

The Fundamental Contribution of Noise Measurement Networks

An Urban Community is a local, intermunicipal government institution, regrouping cities over a large territory. Every year, its technical department carries out numerous studies and measurements dealing with the traffic of roads that constitute its network, in order to feed impact studies on urban planning projects.

In order to meet the many demands of elected representatives, citizens and technical specialists regarding the noise issue, local authorities can deploy an extended long-term noise monitoring network over the main noisy areas of its territory.

01dB-Metravib is frequently selected for the supply of a noise measurement system fully suited to long-term urban monitoring. This system, which revolves around the OPER@ concept, is performing and easy to operate for the technical agents of public services. It allows knowing and precisely following up environmental noise over weeks, months and years. It also allows for an optimised implementation of European Directive 2002/49/CE. This Directive relative to the

assessment and management of environmental noise, and transcribed into local laws since 2006, requires that each city of over 100,000 inhabitants issue a noise map and an environmental noise prevention plan. These documents take into account the noise generated by transport infrastructures and industrial activities. They aim at preserving quiet urban areas and limiting noisy areas, by assessing a set of priority actions. They participate to environmental sustainable development.

Background to the urban monitoring approach

The voluntary approach of Urban Communities

The implementation of an action program aiming at the reducing noise pollution generated by urban motor vehicle traffic is a priority. Before concrete actions are carried out, noise must be assessed and monitored as precisely as possible. The strategy can be based on the complementarities between measurement and calculation. Simultaneously acquired sound levels make up a sound film over the entire network of stations in the area around the main road infrastructures, representative of the long-term environmental evolution over the territory. At the same time, short-term measurements and digital simulation modelling are achieved. Measurement results can be used to validate modelled results.

Presentation of the OPER@ monitoring system

Apprehending a noise situation in a dense urban environment can be complex in the case of a large area to cover. In this case, it may be relevant to refine the on-site meshing so as to increase the acoustic representativeness of the measurement points, hence the quality of measurements. To this aim, 01dB-Metravib offers a unique and innovating solution based on the deployment of a network of OPER@ noise measurement stations. It consists in using a central device and a set of fixed and/or mobile stations installed on the field

The OPER@ system consists of fixed and/or mobile noise measurement stations, transferring collected data through communication technology to a database hosted on a remote computer server. A specific software suite allows for optimum management and operating of the system. It has been developed using Internet-oriented technology, which provides the system with powerful data communication means. Its integration, which is versatile, is possible in a public and private computer network, using available connection protocols (classic telephony – STN, digital telephony – ISDN, broad-band LAN, broad-band ADSL, wireless WiFi connection, wireless GSM connection).

Based on new computer technology, these measuring instruments have unrivalled calculation and processing power. Electronic miniaturisation has allowed for an important decrease of the station size and for a full integration to the urban landscape, thus avoiding vandalism and degradation risks. Designed according to the requirements of French and international standards relative to class-1 sound level meters, the OPER@ system is suited to the constraints of urban deployment, and is fully resistant against outdoor climatic aggressions (temperature, rain, frost, etc.).

Functional accessories have been designed for simplified on-site implementation, and integrated to architecture and street furniture. A software suite allows the user achieving many operations remotely: management of measurement stations and computer administration (configuration changes, etc.) using software dB@dmin, visual display and processing of measured data using software dB@Dat@, automatic publishing of reports using software dB@Report.

The OPER@ noise monitoring system developed by 01dB-Metravib fully meets the requirements and constraints of the new environmental noise management issues in a complex urban context. It is part of the multimodal approach for a global environmental management policy, i.e.:

- Compliance with the current regulations on noise
- Elaboration and implementation of strategic action plans favouring the reduction of environmental noise
- Information of the public regarding noise situations
- Respect of living environment and sustainable development.

OPER@ is then an "intelligent" noise monitoring system that provides access to all functions required to establish strategic action plans compliant with European Directive 2002/49/CE:

- A metrological noise measurement network
- Continuous collection of noise events
- Technological capacity to transfer and communicate information
- Easy implementation in an urban context
- Automated management of measured data, resulting from computer technology.

As genuine decision-making tools, OPER@ networks have become essential for the characterisation of real situations and the selection of action plans suited to the noise environment.

Efficient implementation of the network

Installation of the OPER@ measurement network

The physical on-site installation can be performed by the internal technical team or an external company, specialised in elevated works and installation and maintenance of street furniture. Stations are installed 4 meters above the ground, which allows, not only for protection against vandalism, but also for compliance with statutory requirements such as those of the European Directive. 01dB-Metravib can assist and give advice to the Urban Community throughout the installation process. This step required the presence of a technical agent to supervise the physical installation of the network, and of several collaborators to follow up the progress of the operations.



Figure 2: On-site implementation of OPER@ stations on video-surveillance poles

Phasing of actions and installation time

The installation of a station can be described as follows:

- Selection of the measurement site, based on: the acoustic interest of the site, the presence of a support, the possibility to install a new support, the existence of electrical power supply, the possibility to get connected to it, safety conditions relative to the physical installation.
- Requests for authorisation regarding: installation on an existing support, installation of a new support, electrical connection, validation of the station's electrical protection device.
- Station tests including: opening of the GSM line, set-up of the station, control of the operations, and verification of transferred data.
- Installation of the station including: verification of tools, safety of the installation, physical installation, GSM communication test.

The average installation time for a station is less than 4 hours. It depends mainly on the constraints to access the site and on the complexity of electrical networks.



Figure 1: Fixed and mobile OPER@ measurement stations

The periodic maintenance of the station and the automatic storage of the data

It includes:

- A monthly visual verification visit to the OPER@ station
- Acoustic calibration every 6 months.

The simple operating of the OPER@ system allows for easy, user-friendly and rapid access to retrieved measurement data (one file per station and per day).

Whereas the installation requires people (fitter, electrician, etc.) and time, the actual management part is minimal. Automatic alarms are generated to indicate whether stations have published their respective information. The data are automatically stored in the database, as well as daily reports. Technical team then just has to process data and maintain the system.

Knowledge of the noise situation

Besides the obvious interest of gaining a good knowledge of the current situation, the installation of the stations on the main noisy sites will allow cities measuring concretely and in the long term the performances of its noise abatement actions.

Large-scale urban planning projects, for which commitments have been made in terms of acoustic performances, must be subjected to long-term measurements. Since the contracting authorities are responsible for these, they must be able to monitor noise situations around these developments in a fully objective way. Knowing the impact of a tramway, of a reduced speed limit, of newly created bus lanes, crossroads, parking lots or commercial areas... These are common urban scenarios that are difficult to compute, for lack of precise identification of noise sources. The major stake of noise monitoring is to understand situations better to act better in the future.

Openness with respect to the public

The legal obligation to make the public aware of noise mapping has made permanent noise monitoring nearly compulsory. It is a rich and precise tool to validate mapping results and elaborate evolution hypotheses.

To this date, there has been very little feedback from the population living next to the measurement stations because they are so small that you really have to know where they are to be able to see them. Beyond their legislative aspect, action plans aim at establishing individual responsibility for civic life, thus defining "noise environmental awareness".

Fundamental contributions to noise monitoring

The main advantages of acoustic monitoring based on the OPER@ system rely on:

- Easy installation with mains / battery power supply
- Very good integration of the stations in the urban landscape due to their small size
- Easy mounting using dedicated fixing accessories
- Transparent integration in an existing OPER@ noise network
- Homogeneity in the central computer system management
- "Power" of noise measurements and coupling with weather stations and road Traffic radars radars
- Precision of class-1 metrology
- Relevance of various acoustic indicators defined in regulations (LAeq, third octave spectra, peak levels, statistical indices...)
- Efficiency by allowing for the recording of audio signals for replay and identification of noise sources
- Versatility by offering the triggering of specific actions depending on specific noise events (coding of sources, sending of alarms, etc.)
- Performing storage of measurement files over a very long time
- Innovation in terms of real-time wireless communication technology
- Flexibility, in particular regarding measurement file transfer, using the most suitable communication protocol (GSM, 3G, LAN)
- A global noise monitoring solution, including supply of the OPER@ system onsite installation of the network, assistance regarding the use of the system.

Beyond technology and innovation, there are men and women working for the population, within the Monitoring unit of the Environment division of 01dB-Metravib. This permanent unit manages global noise monitoring projects and assists all collaborators who wish so, in full openness, in achieving their objective for the sustainable management of an environmental noise measurement network.

Noise is unquestionably a major issue in public health protection. Knowing, understanding and acting.

AUTHOR DETAILS

Christine Aujard
Technical Communication
Manager

01dB-Metravib
 200 Chemin des Ormeaux
 FRANCE – 69578 LIMONEST
 Tel: +33 (0) 4 78 66 34 82
 Fax: +33 (0) 4 72 52 47 47
 Email: christine.aujard@
 01db-metravib.com
 Web: www.01db-metravib.com