

Questions and Answers

STEAM SYSTEM DEPOSIT

Cyclohexylamine Carbonate and Bicarbonate

What is the smelly, white deposit building up in my steam lines?

The first thought is that it might be the result of boiler water carryover, but the key observation is the odor from the deposit. When conditions are right in steam systems, cyclohexylamine carbonate or cyclohexylamine bicarbonate deposits can accumulate. When sampled, these deposits smell a lot like ammonia. The deposit is generally a very white, crystalline or granular material. Figure 1 shows a picture of this material.

What mechanical conditions contribute to the formation of these deposits?

The cause of cyclohexylamine carbonate or bicarbonate deposits in steam lines is a concentration mechanism. You see this most often in the normal installation of a pressure or temperature control instrument or heat tracing lines. The take-off point for these is typically off the top (vapor space) of a line. In these situations, the sampled space is a steam environment. Condensate may form in this area, but CO₂ and cyclohexylamine will tend to stay in the steam space. As this continues and concentrations exceed solubility limits, desublimation leads to crystal formation in no flow areas. Vertical take-offs and vertically positioned lines are more prone to plugging because there is a smaller area to plug compared to a horizontal line.

What operational factors impact this?

Sections of the steam system that do not have proper venting or see little to no flow are more likely to see this concentration mechanism.

What chemical factors impact this?

These deposits will only form in steam systems treated with cyclohexylamine. Additionally, the higher the alkalinity, the faster the deposits can accumulate.



Figure 1 - Sample of a steam system deposit that was analyzed to be cyclohexylamine carbonate.

What should I do to clean-up the deposits?

Deposits can be removed mechanically from affected areas, depending on access and the degree of deposition. A typical approach would be to replace the appropriate section of pipe.

What can I do to resolve this issue?

There are a number of remedies to consider to minimize or eliminate the condition.

- **Repipe lines to remove the concentrating mechanism**
- **Maintain temperatures above sublimation with a slow steam bleed or pipe insulation**
- **Switch to steam treatment without cyclohexylamine (or with reduced levels)**
 - *Tri-ACT™ 1840* is one optimized chemistry option to consider
- *Blow out lines weekly or biweekly before deposits have a chance to build*
- *Reduce alkalinity (CO₂) present by reducing makeup water alkalinity*

Note: Items in bold are most likely to prevent recurrence. Items in italics are most likely to slow the rate of recurrence.