



CASE STUDY:
CO₂ MONITORING WITH ARANET4 –
A SOLUTION FOR SAFE THEATER
VISITS DURING THE PANDEMIC

Air quality monitoring



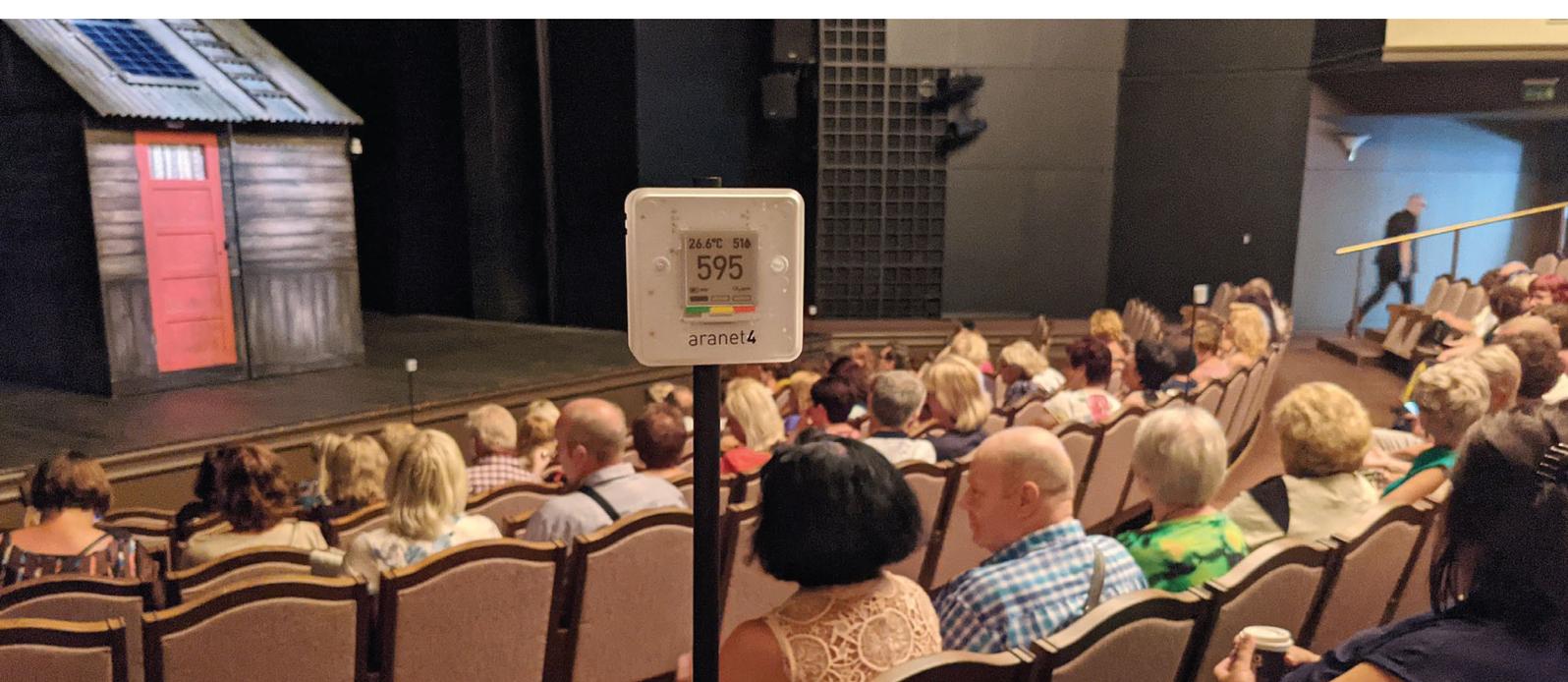
CO₂ monitoring in theaters is the easiest way to control the spread of COVID-19 and hold safe cultural events during the pandemic.



Installing Aranet4 PRO wireless CO₂ sensors in a theater auditorium takes just over an hour and the sensors can be easily relocated.



After using Aranet wireless monitoring sensors for a month, Valmiera Drama Theater realized that the ventilation system upgrades need to be their top priority in their upcoming building renovation.



For public spaces like theaters, cinemas, and concert halls, poor indoor air quality can lead to many problems, including fewer visitors and a fall in turnover. Now, during the COVID-19 pandemic, air quality monitoring and effective indoor ventilation have become even more important. This time, for safety reasons.

COVID-19 is an airborne virus that is primarily transmitted via aerosols when an infected person sneezes, coughs, talks, or even simply exhales. According to the latest **research**, well-ventilated rooms significantly lower the risk of infection.

“Tracking CO₂ levels indoors is, without doubt, the easiest, fastest, and most inexpensive way to monitor whether there’s sufficient air exchange in the room and, that way, determine the risk of people getting infected with COVID-19.” — **Ivars Vanadzins**, Director of Institute of Occupational Safety and Health, Riga Stradins University

If you cannot measure it, you cannot improve it

In June 2021, the Ministry of Culture of Latvia launched a pilot project to find ways of organizing epidemiologically safe cultural events during the pandemic. For theaters across the country, making their environment safer is the only way to keep their doors open to their audiences if another pandemic wave strikes.

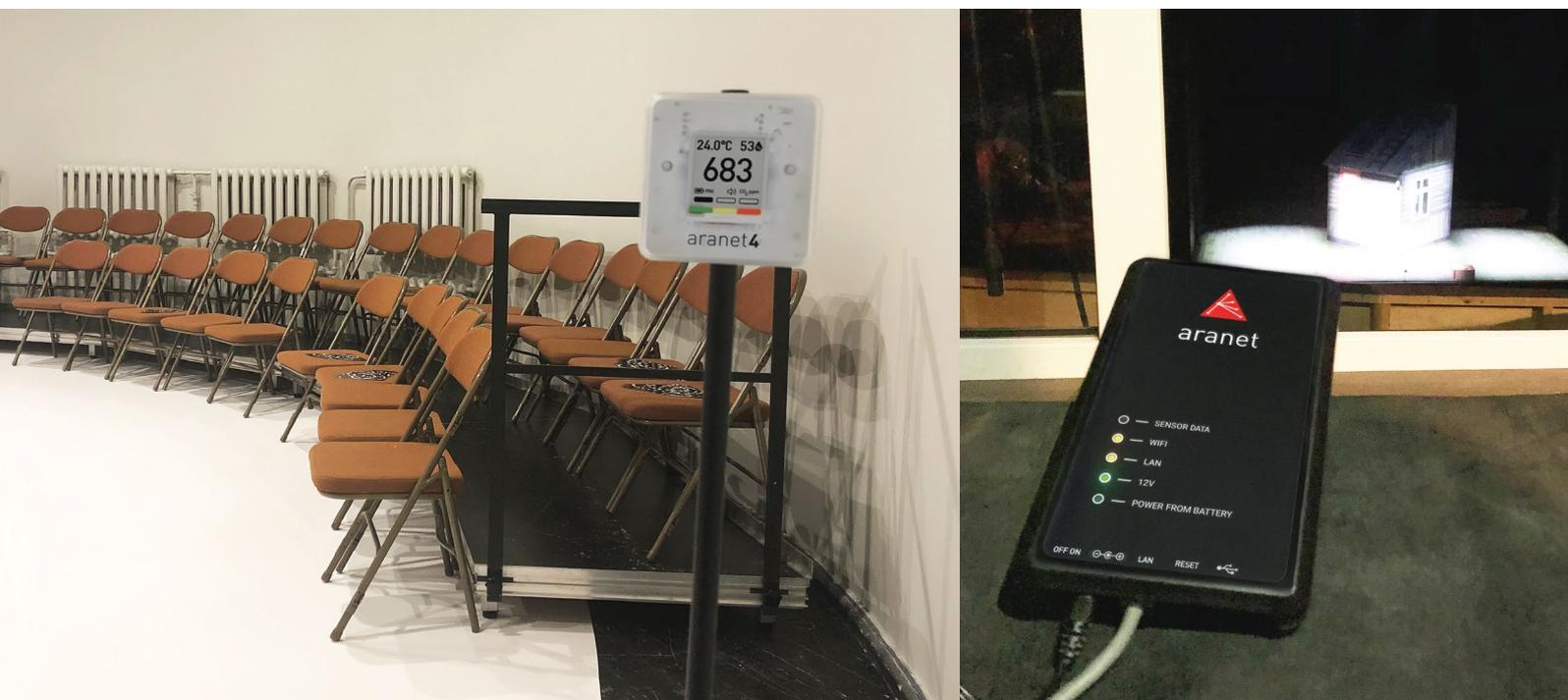
Valmiera Drama Theater, the region's leading theater and center of culture, became one of the first participants in this pilot project. Its new and modern theater building was put into operation in 2004, yet its ventilation system turned out to be its Achilles heel.

"I knew the ventilation in our auditoriums wasn't up to par, but I had no idea how bad it was until we began using Aranet4 PRO sensors," says Janis Kreklis, Technical Director of Valmiera Drama Theater. *"Even with the auditorium half empty and our ventilation system turned on at full capacity, CO₂ levels quickly exceeded the recommended 1000ppm. That was shocking."*

High CO₂ levels reduce the audience's ability to focus and enjoy the play, as well as increase the risk of getting COVID-19. As the scientists **Jose-Luis Jimenez** and **Zhe Peng** point out in their **research**: *"In any given indoor environment, when excess CO₂ levels double, the risk of [COVID-19] transmission also roughly doubles."*

Setting up an Aranet ecosystem takes just over an hour

Prior to testing **Aranet4 PRO** sensors, Janis tried a different sensor, but he admits that there were several issues with it.

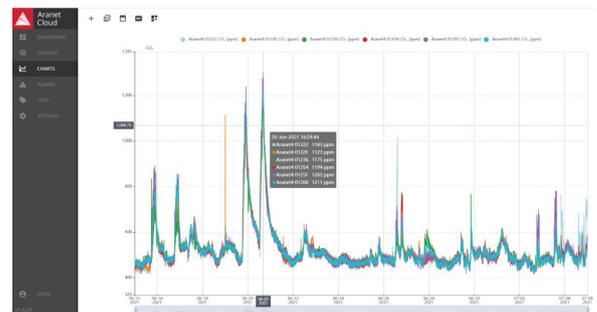


First of all, it required an electricity supply, which isn't that easy to access in auditoriums. Second, there was only one sensor in the corner of a 350sqm-large auditorium with a 6-meter ceiling. That made Janis question the accuracy of the sensor's measurements.

That's when Valmiera Drama Theater approached Prof. Vanadzins for advice on more reliable ways to measure the efficiency of their air ventilation system. They were recommended to try Aranet sensors. Following Aranet guidelines on sensor placement, they installed 6 sensors in the main theater auditorium – one CO₂ sensor for every 50sqm, approximately at the height of the respiratory area (1.5m).



The full set up was simple. The sensors sent measurements to the **Aranet PRO** base station that collected and stored all the data. The base station was further connected to **Aranet Cloud** enabling centralized data monitoring and analysis. When CO₂ levels increased, the system sent warnings that the ventilation should be turned up.



The entire process of setting up 6 sensors and 1 base station took Janis and his colleague just over an hour.

"Because Aranet4 PRO sensors are wireless, their installation is quick and easy. The sensors' signal reception area is up to 3km from the base station, which allowed us to move them around to other areas and use them when and where they were necessary. For example, when we didn't monitor air quality in the main auditorium, we could use the sensors in other theater rooms, like the office, dressing rooms, etc." — Janis Kreklis, Technical Director of Valmiera Drama Theater.

Air ventilation – a clear priority from now on

Valmieras Drama Theater tested the Aranet4 monitoring solution for a month during which they held 6 plays and welcomed 710 visitors. This was enough to realize: the theater's ventilation system fails to maintain a pleasant and safe microclimate when the auditorium is at full capacity.

"When the theater was built nearly 20 years ago, no one paid attention to CO₂ levels and how elevated levels can impact the well-being of our visitors. Now, due to COVID-19, CO₂ monitoring has helped us realize the importance of effective ventilation and good indoor air quality. Improvements to our ventilation system are definitely one of our top priorities in our upcoming reconstruction project,"
Janis reveals.

He recommends other theaters to try Aranet4 PRO sensors, too. They allow theater staff to monitor CO₂ levels and receive timely warnings when ventilation must be turned up before the air quality becomes unhealthy. And if the ventilation is not up to its task, the CO₂ sensors allow you to identify the problem, which is the first step to improving it.

"If you have poor ventilation and everyone falls asleep after the first act, then what are we even talking about? I'm surprised that, so far, theaters haven't measured CO₂ levels in their auditoriums." — Ivars Vanadziņš, Director of Institute of Occupational Safety and Health, Riga Stradins University.





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