Hidden treasures of double diaphragm pumps

Air-operated double diaphragm (AODD) pumps are renowned for their reliability and safe operation. They are versatile, suitable for a wide range of applications, and have relatively low acquisition costs. A significant factor contributing to these positive attributes is the use of compressed air. However, compressed air is also a relatively expensive energy source, which impacts operating costs. This whitepaper demonstrates why upgrading to a larger pump can be highly advantageous, not only financially but also in terms of enhanced reliability, reduced maintenance, and improved environmental compatibility. Additional benefits include decreased downtime and lower repair costs.

The advantages of a larger pump

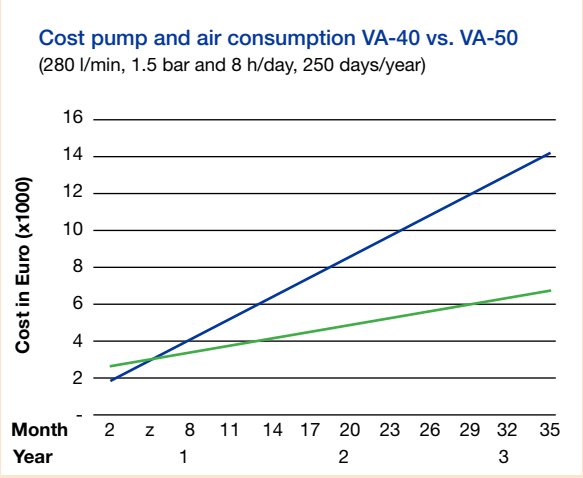
A larger compressed air diaphragm pump offers numerous advantages over a smaller pump. One key benefit is reduced compressed air consumption, as a larger pump uses compressed air more efficiently. This efficiency is achieved through lower internal friction losses and fewer switching operations of the air control valve. The difference in consumption can be significant, with reductions of up to 50%. In long-term or continuous processes, the higher initial acquisition costs of a larger pump are quickly offset by these savings

Example 1

Capacity: 280 l/min
Viscosity: 1cP
Discharge pressure: 1.5 barg

In this example the pumps are consuming Nm^3/min as below:
VA40: 1.7 Nm^3/min
VA50: 0,56 Nm^3/min

This is a saving of 67% in air consumption when using VA50.
With daily operation of 8 hours for 250 days a year and costs of 0.02 €/Nm^3, your savings can average €53 per working week. The higher purchase price of €800 for a 2” pump can be recouped within 4 months. Had a larger pump been selected initially, €7,400 could have been saved in compressed air consumption over a 3-year period.



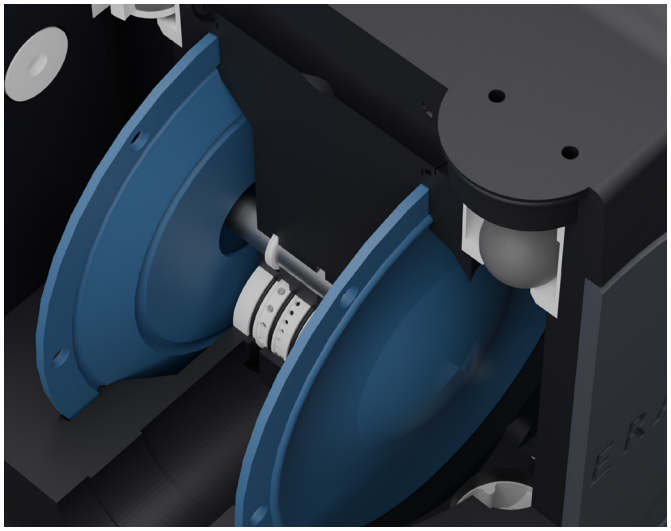
Hidden treasures of double diaphragm pumps

If the pump operates for only 4 hours per day, the payback period extends to 8 months. With just 2 hours of operation per day, the payback period is 11 months. Even when replacing a 1.5” pump with a 2” pump costing €4,250, the investment is recouped in less than a year. **Over a 3-year period, the cost advantage exceeds €5,500.**

A larger pump also means less wear and a longer service life. Another advantage of a larger pump is the lower stroke frequency, which reduces wear due to decreased mechanical load. In addition to mechanical load, chemical material attack can also be a concern. This can be completely avoided by selecting the right materials or minimized when handling particularly aggressive liquids. Ultimately, the mechanical load is a decisive factor in the service life of the pump.

Advantages of a larger air diaphragm pump:

- Reduced wear on valve balls and valve seats, especially with abrasive media
- Absorbs larger solids and conveys them more gently
- Gentle on shear-sensitive media
- Better suited for viscous liquids



High-quality diaphragms, as used in our VA series, achieve up to 10 million strokes, while our composite diaphragms can exceed 20 million strokes. When a compressed air diaphragm pump is selected one size larger, the number of strokes required for the same flow rate is significantly reduced, effectively doubling the diaphragm lifetime (see example 3 on the next page).

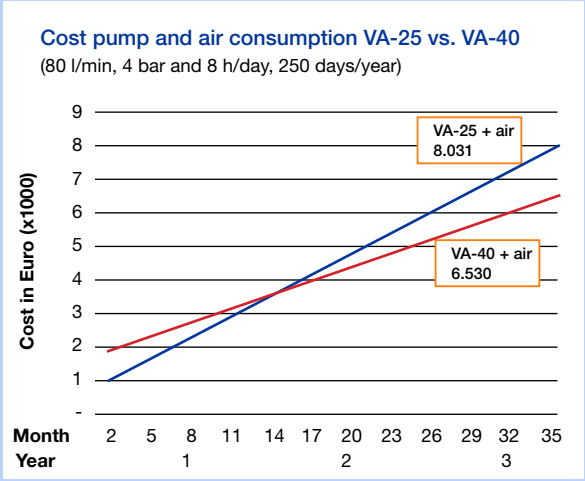
Although spare parts for larger pumps are somewhat more expensive, these additional costs are offset by the significantly longer service lives and reduced maintenance frequency. The increased reliability of your process and the higher Mean Time Between Failures (MTBF) further enhance the benefits.

Example 2

Capacity: 80 l/min
Viscosity: 1cP
Discharge pressure: 4 barg

In this example the pumps are consuming Nm^3/min as below:
VA25: 1.98 Nm^3/min
VA40: 0,65 Nm^3/min

This is a saving of 34% in air consumption when using VA50. When running 8 hours per day, more than €15 per week can be saved. The higher purchase price of €875 is almost completely compensated after one year. The purchase price for a completely new, larger replacement pump (€1,850) is saved after two years of operation.



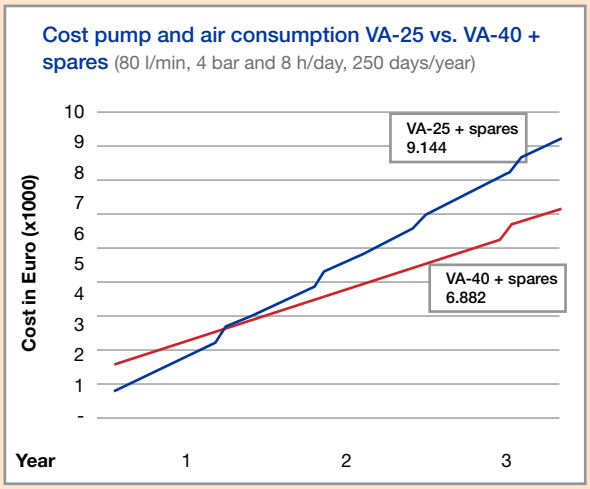
Hidden treasures of double diaphragm pumps

Example 3

Comparing a 1” pump with a 1.5” pump, the displacement per cycle is 0.64 liters for the 1” pump and 2.5 liters for the 1.5” pump. Each pump cycle includes one suction and one pressure stroke per side for the air diaphragm pump, totaling two pressure and two suction strokes (double stroke).

To deliver 80 l/min, the 1” pump must perform 125 cycles per minute, whereas the 1.5” pump only requires 32 cycles. With a diaphragm lifetime of 10 million strokes, it must be replaced after approximately 167 working days for the 1” pump and 651 working days for the 1.5” pump.

Operating 250 working days per year, the smaller pump needs a new diaphragm 1.5 times per year, while the larger pump only needs a new diaphragm after almost 3 years. With total spare part costs of €550 for the small pump and €352 for the large pump, the overall costs, including air consumption and spare parts, demonstrate the cost efficiency of the larger pump.



The comparison did not include personnel costs for maintenance, which vary among companies. If these costs were included, the difference would likely be even more significant, making the choice of a larger pump even more appealing.

Depending on the application, the altered pulsation could potentially be a drawback. While there may be fewer pulsation beats, the magnitude of each deflection could increase. This can be mitigated by using an (active) pulsation damper, which improves operation. The costs for a pulsation damper, around €950 in our example, are offset by the overall benefits of upsizing the pump model. With the inclusion of the pulsation damper, the depreciation time is now reduced to 1 year and 8 months.

If we include the costs for a pulsation damper and consider a total service life of 10 years, the savings increase significantly, up to almost €9,000! This demonstrates the substantial long-term financial benefits of choosing a larger pump.

Conclusion

Of course, this example illustrates potential savings, and actual results may vary depending on specific pump models. Nonetheless, the factors highlighted here are instrumental in reducing operating costs, prolonging pump service life, and managing compressed air efficiently as a resource.

When considering your next air diaphragm pump purchase, explore the benefits of opting for a larger size. Assess the compressed air consumption, performance per double stroke, and potential for both short-term and long-term savings. This strategic approach can lead to significant cost efficiencies and operational benefits.

More than 60 years of experience in professional pumping applications make VERDER the pump manufacturer of choice for customers from many industries on all continents. VERDER offers you process understanding, the technological expertise and the market insight to develop pumping solutions which rank among the best in the world. This is how we enable your progress.