APPLICATION OF FLUX maxguard™ ON CENTRAL A /C SYSTEM FOR SYSTEM PROTECTION FROM SCALE AND CORROSION.

A Case Study by M/s. FLUX HI-TECH INC

Client: M/s Maneesh Pharmaceuticals Pvt. Ltd., Govandi (W), Mumbai-400 043.

This application has a reference to the installation of the FLUX maxguard™ on the central air-conditioning plant at M/s Maneesh Pharmaceuticals Pvt. Ltd., Govandi (W), Mumbai.

The system under consideration is the latest Vapour Absorption Heat Pump manufactured by M/s Thermax with adequate instrumentation for online measurement of operational parameters. The system is held under vacuum and the coolant is water. The condenser is cooled through a water circuit and the water is recirculated through a cooling tower. The system had not been given any chemical treatment since its installation and the major problem associated with it was the chocking of the tubes due to scaling. Municipal water having a total dissolved solids content of around 100 ppm is available as the feed source for the system, which runs for an average of 8 hours per day.

In order to remove the existing scale and prevent the formation of new scale and corrosion, the management decided to install FLUX maxguard™ to protect the entire system.

STUDY:
The FLUX maxguard™ was installed on the feedwater inlet to the condenser on April 20, 1998 and the system was monitored regularly for any observable changes.

SYSTEM DETAILS:

System : Vapour Absorption Heat Pump
Make : Thermax
Model : A 214
Operational Details : Hot / Cooling water system
Pass (Absorber) : 2 no.
Pass (Condensor) : 1 no.
Max. Permissible Pressure : 8 kg/cm² g
Connecting pipe diameter : 125 mmNB
Fouling Factor : 0.0002 m² deg.C/kcal
Flow Rate : 180.00 m³ /hr
OBSERVATIONS:
The following were the observations with respect to the various factors measured in the duration of the study.

Voltage:
The potential difference was measured across the pipe and in the water stream both prior to the installation as well as after the installation. This was achieved with the help of a digital multimeter.

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>P.D. across the pipe</th>
<th>P.D. across the water stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/4/1998</td>
<td>1615 hrs.</td>
<td>-25 mV</td>
<td>+7 mV</td>
</tr>
<tr>
<td>20/4/1998</td>
<td>1715 hrs.</td>
<td>-374 mV</td>
<td>+170 mV</td>
</tr>
</tbody>
</table>

Thus the increase in the voltage within only an hour after installation indicates that the device is functioning in its desired mode. Efforts to record further measurements in the following few days however failed as the makeup water quantities were quite high leading to the charge being diluted. The latest reliable measurement carried out on 23/5/1998 indicated a charge of +374mV in the water stream.
T.D.S:
Total dissolves solids measurements with the help of a digital conductivity meter indicated the change in T.D.S. levels in the water due to the process of descaling which had commenced after the installation of the FLUX maxguard™.

(Note: After May 2nd, the water was changed intermittently due to heavy suspended solids obtained by the descaling process).

Hardness:
The hardness in terms of the calcium carbonate contents of the water was measured by simple titrimetric analysis and the increase in hardness initially indicated the increase in calcium carbonate levels in the water due to the process of descaling. The further decrease in hardness indicates the softening effect of the magnetic treatment on the water i.e., the process of conversion of the descaled calcium carbonate into calcium bicarbonate.
Temperature:
The temperature of the chilled water was recorded by the service engineers of M/s Thermax and the readings are as under:

<table>
<thead>
<tr>
<th>Date</th>
<th>Chilled water temperature (°C)</th>
<th>Steam Used (%) (steam control valve opening rate)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inlet</td>
<td>Outlet</td>
</tr>
<tr>
<td>03/12/97</td>
<td>12.2</td>
<td>10.2</td>
</tr>
<tr>
<td>25/04/98</td>
<td>12.5</td>
<td>10.5</td>
</tr>
<tr>
<td>03/06/98</td>
<td>12.5</td>
<td>9.0</td>
</tr>
</tbody>
</table>

Thus it can be seen that the chilled water has achieved those temperatures in summer which it usually reached in winter with a considerable saving in the amount of steam consumed.

Pressure:
The pressure readings were taken at the inlet and the outlet of the condenser with the help of built in pressure guages.

<table>
<thead>
<tr>
<th>Date</th>
<th>Inlet Pressure</th>
<th>Outlet Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/4/98</td>
<td>1.6 kg</td>
<td>0.5 kg</td>
</tr>
<tr>
<td>2/5/98</td>
<td>1.6 kg</td>
<td>0.4 kg</td>
</tr>
<tr>
<td>4/5/98</td>
<td>1.7 kg</td>
<td>0.45 kg</td>
</tr>
</tbody>
</table>

The initial drop in outlet pressure indicates the clogging of the tubes of the condenser due to the process of descaling. The increase in the inlet pressure substantiates this theory. The subsequent rise in outlet pressure indicates the partial clearing of the blockage due to dissolution of the descaled matter.

Thus we can see that the FLUX maxguard™ has functioned effectively and shown results within 15 days of installation on the system. The system was almost totally descaled after a month of installation and around 25 kgs. of scale and corroded material was recovered from the strainer. Thereafter, the system was given a thorough flushing with water and no new scale was found in the strainer at the end of 40 days after installation of FLUX maxguard™.
At the end of two months, a team of engineers from an independent servicing agency examined the system and their observations indicated that the system was much more efficient than prior to installation of the Flux maxguard™.

The fuel consumption readings indicated a saving of 50 liters of fuel per day, which worked out to around 12% of the total consumption. These savings were in addition to the man-hours previously spent in cleaning the system, but now employed in a more useful area elsewhere.

The industry no longer uses any cleaning chemicals for maintenance of the system, which in turn has saved them the headache of procuring and storing these hazardous chemicals in addition to maintaining a tedious dosing schedule.

The success of this one installation has prompted the management to give a repeat order for the Flux maxguard™ for other locations in this plant as well as their plant in Pune.
TO WHOMSOEVER IT MAY CONCERN

M/s Flux Hi-Tech, Inc. installed Flux maxguard™ on our A/C system on 20th April 1998. Initially we were skeptical of this technology which sounded too good to be true. Hence we decided to carry out a thorough evaluation of this device and its effects on the functioning of our system.

Within a fortnight's time we saw that scales had begun to get collected in the strainer and the basin of the cooling tower. At the end of one month after installation of the Flux maxguard™, we had removed around 25 kgs. of scales from our system.

At the end of two months after installation of the device, an independent team of engineers appointed by the system manufacturers inspected the system. Their observations indicated that the system was working with an efficiency, which was better than prior to the installation of the Flux maxguard™. We opened the condenser and to our surprise, we found the tubes to be absolutely clean.

Observations by our maintenance department indicated a saving of around 12% in fuel consumption (around 50 litres per day). We are no longer using any cleaning chemicals for our system and our man-hours spent earlier on maintenance are being put to a beneficial use elsewhere.

We are convinced that the Flux maxguard™ is an effective alternative to chemical water treatment. Since this device has worked so well for our A/C system, we have decided to install it for our boilers and chiller line here, as well as at our Pune plant.

We recommend this device to all other industries, as it will save them not only the money spent on chemical treatment, but also the headache of regular waterside maintenance.

For Maneesh Pharmaceuticals Pvt. Ltd.,

Managing Director