INCREMENTAL CHANGE Release Notification Date: 01/13/2023

SPM 70-21-17 CLEANING METHOD NO. 17 - THREE-STEP HEAVY-DUTY ALKALINE DESCALING (WITH INHIBITED PHOSPHORIC ACID)

DISCLAIMER

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HIGHLIGHTS

HIGHLIGHT REFERENCE	DESCRIPTION OF CHANGE
tk70-21-17-110-037	Technical Change: Changed CAUTION and NOTE for the procedure.
sk70-21-17-110-373	Technical Change: Added seal teeth aluminum oxide topcoat to the procedure.

TASK 70-21-17-110-037

1. General.

CAUTION: DO NOT APPLY THIS PROCESS ON ALUMINUM, TITANIUM, OR CHROMIUM-PLATED PARTS.

CAUTION: MASKING OF THERMAL SPRAY WEAR COATINGS INCLUDING T400, T800, TUNGSTEN CARBIDE/COBALT, CHROME CARBIDE/NICKEL CHROME, AND SEAL TEETH ALUMINUM OXIDE TOPCOAT ARE NECESSARY FOR THIS CLEANING PROCESS UNLESS OTHERWISE SPECIFIED IN THE APPLICABLE REPAIR DOCUMENT.

NOTE: If the thermal spray wear coat and seal teeth aluminum oxide topcoat will be stripped and replaced before the part is returned to service, then the masking is not necessary.

NOTE: Thermal spray coatings have a dull gray color while chrome plating has a shiny and lighter color. If FPI is used, a thermal spray coated bearing journal will have an even background glow, while a chrome plate will have the characteristic network cracking pattern.

This cleaning method is a multiple hot-tank process that is effective in removing heat scale and oxide formations from high-temperature alloy jet engine parts.

2. Equipment.

Subtask 70-21-17-110-371

A. The following equipment is required for the application of this process:

(1) Safety equipment and devices which are standard equipment in surface treatment shops such as: eye bath, emergency showers, protective clothing against electroplating products and means for neutralizing acid or alkaline splashing.

(2) Processing plant for neutralizing waste and used solutions.

(3) Efficient ventilation system for extracting and neutralizing vapors.

(4) An alkaline degreasing tank made of stainless steel (or a carbon steel tank with a polypropylene liner) with a heating coil that is capable of heating the solution to 200°F (93°C).

(5) A water rinse tank made from stainless steel (or a carbon steel tank with a polypropylene liner) and water spray gun, used after the degreasing bath.
(6) An alkaline stripping tank made of stainless steel (or a carbon steel tank with a polypropylene liner) with a heating coil that is capable of heating the solution to 260°F (127°C).
(7) A water rinse tank made from stainless steel (or a carbon steel tank with a polypropylene liner) and a water spray gun, used after the alkaline stripping.
(8) A permanganate cleaning tank made of stainless steel with a heating coil that is capable of heating the solution to 180°F (82°C).
(9) A water rinse tank made from stainless steel (or a carbon steel tank with a polypropylene liner) and a water spray gun, used after the alkaline permanganate bath.
(10) A phosphoric acid cleaning tank made of stainless steel (or a carbon steel tank with a polypropylene liner).
(11) A water rinse tank made from stainless steel (or a carbon steel tank with a polypropylene liner) and water spray gun, used after the phosphoric acid bath.
(12) A hot water rinse tank made from stainless steel (or a carbon steel tank with a polypropylene liner) that can increase the temperature of the solution to 200°F (93°C).

3. Materials.

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Alkaline Degreasing/Rust Removing Solution - Table 1

Solution	No.	Operating Temperature °F (°C)
Ardrox 185 or Ardrox 185L	S1024	180-200 (82-93)
Turco 4181, Turco 4181-L or Turco 4181-GL	S1006	180-200 (82-93)
MagChem HDP-2888	S1017	180-200 (82-93)
Cee-Bee J-84A or Cee-Bee J-84AL	S1026	180-200 (82-93)
MagChem HDL-202	S1150	180-200 (82-93)
Eldorado HTP-1150	S1161	180-200 (82-93)
Eldorado HTP-1150L	S1162	180-200 (82-93)
Applied 5-840	S1176	180-200 (82-93)

Alkaline Permanganate Solution - Table 2

Solution	No.	Operating Temperature °F (°C)
Turco 4338 or Turco 4338-L or Turco 4338-C	S1012	160-200 (71-93)
Ardrox 188 or Ardrox 188RFU	S1001	160-200 (71-93)
Ardrox 1435	S1205	160-200 (71-93)
Alkaline permanganate	S1004	160-200 (71-93)
MagChem HDP-2524	S1018	160-200 (71-93)
MagChem HDL-2524	S1203	160-200 (71-93)
Cee-Bee J-88 or Cee-Bee J-88L	S1014	160-200 (71-93)
Eldorado HTP 1190	S1163	160-200 (71-93)
Eldorado HTP 1190L	S1164	160-200 (71-93)
Applied 5-770	S1177	180-200 (82-93)

NOTE: Operating the alkaline permanganate solution in the low end of the temperature range will extend the bath life but may decrease effectiveness. Conversely, operating the batch at the high end of the temperature range will improve cleaning ability at the risk of decreasing bath life and increasing the frequency of de-sludging.

Phosphoric Acid Solution with Inhibitor - Table 3

Solution	No.	Operating Temperature °F (°C)
Phos-it	S1016	Ambient
Ardrox 1218	S1022	Ambient
Turco 4409	S1008	Ambient
Turco 4409GL*	S1008	Ambient to 150°F (66°C)*
MagChem AP-954	S1020	Ambient
Cee-Bee C-623	S1104	Ambient
Eldorado AC-183	S1166	Ambient
Applied 2-690	S1178	Ambient
Corrosol 853	S1185	Ambient

CAUTION: * TURCO 4409GL SHOULD NOT BE USED ABOVE AMBIENT TEMPERATURE GREATER THAN 90°F(32°C) ON STEELS DUE TO THE POSSIBILITY OF HYDROGEN EMBRITTLEMENT WHEN AN OUTGASSING HEAT TREATMENT IS NOT USED.

4. Procedure.

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A. In case of excessive dirt, preclean the part using a solvent or, if necessary, vapor degrease per TASK 70-21-02-110-002, Cleaning Method No. 2 - Vapor Degreasing.

B. Apply masking to all areas that have thermal spray wear coatings including T400, T800, tungsten carbide/cobalt, chrome carbide/nickel chrome, and seal teeth aluminum oxide topcoat. Refer to TASK 70-18-01-330-801 (70-18-01, Masking Method No. 1 - Masking With Chemical Maskant) unless otherwise stated in the service document.

WARNING: ALKALINE SOLUTIONS ARE VERY ACTIVE AND CAUSE SERIOUS BURNS. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING. IF CONTACT OCCURS, WASH IMMEDIATELY WITH ABUNDANT QUANTITY OF WATER. AVOID BREATHING VAPORS.

WARNING: OPERATOR SHOULD WEAR FACE SHIELD, GLOVES, PROTECTIVE CLOTHING, AND PROTECTIVE SHOES.

C. Immerse the part in a tank containing one of the alkaline degreasing/rust removing solutions and maintain the solution at the specified temperature. The alkaline degreasing/rust removing solutions are listed in table 1 in Subtask 70-21-17-110-372, Materials.

Duration: 15 to 60 minutes.

D. Rinse by spraying with a water jet and by immersion in water at room temperature.

WARNING: ALKALINE SOLUTIONS ARE VERY ACTIVE AND CAUSE SERIOUS BURNS. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING. IF CONTACT OCCURS, WASH IMMEDIATELY WITH ABUNDANT QUANTITY OF WATER. AVOID BREATHING VAPORS.

WARNING: OPERATOR SHOULD WEAR FACE SHIELD, GLOVES, PROTECTIVE CLOTHING, AND PROTECTIVE SHOES.

E. Immerse the part in a tank containing one of the alkaline permanganate solutions and maintain the solution at the specified temperature. The alkaline permanganate solutions are listed in table 2 in Subtask 70-21-17-110-372, Materials.

Duration: 30 to 60 minutes.

F. Rinse by spraying with a water jet and by immersion in water at room temperature.

WARNING: ACID SOLUTIONS ARE VERY ACTIVE AND CAUSE SERIOUS BURNS. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING. AVOID BREATHING VAPORS. IF CONTACT OCCURS, WASH IMMEDIATELY WITH ABUNDANT QUANTITY OF WATER.

WARNING: OPERATOR SHOULD WEAR FACE SHIELD, GLOVES, PROTECTIVE CLOTHING, AND PROTECTIVE SHOES.

G. Immerse the part in a tank containing one of the phosphoric acid solutions with inhibitor listed in table 3 in Subtask 70-21-17-110-372, Materials.

Duration: 15 to 30 minutes.

H. Rinse by spraying and immersion in water at room temperature.

I. Rinse by immersion in hot water at minimum 150ºF (66ºC).

WARNING: WHEN USING COMPRESSED AIR FOR CLEANING, COOLING, OR DRYING, DO NOT EXCEED 30 PSIG (207 KPA). WEAR EYE PROTECTION AND DO NOT DIRECT COMPRESSED AIR AT SELF OR OTHERS.

CAUTION: PARTS MUST BE THOROUGHLY DRY PRIOR TO FPI INSPECTION. WATER ON THE PARTS MAY DEGRADE THE SENSITIVITY OF THE PROCESS, ESPECIALLY FOR THE WATER WASHABLE PENETRANT PROCESS.

J. Dry the part by one of the following two methods.

(1) Flash dry the part as follows.

(a) Keep the part submerged until the part reaches a temperature sufficient to provide for flash drying.

NOTE: The time required will vary with part size, water temperature and tank size. Proper flash drying is indicated by seeing the water on the surface of a part start to "flash" or "whisk" off as the part is being removed from the hot water tank.

(b) Remove the part from the water. The part will flash dry as soon as it is removed from the water. Use repositioning, suction, blotting with a clean, absorbent material, or by blowing off with an oil and water filtered shop air gun to remove excess water.

(2) You can substitute drying the part in an air re-circulating oven for the dwell time in the hot water.

(a) Remove the part from the water. You can remove excess water by repositioning, suction, blotting with a clean absorbent material, or blowing the water off with an oil and water filtered shop air gun.

(b) Move the part to the oven and dry at 200°F ± 25°F (93°C ± 14°C) until the part reaches the oven temperature and all traces of surface water are removed.

5. Quality Assurance.

Subtask 70-21-17-110-374

A. Visually check the part for removal of all traces of oxide on the part.