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Compressed Air: Versatile, Reliable and Safe Energy

Introduction

Compressed air is a vital utility used in countless ways to benefit everyday life. While those in manufacturing and industrial plants recognize the “plant workhorses’ “ importance as a source of process and instrument air, most people associate compressors with the small compressor in their garage used to inflate tires. They do not realize that compressed air is the energy of choice to power a great variety of applications. Sanders, grinders and paint guns in automotive service shops, presses and accessory equipment in dry cleaning stores and commercial laundries all depend on a reliable supply of compressed air. Theme parks depend on compressed air to run roller coasters, fountains, and animated characters. Construction and road crews use compressed air to power jackhammers and repair our roads.



CAGI is the leading organization representing manufacturers of compressed air system equipment, including air compressors, blowers, pneumatic tools, and air and drying and filtration equipment. Technical articles are information tools and should not be used as substitutes for instructions from individual manufacturers. Always consult with individual manufacturers for specific instructions regarding their equipment.

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Compressed air is, after all, a utility – just like water, gas and electricity. In a practical sense, it is a medium that carries potential energy. However, it can be expensive to produce, and from a simple energy efficiency point of view compressed air may not appear advantageous at first. Considering that it takes about 8 hp of electrical energy to generate 1 hp output on an air motor, compressed air has an efficiency rating of only 12%. How is it then that compressed air is so widely used? What are its real advantages?

High output to weight ratio

Air driven tools such as drills, saws, grinders, impact wrenches, sanders or jackhammers have high output to weight ratios. They use air motors, which are smaller and lighter than electric or hydraulic motors, providing superior ergonomics for the operator. In an assembly line application, it's easy to see that efficiency and productivity increase with tool speed and usability while user fatigue is decreased or eliminated all together.



Air tools are ideal for tough applications such as found in steel mills and foundries. Here they encounter high temperature, dirty environment and frequent overloading. While air tools still require periodic maintenance to keep them at peak efficiency, they are very forgiving under these conditions and are almost indestructible.

Air tools and pneumatic cylinders also have a “soft feature.” If a drill bit or grinder gets stuck in the material, air tools just stop working. When electric and hydraulic tools overload, they can damage not only the tool and/or work piece, but may also seriously injure the operator.

Easy storage

Electric energy cannot be practically stored and must be used immediately. This causes problems when heavy users are brought on line for short periods of time or are temporarily overloaded causing demand spikes in the electrical system. The result may be tripped fuses, and malfunctioning or destroyed equipment because of voltage drop. And since power companies have to produce and then transmit these bursts of electrical power, they often charge costly “peak demand charges”, which can significantly increase a facility’s power bill.

Compressed air on the other hand is easily stored in air receivers and readily available for brief peak demand periods. When a compressed air system is properly controlled, problems such as low system pressure or voltage drop in the facilities electrical system are eliminated, and replaced by seamless operation in the plant system. The result is a smooth air and power system response at lower energy costs.

Efficiency

While there are inefficiencies in converting electricity into compressed air as well as line losses in the compressed air distribution, “efficiency” needs to be considered in terms of a whole process or product being produced. Consider the alternatives to a blow molded gas tank or PET plastic bottle using compressed air. Metal gas tanks are manufactured from cut pieces of sheet metal, which need to be heated, formed and then welded into the final product. Not only is the product more expensive to produce the resulting (welded) seams are subject to leaks. Another example is how efficiently inert gases such as Nitrogen can be produced with compressed air wherever it is needed. Using compressed air for new manufacturing techniques reduces product costs and increases product versatility and quality.

Heat Recovery

Compressors are well suited and easily configured for heat recovery. During the compression process, virtually all input power is transformed into heat. This recovered heat can be used for many applications, increasing the overall efficiency to almost 100%. Space heating applications – one of the easiest to implement - can recover up to 94% of compressor input power. Another example is heating process water or other fluids such as lubricants, milk or shower water for the plant locker room.

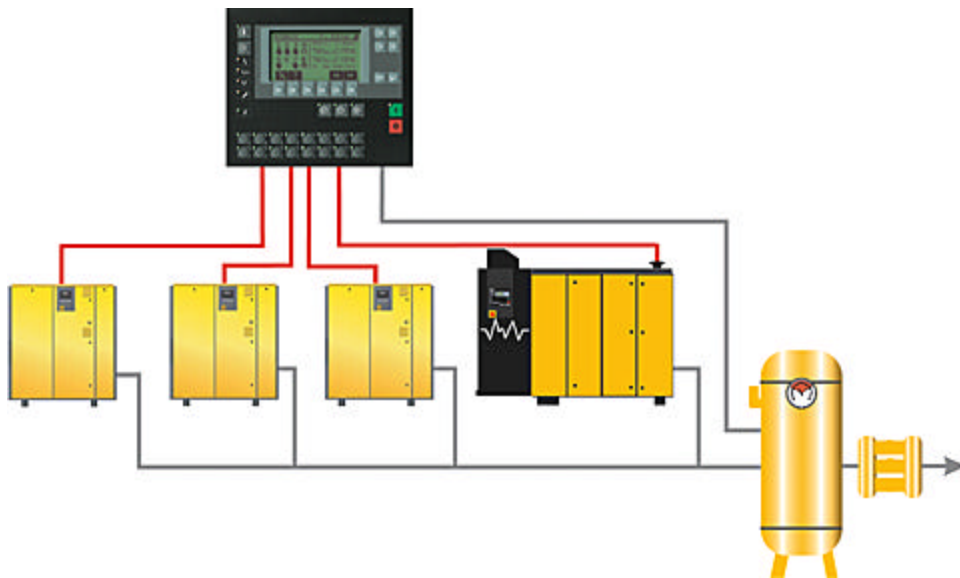


Safety

If handled properly, compressed air offers a safe power source – especially in certain hazardous environments. It is ideal for explosive environments such as chemical plants and oil and gas platforms. In these surroundings, electric motors and controls must be shielded in expensive and bulky enclosures to prevent sparks that could ignite flammable vapors and liquids nearby. Compressed air driven controls or motors and pumps offer a safe and cost effective alternative. Of course, as with any other energy-carrying medium, compressed air should be regarded with caution and handled with care to avoid accidents and user injury.

The future of compressed air

Because of compressed air’s versatility and it’s many advantages, new applications are being developed every day. In order to optimize efficiency, reliability and productivity, it is essential that the compressed air system be properly managed and correctly maintained. Modern compressors, clean air treatment products and system controls provide clean compressed air at an accurate and stable system pressure. New communication technologies provide operators access to real time operating parameters, and enable the user to optimize system efficiency and reliability.



In today’s competitive environment, every production and quality advantage counts...and today’s business owners are finding that compressed air is a true source for innovative solutions. It’s overall efficiency and storage flexibility allows end-users to improve and streamline processes, while reducing overall manufacturing costs. Easily stored, and ready on demand, compressed air powers the foundation of modern life. From car assembly lines to power plants, from water parks to the dentist office, compressed air is there and everyone benefits ... whether you know it or not.