The Advancement of Air

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During one episode of the sitcom *Seinfeld*, George Costanza made a profound observation about a product that had not seen any developments in his lifetime. “Everything else has changed. But toilet paper is exactly the same ... It’s just paper on a roll. And that’s all it will ever be.”

George’s date was fascinated, and in complete agreement. Leave it to Jerry and Elaine to later burst poor George’s bubble by pointing out that several advancements, in fact, had been made with regard to toilet paper, including that it was now softer, offered with more sheets per roll, and available in a wide variety of colors.

Talk about air compressors and you’ll run into plenty of people who share a view comparable to that of George and his date. What’s really changed with air compressor technology? The simple answer is that there has been no monumental change in the way they operate — they compressed air 30 years ago and that’s what they’re doing today.

But plenty of others, much like Jerry and Elaine, would reject this narrow view. While most will accept that the functionality of the air compressor hasn’t been radically altered, there have been improvements nonetheless — and not just to paint color. A closer look at some subtle, incremental changes reveals that there are significant differences in reliability and ease of use that deliver a number of advantages over the compressors of yesterday.

Tried & True

Compressors come in a variety of configurations and designs, but for the purposes of this technology discussion, the focus will be on reciprocating piston compressors. Before exploring the areas where technology in these machines has progressed, however, it’s worth mentioning the tried and true fundamentals of compressor functionality that have mostly remained unchanged.

A piston compressor is similar to the internal combustion engine in the way it operates, with each involving the up and down movement of a piston in a cylinder. The primary difference, of course, is that the engine’s piston is combusting a mixture of fuel and air, while the piston in an air compressor pump is compressing air alone.

Both engines and compressors have seen adjustments in performance and design over the years, but the basic operating principles for each remain the same. The changes have been gradual and efficiency has improved, but not by any great order of magnitude. And in other areas, there have been no changes at all.

For example, car engine and compressor cylinders, to this day, are still made of cast iron. Manufacturers could consider tapping into the best materials modern science has to offer, but the added cost of construction — and corresponding hike in the price tag — would far outweigh any minimal benefit to the end user.

Manufacturers have been wise to avoid expensive upgrades that simply don’t translate into real customer benefits. At the end of the day, cylinder capacity and whether a compressor is a single stage or two stage unit will still have a much greater influence on output volumes and pressures than would any changes to a compressor’s basic design.

Upgrades for Uptime

Rather than reinventing the wheel on a relatively simple machine, manufacturers have instead focused their time and attention on practical innovations that combine to make a true difference, most notably with regard to an air compressor’s reliability.

For many contractors, an air compressor is the driving force of almost all the work they do at a jobsite. Therefore, equipment reliability is obviously among their greatest concerns. Compressor pumps have seen some helpful upgrades in recent years that help contribute to longevity and better overall performance.

Naturally, modern machining processes controlled by computers have played a crucial role in compressor technology and the reliability of individual units. A pump’s cylinder wall can now be machined and honed to an exactness. This reduces bore tolerances to levels that were almost unachievable 50 years ago. Now

that this degree of engineering is commonplace, the potential for compressor failure based on a machining error is virtually nonexistent.

Other enhancements have come in the form of added features or improvements to existing components. Thanks to breakthroughs in metallurgy, piston ring sets are now made of wear-resistant materials that do a better job of preventing air and oil leakage in the cylinder. Specially designed rod inserts on the connecting rod-crankshaft interface help prevent damage to the pump's main components. Additionally, the introduction of rugged, oversize crankshaft bearings has provided a similar benefit of added durability to the pump's design. Another factor in equipment uptime, particularly for piston compressors, engines or other machines whose function involves fast mechanical movements that can create heat, is its ability to prevent overheating. Some air compressors are constructed to promote additional airflow to assist with cooling the pump. This has been done by incorporating a directional air shroud or adding an airfoil blade design on a compressor's flywheel.

The development of synthetic lubricants has also aided pump efficiency, while special compressor-pump oil helps ensure that a compressor's piston, crankshaft, bearings, rings and cylinder are always protected, further contributing to equipment reliability. Again, while only offering an incremental change by itself, improved lubrication is one of many technological advances that contribute to a better overall end result.

Simplified Maintenance

While a reliable and high-performing compressor is bound to experience reduced downtime, every piece of equipment still requires periodic maintenance. Air compressors are equipped with a number of standard features to keep things running smoothly until routine service needs are addressed. These include enclosed belt guards and protective mounted fittings to defend against equipment damage, special unloading valves to assist in engine or motor starting, pressure relief valves to keep the compressor functioning properly, and pressure gauges to assist operators in monitoring performance. Recently, manufacturers have begun to offer additional features to further improve serviceability. An oil sight glass allows an operator to check the oil level of the compressor pump in mere seconds. Furthermore, it serves as a handy reminder to busy people that the oil needs to be checked in the first place. Another update to some pumps is the introduction of easy-access unloader pins that can be lubricated or replaced in under 10 minutes. It wasn't uncommon for the replacement of traditional pins to take well over an hour.

Compressor companies will undoubtedly continue to look for new technology and other ways to simplify maintenance tasks for their customers, but will aim to do so without turning air compressors into a convoluted mess of needless features. Manufacturers understand that their equipment performs one primary function — compressing air — and are smart enough to build their machines using a common sense design that keeps everything relatively simple. **Technology + Support = Success**

While the advancements put forth in compressor technology have been made to assist end users in various ways, many compressor users haven't concerned themselves with these upgrades and new features. Instead they've simply focused on getting equipment that works, or in some cases on getting equipment at the lowest price.

Often this strategy paid off. But today the air compressor market is shrinking, with several manufacturers exiting the business in the last few years and leaving customers to fend for themselves in the process. If a need for parts or product support arises, users may not have anywhere to turn for help. Now, more than ever, customers need to closely examine their equipment choices to ensure they are choosing brands that have exhibited a commitment to sticking around for the long haul — perhaps through the introduction of technological improvements and value-added features.

A compressor is more than an air pump – it's an essential tool in many operations. Keep an eye out for the latest and greatest that air compressor technology has to offer, no matter how small the advancement. These minor changes could lead to a big improvement in quality.

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