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Air Apparent

As seen in
Design World
May, 2018

Huco®
Altra Industrial Motion

Air Apparent

The electric motor may be the most common source of mechanical power in modern industrial environments, but that doesn't make it the best solution for every application.

David Lockett, Managing Director at Huco Dynatork explains the benefits of an alternative approach, using the power of air.

Amid the buzz surrounding Industry 4.0, or the Fourth Industrial Revolution, it is easy to forget the effect of the technologies that powered industry's earlier transformations. The factories of the original Industrial Revolution were driven first by water and then by steam. Later, the mass production of the Second Revolution was enabled by electricity, especially by the electric motor, which freed industrial engineers from their dependence on cumbersome belts and shafts and allowed controllable mechanical power to be delivered anywhere it was required.

Well, almost anywhere. While electric motors remain the prime mover of choice in most industries today, there are plenty of places where the use of an electric motor is difficult, expensive or even hazardous.

A safer, simpler and easier alternative in many of these applications is the use of motors powered by compressed air. Air has a host of advantages over other technologies. It won't ignite flammable atmospheres or contaminate most products. It is easily distributed through simple, low-cost pipework and, in most production environments, it is already widely used and readily available. Moreover, air motors are often smaller for a given power than their electric counterparts, which is a benefit where space is tight.

Typical air motor installations include areas with humid or wet conditions that can cause corrosion problems for most electric motors. Locations that require a submerged motor are also ideal candidates for air motor usage. Air motors are a good solution in harsh washdown environments since they can withstand the water and cleaning solvents routinely used under high pressure. Air motors also perform well in applications with vibrating equipment.

Another ideal application is in explosive atmospheres where sparks generated by motors and their associated switchgear present a significant risk of ignition.

In these applications, industrial engineers are often forced to adopt alternative technologies. They may install electric motors a safe distance away and use shafts and other mechanical transmission components to deliver power where it is needed.

A list of the most common air motor applications includes paint mixers/agitators, paint shop automation drives, conveyor drives, winding/unwinding systems, oilfield down-well cable/hose reel tensioning, and back flush filter drives. Food packaging machinery is also a very popular application where compact air motors are capable of precisely starting and stopping a roll of printed plastic bags used to package meat, poultry and cheese products. Air motors are used on packaging machines that fill precision-metered quantities of sauces into pouches.

Two Types of Air Motor Technologies

Modern air motors use one of two alternative technologies. Vane motors operate like a turbine, with bladed wheels that spin in the flow of air caused by a pressure gradient between the inlet and outlet of the motor housing. Vane motors generally operate at high speed and produce low torque, especially when rotating slower than their design speed. That makes them most suitable for applications requiring operation within a relatively narrow speed range.

Piston motors use reciprocating pistons to turn a central shaft, much like a gas or diesel engine. Piston motors generate maximum torque at start-up, which makes them ideal for applications where frequent stops and starts are required, especially under load. If an AC or DC motor is held by a brake, the motor risks burnout within a very short time frame. However, an air motor will simply stop and then seamlessly operate again when the brake is released.

Cost Saving Efficiency

Piston motor designs offer very high efficiency because the leakage of air through the motor is significantly minimized when compared to vane type models. For example, Huco Dynatork piston-type air motors are up to four times more energy-efficient than vane-style units. Of course, overall motor efficiency depends on the integrity of the air supply from the compressor. Piston motors can consume as much as 80 percent less air than vane designs with similar power output.

Nearly instantaneous stop-start-reverse also allows very accurate control of the rotary position of the shaft, which is ideal for indexing applications or other automation tasks where precision is required.

Installation Considerations

The most important requirement for proper air motor operation is a steady supply of compressed air. A reliable compressor is often the optimal source, but the motors can also be run from compressed air cylinders. The air should be filtered through a standard in-line filter. Air pressure required is typically between 4 and 6 bar. However, some models can run with pressures as low as 1 bar.

Air motors can operate with or without lubrication in the air. For clean applications, such as paint sprayers, always use clean, dry air (with no lube).

Just as important, air motors are simple and reliable. They are not susceptible to overheating or damage if stopped under load. They contain few moving parts and can be specified to meet many motion requirements without the need for complex controls or the addition of reduction gears.

Huco Dynatork piston air motors are often installed on auto paint lines. The air motors are mounted to the top of paint drum agitators ensuring constant rpm of the agitator blade. The result is a better surface finish, lower running costs, and quieter operation.

The simplicity of both the air motors and their air supply system, compared to an electric drive equivalent, makes installation and maintenance very easy. The motors are lightweight and compact, making them easy to lift and maneuver during routine maintenance. Connecting and disconnecting the air supply is straightforward.

Huco's Dynatork air motor line, for example, offers a speed range of 0 to more than 800 rpm and torque figures up to 15 Nm without gear reduction. The motor can be supplied in aluminum, stainless steel or acetal versions. Stainless steel or acetal housings are particularly suited to environments where regular washdowns are required, with its high resistance to caustic acids and chlorinated sanitizers, acetal is perfectly adapted for use in food and beverage processing.

Since air motors don't depend on electricity, they don't generate electromagnetic fields when in use. Special motors produced without magnetic components are used in a number of specialized applications, including MRI scanners, scientific equipment and military applications were the elimination of electromagnetic emissions is a priority.

Applying technology proven over many generations, piston air motors are totally up to date and compatible with Industry 4.0 automation needs. They can be controlled with high accuracy using feedback from either pneumatic or electronic sensors and, hence, combine well with the latest remote system controls. Dynatork air motors use clean, dry air, produce low noise and, with their low air consumption, check all the right boxes for environmental credentials.

Huco Dynatork Air Motors Provide Reliable Performance in Automotive Paint Shops

Huco supplies air motors to a major manufacturer of automated paint shop systems used by a global auto manufacturer. The vertically mounted drive system utilizes the air motor, connected through a worm gearbox, to drive a carousel that delivers paint-filled containers to a spraying robot. The customer chose the Huco air motor due to its ability to deliver high torque instantly in stop-start-reverse conditions at speeds up to 800 rpm. The system uses clean, dry compressor-fed air. The air motors were also selected since sparks generated by electric motors would present a significant risk of ignition in the potentially explosive paint booth environment.

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