New method measures gas pressure with high precision

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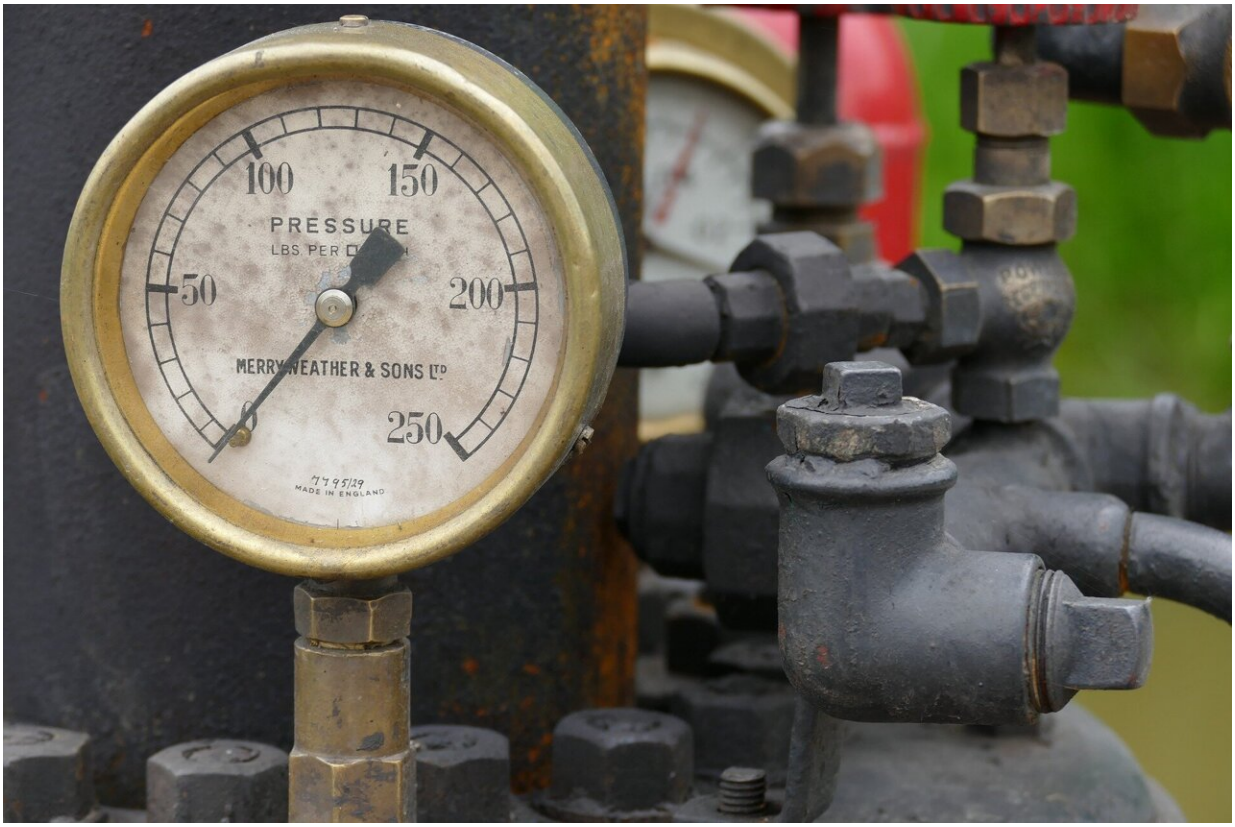

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A newly-developed instrument makes it possible to measure gas pressure by using laser light. The method, developed at Umeå University and the Industrial Doctoral School for Research and Innovation, provides very

precise measurements and can, for example, quickly detect extremely small gas leaks.

Our ability to define and realize what are known as the SI units—such as the meter, the second and the kilogram—with high accuracy is becoming increasingly important in our global society. How long one meter is or how much one kilogram weighs is something we take for granted, but is in fact under constant supervision and development by national metrology institutes around the world. One of their tasks is to ensure the quality of our measuring instruments so that people can, with confidence, shop for groceries, refuel their cars or set their watches.

In his doctoral thesis, Clayton Forssén, a doctoral student at the Industrial Doctoral School for Research and Innovation, presents a new way of realizing the SI unit for pressure, the pascal, which is both precise and accessible. The research was conducted in collaboration with RI:SE Research Institutes of Sweden, which is home to the Swedish National Metrology Institute.

Contributing to safer workplaces

"Unlike the traditional method of realizing pressure by applying a known force on a known area, the new method is based on Boltzmann's constant and an exceptionally accurate laser measurement of gas density," says Clayton Forssén.

The new instrument enables a better global definition for pressure, as well as the development of future solutions in areas such as health care, industry or research where knowledge of precise and accurate pressure is a fundamental requirement. For example, some areas of use include the accurate dosing of drugs in medical applications or the handling of hazardous gases in industry.

Using the new instrument, extremely small gas leaks can be detected in real time, contributing to greater safety when working with explosive or toxic gases.

Sensitive instruments

These types of instruments are often sensitive and therefore difficult to move outside the lab. However, Clayton Forssén has succeeded in creating a portable instrument that can measure pressure with very high precision even outside well-controlled environments. This makes it possible to bring the technology into society and ensure that it benefits more applications.

"Applying a realization for pressure directly can eliminate the need for calibrations, which is very costly but above all carries a high price for the environment," says Clayton Forssén.

"Working with experts on realizations for the SI units across Europe has been incredibly rewarding. I've seen how much work goes into developing and quality assuring these devices, all with the aim of minimizing the impact on us as individuals in society. Being able to contribute to this work that is focused on improving the future of the global community is, of course, something I take great pride in," he concludes.

More information: Fabry-Pérot based refractometry: development of a transportable refractometer for assessment of gas pressure. www.diva-portal.org/smash/record.jsf?pid=diva2%3A1794609&dswid=9355

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