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Long-term Noise Monitoring – How a New Approach Leads to a Better Result

Long-term noise monitoring has taken place in various applications for many years. Business such as airports, power stations, refineries, mines, etc., may be required to perform continuous noise monitoring to ensure legal operating conditions are not breached, and to demonstrate to local authorities and communities that the business continues to be a good neighbour and limit its noise impact. However, anyone who has undertaken such programmes knows that they can be dogged by technical and operational issues that can undermine the accuracy and completeness of the noise data – potentially delivering misleading information.



Industries like these have been continuously monitoring noise for some time and monitoring is now extending to general manufacturing and urban areas

In Europe, noise from industry is handled through the Integrated Pollution Prevention and Control directive and similar legislation exists elsewhere. The IPPC directive covers a wide remit to prevent/reduce noise, odour, vibration and emissions to air, land and water, as well as to reduce waste and environmental accidents, provide site remediation and conserve energy. It aims to achieve this through a single permitting process where businesses must show that they have developed plans in line with “Best Available Techniques” and complying with specific requirements that take local factors into account. Under the IPPC directive, permits are required for all new installations and existing installations undergoing a substantial change that may have a significant negative environmental impact. For noisy industry, the permit may impose a noise restriction prohibiting noise levels above a defined threshold at its boundary. In most cases, this restriction is a condition of the industry’s operating licence meaning noise now becomes a significant business risk.

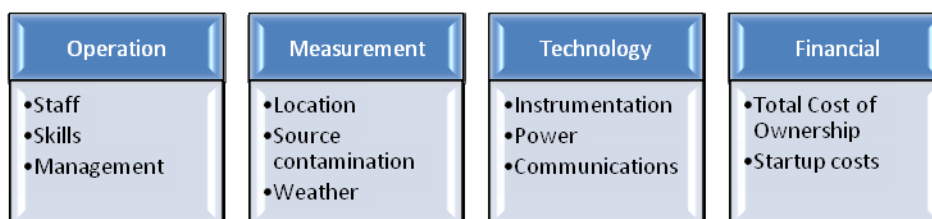
However, the IPPC directive and similar legislation stop short of enforcing continuous noise monitoring. Noise monitoring is generally only imposed on a business when its noise compliance is challenged. Challenges come in the form of local communities lodging complaints either with the local council, politicians or the industry itself, forcing local planning

authorities to impose a monitoring regime. In some cases, the industry may act pro-actively to demonstrate compliance and keep local communities on side.

Challenges of Operating a Long-term Noise Monitoring Regime

The main challenges of a long-term noise monitoring programme may be summarised in four areas: Operation, Measurement, Technology and Financial. In general, when a business is faced with establishing noise monitoring, the financial aspects are looked at very closely, the noise monitoring technology is considered, but other technology, for example, communications, is given only passing thought; measurement issues are addressed only if a compliance problem appears, and the operational aspects are usually overlooked completely.

Operating Issues



The main challenges of a continuous Noise Monitoring Programme

Nobody wants to buy a noise monitoring system; what they really want is to know how noisy it is. Procuring a noise monitoring system goes some way towards this goal, but leaves the business with another problem – who is going to operate it? Your noise supplier might tell you that the system will operate itself but, as you’ll see from the issues below, their noise system is not the whole picture.

Clearly someone has to operate the system, check that it is doing what it should, diagnose and resolve problems, identify and eliminate erroneous measurements, and maintain the IT infrastructure in today’s world of continuous updates and patches. If you are going to do it properly, this needs to be a resource skilled in the domain – skills that are usually not available in the industry itself and in short supply in the labour market. Recruitment (and re-recruitment should staff leave) is difficult. If you are lucky enough to find a suitable resource, they will need managing and you can be certain that at least some of the time, system problems will coincide with vacation or sick leave leaving the manager and industry with a big headache. Analysis has shown that over a 5-year monitoring programme, operating costs are 55 – 65% of the total cost of ownership of the monitoring system and labour costs represent at least half of those (the remainder outsourced to third parties to support instrumentation, provide power and communications). Clearly with such a significant part of the expenditure, operating issues should not be overlooked when evaluating a monitoring system.

Measurement Issues

If you’re reading this article, then you probably already know that noise measurement is complex and those complexities multiply for long-term, continuous noise monitoring, which by its very nature is unattended. With nobody there to see what is actually happening, can you be sure the measurement is valid? The locations of noise monitoring devices can affect measurement validity enormously and measurement standards give general guidance but careful consideration to monitoring locations is essential in each situation. Monitoring at the boundary is standard practice – careful monitoring location selection generally gives a source noise level significantly above the background for assessment purposes. Compliance thresholds are then determined taking into account the projected noise in the local community. Whilst this gives a good measurement position, it may result in a conservative threshold that may penalise the business. Alternatively, a more relaxed threshold could create a greater impact in the community than was anticipated.

You might not have the luxury of being able to choose ideal monitoring locations. In some situations the noise is contaminated with noise from other sources such as other industry, road/rail traffic or indeed the very communities that triggered the need for a monitoring system in the first place. As the monitoring is unattended you might not know the source of the noise. We are now seeing sophisticated acoustic recognition and directional noise monitoring devices in the market which adequately tackle this aspect – but unless you can afford the increased investment in technology, your operator will be left looking at strange noise measurements and listening to sampled audio signals to determine the source – a laborious and time-consuming exercise.

As if those issues were not enough, we are dealing with a dynamic environment that can significantly change with weather conditions. Technology can help here with simultaneous weather measurement, and levels recorded during high wind speeds can be automatically discarded as wind-induced noise levels at the microphone affect the measurement. Other weather conditions, such as heavy rain on tin roofs, can cause erroneous measurements. In quiet areas, even the dawn chorus from birds in nearby trees can create significant noise levels.

Technology Issues

Buyers are probably most aware of technology issues in long-term noise monitoring. Modern day outdoor noise monitoring terminals are very robust, but failures do happen and provision is usually made to repair or replace them under an ongoing support contract with the supplier. What isn't generally understood though is that these services cover noise instrumentation only and not the power and communication lines running to it – responsibility for these remains with the industry. These days, reliability has improved but because these locations are remote and are not considered core to the business, operation can be intermittent. Resolution has to be driven by the system operator and this can be frustrating and time consuming – leading to gaps in data collection and a risk that issues of importance to compliance or neighbour relationship are not being documented.

Financial Issues

Financial considerations receive the most scrutiny because they are the easiest to understand and most tangible issue. Procurement of a noise monitoring system can be anything up to several hundred thousand dollars and represents a significant investment for any business. Despite what some people think, there are ongoing costs associated with a monitoring regime in terms of instrumentation support and calibration, power, communications and as discussed above, operator costs. If you intend to do it properly, all these add up to a significant financial burden with no clear return on investment – but if the implication of non-compliance is that the operation of the business is curtailed, then there is a clear need to invest in a quality solution.

Service Solutions

A service can provide a complete solution to running a long-term, noise monitoring programme. Rather than just providing a technology platform for a business to operate, a service delivers the desired end outcome – compliance reports – essentially outsourcing the entire task to the service provider. There's nothing new here, industry has been outsourcing noise monitoring to noise consultancies for some time. The difference now is the emergence of Specialised Service Providers. Noise consultants are in a better position to provide a monitoring service than industry itself, they have measurement expertise, which is core to their business, but the other issues highlighted above, remain. A Specialised Service Provider is able to control the entire solution and deliver the compliance information needed by the industry. Long-term noise monitoring is the Specialist Service Provider's core business and, therefore, it can put measures in place and structure its business to cover all aspects of the service.

Typically a business function within an instrumentation provider, the Specialist Service Provider operates the system on behalf of a business using qualified operators with years of experience. Because the service provider delivers the same service to many clients around the world, economies of scale mean that more and higher skilled operators are available, delivering a higher quality result. As the Specialist Service Provider has no vested interest in

the output of the service – only in the quality – an added benefit is the increased level of independence, which may be important in some situations.

Being part of a technology supplier means that measurement procedures are very well understood and leading edge measurement technology is used to take measurements. Any technical problems during operation can be easily taken care of to maintain a high system uptime – even power and communication become the responsibility of the service provider, who will then work to limit any supplier downtime or provide an autonomous solution such as solar power.

Finally, financial issues may be eased for the industry as the Specialist Service Provider can deliver the service for a lower Total Cost of Operation than an industry procuring and operating its own system, typically 10 – 20% lower. As ownership of the noise monitoring instrumentation remains with the Specialist Service Provider, there is typically a 40% lower investment in year 1, which simplifies the financial side and delivers a smoother, predictable investment.

One of the key things about a service solution is its adaptability. A service can easily grow and be supplemented by additional monitoring services as the needs of the industry change – either due to changes in noise impact, in legislation, or in the community response. This means that a basic noise monitoring service can be supplemented with additional technology and services and be transformed into a highly available, high-precision, continuous noise assessment programme should it be required.

Two major factors have influenced the move towards service solutions. Firstly, advances in technology, particularly communications, mean that remote operation of technology is practical and cost-effective. Secondly, the increased willingness of industry to outsource non-core functions to specialists – which itself is driven by a climate of cost reduction and an understanding of the benefits of contracting a defined level of service.

Conclusion

A noise monitoring service from a Specialist Service Provider that has experience and expertise in all aspects of a long-term noise monitoring programme is able to provide a superior result, both in terms of quality of measurement giving industry confidence in its noise compliance, and in terms of investment, making it easier for industry to demonstrate its compliance to stakeholders.

As noise monitoring is the Specialist Service Provider's core business, it can deliver a superior noise monitoring programme, enabling industry to focus on its core business of power generation or manufacturing, for example, and freeing Noise Consultants to focus on their core business of data interpretation, advice and mitigation. This represents the most effective and efficient division of labour.