



MAYA FAN AIR
ENGINEERING PRIVATE LIMITED

(An ISO-9001:2008 Certified Company)

**Installation
Manual**





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ENGINEERING PRIVATE LIMITED

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***Air-Cooled Condenser Fan
Or ACC Fans Installation
Manual***

**Instruction for Assembly, Installation,
Maintenance and Storage.**

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ENERGY

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TOMORROW

Introduction

General

This manual will contain descriptions of all major components of the ACC Fan together with accessories and technical data required for operation, supervision and maintenance.

Claims in respect of damage caused by errors of operation cannot be recognized.

Adherence to these regulations is therefore of the greatest importance for trouble-free operation.

Table of Contents

1.	<i>Fan Components</i>	Pg. 01
2.	<i>Assembly Instruction</i>	Pg. 02
3.	<i>Fan Installation instruction</i>	Pg. 03
4.	<i>Blade Pitch Adjustment</i>	Pg. 03
5.	<i>Aerodynamic hub assembly</i>	Pg. 04
6.	<i>Torque chart and retightening chart</i>	Pg. 05
7.	<i>Maintenance</i>	Pg. 06
8.	<i>Services</i>	Pg. 06
9.	<i>Safety parameter</i>	Pg. 07
10.	<i>Handling instruction</i>	Pg. 08
11.	<i>Storage instruction</i>	Pg. 09
12.	<i>De-commissioning/ Disassembly and decomposing</i>	Pg. 09
13.	<i>Part List</i>	Pg. 10
14.	<i>Traubel Shooting</i>	Pg. 11
15.	<i>Preventive maintenance</i>	Pg. 13

Fan Components

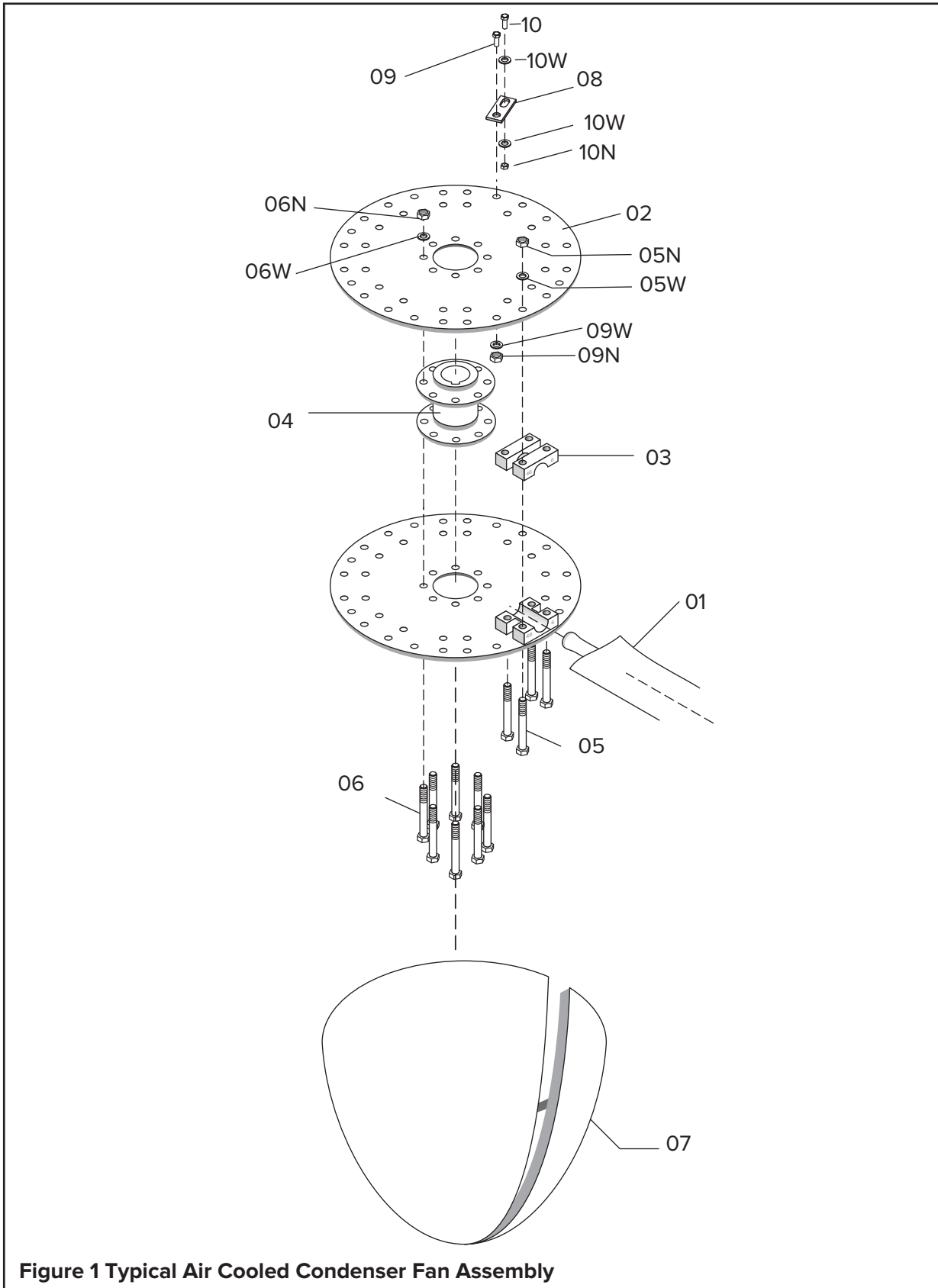


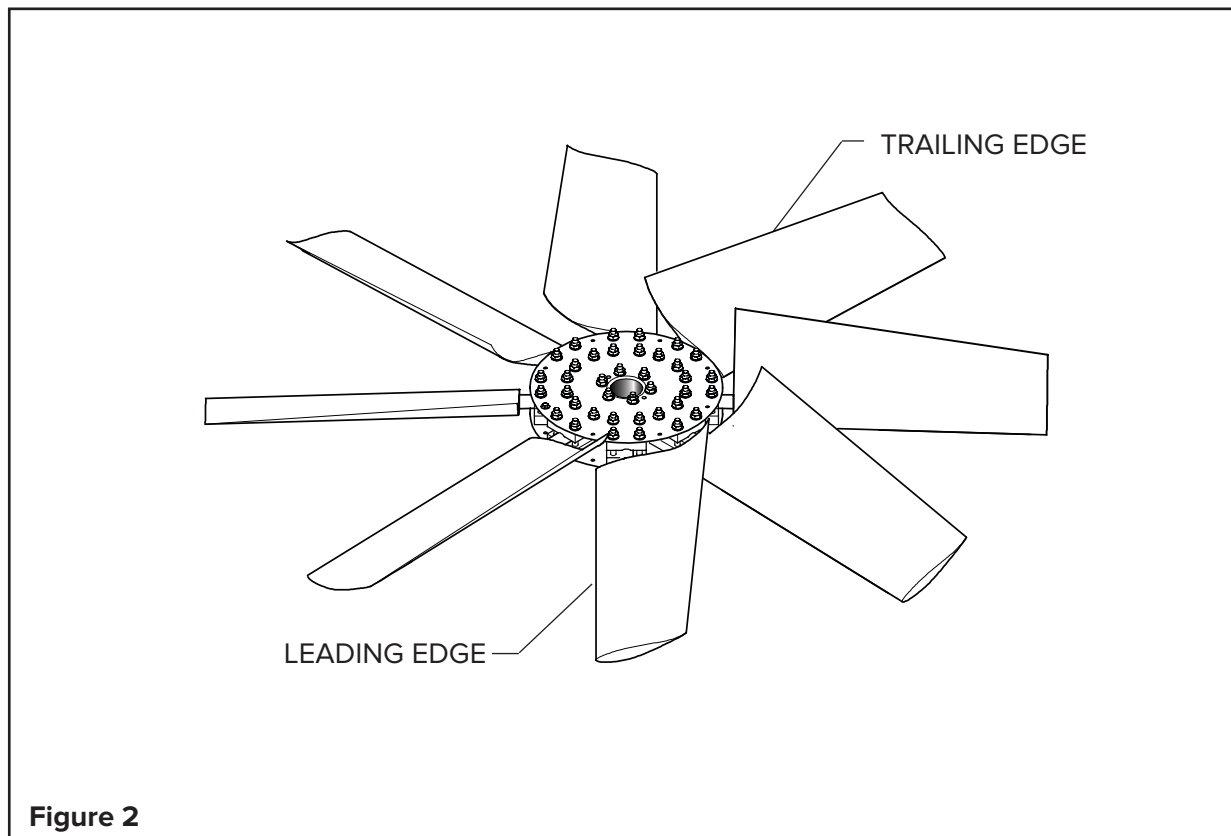
Figure 1 Typical Air Cooled Condenser Fan Assembly

Air Cooled condenser fan (ACC Fan) Assembly Instruction

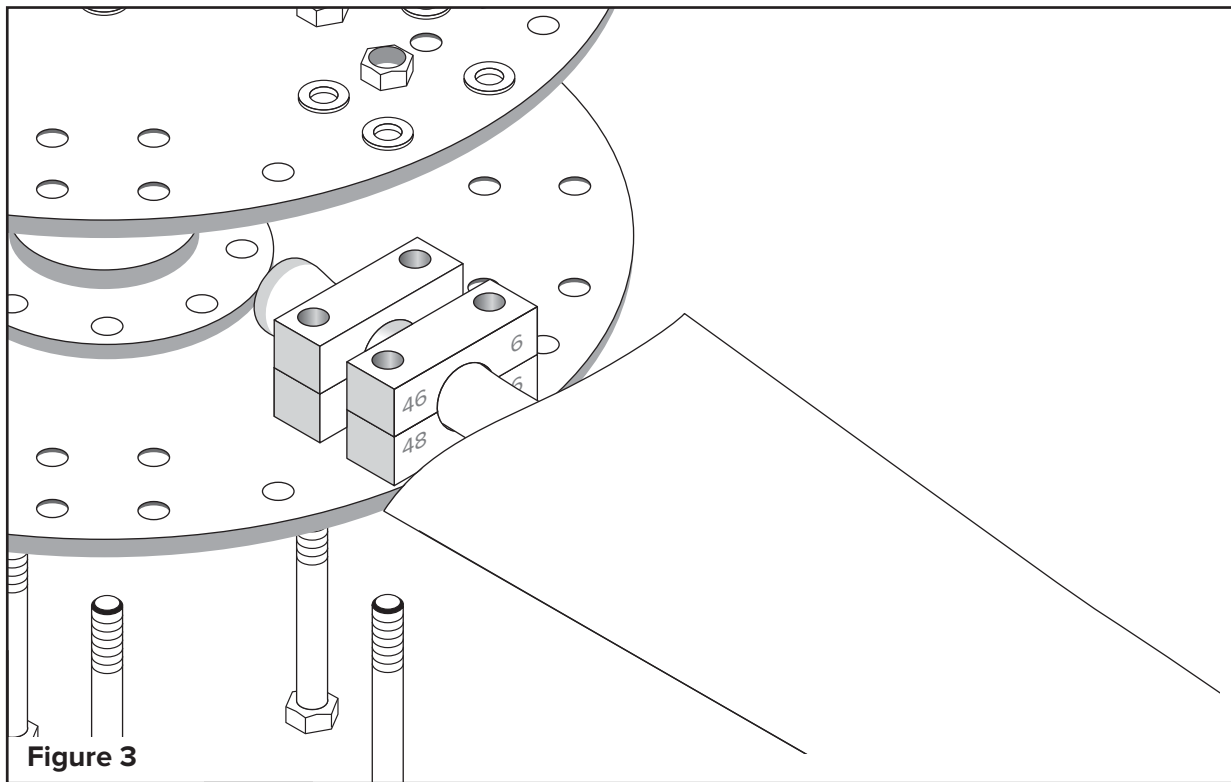
Note : *The following instruction applies to installations having straight bores or tapered output shaft without split taper bushings.*

It is convenient to preassemble the fan before installation on the driving shaft.

- 1 Select a large area corresponding to the air-cooled condenser fan diameter.
- 2 Position the fan hub at the centre of the work area with the centre spool 04 oriented as shown in **Figure 1**.
- 3 Position the hub plate in the centre spool by matching the marking on spool and plate, insert the centre nut bolt but not tight it at the moment.
- 4 Position the blade clamp blocks **03** around the blade shank so that the blade **01** droops slightly when the blade clamp hardware is tight.



- 5 Position the blade clamps and blade between the hub plates **02** to align bolt holes. Loosely install bolts **05**, flat washers **05W** and locking nuts **05N** to secure blades. Finger tighten all nuts.
- 6 On fans where blades overlap at the hub be sure to have the leading edge under the trailing edge of the forward blade. Refer to **Figure 2**.
- 7 Pull the blades radially outward until the blade retention sleeve bears against the backside of the blade clamp.
- 8 Repeat steps 3 through 7 for all blades.
- 9 Progressively tighten all blade clamp nuts **05N** until the blades are barely able to move when twisting the blade.



10 Measure the final fan diameter. minimum clearance between all blade tips and fan cylinder is recommended.

Fan Installation Instructions

- 1 Be sure motor is locked out.
- 2 Clean the hub bore and driving shaft extension for the full length of the key.
- 3 Insert the key in the keyway. The top of the key must be below the top of the shaft by not more than $\frac{1}{8}$ " (3 mm). The key is a tight fit across the width and must never be altered.
- 4 After cleaning, apply a coat of anti-seize compound to the engagement portion of the shaft.
- 5 Raise the fan assembly above the shaft and slowly lower the hub onto the shaft with the keyways aligned. Make certain the key does not slide down during installation.
- 6 Install the Hub Lock Plate with Lock Washer. Torque hub lock plate bolt to the rated capacity.

Blade Pitch Adjustment

Note : ***The trial pitch is the calculated setting for design conditions (water rate, heat load, air density, and brake horsepower). The trial pitch is provided by us.***

- 1 Select a position on the fan circumference and rotate each blade to this common location when setting or checking blade pitch. Support the blade tip to maintain a common rotation plane

setting the fan pitch. The pitch is set $\frac{3}{16}$ " (5mm) inboard of the blade edge that extends across blade width as shown in **Figure 4**.

- 2 Be sure all blades are positioned correctly on hub, then set the pitch. Blades should be within $\pm 1/4^\circ$ of the desired pitch angle. After the desired setting is obtained, progressively tighten the hardware according to **Note**. Recheck the pitch angle. If required, loosen the hex nuts and reset the pitch as necessary until the proper pitch angle is obtained.



Figure 4

Note: the polyester stem will be compressed during tightening and may produce a cracking sound. It is normal behavior and should not be doubted as blade failure.

Aerodynamic Hub Assembly

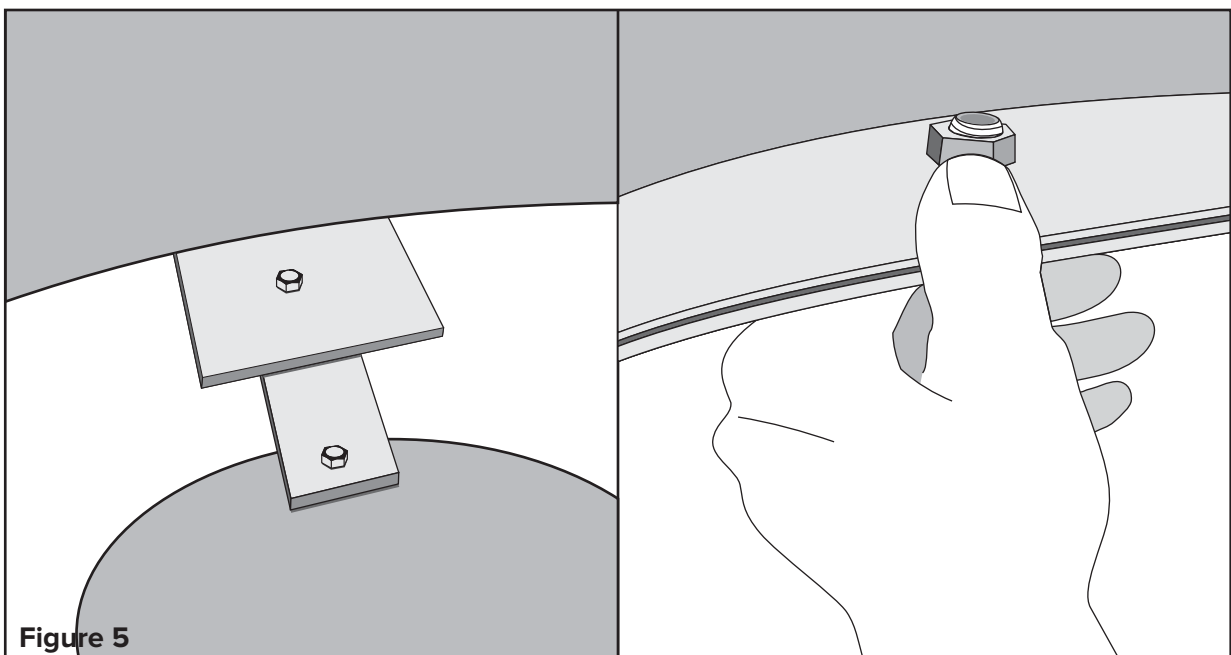


Figure 5

- Take the segments of the upper aerodynamic Hub and place on the floor by keeping an operator inside.
- Now the operator on the floor will sit down, and outside people will put the segment in such a way so that inner people can assemble segments by nut bolt and make a single body.
- After completion of assembly of aerodynamic hub lift the assembled and take the inner operator out from spinner. Now adjust the aerodynamic hub position on it's holding plate.
- After setting position of aerodynamic hub (spinner) on it's holding plate, tight all the nut bolt and fix it with the hub.

Torque Chart And Retightening Chart

• **Torque values for impeller hardware & retaining plate bolt (Table 6)**

Application ø [mm] / [inch]	Thread size	Class 8.8 (A3B)		(A2, St8) Standard		(A4) Optional	
		Nm	lb-ft	Nm	lb-ft	Nm	lb-ft
Coupling flang bolts*		75	55			75	55
		185	136			185	136
		360	266			360	266
		625	461			625	461
		1260	929			1260	929
		2600	1918			2600	1918
		5500	4057			5500	4057
Blade-bolts*	M12			60	44	60	44
	M16			140	103	140	103
	M20			250	184	250	184
	M24			425	313	380	280
	M30			650	479	500	369
	M36			1100	811	970	715
	M42			1300	959	-	-
Retaining plate*	M10 (79 mm / 3.11")	48	35			48	35
	M12 (79 mm / 3.11")	85	63			85	63
	M16 (79 mm / 3.11")	150	110			150	110
	M20 (79 mm / 3.11")	195	144			195	144
	M16 (189 mm / 7.44")	200	148			200	148
	M20 (189 mm / 7.44")	245	181			245	181
	M24 (189 mm / 7.44")	300	221			300	221
	M24(240 mm / 14.17")	540	398			540	398
	M30 (240 mm / 14.17")	700	516			700	516
	M30 (360 mm / 14.17")	850	627			850	627

Maintenance

Preventative maintenance will prolong useful life and assure continued trouble-free operation. After the week and subsequently at six-month intervals :

- Torque all hardware to specifications reference in this manual.
- Visually inspect the fan airborne debris damage, contact with fan cylinder segments, and corrosive attack. Correct any situations determined detrimental to fan operation.
- Remove any accumulated scale or dirt.
- Clear blade drain holes at fan tip.

Service

Proper identification of our fan is necessary to ensure you received correct replacement parts. The Maya Fan serial number can be used to determine the fan and any components installed and maintained as original equipment. Please provide the sales representative of the necessary information when ordering replacement fans or components.

Blades can be replaced without rebalancing the entire fan.

If rebalancing is desired, contact the Our sales representative in your area.

Safety Parameter

Kindly ensure the following before operating the ACC fan for best results.

1. All safety precautions have been followed.
2. All Electrical connection made and locked off.
3. All bolt used are secured tightly.
4. All obstructions in the fan housing and drive are removed (like tools, assembly fixtures, etc.)
5. Check all the blades are in one plane within the allowable tolerance.
6. Check the leading edge of all blades toward the direction of rotation.
7. Check Blade setting angle of all blades, it should be equal and with the allowable tolerance.
8. Ensure minimum tip clearance (The gap between the blade tip and fan ring)
9. In case of Belt drive, check the belt for adequate tension.
10. Turn the fan by hand to ensure that it does not strike housing.
11. Correct any problems found.
12. Close the Inspection doors (if present).
13. Start fan and bring to full speed. Observe operation for abnormal noise or vibration.
14. Caution: Do not run fan close to the critical speed.
15. After 8-10 hours, check for operating parameters and performance.
16. Stop the fan and recheck all the bolt connections and tighten if necessary.

Handling Instruction

Fan blades of larger than 26 ft. area packed in so-called “bunk beds” or specially develop transport frames.



Figure 6

The width of these crates suits standard container dimensions. Fan blades that will be transported by container sea freight are equipped with and hoist eyes (see **Figure 7**), to allow easy container loading/unloading. Through these hoist eyes, one can pull the bunk beds from the container without damaging the fan blades or the crates.



Figure 7

The fan blades can be lifted from the packing by placing a single sling around the blade. Position the sling as such that the blades tip is somewhat hanging down which makes it easier to move blades around.

Fan blades of impellers smaller than 26 ft., are packed in strong wooden/steel cases or crates.

Storage Instruction

If not installed immediately, it is recommended storing the impeller in a dry and shaded area.

For long-term storage (in excess of 6 months) it is necessary to check the condition of the corrosion protection agent on all machined surfaces.

Reapply or repair where necessary, using an acid-free corrosion protection agent (e.g. Esso Rust ban 397 or equivalent).

You may stack the “bunk beds” to a maximum of 3 high. Do not allow any heavy materials of any kind to be stored on top of the blades.

De-commissioning/ Disassembly and decomposing

In accordance with The ISO14001 certificate environmental management system, our cooling fans can easily be disassembled after de-commissioning. Their metal components and polyethene fan casings are highly suitable for recycling. Since no viable recycling procedure for reinforced plastics exists, fan blades need to be shredded and incinerated or used as land-fill. The inert nature of the materials used will prevent chemical pollution of soil and groundwater in case of in land-fill.

Part List

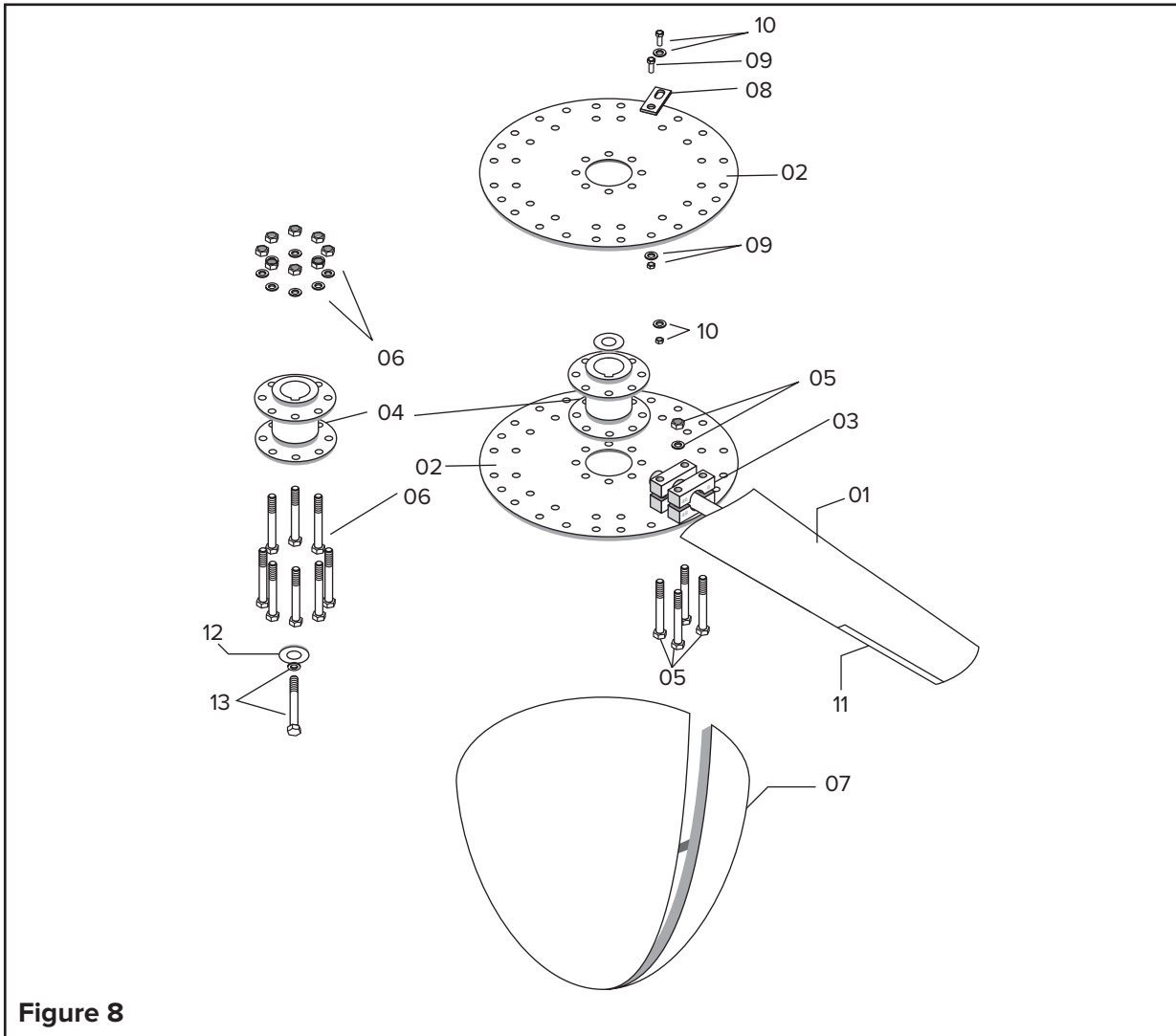


Figure 8

• Table - Material of Construction

No.	Item Code	Description	Material	Quantity
01	20070010	Fan Blades	FRP	08
02	20070020	Supported Hub Plate	MSHDG	02
03	20070030	Blade Holding Block (sets.)	AL/CI	08
04	20070040	Center Bush	CI-FG200	01
05	20070050	U-Bolt M-30 with nut & wisher	SS-304	32
06	20070060	Bolt M-16X230L with nut & wisher	SS-304	08
07	20070070	FRP Spinner	FRP	01
08	20070080	Spinner Support Plate	MSHGD	04
09	20070090	Bolt M-10X30L with nut & wisher	SS-304	08
10	20070100	Bolt M-08X25L with nut & wisher	SS-304	16
11	20070110	Lead edge	FRP	08
12	20070120	Lock Plate	MSHDG	01
13	20070130	Bolt M-16X230L with wisher	SS-304	01

Trouble Shooting

In case of any failure, please contact Maya Fan stating the impeller order number as mentioned on the hub plat and blade of the impeller.

Problem	Possible cause	Possible solution
Air volume low.	Fouling of system.	Clean system air-cooler bundles or cooling tower fill.
	Obstacles in housing/air stream.	Check actual total area of obstacles and impeller housing inlet shape against original selection. In dry-coolers the minimum required free height of the air inlet area is 1.0 times the fan diameter. This shall be higher in case of multiple row units.
	Static pressure higher than specified.	Increase blade angle. (Up to 3 degrees, thereafter do selection check).
	Blade angle decreased due to rotation of the blades. (I.e. forgot to retorque the U-bolt nuts).	Re-set blade angle and refer to the blade installation instructions for the correct torque.
	Air temprature higher than design air temperature.	Increase blade angle. (Up to 3 degrees, thereafter do selection check).
Power absorption (too) high. (1)	Fouling of system.	Clean system air-cooler bundles or cooling tower fill.
	Obstacles in housing/air stream.	Check actual total area of obstacles and impeller housing inlet shape against original selection. In dry-coolers the minimum required free height of the air inlet area is 1.0 times the fan diameter. This shall be higher in case of multiple row units.
Power absorption (too) high. (2)	Static pressure higher than specified.	Decrease blade angle.
		Clean system air-cooler bundles or cooling tower fill.

Problem	Possible cause	Possible solution
Power absorption (too) high. (2)	Air temperature lower than design air temperature.	Check performance against current air temperature.
	Airflow too high.	Decrease blade angle.
	Blade angle too large.	Set blade angle according fan selection details.
Impeller is rubbing against fan casing.	Transmission out of order.	Check transmission.
	Bolting of drive-train connection, support structure or fan housing is not tight.	Tighten all bolts.
	Impeller not centred.	Centre the impeller.
Vibration level high. (1)	Tip clearance too small.	Decrease impeller diameter by placing nylon rings between lower clamping pieces and blade stem collars.
	Fan casing too weak.	Stiffen fan casing.
	Imbalance of impeller.	Check if position of fan blades is according to instruction.
Vibration level high. (2)	Lack of stiffness in support structure.	Reinforce support structure.
	Bolting of drive-train connection or fan housing is not tight.	Tighten all bolts.
	Drive alignment incorrect.	Realign.
Vibration level high. (1)	Driver bearing damage.	Repair or replace.
	Drainage holes are blocked.	Open the drainage holes.
	Blade is not flush against lower clamping piece.	Release U-bolts, pull the blade outwards and retighten the U-bolts to the correct torque.
Vibration level high. (2)	Blade angle(s) not within $\pm 5.0^\circ$ tolerance.	Re-set the blade angles.
	Blades are out of tracking. The blade tips should be reasonably located in the same plane. A maximum tolerable deviation of 0.5% of the fan diameter is advised.	Contact Mayafan for advise.
	Fan is in stall.	Decrease blade angle or replace impeller.
Scratches or small damages.	Resonance of the cooler structure.	Change natural frequency of the cooler or run the fan at a different speed or install a fan with more or fewer blades.
	Transport and handling.	We advise to fill these cracks with a touch-up material e.g. Sikaflex 252 to prevent affecting the blades (Contact Mayafan for repair kit).

Problem	Possible cause	Possible solution
Hairline cracks on blade surface.	Could appear in resin rich areas around the edges of the fan blades and will normally stop progressing.	Hairline cracks are harmless in itself, however we advise to fill these cracks with a touch-up material e.g. Sikaflex 252 to prevent moisture penetration affecting the blades (Contact Mayafan for a
Noise higher than predicted.	Airflow higher than specified. Static pressure too high.	Reduce blade angle.
	Fan too close to obstacles.	Contact Mayafan for advise.
	Influence of mechanical noise caused by drive-trian.	Contact drive-train supplier.
	Resonance of fan-drive and/or support structure.	Contact Mayafan for advise.

Preventive Maintenance

Though the impeller requires little maintenance, it is recommended to conduct inspections at regular intervals, to check damage due to vibrations, fouling or wear and tear.

Actual recommended maintenance intervals will depend on the use and operation of the complete system and shall be determined by the operator.

Important

De-energise the fan and use lock out and tag out procedures prior to performing adjustments, service, inspections or lubrication.

- Check for the smooth operation of the ACC fan and listen for irregular noise or vibrations.
- De-energise the fan and make a visual inspection for deposits, and or damages.
- Visually inspect the blades surface and blade stems for cracks. Hairline cracks could appear in resin-rich areas around the edges of the fan blade and will normally stop progressing. Hairline cracks in itself are harmless, however, we advise you to fill these cracks with a touch-up material (PU filler, e.g. Sika flex 252) to prevent moisture penetration affecting the blades. Maya Fans Air can provide you with a repair kit complete with instructions.

For all other cracks, we suggest sending photographs to Maya Fan Air Engineering Pvt. Ltd. for evaluation.

- Visually inspect the blades for wear and tear. Exposed fibreglass should be recoated. We recommend shipping the worn blades to Maya Fan Air for refurbishment.
- For wet cooling tower applications visually inspect if the leading edge protection is still sufficient. If the leading edge protection is (partly) worn, we advise to either install stainless steel nose caps or to apply a new PU coating. The stainless steel caps can easily be installed over the leading edge of the blades and attached with rivets is a practical solution for repair inside a cooling tower. Maya Fan Air Engineering Pvt. Ltd. shall be glad to advise you about the best maintenance solution for your application.
- Replace corroded bolts and nuts.
- Deposits should be removed the from impeller and fan housing using brushes and/or a water jet

with a maximum water pressure of 3 bar or 45 psi. This is even more important after change out of any blades, to ensure proper balance.

- Check if the drainage holes at the blade tip and blade shoulder are still open.

Repairs of the FRP blades shall be carried out strictly in accordance with Maya Fan Air Engineering Pvt. Ltd. procedures.

We suggest that any damage be photographed and forwarded to Maya Fan Air Engineering Pvt. Ltd. for evaluation.



Thank you
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Regd. Off. & Works: Plot No. 53 B, Industrial Area No. 1, A. B. Road, Dewas (455 001) M. P. India
Ph.: +91 07272-408975, 94250-47572, Fax: 405433 E-mail: info@mayafan.in/mayafan.in@gmail.com, www.MayaFans.Com