



# U. S. Chemical Safety and Hazard Investigation Board

## RECOMMENDATIONS STATUS CHANGE

### SUMMARY

<b>Report:</b>	NDK Crystal, Inc. – High Pressure Vessel Rupture
<b>Recommendation Number(s):</b>	2010-04-I-IL-R5 through R8
<b>Date Issued:</b>	November 14, 2013
<b>Recipient:</b>	NDK America, Inc. formerly NDK Crystal, Inc. (NDK)
<b>New Status:</b>	R5 – Closed No Longer Applicable R6 – Closed No Longer Applicable R7 – Closed No Longer Applicable R8 – Closed No Longer Applicable
<b>Date of Status Change:</b>	October 4, 2016

#### Recommendation(s) Text:

##### **CSB Recommendation No. 2010-4-I-IL-R5**

*For the design and operation of any new NDK Crystal facility using a hydrothermal or equivalent crystal growing process, ensure that the facility uses a process that is rigorously demonstrated to be inherently safer than the existing process (for example through using lower temperatures and pressures, and/or less corrosive conditions).*

##### **CSB Recommendation No. 2010-4-I-IL-R6**

*Implement a program to ensure the ongoing integrity of any coating used on the new process vessels. Employ an expert (e.g., a coatings expert certified by NACE International (National Association of Corrosion Engineers)) to design the program.*

##### **CSB Recommendation No. 2010-4-I-IL-R7**

*Implement an annual inspection and corrective action program to ensure vessels remain resistant to environmentally induced damage mechanisms based on the inspection guidelines set forth in the American Petroleum Institute (API) Standard 510, Pressure Vessel Inspection Code.*

##### **CSB Recommendation No. 2010-4-I-IL-R8**

*Commission a facility siting study of the NDK Crystal facility by an independent consultant. Identify all vessel failure scenarios prior to restarting the crystal growing process. The siting study should include the consequences, necessary preventive measures, and emergency planning and response programs relevant to each failure scenario for all surrounding points of concern. Provide a copy of this study to the City of Belvidere Building and Zoning Department and the Illinois Boiler and Pressure Vessel Safety Division.*

#### Board Status Change Decision:

##### A. Rationale for Recommendation

On December 7, 2009, a 50-foot pressure vessel used to produce synthetic crystals ruptured at the NDK Crystal facility in Belvidere, Illinois. The vessel, located in an enclosed building, generated several projectiles when it ruptured that resulted in one fatality and one injury to members of the public, and significant property damage to both NDK Crystal and an adjacent business

The CSB determined that although the caustic sodium hydroxide solution used inside the NDK pressure vessels was known to be corrosive to carbon steel, the vessels received their initial certification from the state of Illinois for noncorrosive service. As a result, only the vessels' exteriors were inspected along with their safety relief valves. No

internal inspections were performed, and the December 7, 2009, rupture of one of the vessels resulted from internal stress corrosion cracking.

As a result of this investigation, the CSB issued four recommendations (e.g., 2010-04-I-IL-R5 through R8) to NDK pertaining to the design, maintenance and siting of synthetic crystals manufacturing process to be implemented before resuming crystal growing operations.

B. Response to the Recommendation

NDK ceased its crystal growing operations on December 7, 2009 as a result of the explosion. Since then, its Belvidere, Illinois facility has been dismantled and in July of 2016 NDK informed the CSB that it has no plans for resuming crystal growing operations in the United States using a hydrothermal or equivalent crystal growing process.

C. Board Analysis and Decision

As NDK has ceased its crystal growing operations, dismantled its Belvidere, Illinois facility, and has no plans for resuming crystal growing operations in the United States using a hydrothermal or equivalent crystal growing operation, the Board voted to change the status of CSB Recommendation No.'s **2010-04-I-IL-R5 through R8** to: **"Closed – No Longer Applicable."**