

How An Air Motor Operates With Energy Efficiency

DEPRAG SCHULZ



Photograph courtesy of Flickr user [Chuck "Caveman" Coker](#) [1]

An air motor is often the right choice when it comes to specifying a drive system for a manual device or a complex industrial system, whether as a high torque motor in the agitator system of a paint and coating manufacturer, as a highly durable stainless steel motor in newspaper print production, or as a compact power pack for an innovative roller transport device.

Compact and light weight, an air motor represents only one-third of the size and one-fifth of the mass of a standard electric motor with the same power output, offering outstanding power density. Due to numerous model variants, simple construction, favorable performance to weight ratio, large speed range, or the inherent combustion safety feature, air motors can be employed in a wide application spectrum. Their rugged construction and durable performance combined with ease of installation, service and assembly speak for themselves.

Air motors work based upon a simple principle. Compressed air, generated by a compressor, induces the motor to rotate. Here vane motors, turbines and tooth gear motors, differ in their design and application areas. The efficiency of the respective motor type depends critically upon the volume of air and the correct air pressure.

DEPRAG SCHULZ GMBH, based in Amberg, Bavaria, has for decades been a reliable consultation partner with respect to air motors and air tools. With new innovations and continuous optimization of existing product lines, the engineering company has developed into an industry leader. A high priority is placed upon competent consultation and advice from the full service provider.

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DEPRAG Product Manager Dagmar Dübbelde responded to the following frequently asked questions from technicians responsible for the installation of air motors and their energy efficient application. "With a little basic knowledge of the functionality of air motors, installation can be a simple task," says Dübbelde.

Question: "I would like to install a reversible Advanced Line air motor. It provides one air connection each for right hand and left hand rotation. There is also a connection for the exhaust of the air motor. How do I connect this air motor?"

Dagmar Dübbelde: The air inlet connection which is named R (for right hand rotation) should be connected to the main air supply. It is important that both the air connection for the left hand rotation (named L) and the exhaust port remain open or are at maximum covered with an exhaust filter. Only this way will the motor start without problems and achieve its full power capability.

Question: "I have installed a 900 W Basic Line motor. It has not achieved the desired power level, however. What can be the problem?"

DD: Check the compressed air supply connections. Air distributors, pneumatic valves, quick couplers and air hoses can often be specified with too small a cross section. The minimum required tube and port diameter for the 900 W air motor is 13 mm, this specification can be found in the product description catalogue. This minimum requirement will not be realized if the air supply is regulated or throttled anywhere in the system. This also applies to the air pressure. Only with a sustained pressure of 6 bar directly to the inlet port can the air motor deliver the specified power. A pressure drop of 1 bar causes a performance loss of 23%.

Question: "Air Motors are controlled by air pressure or the regulation of the air supply. Which valve types apply in this case?"

DD: To control an air motor in one direction a simple 2/2-way valve is all that is needed. Reversible motors require either two 3/2-way valves or one 5/3-way valve in order to provide the necessary exhaust for the unused incoming air.

Question: "If the air motor requires oil, which type and how much should be applied by the oiler on the air maintenance unit? Can any motor oil be used?"

DD: With proper preventative maintenance the maximum life and optimum performance of the air motor can be achieved. Only acid and resin free oil is suitable. One to two drops of oil per cubic meter of compressed air is all that is required. The specific air motor air volume requirements can be found in the product catalogue or the air motor operating instructions.

Question: "For applications in the food processing or chemical industries the air motor must be oil free for reasons of hygiene. Is that possible? What issues are important?"

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DD:The stainless steel and sealed Advanced Linemotor series are specifically designed for applications in a clean room environment and also operate oil free. A resulting power penalty of approximately 15% should be taken into consideration for the design of the drive system.

Question: “Air motors are very robust but the motor vanes must be replaced periodically on a preventative maintenance schedule. How much effort is required for this?”

DD:It can be fast and easy. Our Basic Line vane motor for example, equipped with a rugged cast iron housing and a power range of 200 W, 400 W, 600 W, 900 W und 1.2 kW, allows the exchange of the motor vanes without the need to remove the air motor or disassemble the housing. With its unique and patented ‘Vane exchange system’, direct replacement of the vanes is possible in minutes. After loosening the SHCS screws and removal of a cover, the worker only requires a pair of tweezers in order to exchange the vanes. Highly trained personnel are not required.

Question: “Air motors can be seamlessly adjusted by regulating the air volume. What is the best way to realize this?”

DD:Basically the air motor is very flexible. The speed of the air motor automatically adapts to the load changes on the drive shaft. This means that at low load (low torque) the speed of the motor will be close to the specified idle speed and with increased load (increased torque) the speed decreases. If you wish to reduce the speed of the motor without reducing the torque output, it is recommended to regulate the motor exhaust output. If you wish to regulate both the speed and the torque then, it is recommended to regulate the incoming air supply.

Question: “Can I also regulate the air motor by manipulating the air pressure?”

DD:The optimal performance of Deprag air motors is based upon 6 bars of air pressure, by adjusting the pressure in the range of 3 to 6.3 bars you can manipulate the speed, power, torque and air consumption of the motor without problems. In practice or from experience, the control of air and pressure is combined effectively. Respective performance data can be obtained from the manufacturer.

Question: “Today energy savings are more important than ever before. How can I make my air motor operate at its peak efficiency?”

DD:You should consider the following rule: An air motor achieves its maximum power when it is operating as close as possible to its rated speed (50% of the rated idle speed). The energy balance is best in this area, the compressed air is used efficiently and the motor makes optimal use of the energy supplied. Theoretical power curves are available for all DEPRAG air motors. It is also very important to select the correct size air motor for the application in the planning stages.

For more information visit www.deprag.com [2].

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