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640 Hembry Street
Lewisville, TX 75057
(800) 4 DEPRAG
www.depragusa.com

Press Release

DEPRAG ensures the selection of the correct motor design for any application

Pneumatic motor – the ideal drive for winding processes

Step less speed regulation due to alteration in the amount of air or operating pressure

Winding drives can be found in many production processes: they wind continuous materials before or after their handling on spirals, rolls, reels or balls. The spectrum of material to be wound ranges from base paper of up to 10 meters wide or thin film with a thickness of 6 µm, to carbon fiber threads with low elasticity and high durability against tearing. Every material to be wound places different requirements on the winding drive due to their specific features in terms of surface, hardness, tensile strength, cross-section profile or thickness. Reams of paper with a roll diameter of around two meters for example are wound at a high speed of up to 2000 m/min. Films are a sensitive material which must be wound or unwound very precisely. The winding of metals on the other hand means that large masses are in play which influences the winding process. Pneumatic motors are safe and robust drive systems providing a drive solution for winding processes.

A pneumatic vane motor consists of a rotor which turns inside an offset chamber in the rotor cylinder. The vanes in the rotor are pressed against the wall of the rotor by centrifugal force creating working chambers. Inside these chambers the sealed compressed air expands and pressure energy in changed into kinetic energy and the rotor turns.

Air motor in a MULTIVAC edge trim macerator

Pneumatic motors are characterized by the fact that the speed automatically adapts as the load changes. The pneumatic motor runs idle when fully loaded. When a lower load is applied and a lower torque on the motor spindle then the working speed is close to idle speed. The working speed is reduced as soon as the torque increases. At 50 percent of the idle speed the pneumatic motor reaches maximum power. "This is also the optimal working range of the pneumatic motor. In the range between 40-50% of the idle speed the pneumatic motor is particularly energy efficient. A criterion to which we particularly pay attention during motor design", explains DEPRAG Product Manager for Air motors Dagmar Dübbelde.

Additionally in comparison to an electric motor, the pneumatic motor can be loaded until standstill without problems. After reducing the load it will run again immediately. In a characteristic curve an additional advantage in comparison to electric motors becomes clear: Whilst electric motors have their maximum power

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consumption at maximum torque (stalling torque), the energy requirement (air consumption) of pneumatic motors sinks with increased torque. Pneumatic air is also an unproblematic energy source. There are no hazards due to electric cables or other electric connections and short circuits are not an issue.

DEPRAG SCHULZ GMBH u. CO. from Amberg, Germany has established itself as a proficient partner in the branch of pneumatic motors and tools and provides pneumatic drives such as pneumatic vane motors, turbines and tooth gear motors for every conceivable application. The robust and efficient pneumatic motors are adapted by the company to every application in regards to the required torque and working speed and can also be customized for winding drives.

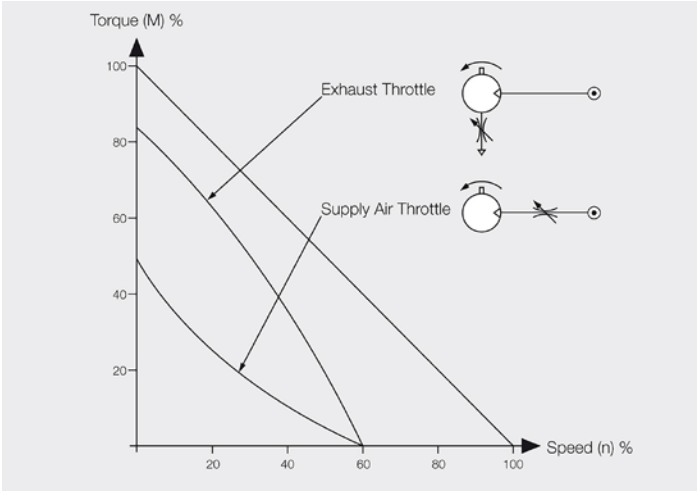
Pneumatic vane motors designed for maximum torque

Two factors are decisive for motor design: the required winding speed and the maximum torque. To calculate the maximum torque, the largest possible roll diameter is taken i.e. the size when the roll is fully wound. The winding speed should also be determined when fully wound. When the roll is carrying less material, the roll diameter will be smaller and the motor will automatically wind the material more quickly, the working speed adjusts correspondingly to the load (the lower torque). If the motor rotates too quickly then the speed can be steplessly adjusted by altering the air supply, the operating pressure or a combination of the two.

Regulation of the speed using the air supply

By regulating the air supply the speed can be simply and flexibly reduced. There are two options depending on the application situation: throttling supply air or exhaust air. By throttling the exhaust air, the speed of the motor is reduced without noticeably reducing the power or the torque of the pneumatic motor. A throttle valve keeps the exhaust air back and creates so-called backpressure or counter pressure – the speed is reduced.

If on the other hand you want to reduce the speed of the air motor and also the power or the torque, then a throttling of the supply air would be recommended. Another specification for winding applications could be to keep the continuous material taut. In this case the pneumatic air must be present at all times to keep it taut. In order to reduce the air consumption the motor's supply air is throttled and operated with reduced operating pressure. It is designed to be energy efficient corresponding to the requirement.



Speed regulation using the supply air

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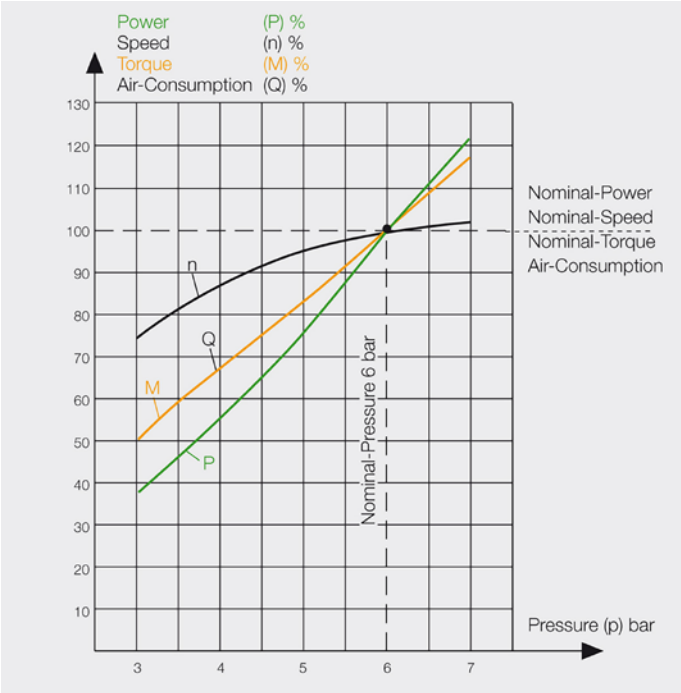
Speed regulation through operating pressure

As well as regulating the air supply the speed can also be adjusted using operating pressure. The technical data of DEPRAG pneumatic drives is based on an operating pressure of 6 bar. Every DEPRAG pneumatic motor can be operated between 4 and 6.3 bar as required in order to adjust the speed and torque. A reduction of operating pressure always makes sense if the motor used for the winding material (e.g. paper) is too powerful. For example it could be the case that the motor is so powerful that the paper may tear during winding. By throttling the supply air the motor power can be reduced to prevent tearing. By reducing operating pressure by 1 bar torque is reduced by 17%. If the pneumatic motor is operated at 4 bar, the torque is reduced by 33%.

A pneumatic motor operated at 4 bar can still be too strong in a winding application e.g. for empty running rolls. In order to utilize the torque range of the air motor further DEPRAG offers the option of equipping the motor with spring loaded vanes, so-called forced started vanes. Using these vanes with torsion spring it is possible to run this motor with an operating pressure of less than 1 bar. Product Manager Dagmar Dübbelde explains, "When you start a pneumatic motor the vanes must be pressed outwards by centrifugal force to create working chambers. This takes a fraction of a second. Using forced start vanes, i.e. vanes which are already pushed against the wall of the rotor cylinder using torsion spring, and then the working chambers are already created. The power control range of the motor (from 0 watt to maximum power) can be almost fully exploited – ideal conditions for a winding drive".



Speed regulation using the air-pressure

The pneumatic motor offers several advantages for a winding drive application. The power density of the motor is very high. Additionally the air motor requires only two thirds of the size and a third of the mass of a comparable electric motor.

Food industry compliant and explosion-proof

For use in the food industry e.g. in packaging machines, air motors must withstand cleaning agents and steam. The pneumatic motors of the DEPRAG ADVANCED LINE range have external parts made from stainless steel and are sealed so they do not need to be housed in special casings. The seal of the air motor is so good that it can even be used underwater. DEPRAG pneumatic motors can be used grease-free, i.e. with un-lubricated air supply. For the greasing of the planetary gears DEPRAG uses food industry conform USDA-H1 grease.

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The DEPRAG "Advanced Line" Air-Motors are able to withstand cleaning agents and steam

The air motors of the BASIC line and the ADVANCED line are also ATEX conform i.e. permissible for use in potentially explosive environments. The workings of the air motor mean that it is predestined for use in critical surroundings as the decompression of the air cools any frictional heat created. Therefore the air motor is cool when loaded and overheating and the ignition of gases is impossible. The internal overpressure also prevents the infiltration of harmful dirt and dust.

Air motors can additionally be steam sterilized when fitted with suitable vanes – an advantage in medical technology applications. These robust drives are ideal for use in conditions where heat, vibration and dust are an issue.

DEPRAG SCHULZ GMBH u. CO. with headquarters in Amberg, Germany is represented with around 600 employees in over 50 countries worldwide. DEPRAG is one of the leading manufacturers of air motors on the market with the widest range of high quality stainless steel drives and innovative turbines. The owner-managed family firm offers pneumatic motors with a wide variety in their standard range from which, using the modular principle, individual drive solutions can be developed and produced at an attractive price-performance ratio for the most varied of applications.

Press Contact:
Dagmar Dübbelde
DEPRAG SCHULZ GMBH u. CO.
Carl-Schulz-Platz 1
D-92224 Amberg
Tel: 09621 371-343
Fax: 09621 371-199
Email: d.duebbelde@deprag.de
Internet: www.deprag.com

US-Contact:
Ms. Lori Logan
Marketing Manager
DEPRAG Inc.
640 Hembry Street
Lewisville, TX 75057
(800) 433-7724 (800 4 DEPRAG)
(972) 221-8731 Local Phone
(972) 221-8163 Fax
l.logan@depragusa.com
www.depragusa.com