ALTRET™ ALTRET Performance Chemicals Gujarat Pvt. Ltd.

A

COMPREHENSIVE REPORT

OF

PRE CLEANING & PASSIVATION PROGRAMME OF ENTIRE RECIRCULATING COOLING WATER SYSTEM OF ECO PLANT

AT

BILAG INDUSTRIES LTD.,

VAPI

"ALTRET" Performance Chemicals Guj. Pvt. Ltd.
12/2881, "**ALTRET** HOUSE", Sayedpura Main Road,
Surat-3, (Gujarat) INDIA.
PH: 2432514, 2451807, FAX:91 0261 2434517
E-MAIL: info@altret.com
WEB SITE: www.altret.com

ABSTRACT:

Pre cleaning of cooling water system is necessarily critical for extending service life and minimizing maintenance cost and down time for repairs. "ALTRET" pre cleaning and passivation programme safely remove deposits, corrosion products and leave passivated metal surfaces. This report will review data, role of "ALTRET" product, methodology and conclusion.

INTRODUCTION:

All new equipment that is installing in cooling water system should be pre cleaned to remove grease, oil, corrosion products, mill scale and dirt. Clean surface enable corrosion inhibitors to establish a uniform protective film. Failure to remove debris can result in deposition on critical heat exchanger surfaces during start up. Passivation of the metal reduces the initial corrosion reaction that occurs at start up and facilitates the establishment of corrosion inhibitor programme. With traditional pre cleaning method separate pre filming (passivation) step is recommended to promote a rapid formation of protective film to retard corrosion of the metal surfaces.

METHODOLOGY:

"**ALTRET"** Pre Cleaning and Passivation programme consist of moderate low pH circulation to remove mild deposit and iron scale from newly installed cooling water system, followed by rinsing and neutralization and finally metal passivation.

The pre cleaning programme was carried out in newly installed cooling water system at Eco Plant. Initial precaution was carried out by disconnected glass line and graphite line from cooling water circulating system. Water was circulated for one hour without chemical, in cooling water system. After one hour gradually "**ALTRET" 3604** was added and through out the cleaning pH was maintained between 3.5 – 6.0. pH and soluble iron ppm was measured at regular interval.

When soluble iron began to stabilized the second stage of dosage of "**ALTRET" 3604** was carried out to extract maximum mill scale. After few hours of re-circulation, when soluble iron level began to stabilize at 24 hr, rinsing of cooling water system was carried out and followed by its

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neutralization through "**ALTRET" 3602**. Finally passivation treatment (**"ALTRET" 2102** & "**ALTRET" 2112**) was given at higher dosage to passivate the system.

Cooling system operating parameters:-

1.	Type of Cooling Tower	Induced Draft
2.	Total Hold up	240 m^3
3.	Recirculation Rate	500 m^3/hr
4.	Metallurgy of system	M.S., S.S.
5.	Water being used	G.I.D.C. Water

G.I.D.C. water analysis:-

1.	pH	8.04
2.	Total Dissolved Solid (T.D.S.)	195.8 ppm
3.	M Alkalinity (As $CaCO_3$)	155.2 ppm
4.	Total Hardness (As $CaCO_3$)	135.2 ppm
5.	Calcium Hardness (As $CaCO_3$)	72.65 ppm
6.	Chloride ppm as Cl^-	59.32 ppm
7.	Silica as SiO_2	13.54 ppm
8.	Iron ppm (As Fe)	Not Detected

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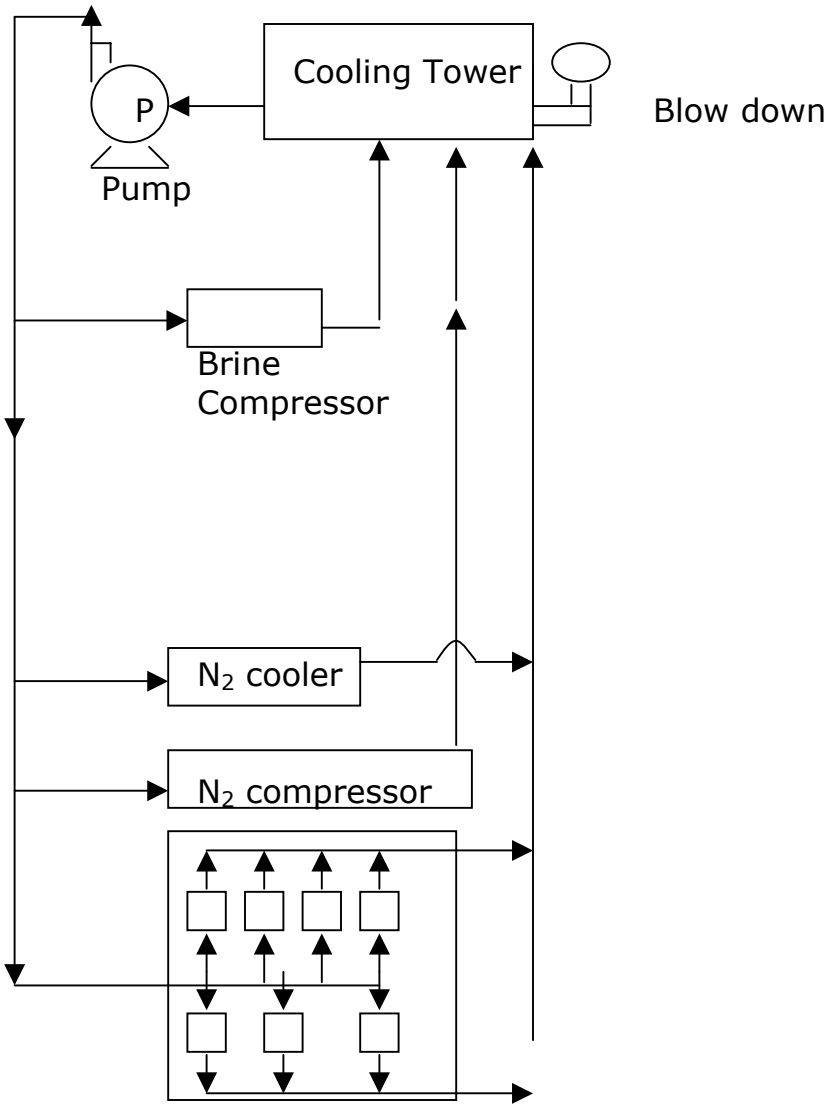
Cooling water system diagram:- (Change C.T. design accordingly)



Brine Compressors

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The role of products being used in pre cleaning and passivation is as mentioned below:

"ALTRET" 3604:

"ALTRET" 3604 is mild organic acid base descalent along with powerful iron dispersing agent and low pH corrosion inhibitor specially develop for iron deposit removal and pre cleaning of new system.

- **It reacts with insoluble iron complex and form soluble iron complex.**
- **It removes the binder which holds the corrosion product onto the metal surfaces.**
- **It contains powerful iron dispersant which removes both soluble and particulate iron.**
- **It removes minor deposit of calcium and magnesium without affecting base metal.**
- **Does not contain any Chloride or Sulphate ions.**
- **Contains acid inhibitor which protects base metals.**

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NEUTRALIZATION:

"ALTRET" 3602:

"ALTRET" 3602 is alkaline base neutralizing agent along with polymer and surfactant.

Passivation Treatment :

"ALTRET" 2102:

"ALTRET" 2102 is synergistic cooling water treatment corrosion inhibitor having a blend of phosphonate and heavy metal.

Cathodic inhibitors suppress the corrosion rate by reducing the effectiveness of cathodic process. They do not cause intense localized attack (pitting) and are generally considered safe inhibitors. Zinc causes rapid development of a protective film over the metal surface

- **Synergistic treatment**
- **Gives good protection to cast steel.**
- **Provides cathodic protection which is superior**
- **Good control in the pH range of 6.5 to 9.0**
- **The Zn effectively counteracts the anodic character of the phosphonate through the formation a phosphonate zinc complex .Which is cathodic compare to phosphonate alone.**
- **Phosphonate having a greater hydrolic stability than poly phosphate.**
- **Threshold inhibition property of phosphonate provide good control on calcium carbonate scale.**

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"ALTRET" 2112:

"ALTRET" 2112 is a synergistic formulation of poly phosphate and phosphanate along with copper inhibitor.

- **Compress formation with calcium and numerous polyvalent metal cation required to form the protective film over the metal surface. The polyphosphate still form the colloidal species for cathodic protection and the phosphonate serves as a cathodic polarizer.**
- **Anodic portion derives from the ortho phosphate ions.**
- **Threshold inhibition of slightly soluble inorganic salt such as calcium carbonate and calcium sulfate.**
- **The copper inhibition property are attributed to formation of an adherent protective film on the metal oxide surface. The inhibitor reacts with the metal surface to form a chemisorb barrier.**
- **Detergent and dispersive action on surface deposit.**
- **Good corrosion control is achieved at bulk water temperature exceeding 60º C.**
- **The antagonistic effect of chloride and sulfate ions are subdued by this treatment.**

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Data :

Sr. No.	Duration in Hours	Dosage of "ALTRET" 3604 in kgs	pH	Dissolve Iron ppm
1	0	0 kg	8.52	2.04
2	0.5	210 kg	8.52	2.04
3	0.75	105 kg	5.79	22.51
4	1	105 kg	4.68	30.08
5	1.5	35 kg	4.34	49.36
6	2.5	-	4.22	63.32
7	3.5	35 kg	3.77	78.36
8	4.5	-	4.02	98.63
9	5.5		4.12	112.54
10	6.5		4.24	125.63
11	7.5		4.59	133.21
12	8.5		4.99	154.65
13	9.5	-	5.27	166.69
14	10.5	105 kg	4.1	198.58
15	11.5	70 kg	4.09	212.36
16	12.5		4.25	245.63
17	21.5	16 kg	4.26	278.96
18	22.5		4.59	294.12
19	23.5		4.61	300.12
20	33.5		6.61	80.01
21	34.5		6.98	65.2
22	35.5		7.65	56.36
23	36.5		7.78	40.12
24	37.5		7.91	36.5
25	40.5		8.05	26.5
26	42.5		8.25	10.49
27	46.5		8.38	10.01
28	47.5		8.3	5.82
29	48.5		8.45	4.81
30	52.5		8.45	2.46

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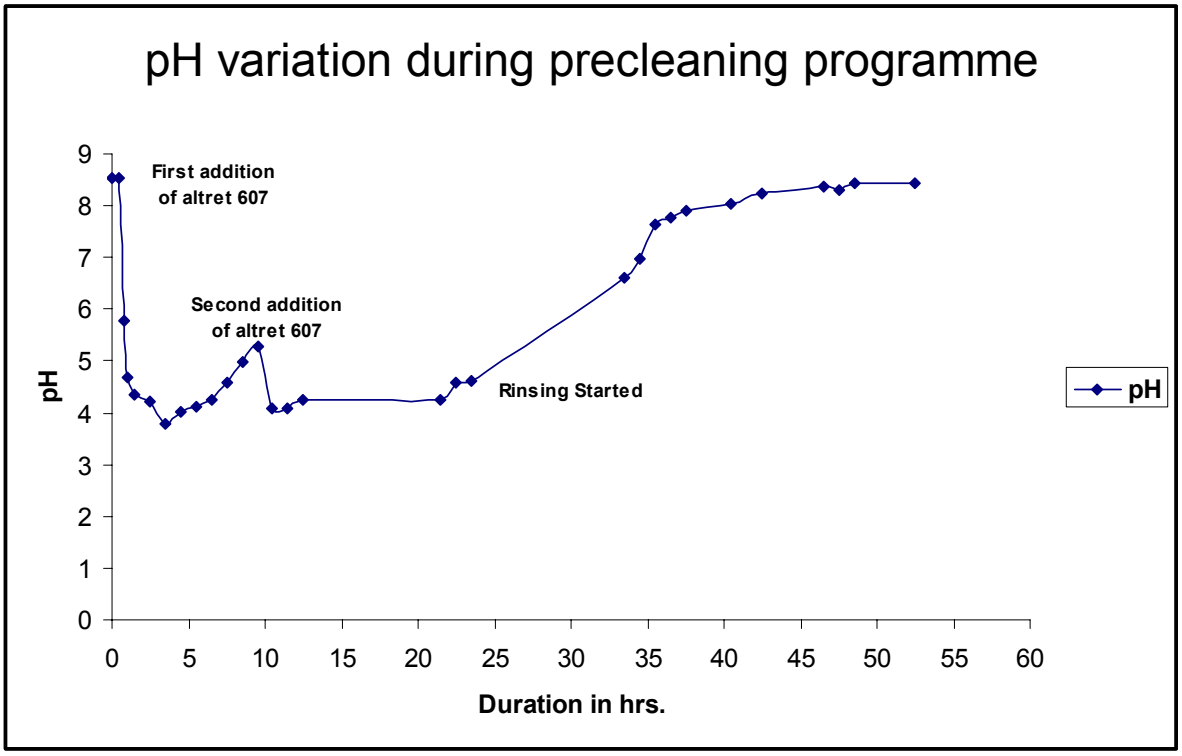

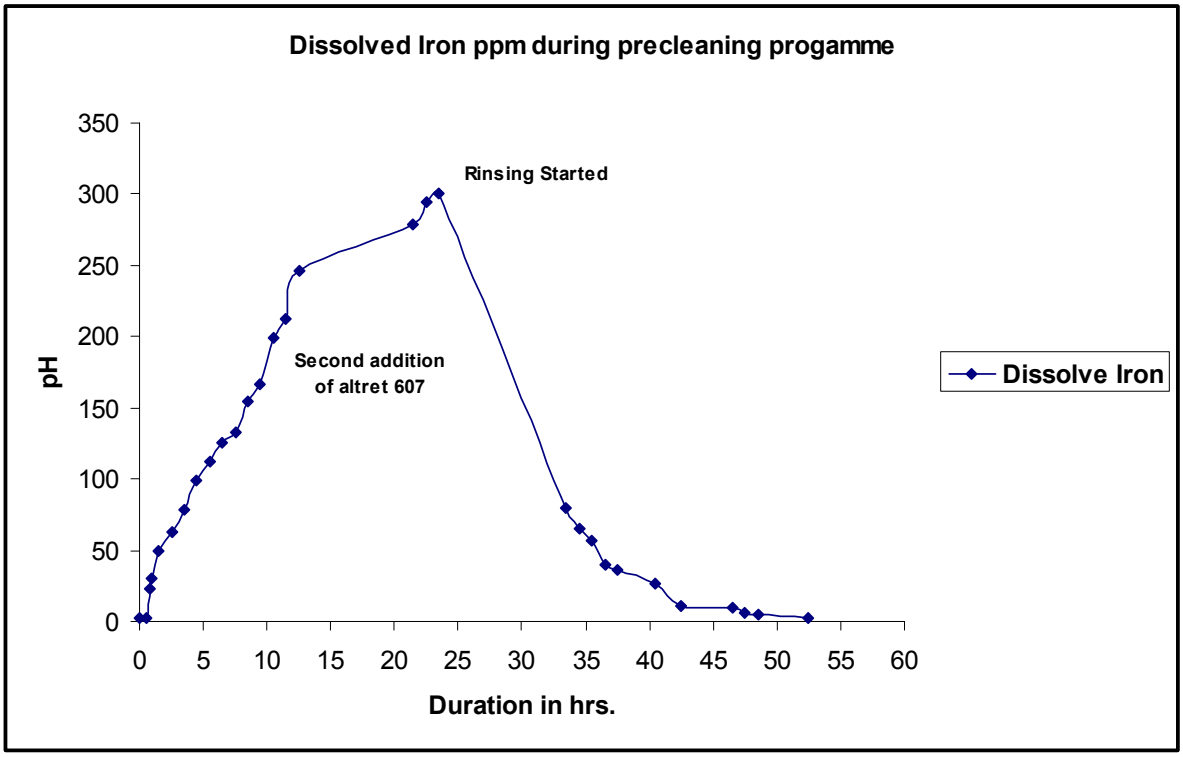

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CONCLUSIONS

1. Before charging dosage of **"ALTRET" 3604** the dissolve iron ppm was 2.04 ppm. The removal of ferrous corrosion product was quick and effective with in 5 hrs, after injecting product over 100 ppm dissolved iron was detected in the system.

2. The dissolve iron ppm was detected approx 200 ppm and began to stabilize. The supplement dosage of **"ALTRET" 3604** was added to remove remaining corrosion products from the system. Soluble iron level rose significantly and began to stabilize at 300 ppm.

3. After cleaning procedure of system, the rinsing and neutralization was done followed by flushing out of the system, resulting in a pH of water to 8.4 and dissolve iron to 2.46 ppm.

4. The residual organic phosphate, inorganic phosphate and zinc level was achieved as per recommended level after passivation treatment of the system.

The **"ALTRET"** Pre Cleaning & Passivation treatment programme was complete success as per results achieved. Whole cleaning & passivation programme was conducted without any interruption.

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It would not have been possible to take this trial without the tireless efforts and sincere co – operation of following APCL personnel.

(1) Mr. Himesh Tailor (Lab Chemist)

(2) Mr. Kumarpal Shah (Vimal Traders)

Cooling Water Analysis Report

Parameter	Make Up Water	Circulating Water	
	Analysis Report	Recommended Limit	Analysis Report
pH	8.04	7.00 to 8.5	8.45
TDS (Total Dissolve Solid in ppm)	195.8	< 2500 ppm	879.3
M. Alkalinity (ppm as $CaCO_3$)	155.2	< 350 ppm	316.2
Total Hardness (ppm as $CaCO_3$)	135.2	< 600 ppm	488.63
Ca Hardness (ppm as $CaCO_3$)	72.80	< 200 ppm	278.3
Chloride ppm as Cl^{--}	62.22	< 1000 ppm	256.89
Silica ppm as SiO_2	13.86	< 50 ppm	46.24
Free Residual Chlorine ppm		< 0.5 ppm	--
❖ Inorganic Phosphate		---	5.34
❖ Organic Phosphate		---	11.32
❖ Total Phosphate		---	
❖ Zinc		1 to 2 ppm	1.96
❖ Turbidity (N. T. U.)		< 100 NTU	--
❖ Iron as Fe			1.98
❖ Sulphate as SO_4			

Comments of P.M. / W.M.

Residual in-organic phosphate, organic phosphate and zinc level are maintained as per recommendation.

We suggest you to give heavy blow down and add fresh water to minimize iron ppm.

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