INDUSTRIAL FANS TECH TALK

INDUSTRIAL FAN CONSTRUCTION - UNDERSTANDING AIR

As we know, air is a mixture of mostly Oxygen, traces of Nitrogen and other elements which surround us and is required for our survival. It is a compressible fluid and has a density which therefore inherits a weight. With the weight of air being 1.2kg/m3 at standard conditions, a simple kitchen exhaust fan for example, would displace approximately 28m3 of air per minute. This equates to 34 kilograms of air per minute which is the equivalent weight of a 10 year old child; every 60 seconds. It is important we recognise the properties of this unique fluid we so take for granted, to appreciate the equipment Indrotech design and manufacture to transport it.

INDUSTRIAL FAN MANUFACTURE

Indrotech build all components produced to their specifications and their components are as follows.

IMPELLER

The most highly stressed component on the entire fan assembly is the impeller. The impeller is the vehicle that transports a particular volume of air at the required pressure and deserves the utmost attention in its design and construction. All impellers are manufactured from either G250 mild steel or 304-316 stainless steel depending on their application and welded to a specific procedure that will ensure proper heat distribution through the entire construction and stiffening that will assist in its overall rigidity and life span. This procedure also reduces the heat buckling effects from welding and assists in the final balancing procedure by reducing the amount of run out.

Dynamic Balancing is carried out to the ISO Standard 1940-1 Second Edition and Certificates are available upon request. Each type of impeller has a specific application and therefore different design and construction procedures. Some impellers are quieter than others and some more noisy than others. Each impeller has its limitations on the air it can displace as well as how fast they can rotate before they fail. It is imperative that tip speeds are kept within their allowable limits before redesigning is required.

CASING

Industrial fans have casings that are constructed from heavy steel plate and are fully welded. Selecting a thicker material for the side plates and scroll will reduce the break out noise from the casing creating low noise industrial fans. It is misleading to believe that low noise industrial fans are specifically designed impellers only. This is not the case. What creates this low noise feature is the construction of the casing along with special variations in its design that will reduce the breakout noise. Sure, there are specific designs for low noise industrial fans generating impellers but they are not economically viable in their construction and therefore rarely manufactured. A true low noise impeller would need to be constructed with specifically designed blades of a set length, various radii and progressing twists that would efficiently move the air through its inlet and out its discharge without creating unwanted air recirculation within its enclosure. To physically fabricate this out of steel plate would be near impossible unless money was invested in creating patterns for press tools.

Noise reduction for industrial fans is performed at the casing level where sound proofing is introduced to the external casing skin and is retained with an extra layer of steel plate to form an enclosed insulated box. The thicker the box, the less noise is likely escape. The other alternative would be to also introduce an inlet and discharge silencer using the same theory as cladding the fan's casing. These silencers however would need to be a specific length at the designed wall thickness. Indrotech follow the allowable industry standard of 85dBA @ 1 meter for all our industrial fans. Where noise attenuation is required, we would recommend these options.

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DECIBEL (LOUDNESS) COMPARISON CHART

In the chart below are some interesting numbers collected from a variety of sources, that help understand the volume levels of various sources and how they can affect our hearing.

Environmental Noise	
Weakest sound heard	0dB
Whisper Quiet Library	30dB
Normal conversation (1-1.5m)	60-70dB
Telephone dial tone	80dB
City Traffic (inside car)	85dB
Train whistle at 150m, Truck Traffic	90dB
Passenger train at 61m	95dB
Level at which sustained exposure may result in hearing loss	***90 - 95dB***
2 Stroke Motorcycle	100dB
Lawn mower at 1m	107dB
Power saw at 1m	110dB
Sandblasting, Loud Rock Concert	115dB
Pain begins	***125dB***
Pneumatic riveter at 1200mm	125dB
Even short term exposure can cause permanent damage - Loudest recommended exposure WITH hearing protection	***140dB***
Jet engine at 30m, Gun Blast	140dB
Death of hearing tissue	180dB
Loudest sound possible	194dB

PEDESTALS

All pedestals for industrial fans are a fully welded fabricated construction. This ensures that the top and side plates do not buckle once the motor starts up and full torque is applied. All stiffening and bracing is relative to the size and shape of the pedestal and also the configuration of the fan. Indrotech always manufactures their units to be serviceable and ensure that all industrial fans components are accessible by introducing inspection access points.

SAFETY GUARDS

All exposed rotating components on our Industrial Fans such as shafts on arrangement 9 fans, heat slingers, couplings and belt drives are guarded with specifically designed guards that comply with the current Safety Standard requirements.

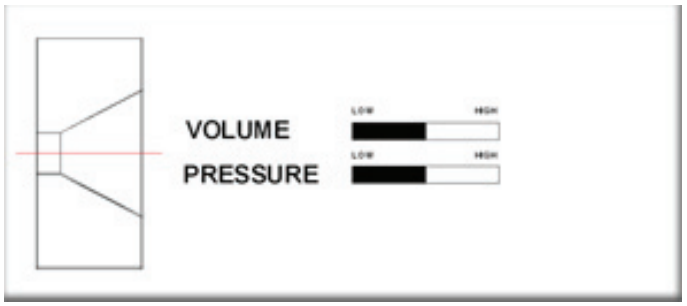
INDUSTRIAL FAN IMPELLERS

Indrotech proudly manufactures a comprehensive range of industrial fans for a wide range of applications. If the industrial fan you want is not listed below call us to discuss your requirements.

RADIAL BLADE (RB)

RADIAL BLADE industrial fans are designed and heavily constructed for conveying materials as light as dust to heavy particles such as pulp or woodchips. The noise it generates is a reflection of its heavy construction and requires to run at least 2 pole speed (2900rpm). This fan can be configured either arrangement 4 Direct drive or arrangement 9 Belt Drive depending on its application.

RADIAL BLADE CLEAN AIR (RBCA)



RADIAL BLADE CLEAN AIR industrial fans have a similar design to the conveying impeller but have a front shroud. This enables the impeller to be constructed out of lighter material and this is reflected in the price difference to the conveying impeller. Again this fan runs at 2 pole speed and is quite noisy. Indrotech have developed specific designs to effectively reduce the noise. This fan too, can be configured either arrangement 4 Direct drive or arrangement 9 Belt Drive depending on its application.

RADIAL BLADE MODIFIED (RBM)

Even though this impeller is classified as a radial tip blade, it is urging on the forward curved style industrial fan. The modified blade allows this impeller and limited to conveying very light up to heavy dust and is ideal in the timber mill industry. The RBM fan runs at 2900rpm and is also quite noisy and inefficient, however a much preferred alternative to the RB.

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FORWARD CURVED (FC)

Forward Curved industrial fans are ideal for re-circulating large volumes of air with low pressure requirements. Slow revolving and not as highly stressed as an RB fan. Forward Curved industrial fans are normally used in the Furnace Industry for oven recirculation and drying. It is typical to find these fans belt driven and slowed down to under half speed of the motor driving it. These fans are not very efficient but are very quiet considering the amount of air they push.

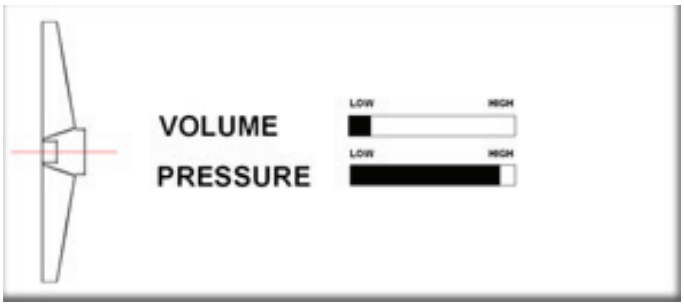
BACKWARD INCLINE LAMINAR (BIL)

Backward Incline Laminar industrial fans are typically known as clean air fans and seen in spray booths as supply air fans. They are also used in ovens where pressure requirements are higher than normal. These impellers are efficient and therefore consume less power. Its inclined laminar blade can help any unwanted material to pass through its discharge even though it is not designed for conveying purposes.

BACKWARD INCLINED AIRFOIL (BIA)

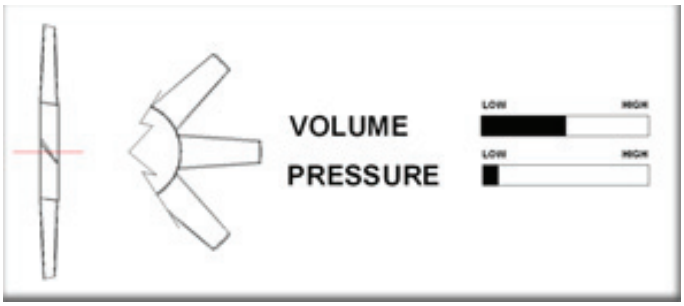
It is evident by looking at the blade profile that this impeller has more to offer than the laminar option. Backward Inclined Airfoil industrial fans generate higher pressure, higher volume and are even more efficient due to their unique blades. These blades create less turbulence in the fan and therefore work less to discharge the air. Again, a clean air fan with similar application to a BIL but a bit more labour involved in its construction.

HIGH PRESSURE (HP)



This impeller performs best at high speeds. The slender design of high pressure industrial fans allows very little air to pass through but throws that little amount out with extreme pressure. High Pressure industrial fans are suitable for combustion air applications and can also be used to convey granular material by removing its front shroud. This impeller needs care in its construction and when balancing. When running at its preferred speed of 2900rpm or greater, it exceeds the allowable noise level and this is why it is common to see these units accompanied by attenuators.

TUBE AXIAL (TA)



Tube Axial industrial fans are typically found in dry spray booths and are commonly uses for supply air and clean air exhaust applications. This impeller is easily designed for a wide duty range by simply setting the desired blade pitch and are manufactured in mild steel, stainless steel and can be sourced in a poly material as well. They are a relatively efficient option and therefore quiet.

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