

**Contract No:**

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55-025

APPROVALS

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PROCEDURE FOR COATING BERL SADDLES *actual displacement volume is 30% of measured volume for 1/2 inch saddles*

The purpose of this procedure is to provide instructions for Construction Division in coating Berl saddles for iodine reactors.

I. EQUIPMENT REQUIRED

1. 185 cu.ft. of  $\frac{1}{2}$  in. Berl saddles.
2. 575 lbs.  $\text{AgNO}_3$ .
3. Stainless steel vessel, minimum 4 cu.ft. capacity. (Standard barrel is satisfactory).
4. Steam coils or water bath for item 3.
5. Two stainless baskets equipped with handles and approximately a capacity of  $2\frac{1}{2}$  to 3 cu.ft. to fit into vessel in item 3.
6. Stainless drip container for baskets listed in item 5.
7. Steam (or electric) heated furnace.
8. Small mixer or other suitable means for making up solution.
9. Steel car, or other means, for transporting containers of dipped saddles into furnace.
10. Absorbent paper to be placed on floor around working area.
11. A weighing container of accurately known volume (approximately one cu.ft.)
12. Small accurate scale with a capacity of at least 50 lbs.
13. Carbon steel 55 gal. drums with polythene liners for storing coated and dried saddles.
14. Seal type stainless steel containers or brown bottles with wooden cartons to store unused silver nitrate solution.
15. Thermometer (up to  $200^\circ\text{F}$ ), 100 ml graduated cylinder, stainless steel dipper, and hydrometers for checking specific gravity.
16. 500 cloth bags (12" x 24").

*saddles pick up 2  
3.1 lbs / cubic ft  
after coating*

II. SAFETY

1. Equipment

- a) Coveralls
- b) Canvas shoe covers
- c) Masking tape
- d) Long rubber gloves
- e) Assault masks

- f) Acid goggles
- g) Face shields
- h) Safety glasses
- i) Salt water for washing hands (2%  $\text{NaCl}$ )

*Data in production files says  
one cubic foot of wet saddles  
weighs 51.7 lbs. modified reactor*

*cartridge is charged  
with 4t.*

2. Hazards

- a) Skin contact or ingestion of silver nitrate dust particles, solutions, or crystals.
- b) Hot silver nitrate splashes.

3. Precautions

- a) Assault masks are to be worn during preparation of the solution, and in all handling of dry coated saddles.
- b) Face shields and safety glasses (or acid goggles if deemed necessary) are to be worn during all other work.
- c) Splashing of the solution is to be avoided.
- d) Do not stand directly above the container of hot solution or above the hot wet dripping saddles.

*Cartridge holds ~ 2.5 cubic feet*

II. SAFETY (contd)3. Precautions (contd)

- e) Wash all skin areas immediately with NaCl (salt) solution that come in contact with silver nitrate solution or crystals, then wash the areas with soap and water.
- f) Skin areas that become discolored because of contact with the chemical should not be scrubbed. Discoloration should be allowed to wear off.

III. INSTRUCTIONS

NOTE: During entire procedure, the coated saddles, silver nitrate crystals and solution should not be exposed to sunlight. Once started, the job should proceed without delay.

1. Prepare 77.3 wt.% solution of silver nitrate in stainless container at 170° to 180°F. Provide sufficient quantity to submerge the amount of saddles to be placed in the stainless basket. The solution is prepared by slowly adding silver nitrate to water at a ratio of 3.4 lbs of crystals to 1 lb of water. The sp.gr. should be in the range of 2.43 to 2.51.
2. Maintain solution temperature within 170-180°F range throughout the dipping operation. Determine specific gravity and correct the concentration, if required, before dipping every second batch (see section V of this procedure for determination of sp.gr. and correction of concentration).
3. Fill a stainless mesh basket with untreated, clean, and dry saddles. Immerse the saddles in the hot silver nitrate solution approximately three minutes, moving the basket gently to insure liquid movement through the saddles.
4. Raise the basket above the liquid; allow excess to drain, and transfer the basket to the stainless drip container.
5. Fill the other basket with saddles while the first basket is draining over the drip container and place the basket in the solution as outlined in item 3.
6. Transfer the drip free saddles from the first basket into the container to be used for drying.
7. Repeat the preceding operations as required to dip all of the saddles once.
8. At intervals, pour the silver nitrate solution that collects in the drip pan back into the main batch.
9. To determine the amount of silver nitrate deposited on a known volume of saddles:
  - a) Fill the weighing container (level with top) with clean, dry, uncoated saddles.
  - b) Accurately weigh the full container and uncoated saddles and carefully record the weight.
  - c) Dip, drain, and dry these saddles along with the remainder of the batch (NOT separately).
  - d) After the drying operation, refill the weighing container (level with top) with a random selection of saddles from throughout the finished batch.
  - e) Accurately weigh the full container and finished saddles and carefully record the weight. \_\_\_\_\_ pounds.
  - f) Carefully record inside dimensions of weighing container.  
\_\_\_\_\_ height      \_\_\_\_\_ width      \_\_\_\_\_ length

III. INSTRUCTIONS (contd)

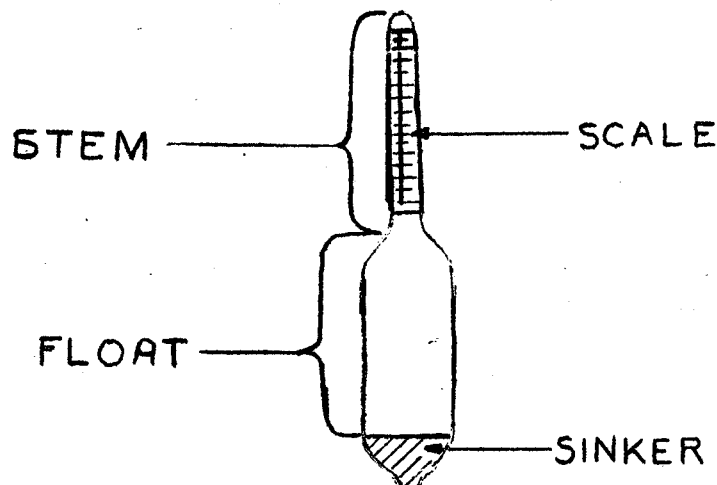
10. Place the containers of dipped saddles on the furnace steel car and move into the drying furnace. Heat furnace to a temp. of approximately 250°F.
11. Dry the saddles at 240-260°F for a minimum of six hours. 121°C
12. Record volume of unused bath. Place left over silver nitrate bath in sealed stainless containers or in box-protected brown bottles. Store this material along with unused silver nitrate crystals as directed at that time.
13. After drying, remove saddles from furnace and cool to room temperature out of direct sunlight. The finished saddles should be slightly gray in color. If darkening is noted, notify supervision.
14. Finished saddles are to be stored in cloth bags, and the bags placed in covered 55 gal. drums lined with polythene bags. The drums are to be stored in a dark, dry location as directed.
15. The finished saddles should be moved to loading areas directed by Separations in cloth bags sealed in polythene lined drums that will keep the saddles dry, unexposed to sunlight, sealed against outside dirt, and reduce dusting to a minimum.

IV. FURNACE OR OVEN REQUIREMENTS

1. It is preferred that the furnace be heated by steam coils or electricity.
2. The furnace atmosphere must be practically free of sulfur or halide contamination. Oil or gas fired furnaces should not be used.
3. If it is necessary to bring a furnace up to temp. with oil or gas before it can be maintained at a specific temp. with steam coils, furnace atmosphere should be checked before use. An active run on a sample of coated saddles or chemical analysis should be made. One hundredth of a grain of sulfur per 100 cu ft of air should not be exceeded.
4. The furnace should be controllable to a temp. of 250°F ± 10°F. Under no conditions should temp. of the saddles be allowed to exceed 350°F.

V. SPECIFIC GRAVITY DETERMINATION AND CONCENTRATION CORRECTIONGeneral

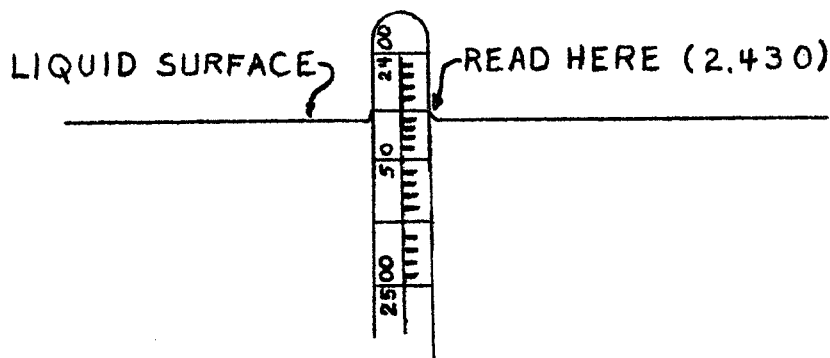
A glass hydrometer of the type to be used in this procedure is shown in the sketch below. The scale of the lower-ranged hydrometer covers the range 2.2 - 2.4, and that of the higher-ranged, 2.4 - 2.6.



V. SPECIFIC GRAVITY DETERMINATION AND CONCENTRATION CORRECTION (contd)General (contd)

Since these hydrometers are easily broken, they should be handled with extreme care. Hold hydrometer by the float until it is in the vertical position (stem up) ready to be lowered into sample; then hold it by the top of stem as it is lowered. Remove from sample by reverse procedure.

The hydrometer should float in sample with part of scale extending above liquid surface. The specific gravity is read directly from scale where stem sticks out of liquid.



To prevent cross-contamination between samples, the thermometer, hydrometer(s) and graduate should be washed and dried (tap water and clean paper towels will be sufficient) between samples.

CAUTION: Let the thermometer, hydrometer(s) and graduate cool before washing.

1. Fill graduate to approximately 100 ml with stainless steel dipper and insert thermometer and lower-ranged hydrometer. If the whole scale of the lower-ranged hydrometer extends above liquid surface, remove it and insert higher-ranged hydrometer.

NOTE: If sp.gr. is consistently higher than 2.4, the lower-ranged hydrometer need not be used.

2. When the temperature drops to 150°F, read the specific gravity.
3. If specific gravity is within the range 2.43 - 2.51, pour sample back into bath and proceed with dipping operation.
4. If specific gravity is below 2.43, pour sample back into bath, add 25 pounds of silver nitrate crystals and stir bath until they dissolve. Resample solution to make certain that specific gravity is within the range 2.43 - 2.51.
5. If specific gravity is above 2.51, pour sample back into bath; add 3 quarts of water and stir bath for 3 minutes. Resample solution to make certain that specific gravity is within the range 2.43 - 2.51.