

## Introduction

This procedure is used to determine ferric iron concentration by the oxidation of iron to the ferric state at a pH of 1 or less. The sample is titrated with a EDTA solution in the presence of a salicylic acid indicator at a pH of approximately 2.4. Hydrogen sulfide interferes with the complexing action of both the EDTA and the salicylic acid. The hydrogen sulfide can be removed by boiling the sample with hydrochloric acid at a pH below 1.

## Procedure

1. To 100 ml clear water sample add 3 drops of concentrated hydrochloric acid (HCL). Check the pH with pH paper. The pH should be between 1 and 2.
2. Add 0.5 ml of hydrogen peroxide solution. The color that develops will be the endpoint color (usually a pale yellow).
3. Add 1 ml iron indicator solution. A purple color will develop.
4. Add 0.5 ml iron buffer solution. pH should be between 2 and 3. Check with pH paper and add additional buffer if necessary.
5. Titrate with versenate hardness titration solution 20 EPM (1 ml = 20 EPM) until endpoint color in step 2 is obtained.

NOTE: If less than 1 ml of the versenate hardness titrating solution (20 EPM) is used to reach the endpoint color repeat steps 1 through 4 using 2 EPM (1 ml = 2 EPM) in place of 20 EPM versenate hardness titrating solution in step 2.

## Calculations

1. For 20 EPM versenate hardness titrating solution ppm iron (FE<sup>+++</sup>) = ml(s) versenate hardness titrating solution X 5.6. For 2 EPM versenate hardness titrating solution ppm Iron (FE<sup>+++</sup>) = ml(s) versenate hardness titrating solution X 0.56.
2. If it is necessary to convert to EPM iron: ppm iron (FE<sup>+++</sup>) / 18.6 = EPM iron (FE<sup>+++</sup>).

## Results

An iron count determination is not sufficient information to evaluate a corrosion condition. The following formulas will allow you to obtain useful data for a corrosion evaluation. The following abbreviations will be used in these formulas.

FE	ppm of iron in water from test
B/D	Barrels of water produced per day
D	Inside diameter of tubing in inches
Dp	Depth of well in feet
LI	Iron loss in lbs per day
AT	Surface area of tubing
Den	Density of iron (.283 lb/in <sup>3</sup> )

1. Calculate LI - iron loss in lbs per day:  $LI = (FE) (.00035) (B/D)$
2. Calculate AT - surface area of tubing:  $AT = (\pi (D) (12) (Dp))$
3. Calculate inches and mLs of iron per year:

$$\text{Inches / Yr} = \frac{(LI) (365) \left(\frac{1}{.283}\right)}{AT} \qquad \text{MILS / Yr} = \frac{(LI) (365) \left(\frac{1}{.00283}\right)}{AT}$$

## Parts List

Part No.	Description
209820	Versenate Hardness Titration Solution 2 EPM, 16 oz
209830	Versenate Hardness Titration Solution 20 EPM, 16 oz
209842	Iron Indicator Solution, 2 oz.
209844	Iron Buffer Solution, 2 oz
209846	Hydrogen Peroxide 3% Solution, 2 oz
209928	Hydrochloric Acid, Concentrated, 2 oz
210053	Hydrion pH Paper w/pH 2-10 & pH 1-11
204219	Instructions for Iron Count Determination
205860	Burette, Automatic, 10 ml, Single
205866	Cylinder, Graduated Glass, 100 ml (TD)
205902	Titration Dish, Plastic, 140 ml
206026	Pipette, 1 ml, Serological
206031	Plastic Stirring Rod, 4 inch
206730	Pipette Pump

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