

MINUTES OF MEETING

VENUE: COMPRESSOR HOUSE

DATE: 22.12.2006

PRESENT:

| | |
|-----------------------|----------------|
| Shri. T.N.Y. Giri | O&U Mechanical |
| Shri. T.K.Dey | O&U Operation |
| Shri. Ramesh Kashikar | CTS |
| Shri. Jitendra Purwar | RMC |
| Shri. Amit Chaurasia | M/S Maya fan |

With reference to **PO no. NM3/3393631** M/S MAYA FAN AIR ENGINEERING PVT. LTD. has supplied "**High efficiency hollow FRP fan**" for Cooling Tower against FCO/O&U/109. This fan installed in CT02 ID fan no. 04 in presence of M/s Maya Fan representative with following observations:

Before installation of fan

- Existing fan Air velocity measurement as per CTI method in presence of CTS, Mechanical & Operation. Average air velocity **6.106 m/sec.**
- Existing fan power consumption taken by IPCL electrical dept. in presence of CTS, Mechanical & Operation. Power consumption **53.13 kW.**
- Existing Fan vibration taken by IPCL/RMC. Vibration **8.2 mm/sec** Max. on G.B. side
- Existing Fan dismantled & new fan assembly installed by IPCL/Mechanical-Maintenance Blade angle **15°** at blade tip, No. of blades 08.

After installation of fan

- New FRP fan Air velocity measurement as per CTI method in presence of CTS, Mechanical & Operation. Average air velocity **6.304 m/sec.**
- New FRP fan power consumption taken by IPCL electrical dept. in presence of CTS, Mechanical & Operation. Power consumption **38.023 kW.**
- New Fan Balancing & vibration reading done by IPCL/RMC and final vibration **5.3 mm/sec** Max. on G.B. side (Report attached)
- Noise level outside cell **78 dB** max.

After installation of High Efficient Hollow FRP Fan, achieve **28.43%** power saving with **6.8%** increase in airflow. (Report attached)

Air pressure measurement at exit not required, if air airflow is same in both cases then exit air pressure also be same. Because exit area & exit air density is constant in both cases.

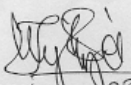
Inlet & outlet water temperature measured after installation of new FRP fan on 22.12.2006 16:00hrs by IPCL/OPN. Total 5 nos. of fan were running at the time of measurement.

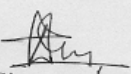
CT-02

| | | | | | |
|--------------|------|------|------|------|------|
| Cell No. | 1 | 3 | 4 | 5 | 7 |
| Outlet Temp. | 27.4 | 25.1 | 25.2 | 27.3 | 24.7 |

| | |
|-------------------|--------|
| Sump supply temp. | 26.1°C |
| CW supply temp. | 26.7°C |
| CW return temp. | 32.1°C |
| WBT. | 23.7°C |
| DBT. | 31.7°C |

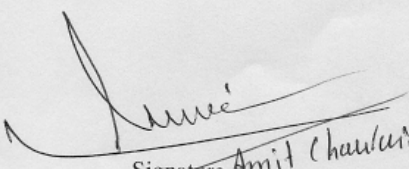
Note: M/s Maya fan agree to send copy of all certificate & inspection report as mention in PO with in a week.

Signature  22/12/06
Project Manager
(TNY am)

Signature  (T. K. Dey)
O&U Operation

Signature
CTS

Signature
RMC

Signature  Amit Chaurasia
Maya Fan

MAYA FAN AIR ENGINEERING Pvt. Ltd.

Plot No.53B, Industrial Area No. 1,
 A. B. Road, DEWAS - 455 001
 Ph : 0091-7272-258734, 0091-9302328890 Fax. 0091-7272 - 251456
 Email : info@mayafanfrp.com



| |
|----------------------|
| Customer : IPCL (NC) |
| Fan Model : |
| Plant : CT - 02 |
| Tag : ID Fan No.-04 |

Date : 16/12/2006

FAN PERFORMANCE REPORT

| | | Unit | For Existing Paharpur Fan | | | | | | | |
|-------------------------------------|--|---------------------|---------------------------|-----|--------|-----|--------|-----|--------|-----|
| Fan Diameter | | mm | 10050 | | | | | | | |
| Hub Diameter | | mm | 2440 | | | | | | | |
| Height of window from fan | | mm | 4000 | | | | | | | |
| Fan casing dia at measuring section | | mm | 11032 | | | | | | | |
| Number of Blades | | Nos. | 8 | | | | | | | |
| Blade Angle | | Degree | 13 | | | | | | | |
| Area at measuring section | | m ² | 95.59 | | | | | | | |
| Hub Area | | m ² | 4.68 | | | | | | | |
| Discharge Area | | m ² | 90.912 | | | | | | | |
| Air Velocity | | m/sec | S1 (N) | | S2 (E) | | S3 (W) | | S4 (S) | |
| R ₁ | | 3.803 | 5.6 | 6.0 | 6.1 | 7.1 | 3.8 | 4.5 | 3.4 | 3.9 |
| R ₂ | | 3.102 | 6.5 | 7.0 | 7.1 | 7.4 | 5.5 | 6.3 | 6.0 | 6.4 |
| R ₃ | | 2.563 | 6.5 | 7.3 | 7.3 | 7.5 | 6.9 | 8.0 | 7.1 | 7.9 |
| R ₄ | | 2.108 | 6.9 | 7.2 | 7.3 | 7.6 | 7.9 | 8.3 | 8.6 | 9.0 |
| R ₅ | | 1.707 | 7.0 | 7.5 | 6.8 | 7.0 | 8.0 | 8.3 | 8.3 | 8.5 |
| R ₆ | | 1.344 | 7.0 | 7.3 | 5.4 | 5.9 | 8.1 | 8.6 | 8.0 | 8.4 |
| R ₇ | | 1.011 | 6.8 | 7.2 | 3.1 | 4.1 | 7.9 | 8.1 | 7.0 | 7.6 |
| R ₈ | | 0.700 | 4.8 | 6.6 | 3.4 | 4.1 | 7.4 | 7.6 | 4.9 | 5.4 |
| R ₉ | | 0.409 | 4.8 | 5.6 | 2.5 | 2.9 | 6.5 | 6.7 | 3.0 | 3.5 |
| R ₁₀ | | 0.133 | 0.5 | 1.8 | 1.5 | 1.9 | 5.0 | 5.8 | 2.7 | 3.8 |
| Av. Air Velocity | | m/sec | 6.106 | | | | | | | |
| Air Flow | | m ³ /sec | 555.134 | | | | | | | |
| | | CFM | 1176262.43 | | | | | | | |
| | | | R | | Y | | B | | Av. | |
| Connected Motor | | kW | 75.0 | | | | | | | |
| Supply Voltage | | Volt | 432 | | 432 | | 432 | | 432 | |
| Motor Current | | Ams. | 89.3 | | 88.7 | | 89.2 | | 89.07 | |
| Consumed Power | | kW | 53.6 | | 52.7 | | 53.1 | | 53.13 | |
| Power Factor | | - | 0.8 | | 0.8 | | 0.8 | | 0.8 | |

Remarks :

Signature
 Maya Fan Air Engineering Pvt. Ltd.

Signature
 CTS

Signature
 O&U OPN

Signature
 RMC

Signature
 O&U MECH

MAYA FAN AIR ENGINEERING Pvt. Ltd.

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Email : info@mayafanfrp.com



Customer : IPCL (NC)
Fan Model :
Plant : CT - 02
Tag : ID Fan No.-04

Date : 20/12/2006

FAN PERFORMANCE REPORT

| | Unit | For Maya Hollow FRP Fan | | | | | | | |
|-------------------------------------|---------------------|-------------------------|-------|--------|--------|--------|-----|-------|-----|
| Fan Diameter | mm | 10050 | | | | | | | |
| Hub Diameter | mm | 1400 | | | | | | | |
| Height of window from fan | mm | 4000 | | | | | | | |
| Fan casing dia at measuring section | mm | 11032 | | | | | | | |
| Number of Blades | Nos. | 8 | | | | | | | |
| Blade Angle | Degree | 15 | | | | | | | |
| Area at measuring section | m ² | 95.59 | | | | | | | |
| Discharge Area | m ² | 1.539 | | | | | | | |
| Air Velocity | m/sec | S1 (N) | | S2 (E) | | S3 (W) | | S4(S) | |
| R ₁ | 4.107 | 2.7 | 3.0 | 2.6 | 3.3 | 2.4 | 3.0 | 2.0 | 2.6 |
| R ₂ | 3.284 | 4.0 | 4.8 | 4.0 | 5.0 | 4.2 | 4.9 | 4.1 | 5.6 |
| R ₃ | 2.692 | 5.3 | 5.6 | 5.0 | 5.8 | 4.8 | 5.2 | 4.6 | 5.2 |
| R ₄ | 2.204 | 4.5 | 5.2 | 5.2 | 5.6 | 5.3 | 5.5 | 5.7 | 6.1 |
| R ₅ | 1.780 | 5.0 | 5.3 | 5.5 | 5.6 | 6.1 | 6.3 | 6.4 | 7.2 |
| R ₆ | 1.398 | 5.6 | 6.6 | 5.5 | 6.1 | 7.5 | 7.6 | 7.8 | 8.0 |
| R ₇ | 1.050 | 7.2 | 7.5 | 7.2 | 7.5 | 8.0 | 8.3 | 8.7 | 9.0 |
| R ₈ | 0.726 | 8.2 | 8.5 | 8.3 | 8.6 | 8.9 | 9.0 | 9.0 | 9.2 |
| R ₉ | 0.423 | 8.8 | 9.0 | 8.5 | 8.7 | 8.8 | 9.0 | 8.3 | 8.8 |
| R ₁₀ | 0.137 | 7.7 | 8.2 | 7.2 | 7.4 | 6.1 | 7.2 | 5.9 | 6.7 |
| Av. Air Velocity | m/sec | 6.304 | | | | | | | |
| Air Flow | m ³ /sec | 592.861 | | | | | | | |
| | CFM | 1256200.888 | | | | | | | |
| | | R | Y | B | Av. | | | | |
| Connected Motor | kW | 75.0 | | | | | | | |
| Supply Voltage | Volt | 432 | 432 | 432 | 432 | | | | |
| Motor Current | Ams. | 70.9 | 70.5 | 69.5 | 70.3 | | | | |
| Consumed Power | kW | 38.21 | 37.82 | 38.04 | 38.023 | | | | |
| Power Factor | | 0.72 | 0.712 | 0.73 | 0.721 | | | | |
| Power Saving | % | 28.43 | | | | | | | |

Remarks :

Signature
Maya Fan Air Engineering Pvt. Ltd.

Signature
CTS

Signature
O&U OPN

Signature
RMC

Signature
O&U MECH



Dipankar Podder/NC/IPCL
12/22/2006 02:03 PM

To Aniruddha B Vartak/NC/IPCL@IPCL
cc Sundar Parthasarathy/NC/IPCL@IPCL, Rajgopal
Mani/NC/IPCL@IPCL, Jitendra Punwar/NC/IPCL@IPCL
bcc

Subject Vibration Data For FRP Fan Installation For CT2/F4

As per the trial taken on bellow mentioned dates the following vibrations were found:

Date: 19/12/06 Time: 15:00 Hrs Remarks: Fan Installation done. First Trial.

| | i=75 Amp No Load Trial | | | i=75Amp Full Load Trial | | |
|---|---------------------------|---------|-----|----------------------------|---------|-----|
| | MDE | MNDE | GB | MDE | MNDE | GB |
| V | 1.6/0.9 | 2/0.4 | 2.5 | 1.6/0.5 | 1.3/0.2 | 2.4 |
| H | 2.8/0.2 | 1.3/0.2 | 8.1 | 2.2/0.2 | 2.2/0.2 | 8.6 |
| A | 1.9 | | | 1.5 | | |

Date: 20/12/06 Time: 18:00Hrs

| | i=72.5 Amp | | |
|---|------------|---------|-----|
| | MDE | MNDE | GB |
| V | 1.6/0.3 | 1.2/0.2 | 1.7 |
| H | 2.4/0.2 | 1.9/0.2 | 11 |
| A | 1.6 | | |

Gearbox vibration found on higher Side. Recommended for Insitu Balancing.

Date: 21/12/06 Time: 09:45 Hrs

Prior to Insitu Balancing

| | i=72.5 Amp | | |
|---|------------|------|------|
| | MDE | MNDE | GB |
| V | 1.4 | 1.2 | 1.6 |
| H | 2.2 | 1.6 | 11.1 |
| A | 1.4 | | |

Insitu Balancing Done. Mass Added 200gms Approx.

Time: 19:00 Hrs

| | i=72.5 Amp | | No Load Trial |
|---|------------|------|---------------|
| | MDE | MNDE | GB |
| V | 1.3 | 1.2 | 1.2 |
| H | 2.3 | 2.1 | 4.4 |
| A | 1.4 | | |

Final Reading Taken On 22/12/06 Time: 11:00 Hrs (Fan was stopped on 0915hrs and again restarted at 10:50 hrs for final reading)

| | i=73 Amp | | Full Load Trial |
|---|----------|------|-----------------|
| | MDE | MNDE | GB |
| V | 1.3 | 0.9 | 1.3 |
| H | 2.2 | 1.9 | 5.3 |
| A | 1.5 | | |

Remarks: The vibration reading are well within the limits and better compared to the previous trend.

Regards,

DIPANKAR PODDER
CES-HES/RMC

Dipankar Podder
22/12/06