

AIRCHECQ+

Improving the accessibility & reusability of the AIRCHECQ deliverables to new disciplines

DURATION 15/03/2019 – 15/03/2021	BUDGET 20 000 €
Valorisation of the BRAIN-be project AIRCHECQ	

PROJECT DESCRIPTION

AIRCHECQ is a project within thematic axis 6 (i.e., Management of collections) and research area 'Collections of physical objects: preventive conservation and methods for sustainable conservation and storage'. Information on air quality is perceived by many heritage guardians as either too technical and difficult to interpret, or as meaningless and of no value. AIRCHECQ developed 3 deliverables with a technology readiness level between 4 and 5 to analyse, visualize and improve indoor air quality in a more intuitive and understandable way.

1. **Monitoring system:** The measuring device is able to monitor environmental parameters (e.g., temperature, relative humidity, particulate matter, pollutant gases, etc.), hazard related parameters (e.g., CO₂, motion) and material behaviour (e.g., shrinkage and swelling of wood, real time corrosion rate of silver). By measuring a larger number of parameters, a more detailed picture of sudden changes in air quality is feasible;
2. **User friendly software:** The software enables heritage guardians to load the data of the monitoring system and visualize it in graphs. It also includes algorithms that transform the data into an indoor air quality (IAQ) index. By using colour bars (see Fig. 1), the absolute values and trends of the IAQ-index becomes accessible in an intuitive way. The main advantages of the visualization of indoor air quality over time is that heritage guardians are able to evaluate environmental appropriateness themselves without being an expert in data science or environmental science;
3. **Work process:** The work process incorporates the IAQ visualization of Fig. 1 in a risk management procedure so that heritage guardians are able to improve the preservation conditions of our precious heritage collections in their daily work. The visualization of IAQ allow heritage guardians to identify periods of elevated risk that would remain unnoticed otherwise, it gives them the possibility to take mitigation actions well before a certain hazard induce severe problems, and decision makers can be more easily convinced to invest in better preservation conditions in order to solve 'invisible' problems.

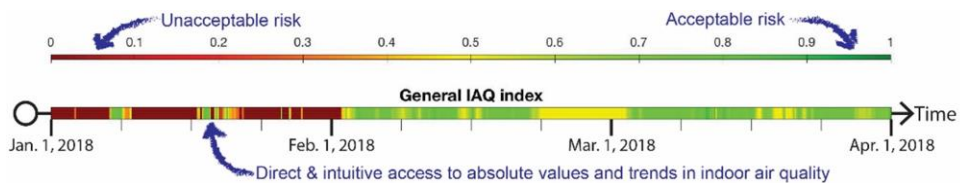


Fig. 1: Example of a large measuring campaign in the St. Martin church of Aalst where 9 environmental parameters are summarized by the general Indoor Air Quality (IAQ) Index.

Objectives

The valorisation goal of the AIRCHECQ+ project is to make the developed AIRCHECQ results accessible outside the domain they were originally intended for. During this project we explicitly target sectors where air quality has an impact on its immediate environment (comfort and human health in ships, corrosion prevention of wind mills, the fluctuating hazard intensity of pollution sources such as power plants, etc.). The goal is to explore the potential to enable growth and innovation through reuse of the AIRCHECQ results by all stakeholders at all levels of society and not only by the original target group of the AIRCHECQ project. In order to achieve that goal, the following objectives will be realized:

AIRCHECQ+

- **Adaptation of the AIRCHECQ algorithm:** In order to demonstrate the wide range of possibilities of the AIRCHECQ software, a measuring campaign with one of the existing AIRCHECQ monitoring systems for 3 months will be performed in the conservation restoration studios at Conservation Studies. That campaign not only assures the relation with the former institute that was responsible for the coordination of the AIRCHECQ project, it will also monitor the air quality in a confined volume where objects of art are stored and where lecturers and students are working with chemicals. Conservation-restoration processes require considerable amounts of solvents which might affect health. The existing AIRCHECQ algorithm will evaluate the air quality for the objects of art (see Fig. 1); the adaptation of the algorithm during AIRCHECQ+ will evaluate the same air for human health in a similar way. For this, the legislation of Belgium, Flanders and Wallonia will be used to extract target values that define environmental conditions of acceptable an unacceptable risk. By comparing smaller periods of enhanced risk with activities in the studio, it is possible to give recommendations about behaviour that resulted in enhanced risk;
- **Organisation of a 2-day stakeholder meeting:** A 2-day stakeholder meeting about the communication of environmental risks will be organized at the Antwerp Maritime Academy. Both those providing and receiving risk information will be confronted with the overarching challenge of how to communicate environmental risk in a more efficient, accurate and better understandable way. A wide variety of stakeholders will be invited: policy makers, maritime sector, non-profit environmental groups, media and scientists. The goal of this meeting is not only to better understand what type of air quality information people need, but also to identify road maps where the AIRCHECQ monitoring system and the software can be used as a basis for future valorisation projects. Besides the definition of future research, also the small case study about the human health in restoration studios will be presented as an example for research paths where human health plays an exemplary role.

Impact

AIRCHECQ+ will demonstrate that the AIRCHECQ concept can be transferred to other domains where preventive measures are considered to reduce the risk for damage to materials or for damage to health.

- **Occupational safety & health where assessment and management of occupational risks play an important role:** This topic will be explored on board of ships during a BOF academisation project that has been granted in September 2018. The project has been submitted by the Antwerp Maritime Academy with 2 former AIRCHECQ partners at the University of Antwerp. The goal is to develop a conceptual framework that considers all ship-related legislations so that health risks of seafarers can be visualized;
- **Understanding the real-time behaviour of pollution sources such as ships in harbours or even power plants so that the behaviour can be changed in a more dedicated way in order to improve air quality:** This topic will be explored in the VLIR-UOS project AIR@PORT in cooperation with a Cuban partner that has been submitted by the Antwerp Maritime Academy. The project has been granted in September 2018. The urban historic centre of Cienfuegos is inscribed on the World Heritage List and attracts many tourists. At the same time the port city is an important industrial centre as well. As a result, both cruise and merchant ships docks in the harbour;
- **Visualization of corrosion risk for large metal constructions immersed in water:** This idea is fairly similar to AIRCHECQ except that the condition of the water will be monitored in order to estimate corrosion risk. It is the basis of an INTERREG 2 seas project that is currently prepared by the Antwerp Maritime Academy.

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