HNDC -TS - 20000

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Title

Boric Acid Solidification Procedure

FOR INFORMATION ONL

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0	07/31/80	M. McCauley	J. Pawlik	D.A. Grube		In-Container Solidificatio
1	11/2/81	K. McDaniel				ECN-81-264
2	5-4-82			T. McCauley		ECN-82-101

- Refer to Revision Page for tabulation of changes for each revision
- Refer to References for tabulation of codes, standards & other criteria applicable

BORIC ACID SOLIDIFICATION PROCEDURE

FOREWORD

This manual provides guidelines and procedures for the solidification of boric acid solutions using the Hittman Nuclear & Development Corporation Incontainer Solidification System. The other parts of the Incontainer Solidification System are listed below and the applicable manuals and installation, operating and maintenance procedures for those parts being used in field operations should be available and used in conjunction with these procedures:

- Liner Loading Procedure - HNDC-TS-14000
- Mixer Drive Assembly Mounting Procedure - HNDC-TS-17000
- Flexicon Cement Feed System Procedure - HNDC-TS-13000
- Electric Mixer Drive Assembly Operation and Maintenance - HNDC-TS-19000
- Hydraulic Mixer Drive Assembly Operation and Maintenance - HNDC-TS-12000
- Power Distribution and Level Control Module - HNDC-TS-18000

1.0 Prerequisites

The following prerequisites should be completed prior to the actual incontainer solidification of boric acid solutions:

1. The proper sampling and analysis of the waste to be solidified has been performed in accordance with the applicable Process Control Program.

2. The amount of waste transferred to the incontainer solidification liner has been established depending on the process to be used (i.e., with or without additive, volume limited or weight limited) and must include an allowance to assure that the limitation on contents are not exceeded and this amount has been transferred to the liner. This amount is established in accordance with the applicable Process Control Program.

3. The appropriate mixing ratios have been established in accordance with the Process Control Program and the necessary amounts of solidification agent(s) are available.

4. The pH of the waste has been determined and the proper amount of NaOH, established in accordance with Section 4.0 of this procedure, has been added to raise the pH to between 7 and 8.5 for boric acid up to 14 weight percent and to a pH of 12 or greater for boric acid with higher weight percents.

   Note: This may be accomplished by the plant in the plant's holdup tank if their radwaste system is equipped with a chemical addition system. If this is not possible, this step is to be completed after the waste is transferred to the incontainer solidification liner; however, the amount of waste to be transferred must be adjusted to allow for the addition of NaOH. Extreme caution should be used while performing this task. NaOH is highly caustic and will burn the skin. Heat will be generated as the NaOH is added. NaOH may be added as caustic flake, however, it is suggested the 50 weight percent solution be used to reduce the amount of heat generated and provide the ability to pump the solution into the liner. Solidification of boric acid solutions must not be attempted if the pH of the waste has not been adjusted to the recommended levels.

5. The waste has been allowed to cool to a temperature of 120°F up to 14 percent boric acid and to 100°F for boric acid 15 weight percent or greater.

   (Note: The waste should be allowed to cool only if it has been pretreated to the recommended pH levels to prevent any crystallization).

6. The liner mixer blade drive has been installed. The mixer head drive assembly may be electric or hydraulic for the solidification of boric acid.

7. The liner has been positioned in such a way as to allow the cement feed system and the mixer head drive to be connected. Adequate shielding has been provided, i.e., shipping cask, if necessary.

8. The cement feed system has been installed in accordance with the cement feed system procedure. The correct quantities of cement and additive have been added to the hopper(s).

9. The cement inlet valve located on the mixer head drive assembly has been opened.

2.0 Introduction

The solidification procedure described below is the final step in the incontainer solidification process of boric acid. The mixer head drive assembly is used to power the internal mixer blades and the cement feed system is used to deliver the cement and additive to the liner. The amount of each is predetermined and premeasured to assure correct mixing ratios.

3.0 Procedure

The following solidification procedure contains the necessary steps to be taken to assure an acceptable solidified product of maximum allowable volume.

1. Start the mixer drive unit in the forward direction at solidification speed in accordance with the appropriate Mixer Drive Operating Procedure.

2. Follow the Cement Feed System Procedure. Start the cement feed system and run it until all cement and additive have been added.

3. The mixing process is to continue for a minimum of 30 minutes or until the mixer stalls, whichever occurs first.

4. At this time, the screw conveyor of the cement feed system can be removed from the mixer head drive assembly, and the mixer head drive assembly can be removed from the liner and properly stored.

5. Cap the liner and replace the shield plug of the primary cask lid, if applicable.

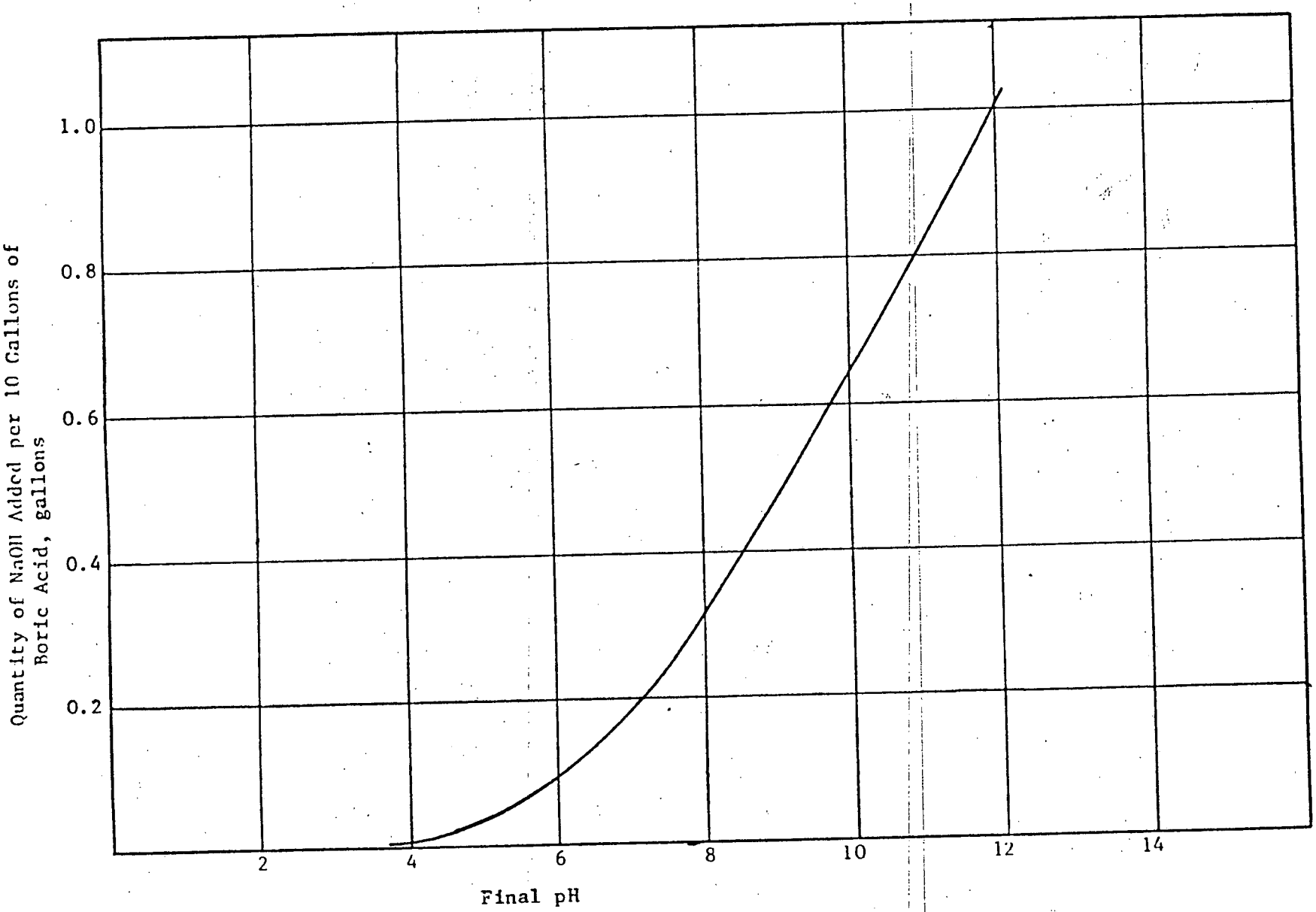
4.0 Waste pH Adjustment

4.1 Prior to solidification the pH of the waste is to be adjusted as per the requirement of Section 1.4.

4.2 Figure 1 is used to determine the approximate quantity of 50 weight percent sodium hydroxide to be used assuming an initial waste pH of 3. Following up to the curve from the desired pH and then over to the vertical axis gives the quantity of sodium hydroxide required to raise the pH of 10 gallons of waste.

4.3 For boric acid wastes which have an initial pH greater than 3 use the difference between the desired final pH and the actual initial pH. Example - To go from a pH of 8 to 10 requires 0.64 gallons (the quantity required to get to pH 10 from pH 3) minus 0.32 gallons (the quantity required to get to pH 8 from pH 3) for a net quantity of 0.32 gallons 50 weight percent NaOH per 10 gallons of boric acid.

Figure 1


Quantity of NaOH Added per 10 Gallons of Boric Acid, gallons
1.0
0.8
0.6
0.4
0.2
2
4
6
8
10
12
14
Final pH

ATTACHMENT 1

Mobile Solidification System (MSS)

The MSS takes radioactive wastes (resins and liquid wastes) and with these combines solidification agents and needed additives to solidify the waste. The solidified waste is packaged in a disposable container and placed in a shielded transportation enclosure for shipment or onsite storage. Solidification is done in accordance with a Process Control Program to ensure that each batch of waste is properly solidified. Only solidification agents (such as cement) which have been approved by licensed disposal facilities shall be used.