



JM Tube Axial Fans

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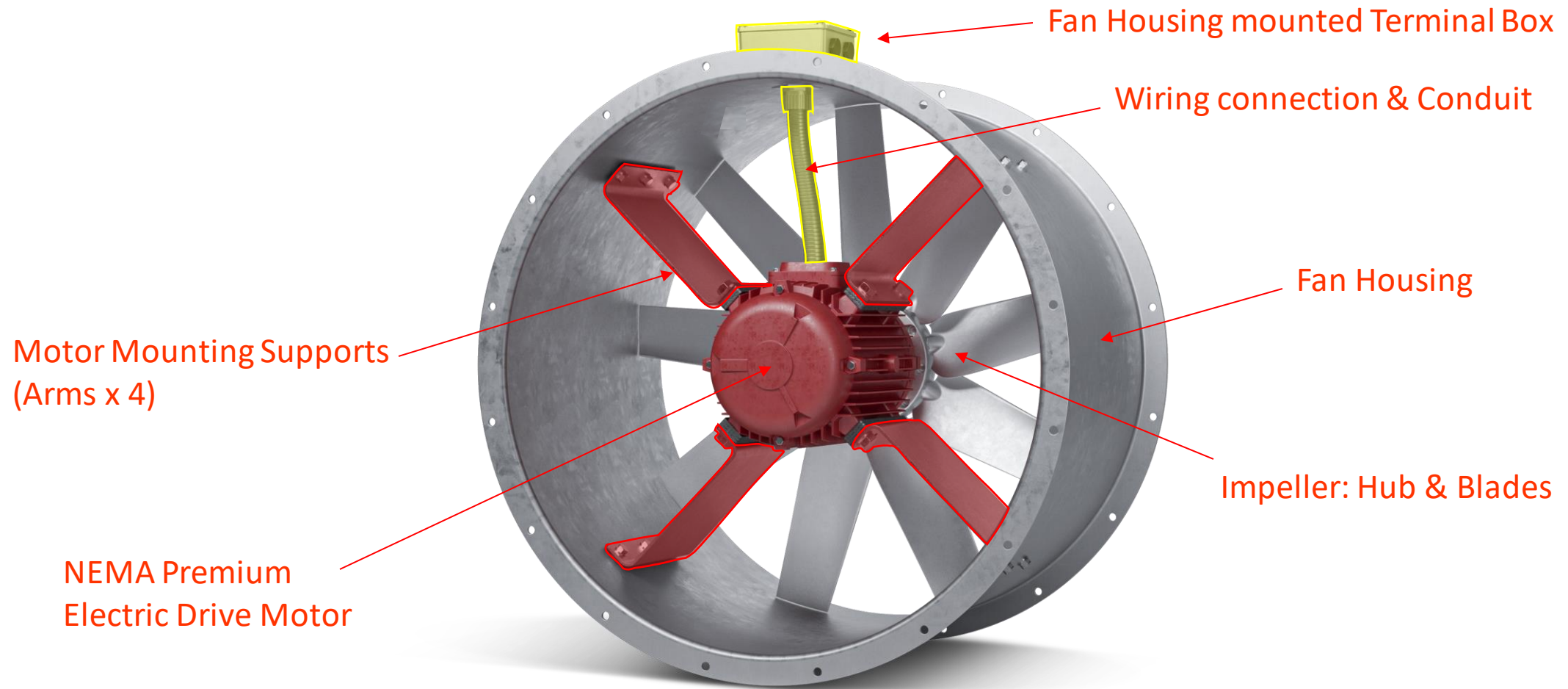
18th May 2022 (v2.3)

JM TUBE AXIAL FLOW FAN - TOPICS

- JM fan: Key Fan Components & Variants
- Axial fan Performance capabilities
- Aerofoil impeller blade design
- Axial fan Customer benefits:
 - High Air volumes
 - High Efficiency
 - Easy installation



Tube Axial Flow Fan – Key Components



Axial v Centrifugal Fan Comparison

Axial Flow Fan Features

- ✓ Small Footprint
- ✓ Easy Installation & Removal
- ✓ Ductwork is inline (easy to install)
- ✗ Efficiencies up to 77% (v 88%) – vane Axials are 85% efficient
- ✓ Direct Drive – Less maintenance (no belt or pulley replacements)
- ✓ High Frequency Noise, easy to attenuate
- ✓ Adjustable geometry (flexible solution)
- ✓ High Volume / Medium Pressure
- ✗ Limited operating temperature: $\leq +752^{\circ}\text{F}$ (Aluminium)
- ✓ Extended operating temperatures with Steel impellers



Basic Product Variants: Scope & Features

JM Axial Fan: Standard Ambient & HT

- 315 – 1600 mm diameter (12.4" to 63")
- Adjustable Pitch Die Cast Impellers
- R20 Series Progression
- Multiple Motors Options : NEMA Premium
 - : 2 to 8 Pole Speed
- Multiple Impeller combinations:
 - : 6 Hub diameters; 3, 6, 9 or 12 Blades
- Long, Short and Plate Mounted
- Pad Mounted Motors as standard
- Steel Fan Housing & Arms: Galvanised as Standard (paint available as an option)
- Range of Guide Vane variants
- Unique high efficiency, low noise Aerofoil Blade Section
- X-Ray examined Impeller parts



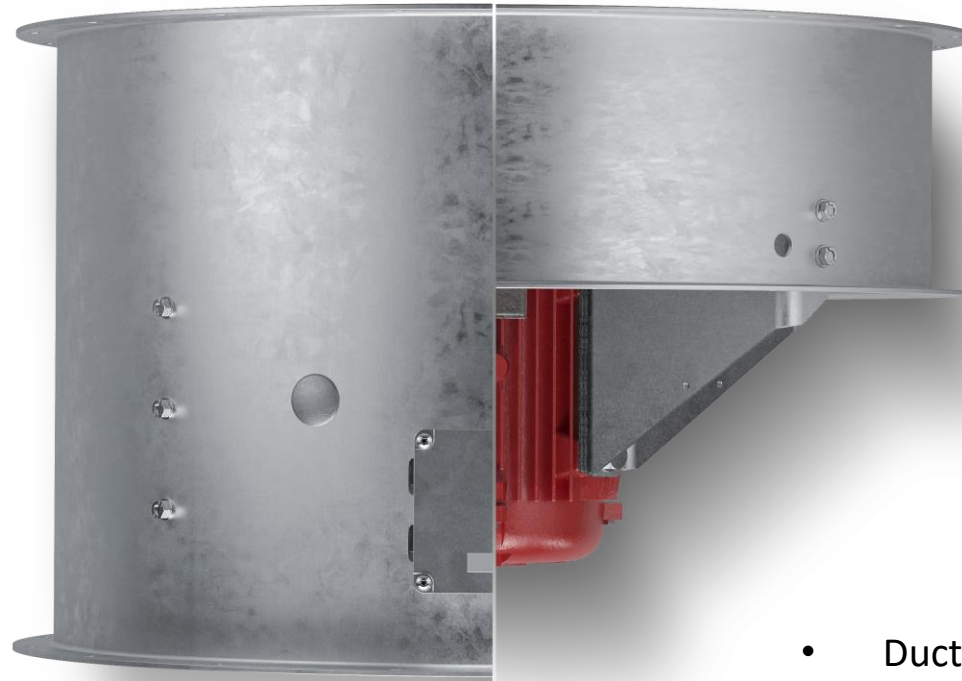
JM AEROFOIL AXIAL FLOW FAN

- Available in 15 diameter, 315-1600mm diameters (12.4" – 63")
- Volume up to 123,380 cfm
- Static pressures up to 9.65 inwg
- Fan efficiencies of up to 79%
- Fans tests to ISO5801 and BS848
- Suitable for Standard temperature ventilation (up to 104°F), plus a once off emergency smoke extraction duty at 572°F for 2 hours
- Fan housings are hot dip galvanised to offer enhanced corrosion resistance
- Fully cased design makes installation quick, simple and cost effective
- Motors are single speed, 60Hz, Nema Premium efficiency (IE3) machines, which are UL Listed and have IP55 ingress protection as standard
- Low Installed noise levels



Long Case Fans

- Duct covers both Impeller and Motor
- Easy to remove from Ductwork
- Standard choice for HVAC

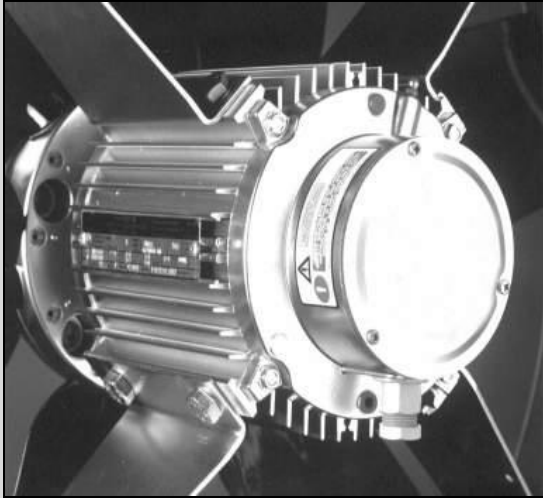


Short Case Fans

- Duct only covers Impeller – motor is exposed
- Often used at the start of a duct run
- Suited for OEM equipment cooling
- Non-Standard design available on request

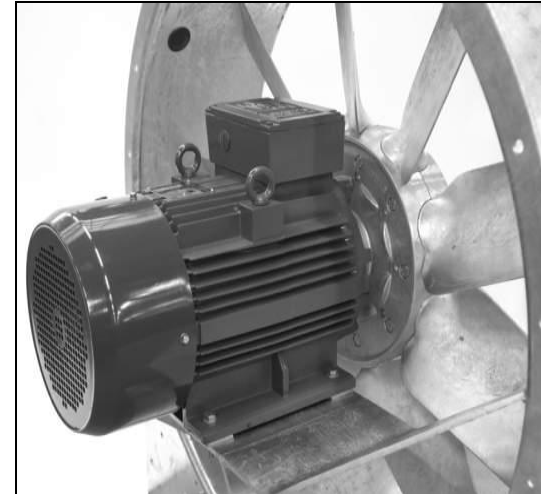
JM Axial – Motor Mounting Types

Pad Mounted



Motor is centred in Fan Housing using four Mounting Arms. Aerodynamically preferable in smaller Fans. Only available from a limited number of suppliers

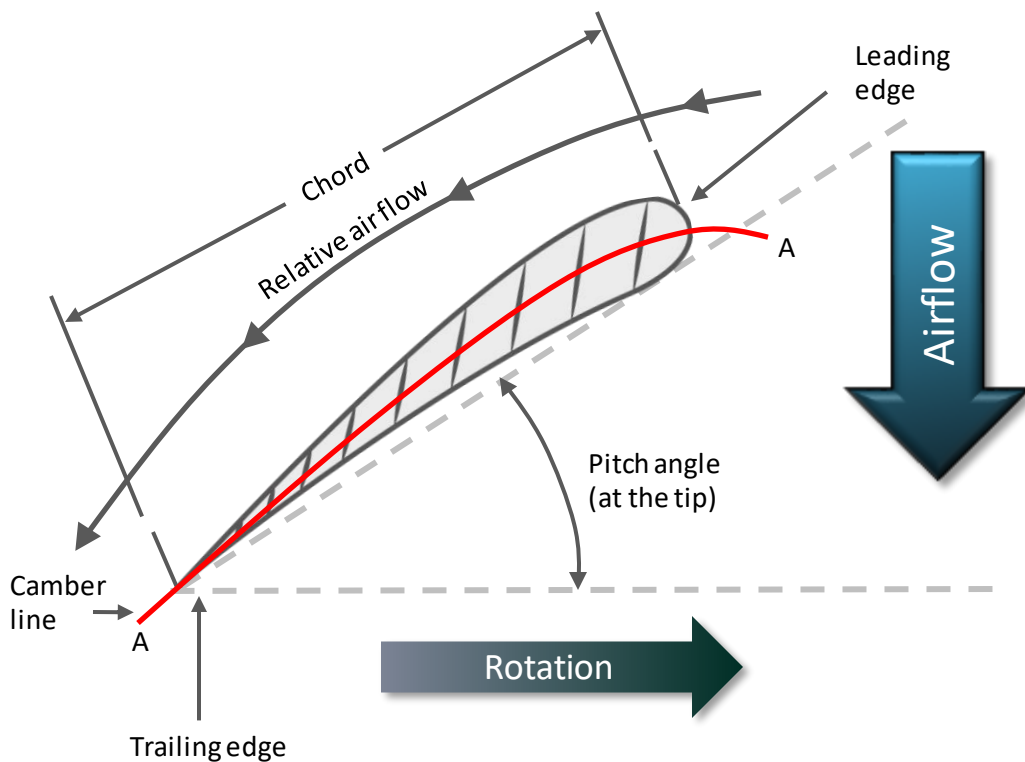
Foot Mounted



Motor is bolted to horizontal platform. Heavier and more expensive Fan. Motor format is standard for many Motor suppliers. Not suitable for Fans less than 500mm diameter due to high aerodynamic losses

JM Axial – Aerofoil Impeller Blade design

Typical aerofoil cross-section



Truly Reversible **JMTSP** impellers also available

NARAD Section – Airbus technology

- **Unique Woods Design**
- **Low noise**
- **High Efficiency**
- Features Modified Leading Edge
- 10° Linear Twist (Left hand)
- 26° Non-Linear Twist (Right hand)
- Aluminium Impellers:
 - High Pressure Die Cast (up to 1000 mm)
 - Gravity Cast (up to 1600 mm)

Impact of Impeller Tip Gap on Performance

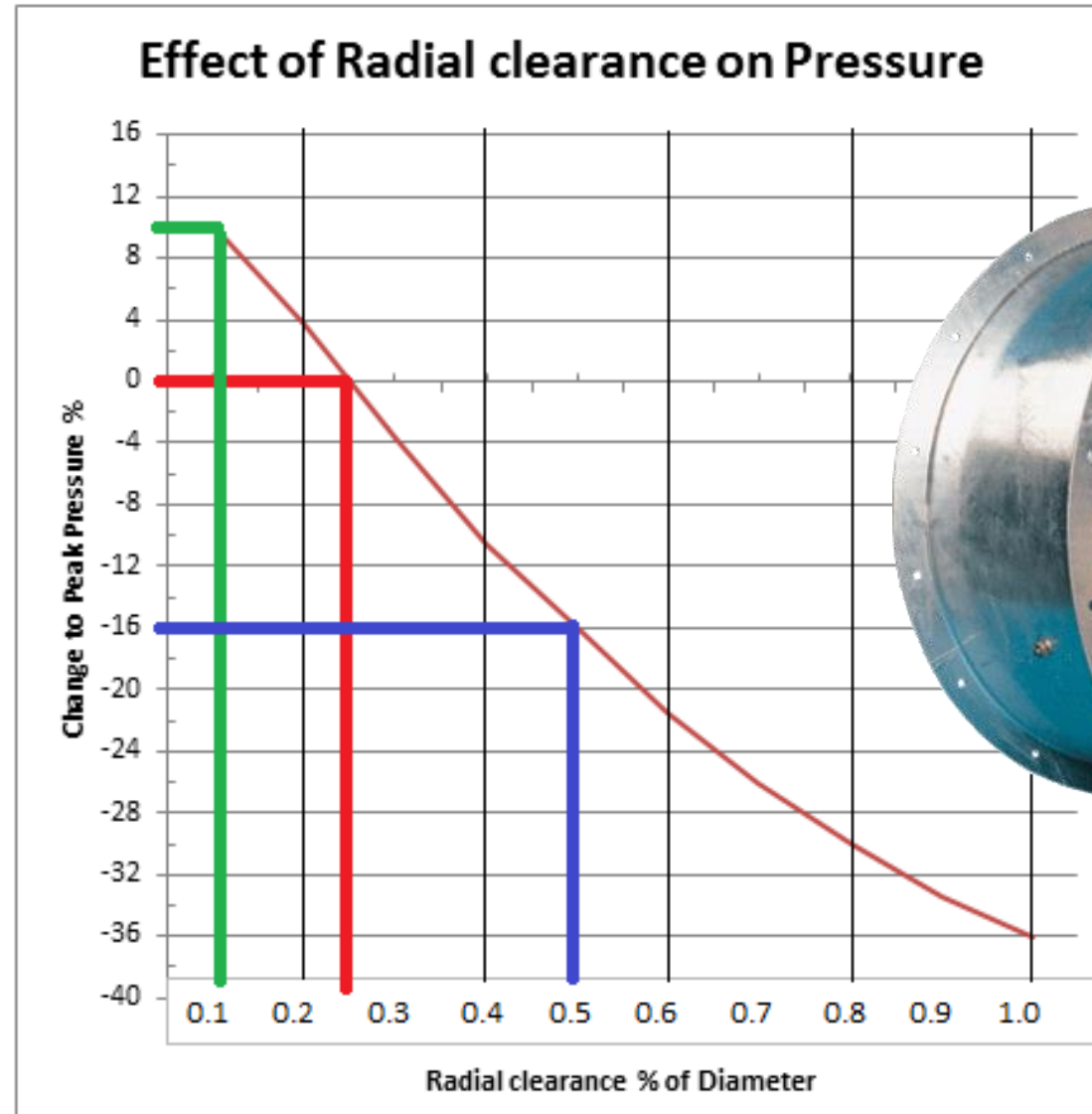
+10%

Catalogue

-16%

1000mm (39.4") dia. Fan

0.10% = 1.0 mm (0.039")
0.25% = 2.5 mm (0.098")
0.50% = 5.0 mm (0.197")

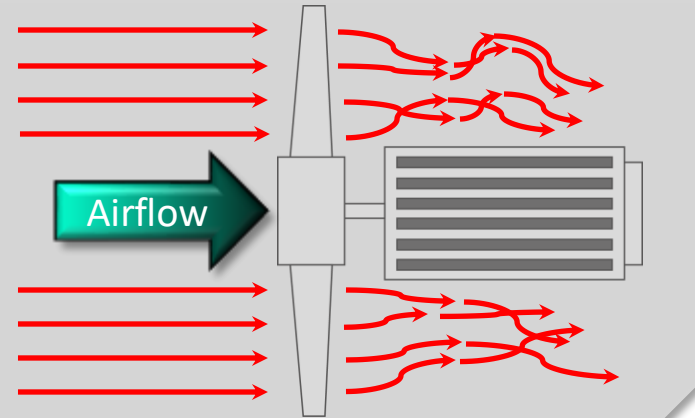


Tip gap

Form of Running: Performance Impact

Form B

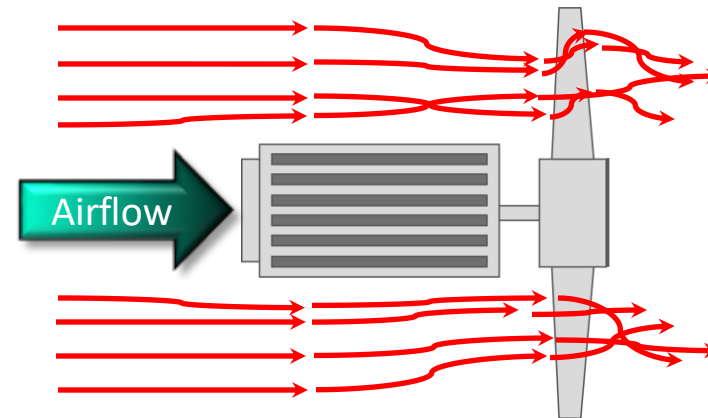
- Air passes over the **Impeller** first
- Standard form for **JM Fan**
- **Quieter**
- **Optimum** performance (ducted systems)



Preferred
form of
running

Form A

- Air passes over the **Motor** first
- Often **used on Short Cased or Plate mounted Fans** for equipment cooling
- Slightly **less performance: 2% less than form B**
- Slightly **noisier: 2 to 3dB**



Turbulence
reduces
Efficiency!

Fan Housing Finish

- Steel - Hot Dip Zinc Galvanised to BS EN ISO 1461
- Galvanising thickness varies based on steel thickness
- Excellent Anti-Corrosion protection properties
- L type Fan Housing also includes an easy access Bolt on Terminal Box

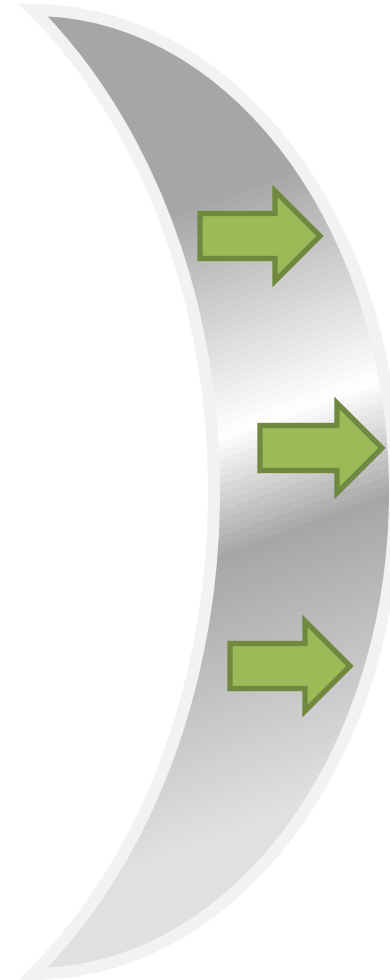


Anti-Corrosion protection for Fasteners

Magni 565 Finish for Steel Fasteners:

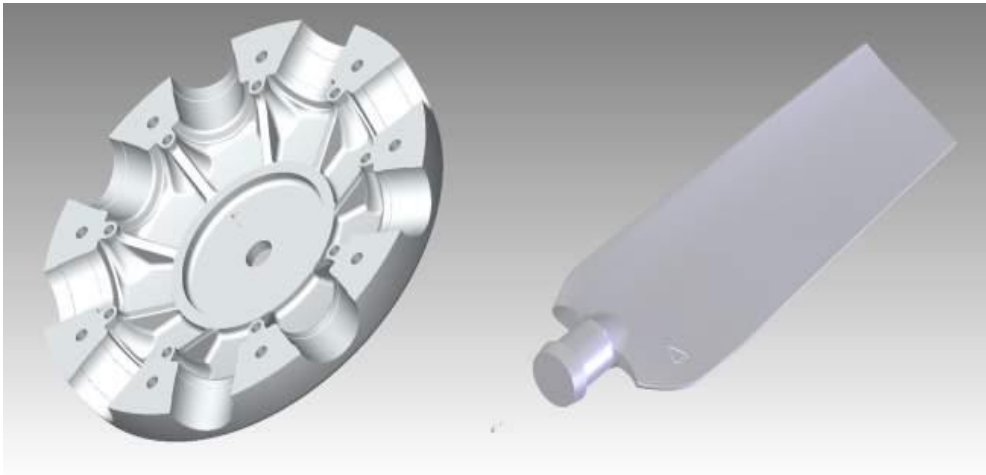
A water-based Zinc & Aluminum flake coating for fixings and fastenings. The coating is silver grey in appearance and provides a 4-way protection system:

- **Barrier Protection:** Overlapping Zinc & Aluminum flakes provide an excellent barrier between Steel and any corrosive materials
- **Galvanic Protection:** Sacrificial corrosion of the Zinc component, protects the Steel (up to C4 protection)
- **Passivation:** Metal Oxides slow down the corrosion reaction of Zinc and Steel which provides 3 times greater protection than pure Zinc
- **Self Repairing:** Zinc Oxides actively repair the coating and restores protection



Our impeller assembly design is unique to the JM Aerofoil

- Refined aerodynamic design
- Economic manufacturability
- Efficient solution


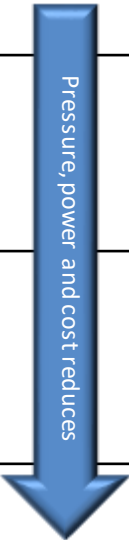

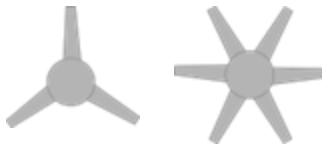



- **Aluminum alloy LM6** – has a high silicon content – ideal **corrosion resistance**. It is also ductile, so has high stress capability.
- **Alternative alloy (LM13)** is used to offer impellers with **higher temperature capabilities**.
- All rotating aluminum alloy parts, blade, hub, clamp plate, are **100% X Ray examined to provide reliability assurance**.
- **Blade tip gap is manufactured to 0.25% of diameter** to give highest peak pressure / lowest noise solution.
- **Pitch angle is adjustable to customer duty** – to achieve optimum performance.
- **Balanced to G6.3**. Hub designed to accommodate balance weights

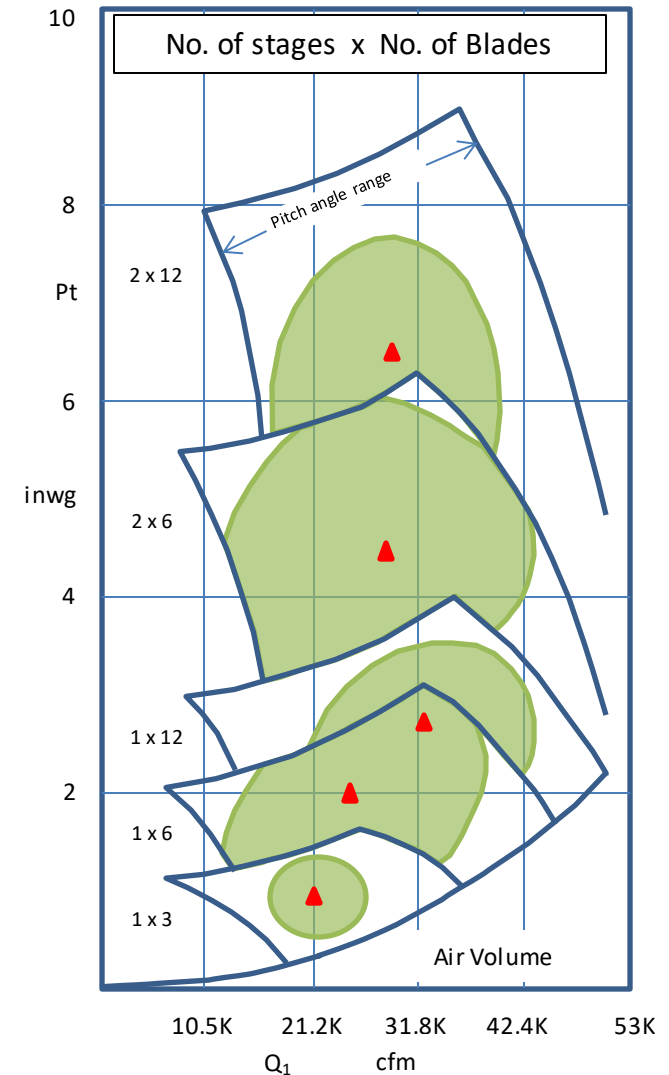
Impact of Blade Solidity on Performance

Impeller Solidity

Different number of Blades for wider range of selections – more efficient, cost saving

500mm (19.69") Hubs 6, 9 or 12 Blades		
250mm (9.84") – 400mm (17.75") Hubs 3, 6 or 9 Blades		
200mm (7.87") Hubs 3 or 6 Blades		
160mm (6.3") Hubs 5 Blades		

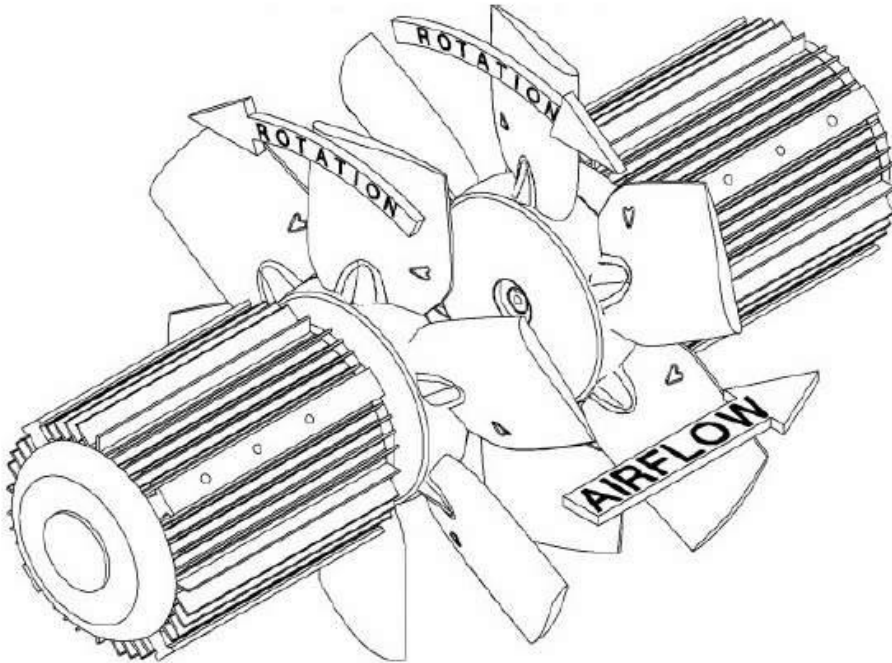
Example shows 50Hz data for illustration only



Multi-Stage Fans: Increased Pressure Development

JM multistage

- Contra-rotating design
 - 2 stages give 2.7 times pressure development of single stage fan.

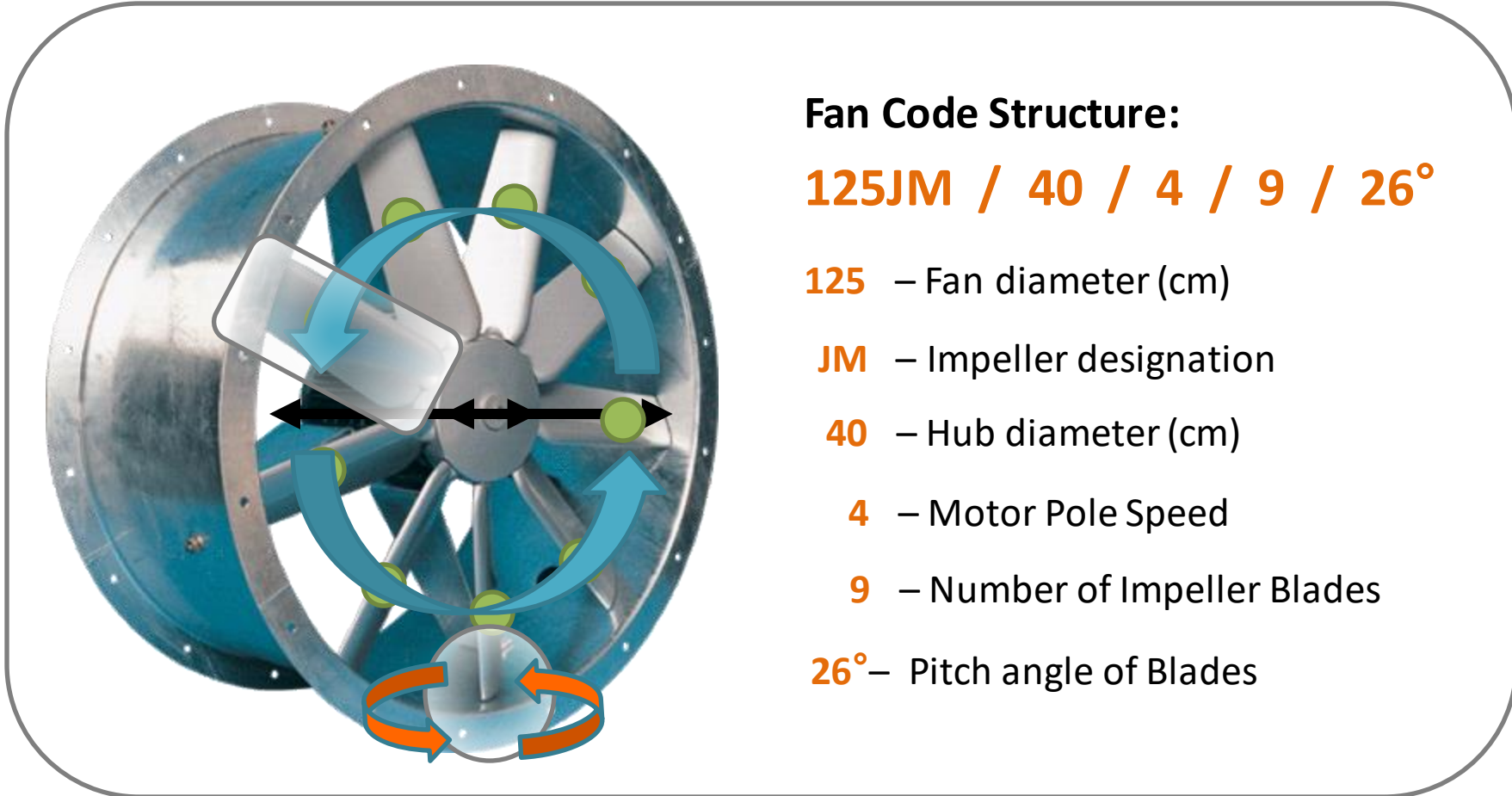


A standard JM Two Stage comprises a Form A right hand fan followed by a Form B left hand fan.



- High Efficiency (80-85%) above 500Pa pressure development
- Easy to install - in-line
- Flexibility. Add new stages as pressure increases
- Duty / Standby arrangement gives some performance even with one Fan stopped

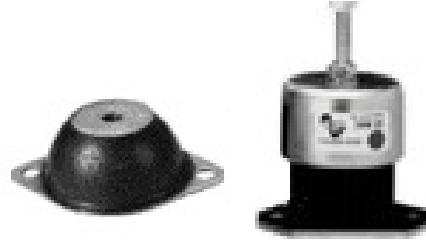
JM Tube Axial – Product Model Code Nomenclature



JM Tube Axial – Accessories



Mounting Feet



Anti Vibration
Mounts



Flexible Connector
and clips



Safety Guard



Bellmouth
inlet



Silencer



Damper
(AOD)



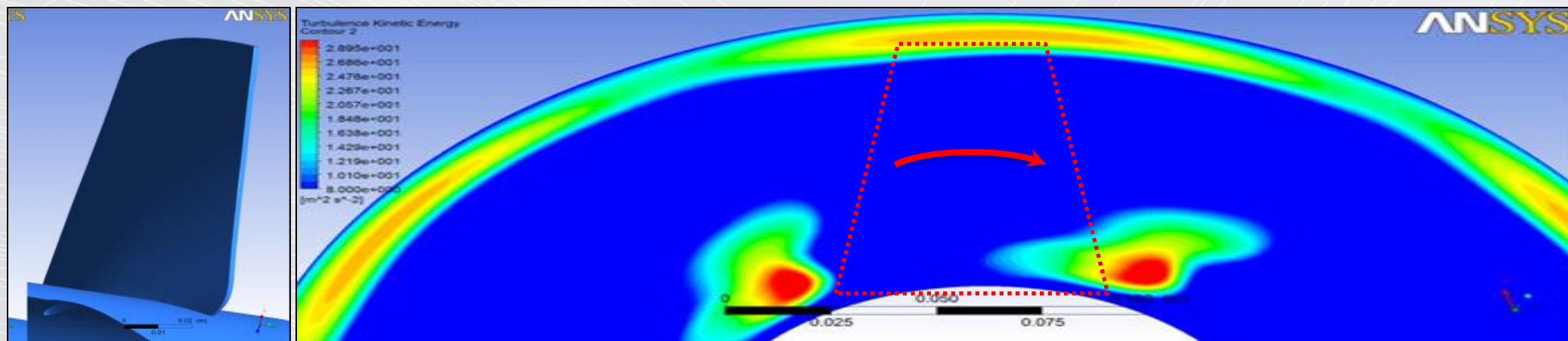
Matching
Flange

Engineering Design Tools

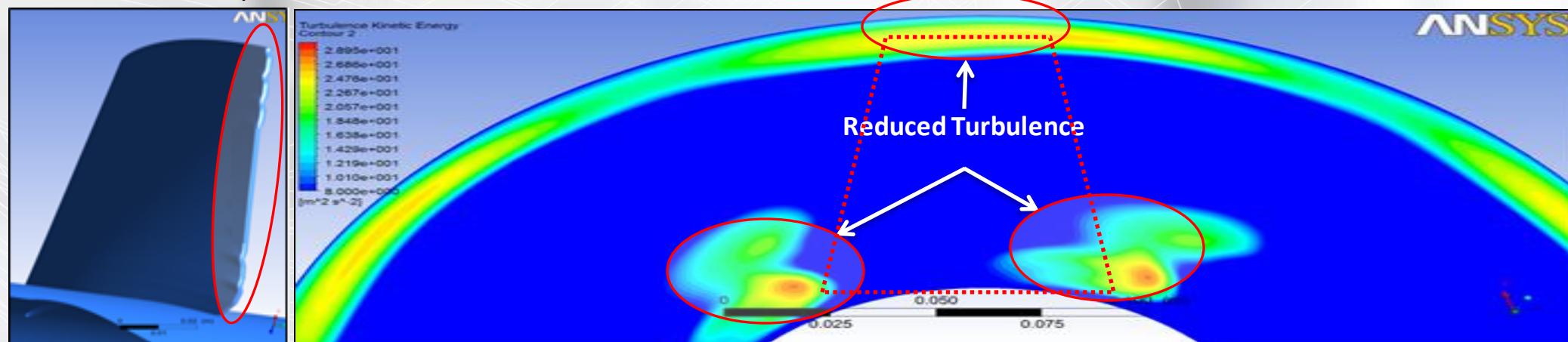


CFD Analysis – Turbulence at Blade Trailing Edge (TE)

Blade Geometry ***without*** Vortex Generators



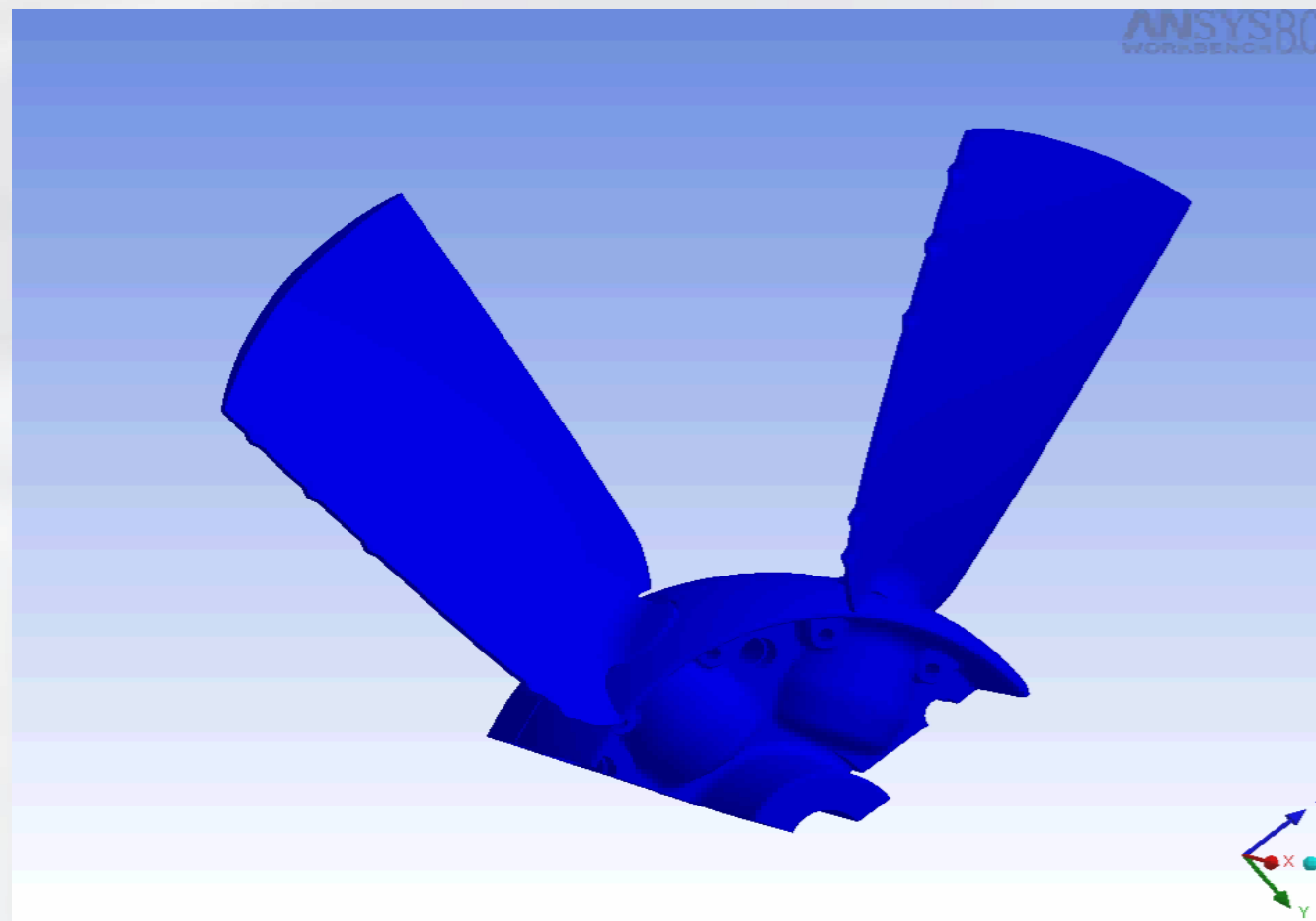
JMv Blade Geometry ***with*** Vortex Generators



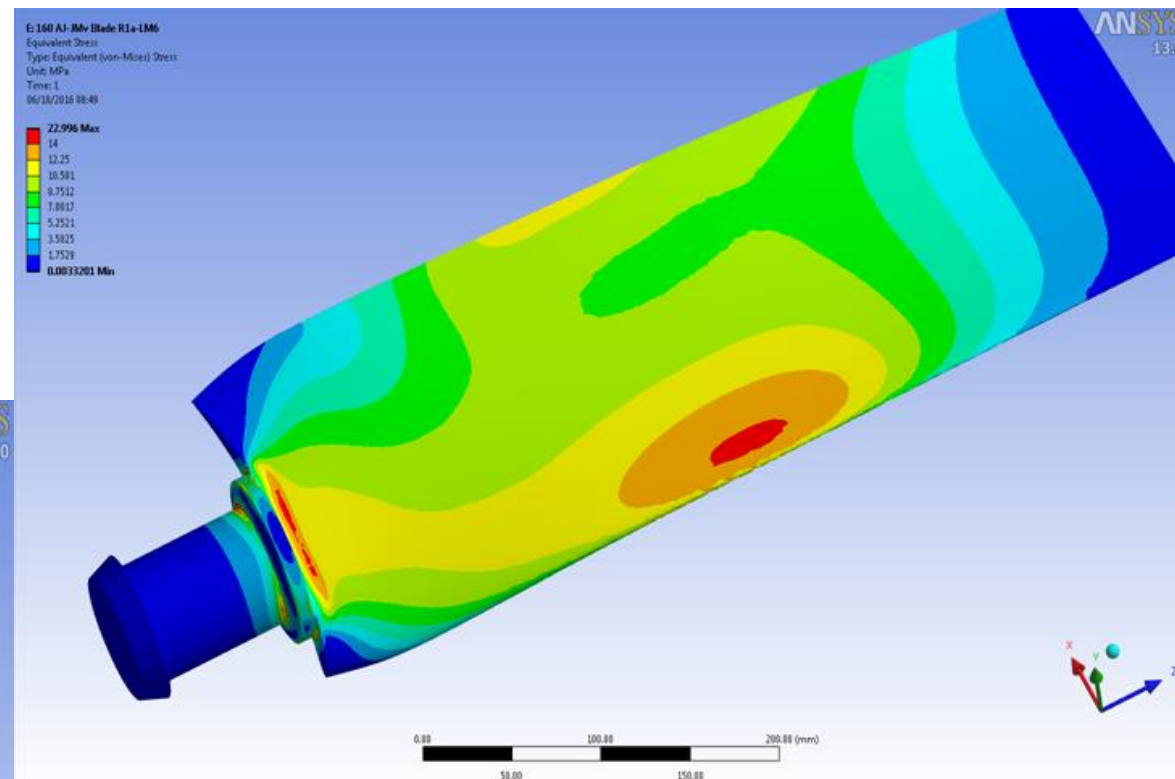
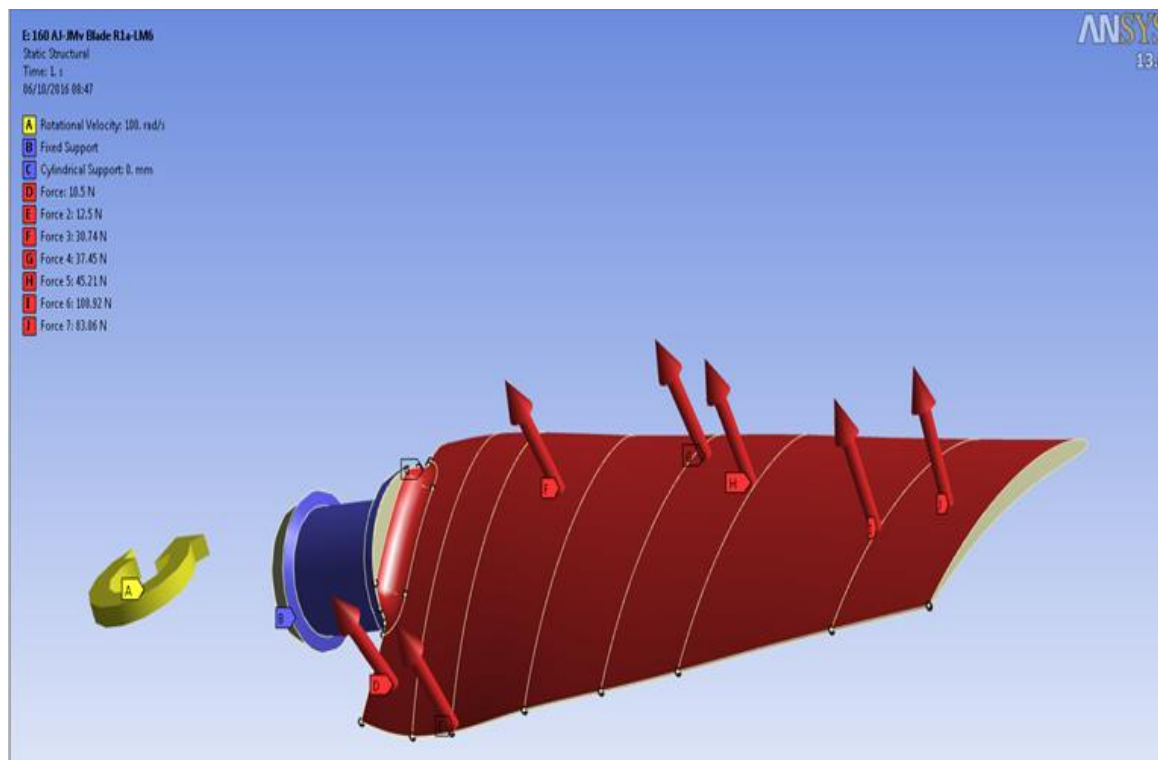
Looking in direction of Air Flow at a single impeller blade

Our Engineering team uses advanced **FEA** or **Finite Element Analysis** computer modelling software to review stress, strength and load locations within key fan components.

We have shown a typical animated output example, which illustrates how we visualise these variables within the design software



Finite Element Analysis computer modelling software is a powerful design tool that allows us to refine our design before we even make a “physical” component.



Forces and Stresses can be modelled using alternative designs and materials



JM AEROFOIL STANDARD TEMPERATURE

Our Standard temperature JM Tube Axial variant is designed for normal ventilation applications where every day running costs and performance are important. It combines reliability, quality and energy efficiency into one optimised package.



JM AEROFOIL HT (SMOKE EXTRACT)

Our HT JM Tube Axial variant is not only designed for normal ventilation applications, but can also be used for “one-off” emergency smoke extraction. Even though it is specifically designed to handle smoke extract temperatures of up to 572°F for 2 hours, it still offers an energy efficient solution.

Other Fan Products



Other Axial Fan Derivatives: Larger Fans for Infrastructure & Specialist Applications

JM Aerofoil (1.6m+) T/S



Diameters 1600 mm to 3550 mm
Volumes Up to 360 m³/s (1,296,000 m³/h)
Pressures Up to 3300 Pa (Static)
Impeller Adjustable Pitch T/S
Case Style Ducted, Long case
Case Coating Hot dip galvanized
Installation Horizontal or Vertical
Location Internal or External
IP rating IP55
Temperature -40°C to +50°C
Emergency 200°C/2 to 400°C/2 (Optional)
Standards EN12101-3-2015 available

Smoke Venting	Inverter Control	Speed Control	2 Speed	Motor Grades
✓	✓	✓	✓	IE1 IE2

JM Aerofoil (1.6m+) U/D



Diameters 1600 mm to 3550 mm
Volumes Up to 400 m³/s (1,440,000 m³/h)
Pressures Up to 4000 Pa (Static)
Impeller Adjustable Pitch U/D
Case Style Ducted, Long case
Case Coating Hot dip galvanized
Installation Horizontal or Vertical
Location Internal or External
IP rating IP55
Temperature -40°C to +50°C
Emergency 200°C/2 to 400°C/2 (Optional)
Standards EN12101-3-2015 available

Smoke Venting	Inverter Control	Speed Control	2 Speed	Motor Grades
✓	✓	✓	✓	IE1 IE2


KMG Aerofoil



Diameters 315 mm to 1600 mm
Volumes Up to 62 m³/s (223,200 m³/h)
Pressures Up to 2200 Pa (Static)
Impeller Adjustable Pitch
Case Style Ducted, Integral Guide Vane
Case Coating Hot dip galvanized
Installation Horizontal or Vertical
Location Internal or External
IP rating IP55
Temperature -40°C to +50°C
Emergency 200°C/2 to 400°C/2 (Optional)
Standards -

Smoke Venting	Inverter Control	Speed Control	2 Speed	Motor Grades
✓	✓	✓	✓	IE1 IE2

JM Aerofoil with Guide vanes



Diameters 315 mm to 1600 mm
Volumes Up to 65 m³/s (234,000 m³/h)
Pressures Up to 2000 Pa (Static)
Impeller Adjustable Pitch
Case Style Ducted, Bolt on Guide vane
Case Coating Hot dip galvanized
Installation Horizontal or Vertical
Location Internal or External
IP rating IP55
Temperature -40°C to +50°C
Emergency 200°C/2 to 400°C/2 (Optional)
Standards -

Smoke Venting	Inverter Control	Speed Control	2 Speed	Motor Grades
✓	✓	✓	✓	IE1 IE2

JMST Stainless Steel (316)



Diameters 500 mm to 1000 mm
Volumes Up to 65 m³/s (234,000 m³/h)
Pressures Up to 2000 Pa (Static)
Impeller Adjustable Pitch
Case Style Ducted, Long or Short
Case Coating EN1.4401 (316) Stainless Steel
Installation Horizontal or Vertical
Location Internal or External
IP rating IP55
Temperature -40°C to +50°C
Emergency 200°C/2 to 400°C/2 (Optional)
Standards ATEX Available

Smoke Venting	Inverter Control	Speed Control	2 Speed	Motor Grades
✓	✓	✓	✓	IE1 IE2

Other Axial Fan Derivatives: High Temperature Bifurcated fans

JM Bifurcated 200 °C



Diameters 400 mm to 1000 mm
Volumes Up to 19 m³/s (68,400 m³/h)
Pressures Up to 950 Pa (Static)
Impeller Adjustable Pitch
Case Style Ducted, Long case
Case Coating Hot dip galvanized
Installation Horizontal or Vertical
Location Internal or External
IP rating IP55
Temperature Up to 200°C Continuous
Emergency -
Standards -

Smoke Venting	Inverter Control	Speed Control	2 Speed	Motor Grades
-	✓	✓	-	IE2

Series 33 200 °C



Diameters 152 mm to 305 mm
Volumes Up to 0.95 m³/s (3,420 m³/h)
Pressures Up to 380 Pa (Static)
Impeller Aluminium silicon alloy, Fixed pitch
Case Style Ducted, Long case
Case Coating Hot dip galvanized
Installation Horizontal or Vertical
Location Internal or External
IP rating IP55
Temperature Up to 200°C Continuous
Emergency -
Standards -

Smoke Venting	Inverter Control	Speed Control	2 Speed	Motor Grades
-	-	✓	-	IE2

JM Bifurcated 600 °C



Diameters 400 mm to 1250 mm
Volumes Up to 33 m³/s (118,800 m³/h)
Pressures Up to 1000 Pa (Static)
Impeller Adjustable Pitch
Case Style Ducted, Long case
Case Coating Hot dip galvanized
Installation Horizontal or Vertical
Location Internal or External
IP rating IP55
Temperature Up to 600°C/2 hours
Emergency -
Standards -

Smoke Venting	Inverter Control	Speed Control	2 Speed	Motor Grades
✓	-	-	-	IE3

Other Axial Fan Derivatives: Car Park Jet Thrust Fans



THANK YOU FOR YOUR ATTENTION

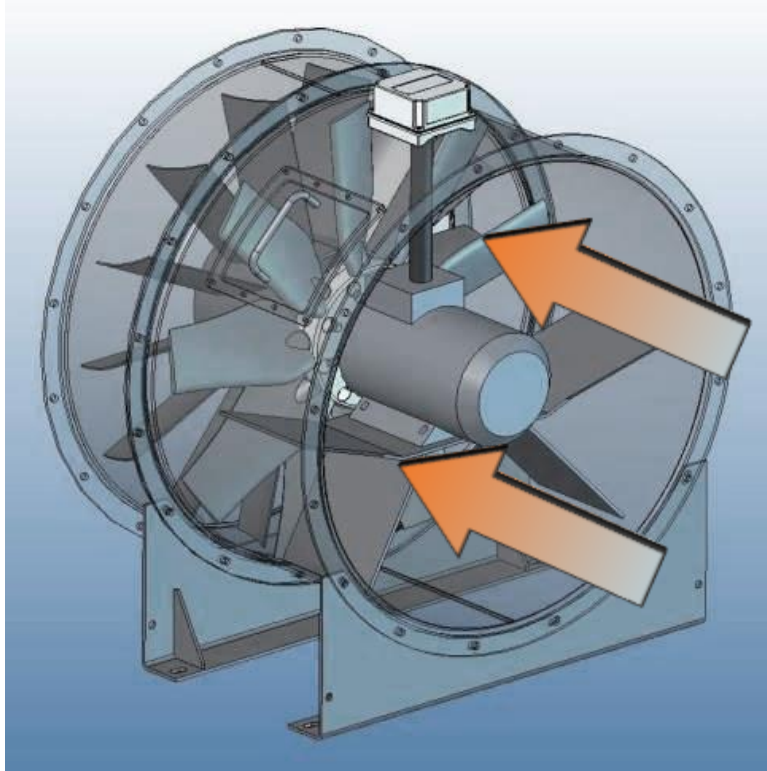
Contact details: andy.cardy@flaktgroup.com

www.woodsairmovement.com



Appendix – Additional Supporting Information



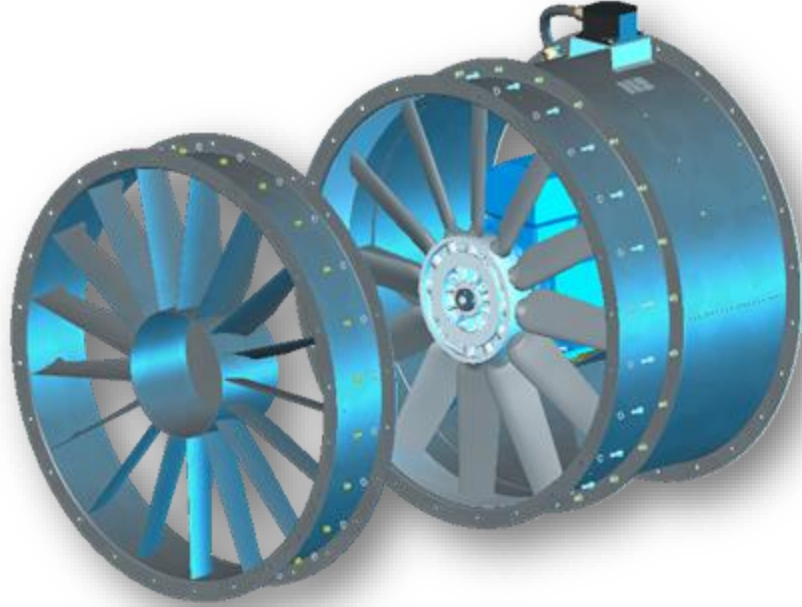


Guide Vane Principles

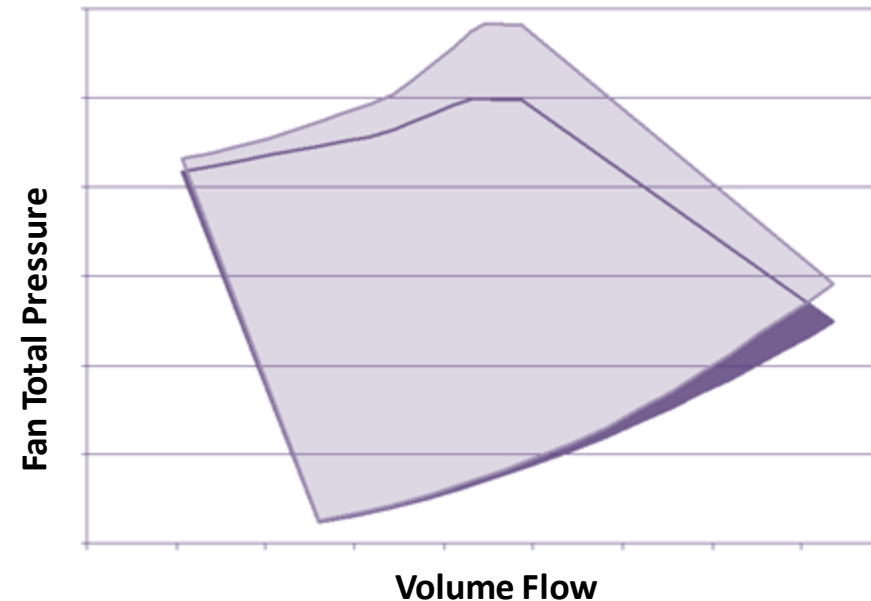
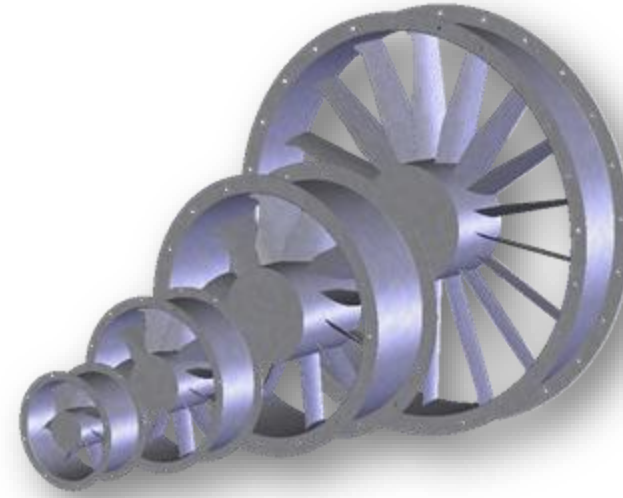
Guide Vanes mounted downstream within a **Form A Fan** gives extra pressure for **no extra power**

1. Right hand impeller blade imparts **extra swirl into the airstream**
2. **Swirl is removed by Guide Vanes**, which in turn creates additional static pressure

JM Vane Axial – “Bolt On” Guide Vanes



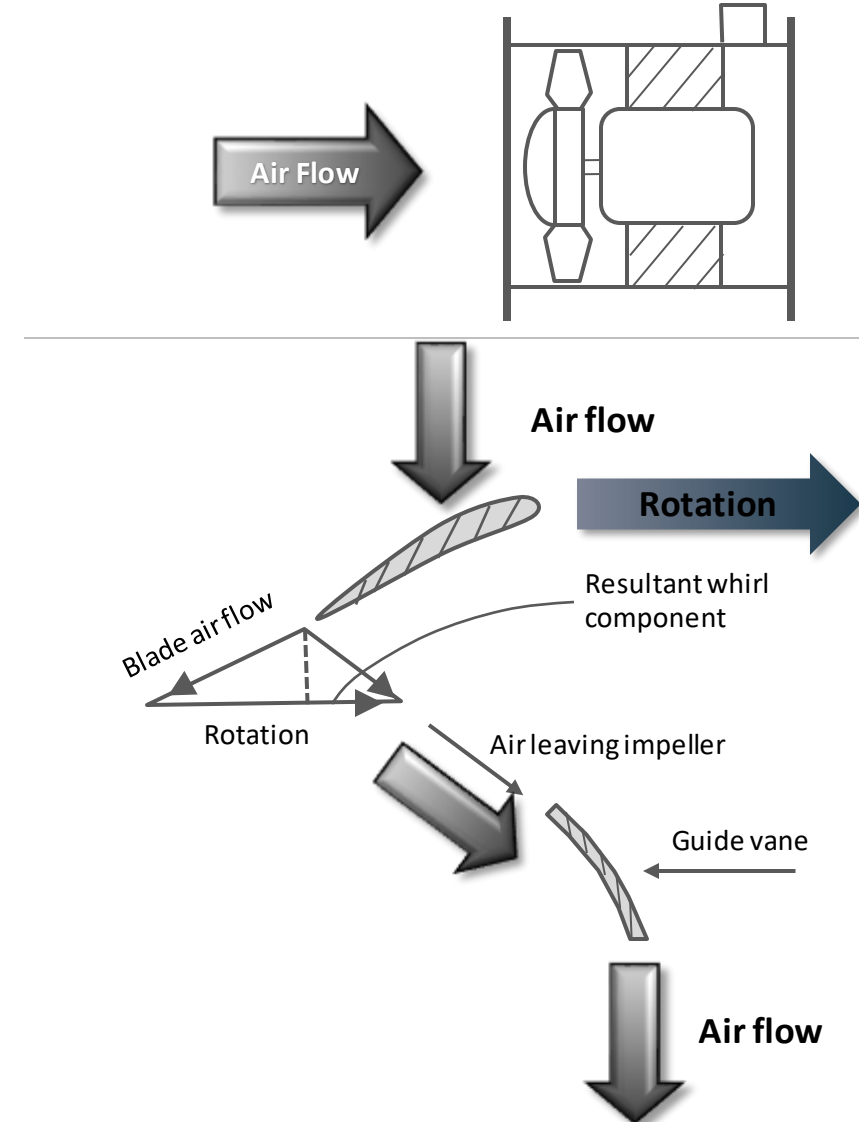
- Design derived from JM Marine Fan product development
- Downstream Bolt on Guide Vane offers a simple method of increasing pressure development without having to change the motor



JM Axial – Product Variants: Guide Vanes: Downstream

JM Guide Vane – **Downstream**

- Increased Efficiency
 - No increase in power
 - Slightly higher pressure development
- 26° Non-Linear Twist (Free Vortex)
- Aluminium Impellers:
 - High Pressure Die Cast (up to 1000 mm / 39.4")
 - Gravity Cast (up to 1600 mm / 63")



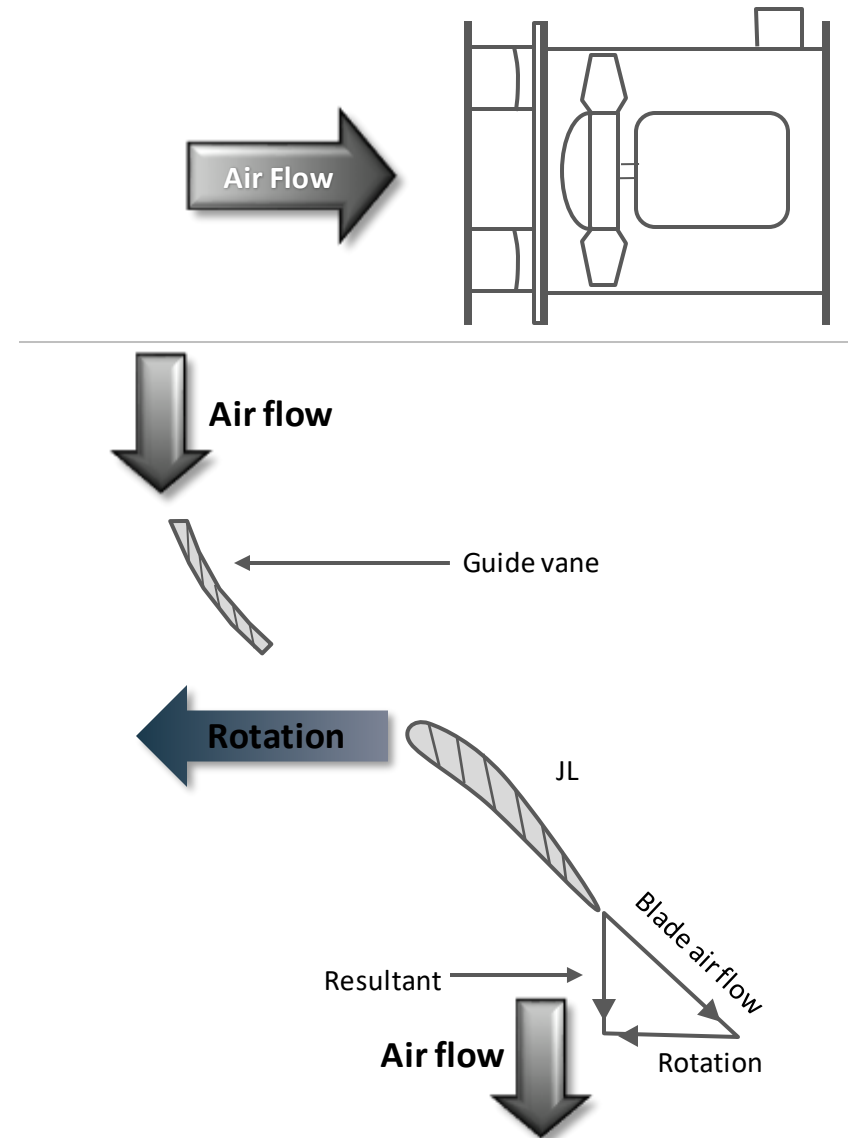
JM Axial – Product Variants: Guide Vanes: Upstream

JM Guide Vane – **Upstream**

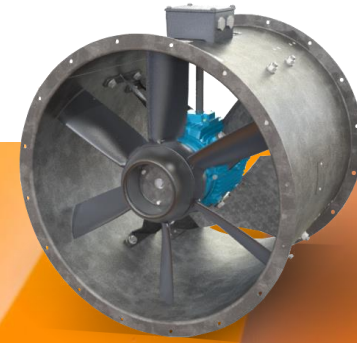
- Can be offered as a separate Accessory which can be retro-fitted
- **Up to 30% more pressure development**

BUT



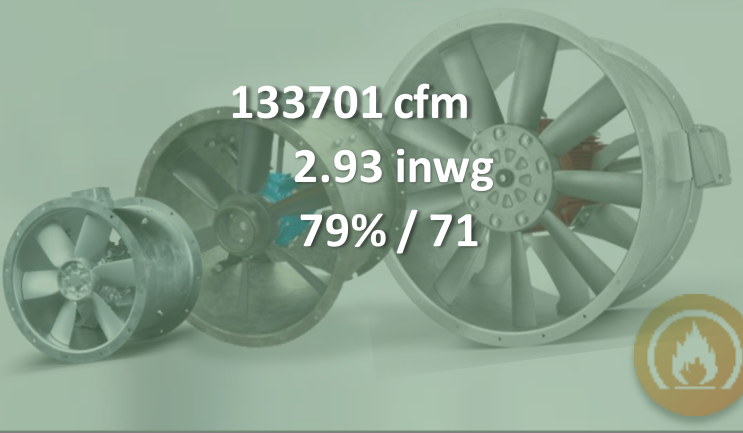

- **Power consumption increases (by 30%)**
- Same Efficiency as Standard Fan
- Motor rating may not be sufficient, so a motor change may also be needed



THE JMV(G) VENTILATION FAN



JMv(G) » RANGE SUMMARY: ALL SIZES / STANDARD TEMPERATURE & HT VARIANTS

Product Name >	JMv(G) Aerofoil (Std Ambient)	JMv(G) Aerofoil HT
<p>Maximum Airflow »</p> <p>Maximum Pressure »</p> <p>Max Efficiency / FMEG »</p> 	 <p>117810 cfm 6.63 inwg 84.8% / 77</p> 	 <p>133701 cfm 2.93 inwg 79% / 71</p> 
Casing Style	Long Cased with integral Guide Vanes	Long Cased with integral Guide Vanes
Available Sizes	14 Sizes available: 12.4" to 55.2"	14 Sizes available: 12.4" to 55.2"
Impeller hub diameters (mm)	5.5", 6.3", 7.9", 9.8", 12.4", 15.75" & 19.7"	5.5", 6.3", 7.9", 9.8", 12.4", 15.75" & 19.7"
Impeller blades (number)	6, 9 or 12 Blades (hub dependent)	6, 9 or 12 Blades (hub dependent)
Motor Speed Options	2, 4, 6 or 8 pole #	4, 6 or 8 pole #
Operating Temperature range	-40°F to +122°F	392°F, 572°F or 752°F (For 2 Hours)
Electrical Supply	1Ph / 50 or 60Hz and 3Ph / 50 or 60Hz	3Ph / 50Hz and 60Hz (400°C Max.*)



PROPERTY OWNER

- **Operating Cost Savings:** up to **44.5%**
- Available as a **standard fan or high temperature** fan up to HT 752°F / 2 hours (EN12101-3 certified)
- **Innovative "VCC technology"** using 2-stage integrated guide vanes & impeller spinner for larger diameter fans (24.8" fans, with our 9.84" hub and above) delivers **high efficiency solution**



CONSULTANT

- **Impeller efficiency increased up to 84.8%** (increased by up to **19.3%**).
- Innovative new fan design (integrated guide vanes) increases overall fan efficiency
- **High efficiency performance** supports the design of "green buildings"
- **JMv(G) offers a single stage, high pressure, high efficiency solution to replace the need for 2 stage fans**



CONTRACTOR

- Long casing fans offer easy and affordable installation - saves time
- Large range and fast availability – **Offers smaller motor or Fan diameter solutions**
- **JMv(G) offers a single stage, high pressure, high efficiency solution to replace the need for 2 stage fans**
- Operating costs are calculated automatically by Fan Selector software

JMv(G): Achieve More With Less

High Efficiency, High Pressure Alternative to Steel impeller @ 2 pole speed



ENVIRONMENT

- Offers **Environmental** protection by **reducing carbon dioxide emissions by up to 624 tonnes** (over operational life)
- Less material than alternative 2 stage & bolt on guide vane solutions
- Able to achieve higher performance at lower speed (2 pole Vs 4 pole) therefore significantly quieter



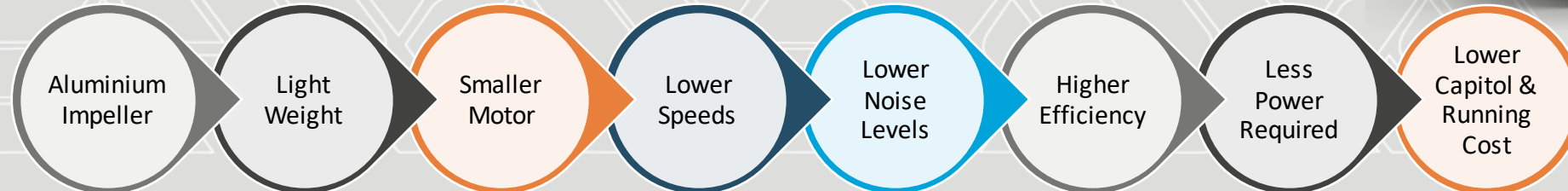
ECONOMICAL

- **Reduced running costs by up to 44.5%** (when compared with our JM fan product), even with IE2 motors
- **Reduced power needs** translates into a more economical solution for installers
- IE3 (Premium efficiency) grade motors can also be fitted to provide even greater energy savings

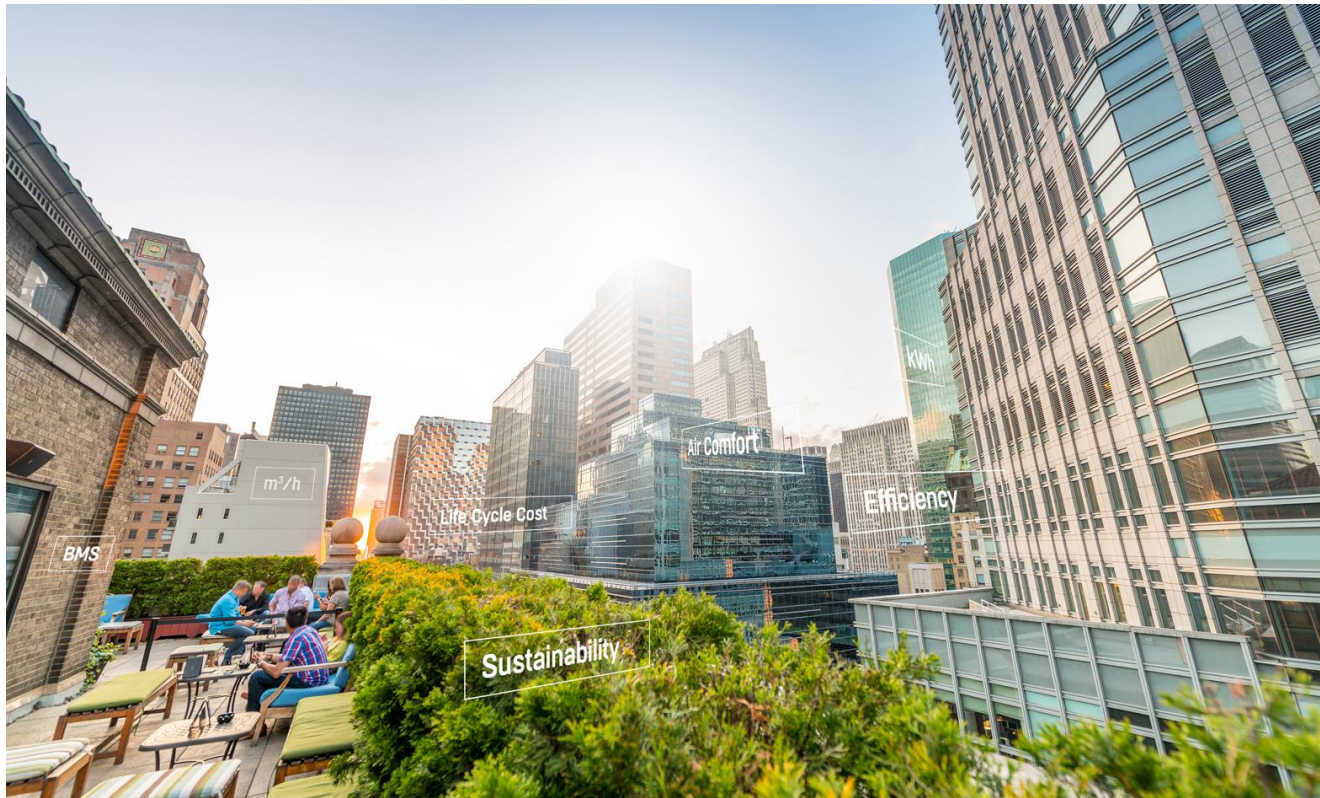


EXPERTISE

- **Uses our Vortex Creation Control technology** developed using advanced Engineering software tools (Computational Fluid Dynamics and Finite Element Analysis)



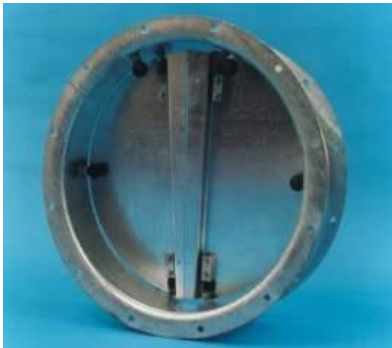
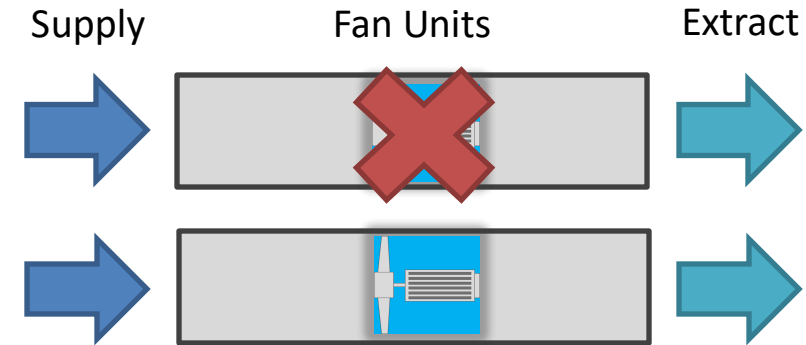
Axial Fans: Typical Applications Reference Material



JM Axial – Fans in Parallel

Two or more Fans in parallel increases volume at the same pressure...

- Space saving (duct run length)
- Run & Standby
- Variable volume (2 Different Systems)
- Often standard requirement for emergency smoke removal



Note: Requires care in selection at higher pitch angles to avoid possible “stall”

Fit Dampers to prevent back-draught/re-circulation

JM Axial – Fans in Parallel

**Typical
application:**
Garage Fan
Emergency
Smoke Extract



JM Axial – High Temperature Smoke Extract Fans

Certification: High Temperature Emergency Smoke Extract Fans

- Tested to EN12101-3: 2015
 - CE-Marked / UKCA Marked
- Temperature/time categories:
- 200°C (392°F) / 2 hours
 - 300°C (572°F) / 2 hours
 - 400°C (752°F) / 2 hours



HT JM Axial

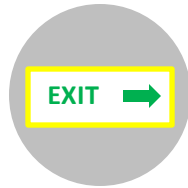
JM Axial – High Temperature Smoke Extract Fans

High Temperature Emergency Smoke Extract Fans

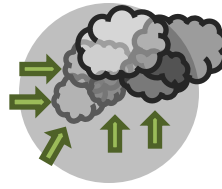
Emergency smoke extraction
from occupied space



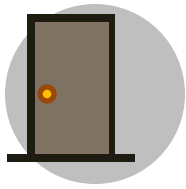
JM Axial – Stairwell Pressurisation Systems: Functions



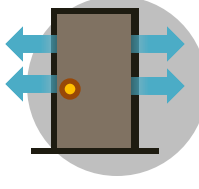
Protection of emergency escape routes



- Create positive pressure to resist smoke entry to escape route
- Provide positive smoke control in the protected escape routes



Use of pressure relief to atmosphere to balance pressures to allow doors to be opened



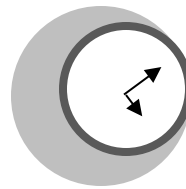
Provide sufficient airflow through door openings and gaps to resist smoke flow



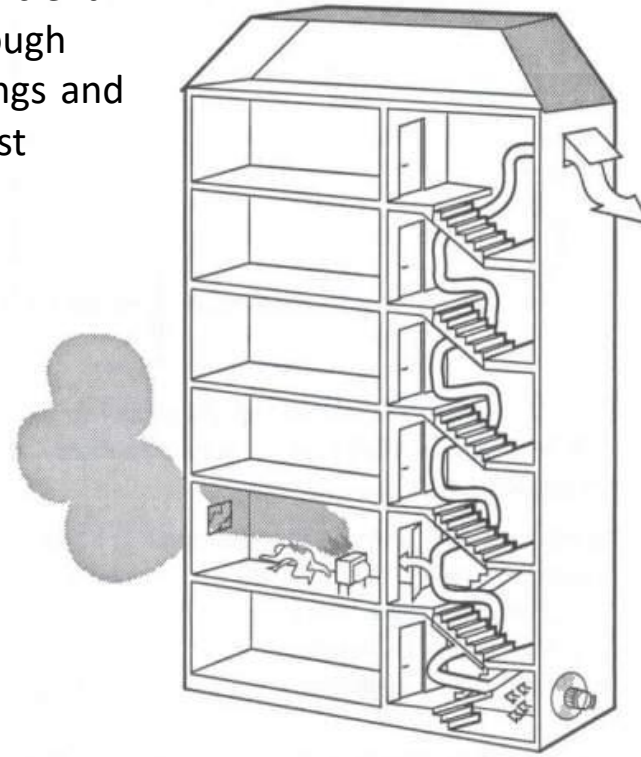
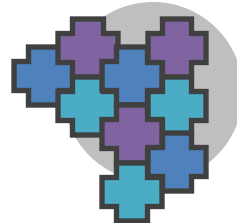
Be readily available when fire / smoke detected



Be simple, economic and installed to avoid malfunction



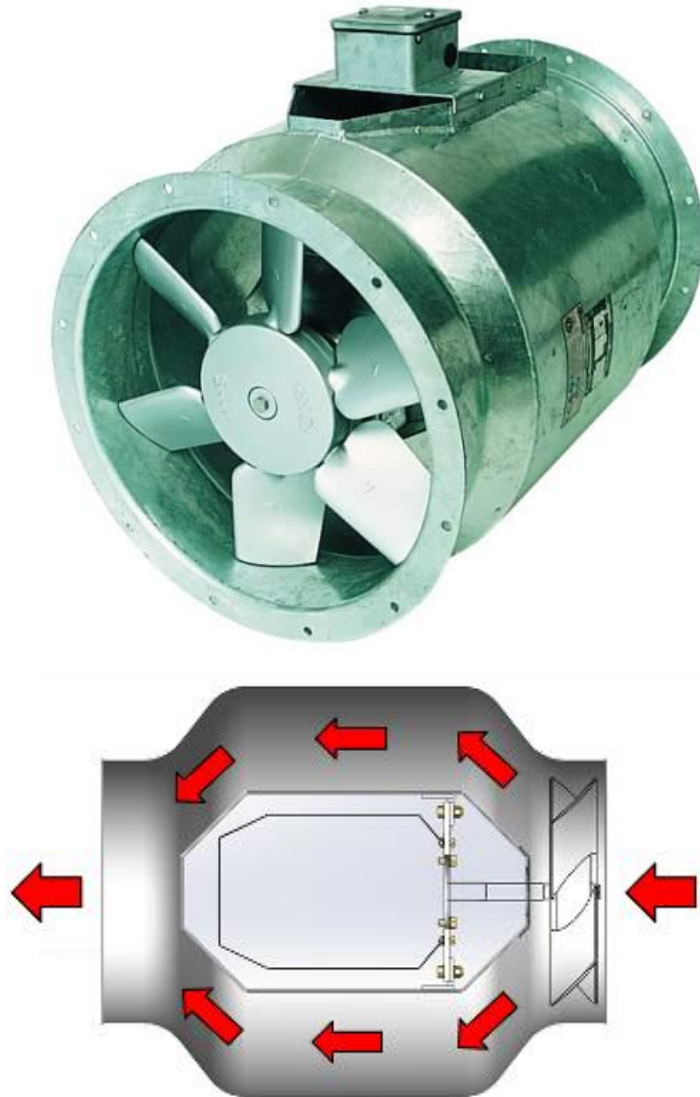
Be reliable and capable of functioning for period required



JM Axial – JTv Garage Fan Smoke Extract Systems (Thrust Fans)



JM Axial – High Temperature (Continuous use)



JM Bifurcated Fan

- 12.4" – 39.4" diameter
- 2, 4 & 6 Pole Speeds
- Continuous temperature rating: 392°F
- Aluminium Impellers:
 - High Pressure Die Cast

Applications:

- for high temperature air,
- fume extract or
- contaminated air

JM Axial – Bifurcated High Temperature (Continuous use)



**Typical
application:
Kitchen Hood
Extract**

JM Axial – Product Variants: Stainless Steel (Food Industry)



JM Stainless Steel

- Stainless Steel Case and Arms
- JM Aluminium Alloy Impeller
- Standard pre-designed range 19.7" – 39.4" diameter
- Pad Mounted Motor
- Used for hygiene, food industry, wood drying applications

JM Axial – Product Variants: Marine Fans

JM Marine: Sizes 50 – 160 with Standard Motors, Sizes 50, 63 – 160 with Hazardous Area Motors

JM Marine hazardous areas range includes:

- 10 diameters – 500mm (19.7”), 630mm (24.8”) to 1600 mm (63”)
- 6 mm (0.24”) thick fan housing
- Inspection Doors
- 50 Hz or 60 Hz supply
- Marine EExd Foot Mounted Motors
- EExe T/Box & approved Conduits & Glands
- Additional Impeller locking feature
- Anti-Spark Track
- Increased Tip Gap*
- 2 Fan speeds per diameter (achieved by 2 Motor Pole variations)
- Vertical & Horizontal Mounting

Options:

- Epoxy paint on top of galvanised finish
- Bolt-on Guide Vane
- Ancillaries





Tunnel Jet Fans

- 400mm (15.75") – 1600 mm (63") sizes
- 2, 4 & 6 Pole Speed
- Uni-directional & Truly Reversible
- Up to 752°F for 2 hours options
- Tested at BSRIA UK to EN12101-3
- Integral Silencers with length options
- Stainless Steel variants available