

Plant Manager+

This is the sixth in a series of discussions from a selection of round table topics discussed on the UreaKnowHow.com website. UreaKnowHow.com promotes the exchange of technical information to improve the performance and safety of urea plants. A wide range of round table discussions take place in the field of process design, operations, mechanical issues, maintenance, inspection, safety, environmental concerns, and product quality for urea, ammonia, nitric acid and other fertilizers. The sixth subject to be discussed is the choking of urea fluid bed granulator nozzles.

Problem No. 6 Choking of urea fluid bed granulator nozzles

The nozzles of a urea fluid bed granulation form the most essential part of a fluid bed granulation plant. Each licensor has developed its own specific nozzles and its



features have a significant impact on the performance and efficiency of the granulation plant. Common in every nozzle is that urea melt is mixed with air although in which way the mixing is taking place differs widely between the different technologies. In the Uhde Fertilizer Technology the nozzle produces tiny droplets which solidify and join the seed material by an accretion process leading to a very hard granule. Stamicarbon's fluid bed nozzle produces a layer of urea melt, which solidifies on the seed material forming an "onion" kind of granule leading to a very spherical shape. In a Toyo Engineering Corporation fluid bed granulator each nozzle forms a spouted bed where vigorous mixing occurs leading to round and uniform granules. Urea Casale applies a nozzle, which generates very fine droplets due to the fact that in the nozzle an emulsion of urea melt and air is formed, which is sprayed out of the nozzle. The very fine urea melt droplets make it possible to apply a urea melt feed to the granulator with a higher water content as the water is able to evaporate from the fine droplets.

This Round Table discussion discusses the problem of choking of such a nozzle: what can be the various causes and solutions. Via several rounds of questions and answers the problem area and a most likely root cause has been identified, which could solve the problem for this urea producer.



Mr Saadat Motamedi of Operations of Pardis Petrochemical Company in Iran introduces to the Round Tables his problem with choking fluid bed urea granulation nozzles illustrated with some pictures (see above) and asks:

What do you think is the cause of the choking as indicated in the pictures ?
Is it from the urea melt or atomization air stream? and why?

Mr. Prabhat Srivastava of TATA Chemical Limited in India replies:

Seeing your pictures it is my assumption that it may be possible that a particular nozzle gets partially choked and the urea melt/air mixture could not exit with the desired velocity.

Mr. Ramchandra Nesari, Freelance Consultant in India adds the following valuable information:

The choking of the nozzle can be due to following reasons:

Trapping of foreign material in the spray nozzle internals resulting into a change in the atomization profile of urea melt. Once this starts, the choking of the nozzle starts building up and finally the

nozzle gets choked completely. Also, sometimes, the internals of the nozzle get damaged due to foreign material and due to this also the atomization profile of urea melt is changed. That is why normally, atomization profile of nozzles in a row is observed through inspection window and any malfunctioning of nozzles is noted down and choked nozzles are inspected during a short shut-down of the granulator and choked nozzles/ internals are replaced with spare nozzles. What was your observations on choked nozzles/ its internals?

Mr. Mark Brouwer of UreaKnowHow.com in the Netherlands posts some more questions:

A very nice topic and good discussion.

Further I would like to ask:

- Is this problem during certain plant capacities only ?
- Did this problem occur already at the start up period of the plant or only after a certain period ?
- How long you can keep the granulator running before this problem becomes too big. Is this problem determining the operating time between stops ?

Mr. Majid Mohammadian of PIDMCO in Iran also adds some questions:

Thank you very much for your nice pictures.

In addition to Mr. Brouwer's questions please let me know the followings:

1-After how much time you faced with the problem ?

2-How many choked nozzles did you find in each bed ?

3-Regarding the pictures and as you know the type of choking in nozzles are different, So please let me know which one is in majority ?

Mr Saadat Motamedi replies:

1. After two days in service the problem starts already
2. Four nozzles in each bed
3. After opening the atomization air stream line, we realized that we have a special congestion (choking) that could not be solved with steam condensate and has a characteristic like plaster.

Mr. Majid Mohammadian asks further:

Did you find the choking problem in the main header of the atomization air or in the inlet of choked nozzles?

Mr Saadat Motamedi replies:

Choking was not in main header but it was at the inlet of the choked nozzles.

Mr. Majid Mohammadian adds:

In case you found the reason I think you can solve the problem because you should investigate for the bad distribution or the reason for insufficient air on those nozzles.

Mr. Ali Azhar of Technical Services of FFBL in Pakistan

Referring to "we found a special congestion (choking) that could not be solved with steam condensate and has a characteristic like plaster" I have the following question:

Is this some sort of plastic / jelly type material normally used for sealing purpose? RTV?

Mr. Mark Brouwer adds some suggestions :

It is also possible that there is a mechanical problem:

For example when urea melt is able to leak to the injection air, it will cause that the injection air slowly will clog. Proper attention need to be paid to the teflon closing rings, for example always use new ones when one installs a nozzle. And use sufficient teflon tape when installing the nozzles in order to assure a proper tightening.

Another possibility is that there is debris in the atomization air, but typically this happens only the first weeks of operation.

The things to do is clean the atomization air pipes by hydro jet to remove the biuret and check the individual sprayers for urea leak. If the problem happens on one single nozzle and you find a leak it

is merely an incident. If you have several problem nozzles, you better check all nozzles and do a leak test procedure.