the losses and the energy consumption in the LP stripper are dramatically reduced.

The Chairman thanked the speaker.