ARDROX® 1435

SCALE AND CARBON REMOVING AID

1 Description

Ardrox 1435 is a two-part alkaline liquid concentrate containing an oxidizing material. It is primarily intended as an aid in removing difficult heat scale such as those produced on high chromium steels and nickel and cobalt alloys, which are notoriously difficult to remove even with strong acids. Ardrox 1435 will not normally remove such scales by itself but will chemically and physically modify them in such a manner as to make them more easily removable by milder and less dangerous methods than the use of strong acids.

The main field of use for Ardrox 1435 is the overhaul of "hot end" components of gas turbine engines. Ardrox 1435 has also been found useful for the removal of adherent carbon smut produced after heat treatment.

Approvals

✓ CFM International	CFM56 SPM – S1235 & CP2702
✓ GE Commercial Engines	SPM 70-80-04, Ref. C04-279
✓ Pratt & Whitney	SPM 70-22-00, SPMC 203-1 &203-2
✓ Rolls-Royce	CSS 249 & OMat 198L
✓ SAE	ARP 1755B (conformance)
✓ Turbomeca	TS 00540L

Ask your Chemetall representative for a complete list of approvals.

2 Physical and chemical properties

Property	Ardrox® 1435A	Ardrox® 1435B
Appearance	Clear liquid	Dark purple liquid
Density	1.40 g/ml	1.16 g/ml

These are typical values only and do not constitute a specification.

3 Application

Run cleaning solution as per the instructions of the engine manufacturer standard procedure.

Ardrox 1435A and Ardrox 1435B are each typically used at 15 %v/v to 25 %v/v of the solution. The operating temperature is 88 °C to 99 °C (190 °F to 210 °F).

When making up a new bath the following procedure should be adopted:

Fill the tank half full with cold water. Add Ardrox 1435A while agitating the water and then add the Ardrox 1435B. Fill the tank to the required volume with water and then heat up to the operating temperature. The product must not be allowed to form a concentrated layer at the bottom of the tank.

It is essential that the bath is fitted with an automatic water make-up device to maintain the volume. If evaporation proceeds too quickly the concentrated solution will tend to decompose and lose its efficiency.

Ardrox 1435 is normally used in conjunction with Ardrox 185L/185 and Ardrox 1873A as a process sequence.

4 Effects on materials

When Ardrox 1435 is used in the prescribed manner no significant corrosion will take place on ferrous alloys and "Nimonic" alloys but aluminum, tin and zinc will be attacked. Glass and ceramics will be etched and many plastics and rubbers will be degraded. Polypropylene and P.T.F.E. are substantially unaffected.

Stainless steel (Grade 304 or equivalent) is recommended for the construction of tanks and heating element sheaths.

5 Shelf life

The shelf life is 3 years from date of manufacture.

6 Storage

Store under normal conditions with the containers tightly closed.

7 Waste release

All waste waters must be treated in accordance with national legislation and local regulations prior to discharge to the sewer.

8 Safety guidance

Before operating the process described it is important that this complete document, together with any relevant Safety Data sheets, be read and understood.

9 General information

Chemetall supplies a wide range of chemical products and associated equipment for cleaning, descaling, paint and carbon removal, metal working and protection and non-destructive testing. Sales Executives are available to advice on specific problems and applications.

Method of control

Changes in the composition of Ardrox 1435 solutions occur in the following ways:

- evaporation of water,
- drag-out losses,
- reduction of the oxidizing agent,
- carbonation of the alkali.

Testing chemicals and equipment required

- ✓ 2 x 50 ml burette (graduated to 0.1 ml)
- ✓ 3 x 10 ml pipette
- ✓ 1x 100 ml volumetric flask
- ✓ 2 x 250 ml beaker
- ✓ 2 x 50 ml measuring cylinders
- ✓ pH meter and suitable electrode assembly
- ✓ magnetic stirrer (optional)
- ✓ thermometer (0 °C to 100 ºC)
- ✓ 1.0 N sulphuric acid
- ✓ 50 % sulphuric acid solution
- ✓ distilled water
- ✓ 10 % potassium iodide solution
- ✓ 0.1 N sodium thiosulphate
- ✓ starch indicator solution

Procedure

Before sampling, restore the volume of the solution to its original level with water and thoroughly mix.

1) Examine the color of the sample solution. It should be a dark purple. If it is dark green, most of the oxidizing agent has been lost. This will normally only happen if the bath is allowed to become too concentrated by evaporation.
2) Pipette a 10 ml sample into a 100 ml volumetric flask and dilute to the mark with water.
3) Pipette a 10 ml aliquot from the volumetric flask and transfer to a 250 ml beaker. Add 50 ml to 60 ml of water.
4) Add 10 ml of 50 % sulphuric acid and 25 ml of 10 % potassium iodide solution to the beaker.
5) Titrate with 0.1 N sodium thiosulphate to a light yellow color. Add 1 ml to 3 ml starch solution and continue titration to the disappearance of the dark blue color. Record this titration as V_1 ml
6) Pipette 10 ml of the bath sample into a second beaker, dilute with 50 ml distilled water and cool to room temperature. Carry out a pH titration using 1.0 N sulphuric acid solution to a pH of 11.0. Let this titration be V_2 ml.

In view of the etching effect of strong solutions of sodium hydroxide on glass, it is recommended that one pH electrode is used solely for Ardrox 1435 determinations. After use it should be thoroughly rinsed in water and left in 1.0 N hydrochloric acid until next required.

Calculations

Ardrox 1435A (liters per 100 liters bath) = 0.80 x V2 ml
For a new bath this should be 20 liters.

Ardrox 1435B (liters per 100 liters bath) = 1.26 x V_1 ml
For a new bath this should be 20 liters.

The concentrations of Ardrox 1435A and Ardrox 1435B should not be allowed to drop below 15 liters / 100 liters and should not exceed 25 liters / 100 liters.

Equations for Bath Replenishment

CR = Concentration Required (liters /100 liters)
CF = Concentration Found (liters / 100 liters)
PV = Present Volume in tank (liters)
DV = Desired Volume in tank (liters)

Low concentration:

$$\text{Liters of Ardrox 1435A or Ardrox 1435B to add} = \frac{(CR * DV) - (CF * PV)}{100}$$

High concentrations:

$$\text{Liters of liquid (water and / or another part) to add} = \frac{(CF * PV)}{CR} - PV$$

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