Industry/TSTF Standard Technical Specification Change Traveler

Revise TSP Description

Priority/Classification 1) Correct Specifications

NUREGs Affected: ☐ 1430 ☐ 1431 ☑ 1432 ☐ 1433 ☐ 1434

Description:

Delete "dodecahydrate" and "granular" from the description of TSP and replace with hydrated form with specified moisture content.

Justification:

The chemical industry defines hydrated TSP dodecahydrate as having 45-57% moisture content. The theoretical moisture content of TSP dodecahydrate is 55% and the theoretical moisture content of TSP decahydrate is 51%. The basis for using the TSP in a hydrated form is to ensure that it will not absorb large amounts of water. The word "granular" is removed because after the TSP has been in the containment baskets and absorbed some moisture from the containment atmosphere, it is no longer granular, but is still capable of performing its safety function.

Revision History

OG Revision 0 Revision Status: Closed

Revision Proposed by: Fort Calhoun

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 29-May-96

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 04-Jun-96

TSTF Review Information

TSTF Received Date: 01-Jul-96 Date Distributed for Review 31-Jul-96

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

BWOG - Not applicable, BWOG accepts
WOG - Not applicable, WOG accepts
BWROG - Not applicable, BWROG accepts

TSTF Resolution: Approved Date: 10-Oct-96

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NRC Review Information

NRC Received Date: 22-Jan-97 NRC Reviewer: Weston, M.

NRC Comments:

3/5/97 - The reviewer, along with EMCB, finds the TSTF should modify their justification to include the term "hydrated" because it is important to clearly specify that a hydrated form of TSP is used.
4/10/97 - C. Grimes returned package to the reviewer to determine whether proposed changes are acceptable without modification, since the NRC-requested modification is to the TSTF's justification statement, but does not address whether the changes are technically acceptable.
6/11/97 - Reviewer provided justification and comment to be included in the review package. The package was modified to include the term "hydrated" because it is important to clearly specify that a hydrated form of TSP is used. From past experience, in many cases, licensees did not specify which form of TSP they were using and then made the mistake in determining the required amount by either using ahydrous instead of hydrated TSP or vice versa. The justification should be changed to:
The chemical industry defines hydrated TSP as having 45-75% moisture content. The theoretical moisture content of TSP dodecahydrate is 55% and the theoretical moisture content of TSP decahydrate is 51%. This is for [sic] using the TSP in a hydrated form is to ensure that it will not absorb large amounts of water. The word "granular" is removed because after the TSP has been in the containment baskets and adsorbed some moisture from the containment atmosphere, it is no longer granular, but is still capable of performing its safety function.
6/18/97 - to M. Reinhart for disposition.
10/1/97 - NRC requested changes to the justification.
10/2/97 - Revised Traveler provided.

Final Resolution: Superceded by Revision Final Resolution Date: 02-Oct-97

TSTF Revision 1 Revision Status: Active Next Action:

Revision Proposed by: NRC

Revision Description:
Revised justification based on NRC comments.

TSTF Review Information

TSTF Received Date: 02-Oct-97 Date Distributed for Review 02-Oct-97

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 02-Oct-97

NRC Review Information

NRC Received Date: 02-Oct-97 NRC Reviewer: Weston, M.

NRC Comments:
(No.Comments)

Final Resolution: NRC Approves Final Resolution Date: 02-Oct-97

Incorporation Into the NUREGs

File to BBS/LAN Date: TSTF Informed Date: TSTF Approved Date:

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NUREG Rev Incorporated:

Affected Technical Specifications

Bkgnd 3.5.5 Bases	TSP
LCO 3.5.5 Bases	TSP
SR 3.5.5.1	TSP

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Monsanto

TSTF-128
Rev1

The Chemical Group
800 N. Lindbergh Boulevard
St. Louis, Missouri 63167
Phone: (314) 694-1000

June 14, 1994

Mr. Andy Anderson
Consumers Power Company
27780 Blue Star Memorial Highway
Covert, Michigan 49043-9530

Dear Mr. Anderson,

Thank you for your interest in Monsanto Trisodium Phosphate Crystalline (TSP/C). The chemical referred to as Trisodium Phosphate Dodecahydrate, $4(Na_3PO_4 \cdot 12H_2O)NaOH$, is generally defined as having a moisture content range of 45-57%. The calculated theoretical moisture contained in this compound would be ~55%. Even though most material available within the industry fits the definition, Monsanto feels that the moisture levels of 47-53% routinely found for this product are more indicative of a Trisodium Phosphate Decahydrate, $4(Na_3PO_4 \cdot 10H_2O)NaOH$, which would have a theoretical moisture level of ~51%. Monsanto's position is that, due to the lower moisture content found throughout the industry, the chemical formula should be shown as the decahydrate form. Our current Trisodium Phosphate Crystalline, TSP/C, specification lists the chemical formula as the decahydrate. Monsanto also prefers the nomenclature of Trisodium Phosphate Crystalline, which does not indicate a chemical hydration level but defines moisture content by specification only.

Enclosed is the Product Data Sheet for TSP/C, Technical Granular, Code No.: 7870-100. A sample has been requested to be sent to your attention at the address above. If we can be of further assistance, please let us know.

Sincerely,

Don Oberkramer

Donald W. Oberkramer
Product Specification Coordinator
Marketing Technical Service
Industrial Products Group

TSTF-128
Rev 1

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.5 Trisodium Phosphate (TSP)

LCO 3.5.5 The TSP baskets shall contain ≥ [291] ft^3 of active TSP.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. TSP not within limits.	A.1 Restore TSP to within limits.	72 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	6 hours [12] hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.5.1	Verify the TSP baskets contain ≥ [291] ft^3 of granular trisodium phosphate dodecahydrate.	[18] months
SR 3.5.5.2	Verify that a sample from the TSP baskets provides adequate pH adjustment of RWT water.	[18] months

TSTF-128
Rev 1

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.5 Trisodium Phosphate (TSP)

BASES

BACKGROUND

Trisodium phosphate (TSP) dodecahydrate is placed on the floor or in the sump of the containment building to ensure that iodine, which may be dissolved in the recirculated reactor cooling water following a loss of coolant accident (LOCA), remains in solution. TSP also helps inhibit stress corrosion cracking (SCC) of austenitic stainless steel components in containment during the recirculation phase following an accident.

Fuel that is damaged during a LOCA will release iodine in several chemical forms to the reactor coolant and to the containment atmosphere. A portion of the iodine in the containment atmosphere is washed to the sump by containment sprays. The emergency core cooling water is borated for reactivity control. This borated water causes the sump solution to be acidic. In a low pH (acidic) solution, dissolved iodine will be converted to a volatile form. The volatile iodine will evolve out of solution into the containment atmosphere, significantly increasing the levels of airborne iodine. The increased levels of airborne iodine in containment contribute to the radiological releases and increase the consequences from the accident due to containment atmosphere leakage.

After a LOCA, the components of the core cooling and containment spray systems will be exposed to high temperature borated water. Prolonged exposure to the core cooling water combined with stresses imposed on the components can cause SCC. The SCC is a function of stress, oxygen and chloride concentrations, pH, temperature, and alloy composition of the components. High temperatures and low pH, which would be present after a LOCA, tend to promote SCC. This can lead to the failure of necessary safety systems or components.

Adjusting the pH of the recirculation solution to levels above 7.0 prevents a significant fraction of the dissolved iodine from converting to a volatile form. The higher pH thus decreases the level of airborne iodine in containment and reduces the radiological consequences from containment atmosphere leakage following a LOCA. Maintaining the

(continued)

BACKGROUND (continued)

solution pH above 7.0 also reduces the occurrence of SCC of austenitic stainless steel components in containment. Reducing SCC reduces the probability of failure of components.

Granular TSP dodecahydrate is employed as a passive form of pH control for post LOCA containment spray and core cooling water. Baskets of TSP are placed on the floor or in the sump of the containment building to dissolve from released reactor coolant water and containment sprays after a LOCA. Recirculation of the water for core cooling and containment sprays then provides mixing to achieve a uniform solution pH. The dodecahydrate form of TSP is used because of the high humidity in the containment building during normal operation. Since the TSP is hydrated, it is less likely to absorb large amounts of water from the humid atmosphere and will undergo less physical and chemical change than the anhydrous form of TSP.

hydrated form (45-57% moisture)

APPLICABLE SAFETY ANALYSES

The LOCA radiological consequences analysis takes credit for iodine retention in the sump solution based on the recirculation water pH being $\geq$ 7.0. The radionuclide releases from the containment atmosphere and the consequences of a LOCA would be increased if the pH of the recirculation water were not adjusted to 7.0 or above.

LCO

The TSP is required to adjust the pH of the recirculation water to > 7.0 after a LOCA. A pH > 7.0 is necessary to prevent significant amounts of iodine released from fuel failures and dissolved in the recirculation water from converting to a volatile form and evolving into the containment atmosphere. Higher levels of airborne iodine in containment may increase the release of radionuclides and the consequences of the accident. A pH > 7.0 is also necessary to prevent SCC of austenitic stainless steel components in containment. SCC increases the probability of failure of components.

The required amount of TSP is based upon the extreme cases of water volume and pH possible in the containment sump after a large break LOCA. The minimum required volume is the volume of TSP that will achieve a sump solution pH of

(continued)

LCO (continued)

≥ 7.0 when taking into consideration the maximum possible sump water volume and the minimum possible pH. The amount of TSP needed in the containment building is based on the mass of TSP required to achieve the desired pH. However, a required volume is specified, rather than mass, since it is not feasible to weigh the entire amount of TSP in containment. The minimum required volume is based on the manufactured density of TSP dodecahydrate. Since TSP can have a tendency to agglomerate from high humidity in the containment building, the density may increase and the volume decrease during normal plant operation. Due to possible agglomeration and increase in density, estimating the minimum volume of TSP in containment is conservative with respect to achieving a minimum required pH.

APPLICABILITY

In MODES 1, 2, and 3, the RCS is at elevated temperature and pressure, providing an energy potential for a LOCA. The potential for a LOCA results in a need for the ability to control the pH of the recirculated coolant.

In MODES 4, 5, and 6, the potential for a LOCA is reduced or nonexistent, and TSP is not required.

ACTIONS

A.1

If it is discovered that the TSP in the containment building sump is not within limits, action must be taken to restore the TSP to within limits. During plant operation the containment sump is not accessible and corrections may not be possible.

The Completion Time of 72 hours is allowed for restoring the TSP within limits, where possible, because 72 hours is the same time allowed for restoration of other ECCS components.

B.1 and B.2

If the TSP cannot be restored within limits within the Completion Time of Required Action A.1, the plant must be brought to a MODE in which the LCO does not apply. The specified Completion Times for reaching MODES 3 and 4 are

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