

Locating leaks in vacuum systems

Tracking down leaks during deep drawing

Anyone who checks their compressed air network for leaks with the leak detector from IPF and eliminates them can save immense costs for expensive compressed air tools. With this solution, Lechenauer has also opened up another highly interesting field of application.

Lechenauer GmbH, based in Kremsmünster (Upper Austria), around 40 kilometers southwest of Linz, has around 30 employees and is a specialist in the field of mechanical engineering plastics technology. The range of services extends from small devices to complex automation, from simple steel construction to complete production lines. The full-service offer includes planning and design, toolmaking, control (unit) and programming as well as assembly and start-up. The company's core competencies also include injection molding from the sketch to the finished product and plastic thermoforming.

"In the field of thermoforming, we develop and produce in series production with a large part for the automotive industry, for example, transport packaging or circulation packaging that can be used in intralogistics. We also manufacture machine covers, cladding and switch housings, to name just a few examples. The dimensions here range from small parts to products measuring 2,200mm x 1,500mm using state-of-the-art thermoforming systems," explains Wolfgang Zorn, design engineer at Lechenauer.

Another specialty of the company is the design and manufacture of its own plastic thermoforming machines under the brand name Universal Formers. "In a way, these are smaller versions of the large thermoforming machines we use for contract manufacturing."

Development of customized vacuum press

At the beginning of 2024, Lechenauer received a customer order to develop and implement a thermoforming machine for the production of plastic shower trays. Wolfgang Zorn describes how the system works: "The machine essentially consists of four extendable vacuum tables arranged one above the other. The warming plastic is placed in a mold and drawn into the mold by a membrane stretched via the upper frame of the table using a vacuum at a negative pressure of up to -0.85 bar. We therefore also describe this machine as a membrane or vacuum press."

Detecting leaks proves difficult

In order to ensure a high degree of impermeability of the membrane press and, in particular, to ensure optimum and therefore extremely economical operation of the pump connected to a vacuum vessel, the entire system is checked for possible leaks from which the vacuum generated could escape. "In the past, we have used fumigation, special sprays for leak detection or similar methods for this purpose. However, it is very difficult to detect leaks, especially in a vacuum, especially as the working chamber of this machine is closed and it is therefore no longer possible to see where the vacuum is ultimately disappearing due to leaks," says Wolfgang Zorn.

Localization of even the smallest leaks

Some time ago, Lechenauer also acquired the leak detector **UY000003** from IPF to inspect the compressed air network for possible leaks. "There were an astonishing number of places with leaks that we had not previously suspected, e.g. on couplings and plug connections. Based on our positive experience with this solution, we finally came up with the idea of using the device to check our membrane press for vacuum leaks too."

Similar to compressed air, leaks in vacuum systems generate ultrasonic waves. If you direct the **UY000003** to an area with a suspected leak using the integrated camera and color display, these waves are bundled using a sound funnel, recorded via a microphone, converted into audible frequencies and transmitted to headphones. For precise leak detection and color representation of the leakage point on the display, the **UY000003** has an UltraCam and 30 digital MEMS microphones in the sound funnel. In addition to this, there is also a so-called sound reducer, which can be used to locate particularly small leaks. And it is precisely this device attachment that plays a decisive role at Lechenauer.



The leak detector **UY000003** from IPF has, among other things, a color display that shows a leak in color. (all pictures: ipf electronic gmbh)



Design engineer Wolfgang Zorn checks the vacuum vessel of the membrane press for leaks using the acoustic funnel of the leak detector.

Up to 100 test points on one machine

Wolfgang Zorn explains: "We use the acoustic horn to check the screw fittings and three-way control valves on the vacuum vessel, among other things. Possible leaks are clearly visible on the color display. For example, we found that a screw fitting on the boiler was incorrect, resulting in higher vacuum losses. The defective screw fitting was replaced instantaneously and the problem was solved immediately."

For the entire vacuum tables and thus the complete vacuum space in the operating range of the machine, however, the sound reduction piece is preferably used because the vacuum losses in these areas are so low that they cannot be detected with the sound funnel. Wolfgang Zorn explains: "The test points include the support plate of the table and the clamped diaphragm. There are also various seals in between. In addition, there is the inspection of various fittings, screw fittings and hose transitions. Taken together, this is estimated to be up to 100 test points."



With the sound reducer and the headphones for the **UY000003** from IPF can be used to locate the smallest vacuum losses below the vacuum table, as shown here on a screw fitting. It is estimated that up to 100 test points must be checked on the machine.

New potential for targeted optimizations

From the previous results with the **UY000003** from IPF: "We will definitely use the leak detector in the design and manufacture of further thermoforming machines in order to precisely detect possible defects. With this solution, we can not only sustainably optimize pump operation for the vacuum vessel, but also make targeted improvements to various components and parts of the machines."



Testing a compressed air line for leaks. The leak detector is equipped via laser distance measurement, which makes it easier to locate the possible leak. In addition, the time-of-flight measurement in combination with the intensity of the ultrasonic signal received by the device can be used to precisely quantify compressed air losses.