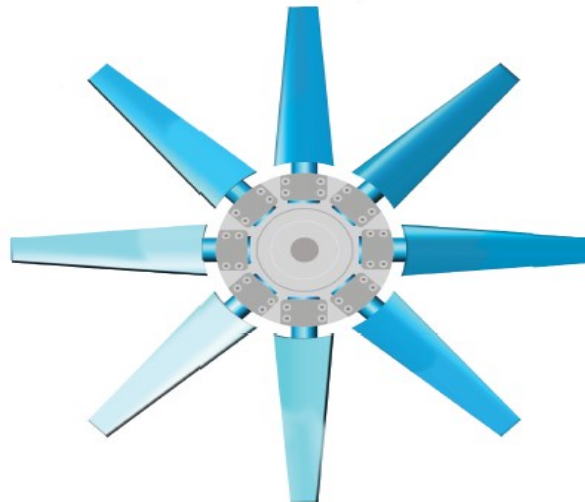




*Energy
Saving
Guarantee*

ชุดใบพัดประหยัดพลังงาน
Energy **S**aving
Fans



ENCON History

- Established in **1981**
- Organization led by **Mr. R.K. Sharma** with tech-know-how as **Aerodynamics engineer**

ENCON Vision

“To be the World leader in the field of Axial Flow Fans by rendering unbiased & unmatched product and service quality to our esteemed clients & customer”

DESIGN CRITERIA

Performance : by Optimizing Fan dia. & no. of Blades
 Efficiency : by Lower H.P.

$$nf = \frac{Q \times TP}{1,000 \times KW}$$

Q = Airflow (M³ / Second)
 TP = Total pressure (Pascal)
 nf = Fan efficiency

- E & C Resistance : Selection of High-Grade FRP
 UV Degradation (Epoxy Resin) Composites
- Vibration : Higher dampening property
- Noise : Lower level (< 85 dbA)

FACTORS AFFECTING FAN PERFORMANCE

➤ Design of Blade

- ✓ Airfoil section
- ✓ Profile of blade at difference radii & staggering
- ✓ Chord length at difference radii
- ✓ Thickness and Camber
- ✓ Blade twist
- ✓ Angle of attack

➤ Design of Hub

- ✓ Minimum Air Cycling loss

➤ No. of Blades

- ✓ Air volume & Pressure requirement

➤ Fan RPM

- ✓ For tip speed along with Noise & Vibration Criteria

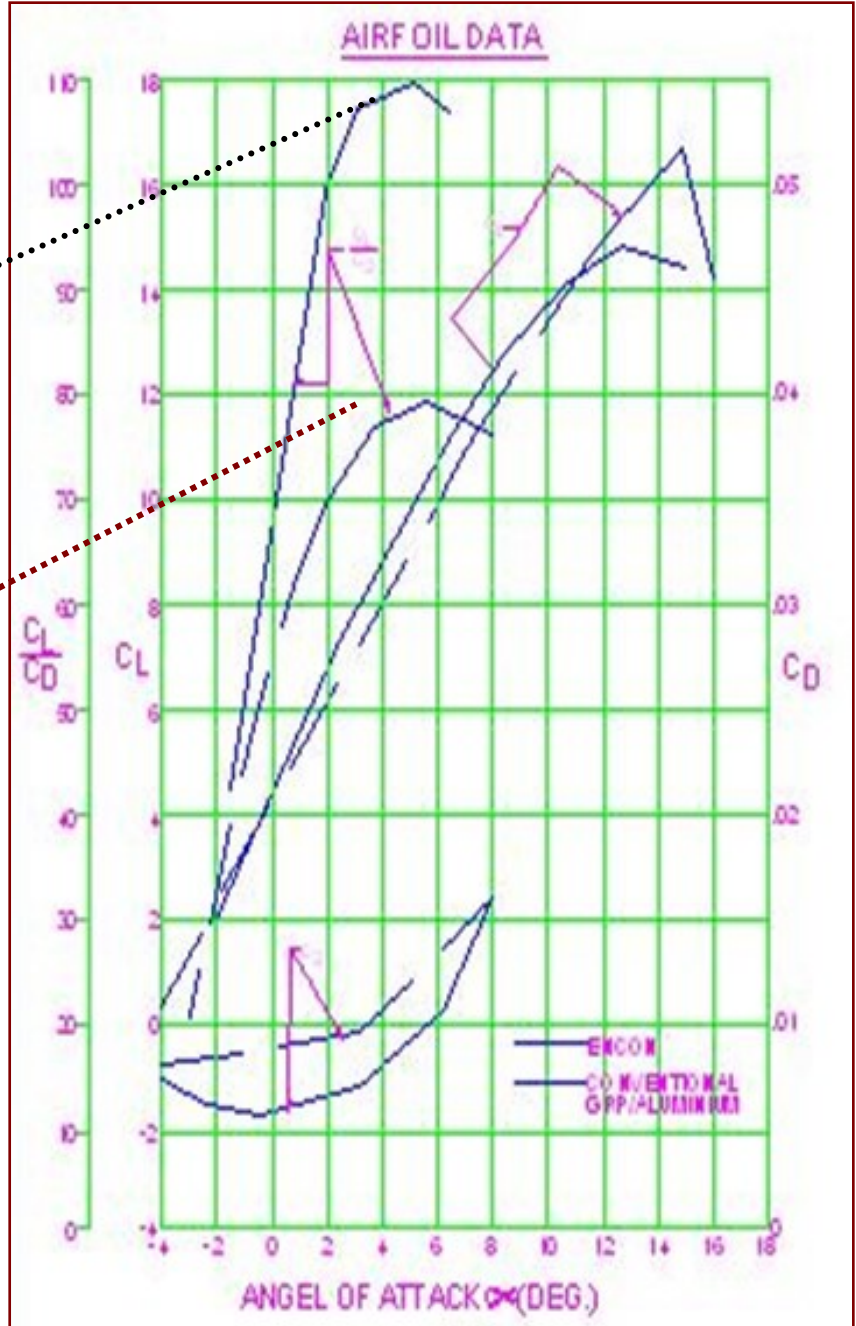
ปัจจัยที่ส่งผลต่อการประหยัดพลังงานของใบพัด ENCON

- 1) Fans Design : 70 %
- 2) Deteriorated Factor : 15 %
- 3) Friction Loss : 10 %
- 4) Weight of Fans : 5 %

Airfoil Data

ใบพัด
ENCON
 $C_L/C_D = 110$

ใบพัด
 Aluminium
 $C_L/C_D = 79$



—————
ENCON Fans

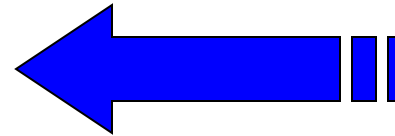
 Conventional GRP / Aluminium

C_L = Lift Coefficient
 C_D = Drag Coefficient

CHOICE OF RESINS

➤ *Epoxy Resin*

- Superior mechanical strength
- Greater chemical resistance
- Lower water absorption
- Higher heat resistance
- High dynamic strength
- High fatigue strength
- Better surface finish



**ENCON
Selection**

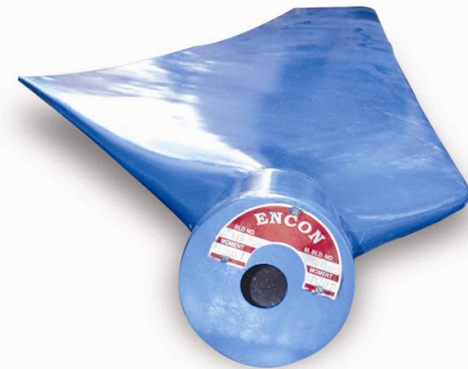
➤ *Polyester (GRP)*

- Cheaper quality standard
- Weak resin structure
- High Water absorption

Properties Comparision of ENCON FRP with Epoxy Blades & Steel Blades

Properties	Unit	ENCON FRP with Epoxy Fans Blades	Steel Blades
Ultimate Tensile Strength	Kg/cm²	4,000 – 8,000	2,038
Tensile Modulus	Kg/cm²	2.5 – 4.8 x 10⁵	21.4 x 10⁵
Flexural Strength	Kg/cm²	2,500 – 10,000	1,940
Flexural Modulus	Kg/cm²	3 – 5 x 10⁵	21.4 x 10⁵
Compressive Strength	Kg/cm²	2,500 – 5,000	1,900
Specific Gravity	-	1.8 - 2	7.8

ENCON PRODUCT RANGE



Fan diameter	2 – 50 ft (0.6 – 15 m.)
No. of Blades	2 – 22
Air Flow	Up to 1,800 M ³ /sec
Pressure	Up to 1,400 Pascal
Speed	81 – 3,000 RPM
Power rating	0.5 – 270 HP
Operating temperature	-10 °C – 230 °C

STANDARD MATERIAL OF CONSTRUCTION

Material of Construction

Blades

- ✓ **Fibre Glass Reinforced Plastic with High Grade Epoxy Resin**

➤ **Hub Assemblies**

- ✓ CS HDG/CI Alloy
- ✓ Aluminium Alloy LM-4/LM-6
- ✓ SS 304
- ✓ SS 316
- ✓ SS 316L





Fan Materials

1) FRP (Vetrotex ; France)

2) Epoxy (Huntsman; Switzerland)

Top coated

3) Anti-Corrosion Paint

***Production
by Pressure Bag Molding***

APPLICATION AREAS of ENCON

Factories

- ❖ Petroleum Refining
- ❖ Petrochemical
- ❖ Power Generation
- ❖ Gas Processing
- ❖ Textile / Spinning
- ❖ Cement
- ❖ Pulp & Paper
- ❖ Steel & Metal
- ❖ Foods
- ❖ Chemicals etc.

Building

- ❖ High Rise Building
- ❖ Hotel
- ❖ Hospital
- ❖ Department Store
- ❖ Institution / Government
- ❖ Others



Application	:	Cooling Tower
Fan Dia.	:	5 ft – 40 ft.
No. of Blades	:	4 - 12
Air Flow Range	:	5 m ³ /sec – 1,200 m ³ /sec
Total Pressure	:	5 – 300 Pascals
Efficiency	:	81% - 90%
RPM	:	78 – 900 RPM

Difference between ENCON FRP Fans & Aluminium

No	Items	ENCON Fans	Aluminium/Metallic
1	Efficiency	81% - 90%	56% – 65%
2	Design	Aerodynamic High Profile design	Old conventional designed
3	Material	High Grade Epoxy (Huntsman) laminated with FRP (Vetrotex)	Aluminium Casting
4	Blade	Hollow Blade (Less Weight)	Solid Blade (More Weight)
5	Axial	Low Axial thrust on Gear box	High Axial thrust on Gear box
6	Energy Saving Guarantee	20% up for Energy Saving Guarantee	Energy Saving is Nil
7	Endurance	Life > 10 years	Aging effect after 2- 3 years

Difference between ENCON FRP Fans & Aluminium

No	Items	ENCON Fans	Aluminium/Metallic
8	Skin Friction	Negligible skin friction due to smooth surface without loss of Efficiency & Wear & Tear	More Drag losses due to rough surface
9	Heat Distortion Resistance	High , due to Epoxy base material	N.A.
10	Maintenance Cost	Zero Maintenance cost due to high grade material	More Maintenance cost & downtime for assembling & dismantling
11	Leading Edge Protection	Provided with extra re-inforcement of Epoxy resin	Leading Edge deteriorates frequently after 6 months
12	Degradation	Protected from Erosion, Corrosion, UV degradation & Abrasion resistance	High prone to Erosion, Corrosion, UV degradation, Abrasion causing of Fatigue/Aging effect
13	Fan replacement	Only individual blade to be replaced	Discarding pair of blade

ENCON Fans Advantages

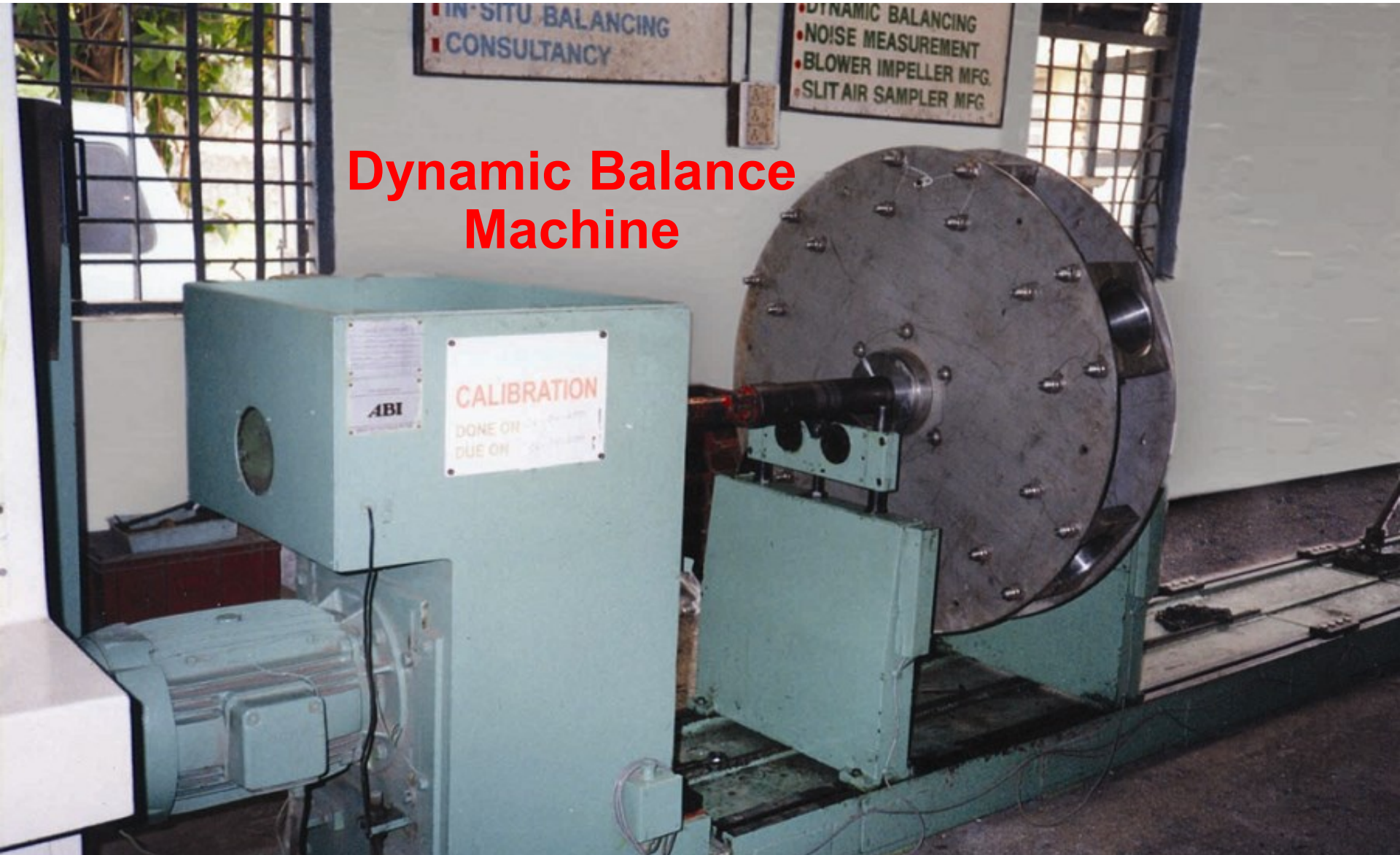
- **ENERGY SAVING :**
 - **Lower H.P. motor** can be used after installation of ENCON fan.
- **REDUCTION IN THRUST LOAD :**
 - The **thrust load** of ENCON fan is **less than** Aluminum blade
 - **Increase life of Gear Box** bearings.
- **EFFICIENCY :**
 - Design to achieve minimum **86% efficiency**
- **EASE OF MAINTENANCE:**
 - ENCON Fans are designed for **long-free service**
 - **Reduce down time** or maintenance power requirement & maintenance cost
- **BALANCING & VIBRATIONS**
 - Balance as per **ISO standard 1940** (grade 6.3)
 - Residual unbalance **below 80 mm x gms / kg** (micron).
- **ENVIRONMENT FRIENDLY**
 - Negligible skin friction due to **glossy surface finish**
 - Achieves a **low noise level** due to Airfoil profile of blades
 - **Better ecological peaceful** surroundings.

FAN PRODUCTS TESTING FACILITIES

- ❖ ENCON Wind Tunnel Test Bench
- ❖ Electronic Moment Balancing Machine
- ❖ Dynamic Balancing Machine
- ❖ Hardness Tester
- ❖ Cantilever Test Fixture
- ❖ Coin Tapping Test
- ❖ Universal Testing Machine
- ❖ Pendulum Impact Tester
- ❖ Heat Distortion Test
- ❖ Muffle Furnace
- ❖ Anemometer
- ❖ Sound Level meter
- ❖ Power Analyzer

ENCON Products Testing

Dynamic Balance Machine



ENCON Products Testing

Static Balance Machine



ENCON Products Testing

Loading Testing



Reference :

ENCON Fans Products Installation

Example Case 1)

Cooling Tower : Fans Dia. 6600 mm.

Example Case 2)

Cooling Tower : Fans Dia. 3100 mm.

Aluminium Fans Dismantling



Aluminium Fans Dismantling



ENCON Fans Installation



ENCON Fans Installation



ENCON Fans Installation



HONDA Installation



Aluminium Fans Removed

HONDA Installation



Aluminium Fans Removed

HONDA Installation



ENCON New Hub

HONDA Installation



ENCON Hub Installed

HONDA Installation



ENCON Blades

HONDA Installation



ENCON Blades Installed

HONDA Installation



FANS OPERATION

BEFORE



AFTER



PERFORMANCE TEST :

CTI Code

CTI Member

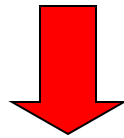
OUR ENGINEER WILL BE CONDUCTING THE '**PERFORMANCE TEST**' OF YOUR EXISTING ALUMINIUM AND OUR FRP FANS IN PRESENCE OF YOUR OFFICIALS AND SHALL BE MEASURING THE FOLLOWING PARAMETERS :

- AIR FLOW
- POWER CONSUMPTION AT MOTOR TERMINALS.

Required Information for Fans offer

- ✓ Fan Material & Fan diameter
- ✓ Fan RPM
- ✓ Motor power (HP/KW)
- ✓ Air Flow
- ✓ Actual power consumption (KW or Amps)

ENCON will offer



- % Energy Saving Guarantee
- Pay-Back Period
- Technical Details

ENCON Fans : Easy Maintenance

Daily Maintenance

- Check for any **unusual noise or vibration**
- Check **Ammeter** for undue fluctuation in the **current**.

Monthly Maintenance

- Stop the fan & **check the fan blades**
- **Check motor** for overheating
- **Check all hardware** for security/perfect tightening
- Ensure that **hole at the blades** tip from blockage
- To touch up with suitable **paint**, whatever required to all exposed parts of steel. Any abnormal condition noticed during the above inspection, the corrosive should be taken up immediately, as required.