



U. S. Chemical Safety and Hazard Investigation Board

RECOMMENDATION STATUS CHANGE SUMMARY

Report:	TS USA Molten Salt Eruption
Recommendation Number:	2024-01-I-TN-R1 (R1) 2024-01-I-TN-R2 (R2) 2024-01-I-TN-R4 (R4) 2024-01-I-TN-R5 (R5) 2024-01-I-TN-R6 (R6) 2024-01-I-TN-R7 (R7)
Date Issued:	May 30, 2025
Recipient:	TS USA/HEF Groupe
New Status:	R1: Open – Acceptable Response or Alternate Response R2: Open – Acceptable Response or Alternate Response R4: Open – Acceptable Response or Alternate Response R5: Open – Acceptable Response or Alternate Response R6: Open – Acceptable Response or Alternate Response R7: Open – Acceptable Response or Alternate Response
Date of Status Change:	December 4, 2025

Recommendation Text:

Recommendations Issued to TS USA

2024-01-I-TN-R1

Implement physical, protective barriers around the molten salt baths that isolate employees from hazardous releases at all locations that perform liquid nitriding.

2024-01-I-TN-R2

Develop a safety management system that incorporates industry guidance and includes, but is not limited to:

- a. A hazard analysis program for assessing the nitriding process. The program shall incorporate industry guidance, such as the Center for Chemical Process Safety's (CCPS) Guidelines for Risk-Based Process Safety, the National Fire Protection Association's (NFPA) Standard for Ovens and Furnaces, and ASM International's Handbook. The program shall apply to new and existing parts, assess parts for accumulation hazards and sealed cavities, and include non-routine tasks such as reprocessing unsatisfactory parts.*
- b. Written operating procedures for the nitriding process. The procedures shall be based on the information gathered from the hazard analysis program. The procedures shall incorporate industry guidance, such as the Center for Chemical Process Safety's (CCPS)*

Guidelines for Risk-Based Process Safety and the CCPS's Guidelines for Writing Effective Operating and Maintenance Procedures.

- c. A training program, including written materials, for the employees involved in the nitriding process. This program shall be based on the nitriding facility's operating procedures and other relevant information from the hazard analysis program. The program shall incorporate industry guidance, such as the Center for Chemical Process Safety's (CCPS) Guidelines for Risk-Based Process Safety.*
- d. An incident investigation program. This program shall include requirements for performing causal analysis, producing written reports, and communicating findings and corrective actions throughout the entire TS USA organization. The program shall incorporate industry guidance, such as the Center for Chemical Process Safety's (CCPS) Guidelines for Risk-Based Process Safety and the CCPS's Guidelines for Investigating Process Safety Incidents.*

Recommendations Issued to HEF Groupe:

2024-01-I-TN-R4

Include physical, protective barriers as part of the standard design for liquid nitriding processes. These protective barriers shall be intended to isolate employees from molten salt releases.

2024-01-I-TN-R5

Develop a safety management system that incorporates industry guidance and includes, but is not limited to:

- a. A hazard analysis program for assessing the nitriding process. The program shall incorporate industry guidance, such as the Center for Chemical Process Safety's (CCPS) Guidelines for Risk-Based Process Safety, the National Fire Protection Association's (NFPA) Standard for Ovens and Furnaces, and ASM International's Handbook. The program shall apply to new and existing parts, assess parts for accumulation hazards and sealed cavities, and include non-routine tasks such as reprocessing unsatisfactory parts.*
- b. Written operating procedures for the nitriding process. The procedures shall be based on the information gathered from the hazard analysis program. The procedures shall incorporate industry guidance, such as the Center for Chemical Process Safety's (CCPS) Guidelines for Risk-Based Process Safety and the CCPS's Guidelines for Writing Effective Operating and Maintenance Procedures.*
- c. A training program, including written materials, for the employees involved in the nitriding process. This program shall be based on the nitriding facility's operating procedures and other relevant information from the hazard analysis program. The program shall incorporate industry guidance, such as the Center for Chemical Process Safety's (CCPS) Guidelines for Risk-Based Process Safety.*
- d. An incident investigation program. This program shall include requirements for performing causal analysis, producing written reports, and communicating findings and corrective actions throughout the entire TS USA organization. The program shall*

incorporate industry guidance, such as the Center for Chemical Process Safety's (CCPS) Guidelines for Risk-Based Process Safety and the CCPS's Guidelines for Investigating Process Safety Incidents.

2024-01-I-TN-R6

Develop and implement an effective and comprehensive Knowledge Management program for sharing knowledge throughout the HEF Groupe organization. Knowledge shall include all information from audits, hazard analyses, and incident investigations, including causal analyses and corrective actions recommended and taken. This program shall incorporate industry guidance, such as the Center for Chemical Process Safety's (CCPS) Guidelines for Process Safety Knowledge Management.

2024-01-I-TN-R7

Develop and implement a comprehensive and effective Corporate Governance program. This program shall include regular audits of subordinate facilities throughout the organization, with tracking and accountability for implementation of all recommendations and corrective actions identified in the audits. Facility adherence to the safety management system recommended above shall be evaluated during the audits. The program shall require documentation of audit findings, prompt responses to deficiencies, development of corrective actions, and implementation of the corrective actions throughout the organization. This program shall incorporate industry guidance, such as the Center for Chemical Process Safety's (CCPS) Guidelines for Implementing Process Safety Management.

Board Status Change Decision:

A. Rationale for Recommendation

On May 30, 2024, molten sodium hydroxide and sodium nitrate erupted from an oxidizing salt bath when a part being processed exploded at the TS USA facility in Chattanooga, Tennessee. Unbeknownst to plant personnel water was trapped in the hollow part which rapidly expanded upon contacting the molten material resulting in the explosion. One employee was fatally injured as a result of this incident. \$1.3 million in property damage was reported, and the facility was shut down for approximately eight months.

The U.S. Chemical Safety and Hazard Investigation Board (CSB) investigated the incident and found several safety issues including those associated with the lack of an effective safety management system specially regarding hazard analysis, operating procedures, and training. Deficiencies in learning from past incidents and corporate engagement in safety were also identified. As a result of these findings, the CSB issued three recommendations to TS USA and four recommendations to HEF Groupe. This status change summary addresses CSB Recommendation Nos. 2024-01-I-TN-R1, 2024-01-I-TN-R2, 2024-01-I-TN-R4, 2024-01-I-TN-R5, 2024-01-I-TN-R6, and 2024-01-I-TN-R7.

B. Response to the Recommendation

HEF Groupe notified the CSB that they intend to implement the recommendations issued to both TS USA and HEF Groupe. They have provided a plan of action that appears, when implemented, will satisfy the objectives of the recommendations and they provided a timeline for completion.

C. Board Analysis and Decision

Based upon the information above, the Board voted to change the statuses of CSB Recommendation Nos. 2024-01-I-TN-R1, 2024-01-I-TN-R2, 2024-01-I-TN-R4, 2024-01-I-TN-R5, 2024-01-I-TN-R6, and 2024-01-I-TN-R7 to: “Open – Acceptable Response or Alternate Response.”