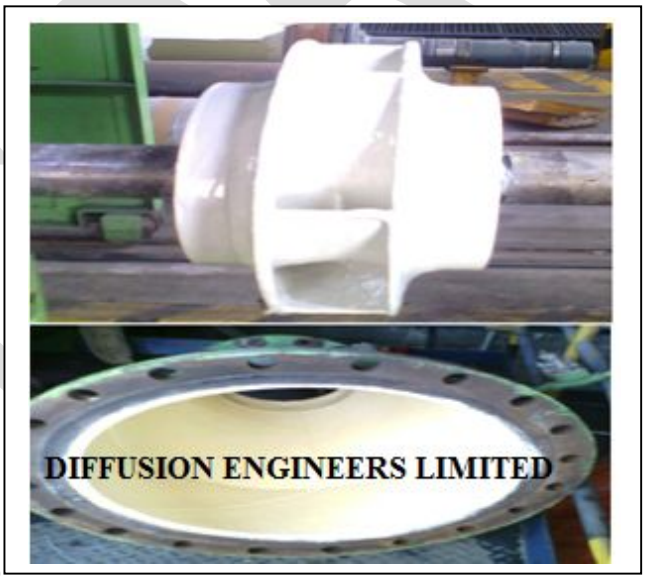
DIFFCOR
New Generation Surface Engineering

DIFFUSION
Innovative superconditioning solutions

REPORT NO: DCQ/ NGP/2015-16/105

APPLICATION REPORT

INTERNAL COATING OF COOLING WATER PUMPS



AT

ITC LIMITED, BHADRACHALAM

INTRODUCTION:-

DIFFCOR division of DIFFUSION ENGINEERS LTD successfully completed job work for Internal coating of COOLING WATER PUMPS. This job work was carried out for our customer ITC LIMITED, BHADRACHALAM. Our customer were facing problem of reducing efficiency of pump and high corrosion and pitting pump casing and Impeller. Coating was done with DIFF CERAGLASS and CERAMETAL 3.

During Treatment of cooling water wide range of cooling water treatment chemicals are used across a wide range of commercial, industrial and process applications including water cooling systems, cooling towers, condenser and compressor systems, heat exchangers etc.

Cooling water systems usually requires high pH and high levels of corrosion inhibitors.
"The pH range of operation generally limits the choice of corrosion inhibitors & other water treatment chemicals."

Corrosion is an electrochemical reaction converting the metal into its oxide. Corrosion requires an anode, cathode & an electrolyte. The metal acts as an anode & cathode while water acts as an electrolyte.

PROBLEMS:-

1. Cross-section shows that the pits are craters like, which is typical to pits that are formed by impingement.

2. Corrosion, which follows impingement, roughens those pits surface.

3. These pits were mainly formed due to erosion–corrosion mechanism.

PRODUCT RECOMMEND:-

1. DIFF CERAGLASS:

DIFF-CERAGLASS is High solid, Heavy duty glass flake filled modified epoxy coating system designed to meet aggressive environments with excellent resistant to acid, bases and solvent.

3. CERAMETAL 3:

CERAMETAL 3 is a low friction corrosion resistant two component solvent-free lining compound specially designed to combat erosion/corrosion found in fluid flow environments. It is easily applied by brush or roller, keeping application cost to a minimum. The finished system can be spark tested to ensure that no pinholes or holidays are present in the lining. It is a 'resin rich' system that 'wets out' surfaces completely thus ensuring maximum adhesion. It is the most economical chemical and corrosion resistant coating system for the most aggressive industrial environments. It exhibits excellent adhesion to concrete as well as metal surface.

APPLICATION PROCEDURE:

A.SURFACE PREPARATION

1. Before application of any kind of coating surface preparation is must to activate the base metal so that coating will have better bonding.

2. The surface preparation is done by Abrasive blasting.

Fig. Surface Preparation done by Abrasive Blasting.

B.PRODUCT APPLICATION:-

1. After surface preparation First coat of **DIFF CERAGLASS** was applied with slight pressure.

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Fig: Application of DIFF CERAGLASS as primer

2. **DIFF CERAGLASS was** applied after that to increase the abrasion resitance and to level outthe surface.

Fig. Application of DIFF CERAGLASS as Second

3. Final top coat of **CERAMETAL 3** was applied to increase the effciency.

Fig. Application of CERAMETAL 3 as Top coat

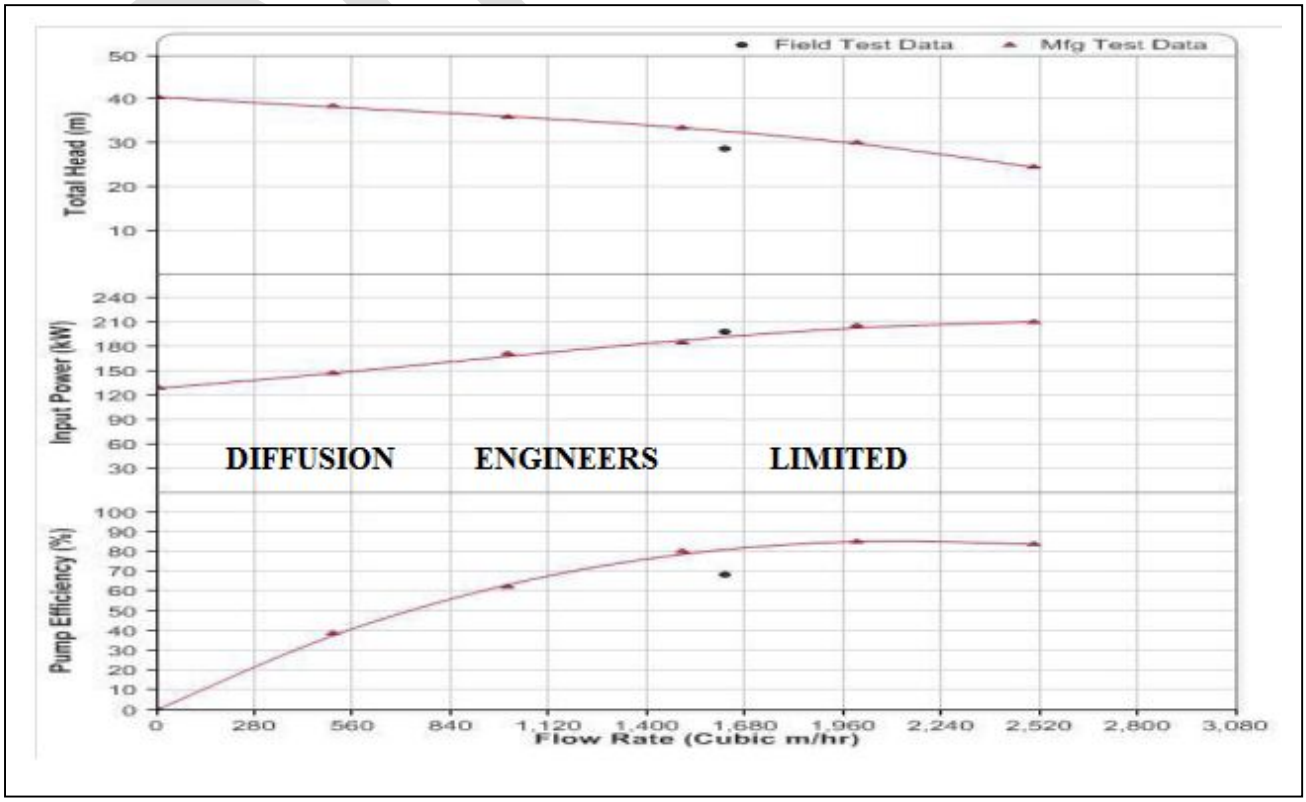
Pump effeciency testing at itc limited, bhadrachalam (PRE REFURBISHMENT)

Observations / Recommendations:

1. The present efficiency of pump 2 is 68.4% at the flow rate 1621.8 m3/hr. This is 15.9% down from its as new efficiency at the same flow rate. This indicates that the pump is in poor condition.

2. There is huge deterioration of the pump performance from its as new condition. This could be due to increase in clearance between impeller and neck rig.

Effeciency curve before coating:



Pump effeciency testing at ITC limited, Bhadrachalam (POST REFURBISHMENT)

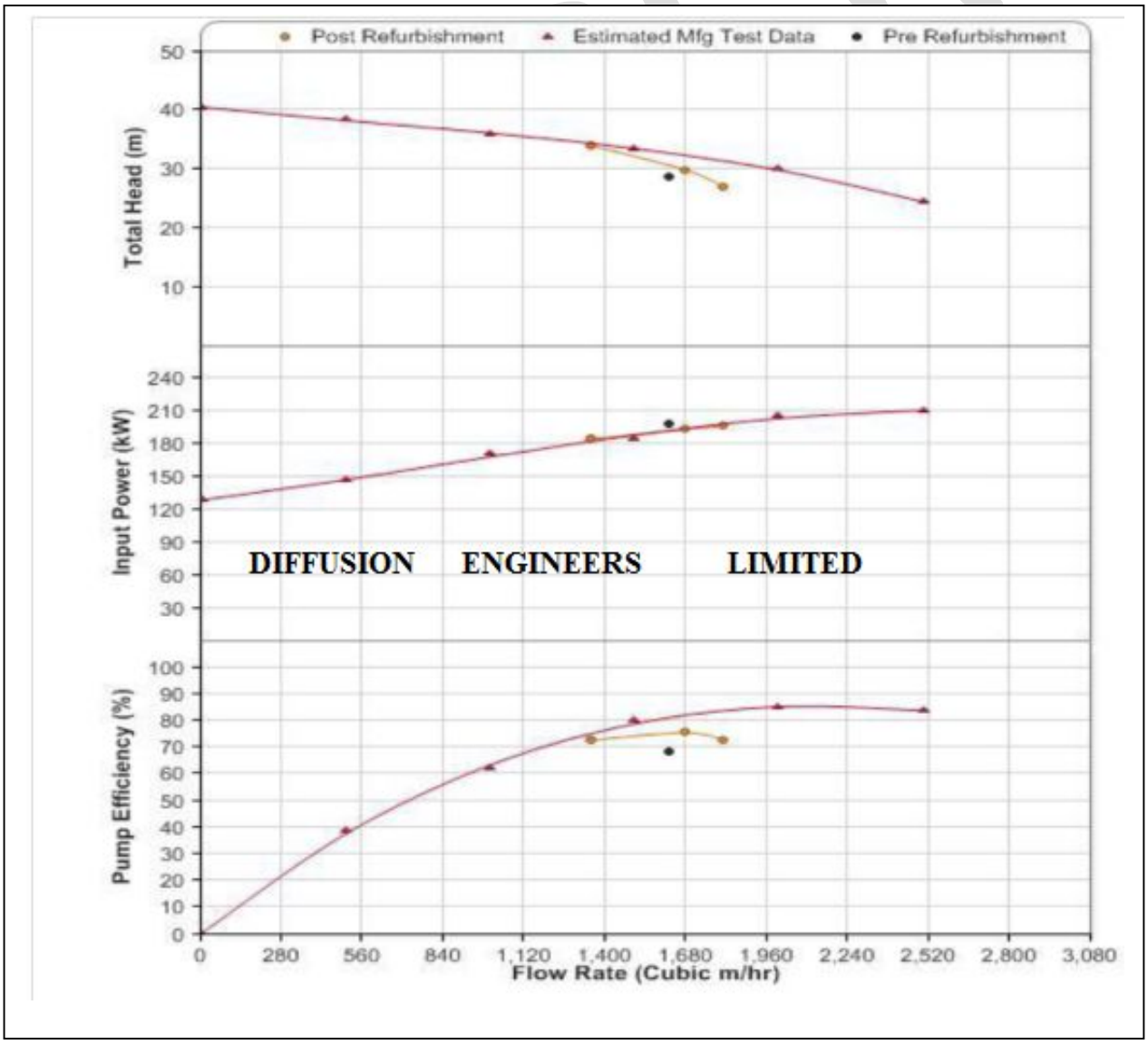
Observations / Recommendations:

1. Cooling water pump 2 at ITC, Bhadrachalam was tested on 09/07/2015 to assess the pre refurbishment pump performance. And the same pump was retested on 19/08/2015 to assess the post refurbishment pump performance.

2. The comparison between pre refurbishment test and post refurbishment test suggests the pump has recovered substantial performance. The pump efficiency improvement is about 11.3% at the flow rate measured during pre refurbishment test.

3. The comparison of post refurbishment performance with estimated manufacturer pump performance suggests that pump has recovered majority of its as new performance.

Effeciency curve after coating:



Interpretation of results

Diffusion Test vs. estimated manufacturer test data comparison

The table below shows a comparison of the Diffusion Test data (Pre & Post Refurbishment) with the estimated manufacturer's performance test data. The comparison is carried out at the at the flow rate measured during pre refurbishment test.

System	**Cooling Water Pumps**	
Pump No:	**Pre Refurbishment**	**Post Refurbishment**
Pump Flow Rate (m3/hr):	1621.8	1621.8
As-New Pump Head (m):	32.8	32.8
Present Pump Head (m):	28.5	31.0
Change from As-New (%):	-13.1	-5.4
As-New Power to Motor (kW):	192.9	192.9
Present Power to Motor (kW):	198.0	192.0
Change from As-New (%):	2.6	-0.4
As-New Efficiency (%):	81.3	81.3
Present Efficiency (%):	68.4	76.1
Change from As-New (%):	-15.9	-6.3

Table 1: Comparison of Results with Estimated Manufacturer Performance

The above comparison suggests that the pump has recovered substantial performance after coating of impeller and casing.

Following table represents the comparison between pre refurbishment and post refurbishment tests.

Parameter	Pre - Refurbishment	Post - Refurbishment	% Change
Flow (m3/hr)	1621.8		
Tested Pump Head (m)	28.5	31.0	8.8
Power to Motor (kW)	198.0	192.0	-3.0
Efficiency (%)	68.4	76.1	11.3
Pumping Cost(kWh/Ml)	122.1	118.4	-3.0

Table 2: Comparison of Pre & Post Refurbishment Results

The above comparison suggests that the pump efficiency performance has improved by 11.3% from its pre refurbishment condition.

After coating saving Rs. 12 lacks – 14 Lacks per Annual.

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