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Energy Conservation in Biotech/ Pharmaceutical Production

BEST PRACTICES IN COMPRESSED AIR

Pharma and biopharma manufacturers have many requirements for compressed air, but very few have a good handle on how much compressed air they're using and how easily they might save air, and money, with simple improvements in pneumatic technology and monitoring practices.

This clickable e-resource is devoted to improving compressed air practices in the life sciences. We provide an interview with an expert in the field, Michael Reichert, and share links to key web-based resources detailing how drug manufacturers are improving their compressed air usage.

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COMPRESSED AIR: GAINING CONTROL, CUTTING COSTS

Leakage and other issues plague pharma and biopharma compressed air operations, but simple, cost-saving fixes and practices are well within reach.

Festo expert Michael Reichert discusses key issues and offers practical solutions.

In this interview with *Pharmaceutical Manufacturing magazine*, Festo's Michael Reichert, Industry Segment Manager for Biotech and Pharma (Americas), shares best practices in compressed air usage, including:

- common mistakes in compressed air usage
- how progressive manufacturers are monitoring compressed air
- compressed air maintenance best practices
- a discussion of the "golden rule" of compressed air consumption.

PhM: Do most drug manufacturers have a good handle on their compressed air usage? Do they realize there are significant potential energy (and cost) savings?

M.R.: The highest number of requests we get regarding "energy saving in pneumatic systems" is actually from the food and beverage, consumer goods and automotive industries. For whatever reasons, drug manufacturers unfortunately make up only a



little share of our worldwide energy saving projects. Therefore, it is likely that the saving potentials are not yet realized in the pharmaceutical industry segment.

PhM: What are some of the common mistakes or misunderstandings that pharma and biopharma manufacturers have regarding energy consumption in compressed air?

M.R.: There are several typical problems we see, especially the following:

1. the loss of compressed air by leakages
2. inefficient compressed air applications due to wrong dimensioning (over-dimensioning), wrong product selection, or wrong installation

3. inefficient compressed air generation (choice and dimensioning of compressors, compressor controls) and compressed air distribution (piping)

PhM: You cite leakage as a main problem. What's the extent of this issue at a typical manufacturer (either during operation or at standstill), and how can leakage be monitored and managed?

M.R.: From our experience in energy-saving projects, we have found that leakages make up, on average, about 18% of the overall air consumption of a plant per year. From our point of view, this is far too high, as with the right maintenance strategy and the right products, a maximum leakage level of 5 % is achievable.



After the optimization of a machine or line, it is useful to have a condition monitoring system installed in order to sustain good machine condition. The system will permanently monitor the line and detect any deviations and future leakages as well.

PhM: How easily can compressed air usage (flow) be monitored in real time? What are the keys to do doing so?

M.R.: In order to monitor air flow permanently, a flow sensor is necessary. Festo offers flow sensors for various measuring ranges (from 50...5'000l/min. to as low as 0.1...10 l/min.). All sensors are "mass flow sensors", so no matter the pressure, the measured value is automatically displayed in "norm liters," depending on the standard selected—e.g., DIN1343. The sensors do not only offer analog (voltage or current) output signals, but also a digital signal for counting a number of specified volumes passed through (e.g. digital pulse for every 100 liters).

Although it is easy to use the provided signals, the best solution for real-time monitoring is the usage of a professional energy-monitoring system. With

this system, the monitored parameters are set into relation to the machine state; referencing and condition-based thresholds are possible.

Festo offers condition monitoring as a service or even as a standard system (GFDM). (Read more about these offerings here.)

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PhM: How important is maintenance to efficient compressed air systems, and what is the relation to energy savings in pharma/biopharma?

M.R.: Maintenance plays a significant role regarding energy efficiency, especially when it comes to the topic of leakages. We recommend a plant-wide leakage survey with ultrasonic leakage detectors at least once a year, followed up by a prompt repair of the detected leakages. Experience shows that both the leakage surveys and the repair of the leaks are very often neglected due to a lack of time or personnel in maintenance departments. Sometimes the manufacturer's mindset is also an issue: Compressed air in general and leakages in particular are not always viewed as high priorities.



FREQUENTLY ASKED QUESTIONS

COMPRESSED AIR

Informative FAQ resources on compressed air
Click on the following:

[ENERGY EFFICIENCY IN COMPRESSED AIR](#)

[COMPRESSED AIR PREPARATION](#)

[VALVES/VALVE TERMINALS](#)

[VACUUM TECHNOLOGIES](#)



PhM: Are there special considerations for cleanrooms in terms of compressed air usage, and do significant energy saving opportunities exist as well?

M.R.: In most biotech/pharmaceutical production, there are no special requirements for the use of compressed air in cleanrooms. As the pneumatic control circuit is quite a closed loop system, only the exhaust air has to be deflated into a dedicated area.

If the compressed air is used for ventilation, blowing functions, and so on, multiple fine filters and carbon filters are available to achieve compressed air of a designated quality.

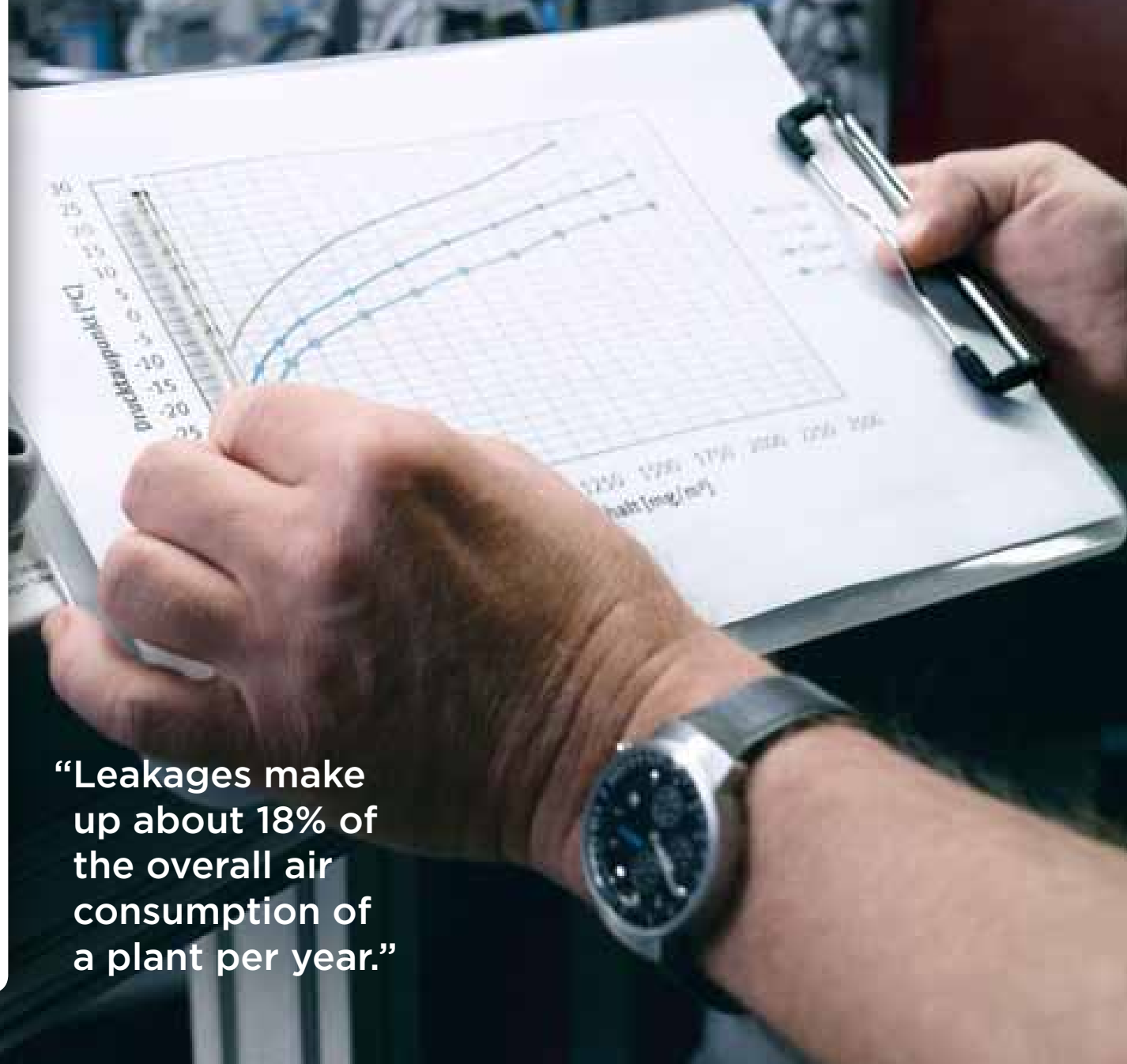
Finally, to save energy, the design and dimensioning within a cleanroom has to follow the same principles as in any other pneumatic control circuit.

PhM: We've heard about the "golden rule" of compressed air consumption. What is it exactly, and what are its implications for pharma manufacturers?

M.R.: It is to switch off the compressed air supply whenever it's not really needed—this is one of the easiest ways to save compressed air. In particular, that means that the compressed air supply for a machine or machine line should be stopped whenever the machine is not producing (except when the machine manufacturer recommends it because the compressed air is needed for any machine-specific function—e.g., for purging). We also see a significant number of vacuum or blowing applications which are consuming compressed air although the machine is not producing at all.



“Leakages make up about 18% of the overall air consumption of a plant per year.”



PhM: What's new in terms of pneumatic technology and equipment that is improving compressed air operations?

M.R.: There are several new trends that we're seeing:

- Manufacturers are looking at compressed air more comprehensively. It is important for the manufacturer to analyze its complete compressed air applications and not only look at a single product.
- There's an increase in the use of intelligent dimensioning tools.
- We see the installation of valves and valve terminals closer to actuators, reducing tube lengths.
- Manufacturers are continuously monitoring at the machine to prevent unneeded air consumption.
- They are using the different pressure zones on a valve terminal for forward stroke and reverse stroke of cylinders, in order to reduce the consumption of compressed air.
- There's an increase in the use of intelligent vacuum generators with air saving circuits.

PhM: Can you provide examples or anecdotes of how manufacturers have achieved significant improvements/savings in compressed air usage?

M.R.: The number one thing is to reduce leakages. Almost every customer at which we do Energy Saving projects has a problem with leaks, thus the reduction of leaks is always the first and easiest

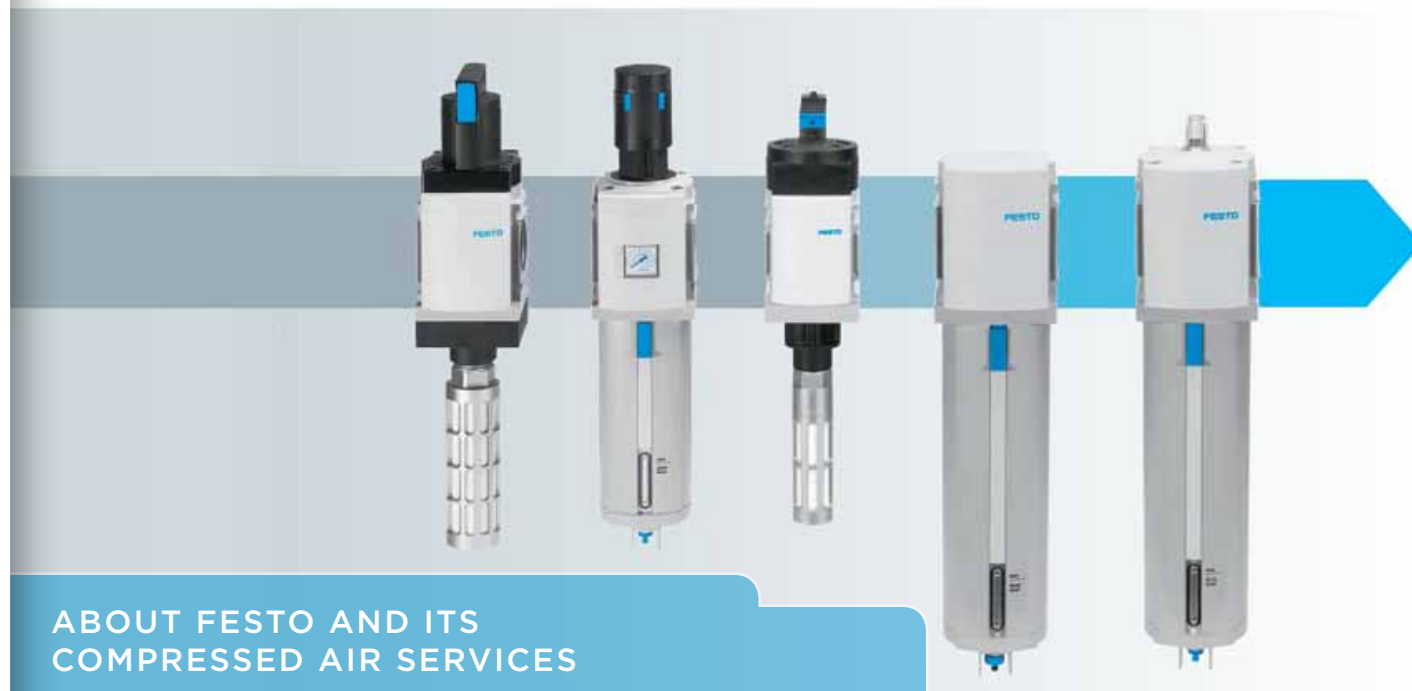


“We have seen applications where vacuum generators were ‘working’ 24 hours per day although the complete machine line was not used for several weeks.”

step. We have seen cases where leaks caused 80% of the air consumption of a machine. But also blowing and vacuum applications sometimes realize a significant saving potential—we have seen applications where, for example, vacuum generators were “working” 24 hours per day although the complete machine line was not used for several weeks. The same is true for blowing applications.

PhM: Finally, what are some partnering best practices? How does Festo typically work with pharma/biopharma clients to ensure consistent compressed air operations and help build in-house expertise?

M.R.: Our first step is typically to analyze the customers’ actual situation with respect to what it wants to achieve and what it has done so far. Once we define the targets of the project, we go into the analysis of our customers’ needs—both technical and organizational—and set up a customer-specific program, which covers the complete pneumatic system from the compressors up to the pneumatic applications. Typically the program is a mix of outsourcing services, where Festo people perform the needed activities, and a “do it yourself” concept, where Festo helps build up the necessary knowhow to enable the customer to do specific activities on its own. Building in-house knowhow is an important step towards a sustainable approach for saving energy in the long run.



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