

MANAGING THE NOISE IMPACT FROM SHALE GAS DRILLING

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ABSTRACT

Shale gas has transformed the energy market in the United States where drilling is underway in 17 states, with more than 80,000 wells drilled or permitted since 2005. Deposits elsewhere in the world are under varying degrees of exploration.

The main environmental impacts of the process are water usage, waste water management, methane emissions, groundwater and soil contamination. These are generally addressed as part of national environmental regulations and strong stakeholder engagement is critical in addressing concerns.

Noise impact is also a significant issue. Drilling typically takes place 24 hours a day, and where drilling is close to residential areas there is a significant risk of disturbance triggering complaints.



NOISE FROM THE HYDRAULIC FRACKING PROCESS

Shale gas extraction can continue at each drilling site for many years but it is the initial construction, drilling and hydraulic fracturing process that creates the main environmental impact.

Initial construction of the well takes approximately 2–3 weeks. Noise is caused by the construction activity but also from frequent movement of heavy plant and vehicles in and out of the site.

Once the well has been constructed, drilling commences and may last up to 30 days depending on well depth. The drilling process is noisy and usually continues 24 hours a day and throughout the night when surrounding communities are most sensitive to noise. Extensive measures are taken around the drilling site to reduce noise which can include, for example, a sound wall or curtain to reduce noise levels in neighbouring communities.

After drilling is complete, the hydraulic fracking process directs a high pressure water mixture into the well to fracture the rock and release gas. Fracking can take between 3–5 days and is usually limited to daylight hours. Fracking does create noise but usually at a lower level than that from drilling. Once the well is capped, everything is removed from the drilling pad and gas is drawn from the pipeline using compressors. These create some noise, which is usually successfully managed by housing the compressors in sound isolating enclosures. However, there has been noise disturbance reported where they are located close to residences.



Noise can come from more sources than the actual drilling rig. Vehicles moving in and out of the site are often the cause of noise increase

APPLICABLE NOISE LEGISLATION

In the United States, noise impact from drilling can be regulated at a state level or effected through legislation at the City or municipality level through specific modification of general noise ordinances.

An example at the state level is the Colorado Oil and Gas Conservation Commission, which was established as part of the Colorado department of natural resources. It aims to foster the responsible development of the state's oil and natural gas resources. Their noise regulations stipulate maximum permissible levels depending on land use ranging from 55dB for residential/agricultural and rural to 80dB for industrial land use. Levels are more stringent during night time. During daytime, the regulations permit an exceedance of up to 10dB of these limits providing it does not last more than 15 minutes in any one hour period. In addition, periodic, impulsive or shrill noises have different level limits.

Zone	Daytime	Night Time
Residential	55 dB(A)	50 dB(A)
Commercial	60 dB(A)	55 dB(A)
Light Industrial	70 dB(A)	65 dB(A)
Industrial	80 dB(A)	75 dB(A)

Complex legislation such as this presents a huge challenge to drilling companies needing to demonstrate compliance.

Local legislation typically requires city or parish noise ordinances to be modified. These address a wide range of community noise disturbances from amplified sound, power tools and setting off fireworks. Additional requirements to address noise from oil and gas wells may include:

- Limiting drilling operations to daylight hours during weekdays only
- Limiting heavy vehicle movement
- Ambient noise level test requiring continuous noise monitoring for 24 to 72 hours prior to works commencing to gain a valid background noise measurement
- Continuous monitoring during the drilling and fracking process at any nearby sensitive receptors such as schools, hospitals and churches
- If complaints are received, immediate continuous monitoring for 24 or 72 hour period to take place within 24 hours of the notification of complaint

Violation of any of these requirements can trigger a fine of around US\$2000 per day that the breach is present.

In the UK, where shale gas drilling is still in the preliminary exploratory phase, noise regulations were imposed as part of planning permission for the exploration site in Balcombe in Sussex, granted in 2010. The restriction required that noise levels should not exceed 55dB for nearby residents between 7:30 a.m. and 6:30 p.m. Monday to Friday and not to exceed 42dB at all other times. A number of complaints about the noise were received and measurements taken by independent experts indicated that noise levels were nearing the prohibited levels, prompting calls for the site to be shut down. The exploration company immediately stopped work in order to fit sound baffles to reduce noise levels.

NOISE MONITORING CHALLENGES



Noise monitoring is a relatively common requirement for noisy industry and is usually achieved through the installation of a noise monitoring system. However, shale gas drilling has a number of important differences which raise particular challenges. Firstly it's not permanent noise monitoring usually only being required for

the construction, drilling and fracking process. It frequently relocates to the next drilling site where regulations can be different. Some of these challenges are covered below.

Noise monitoring against complex requirements

As highlighted above, some of the noise regulations can be quite complex requiring different limits at different times of day, days of the week and for different land uses. Keeping track of permissible levels and your compliance can be a significant challenge.

Quick response required to monitoring

Drilling activities are going on continuously and permits are granted at short notice requiring immediate response. This needs engineers on call 24/7 with equipment ready to deploy.

If complaints are received, then a very rapid response to commence monitoring at the complaints location is needed within 24 hours.

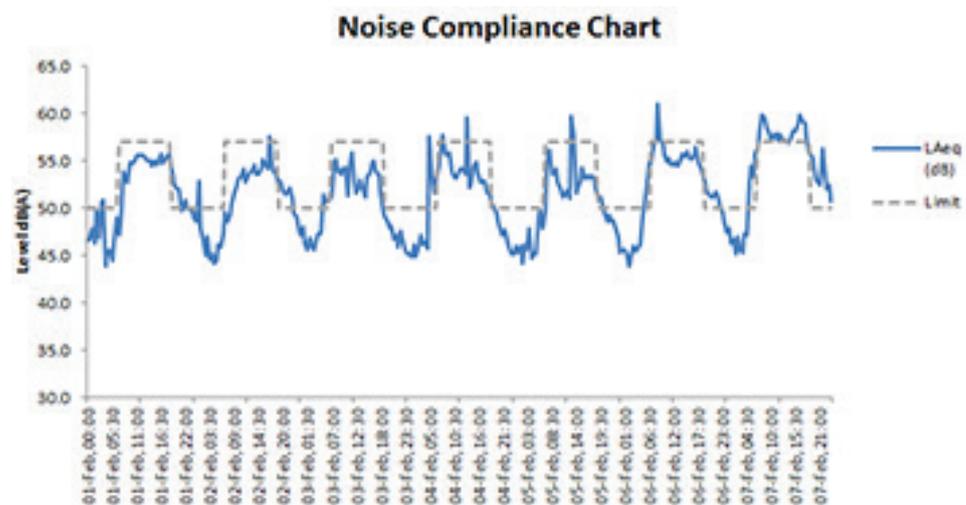
Noise from other sources

Permissible noise levels from the drilling activities can be small relative to other noise sources in the community. For example, a level of 55dB can be much lower than road traffic, a lawnmower, or in some cases, the effect of wind noise on a measurement microphone. This leads to contamination of the measured noise level. It is not sufficient to just measure the noise, it is necessary to determine if the noise came from the drilling rig or not. Measurement of different noise metrics may be allowed, specifically the L90, the level exceeded 90% of the time. This can be a valid way of assessing drilling noise, which is generally continuous and separating it from intermittent noise such as wind or road traffic.

Visibility of compliance

Continuous measurement of noise is important to ensure that operations are compliant. However, being compliant is not sufficient, you have to be seen to be compliant for the benefit of regulation to be understood. How you communicate compliance to communities is a major challenge when faced with complex, varying limits of technical measures such as decibels.

For a drilling contractor, doing all of the above, while focusing on the core job of drilling, presents a significant, but necessary burden. The risk of not meeting the challenge can be expensive, not just in lost hours from drilling shutdown, but in the cost of establishing additional mitigation measures and possibly, most significantly, in the loss of trust with communities and regulators which could hamper future drilling applications.



The noise compliance chart shows your noise level history against set limits

HOW CAN NOISE SENTINEL HELP?

Noise Sentinel was originally developed for long-term or permanent monitoring of noise compliance but with some small adjustments it has proven to be an extremely effective way of managing the noise from shale gas drilling activities. Using portable, hand carry noise monitoring instrumentation addresses the need for frequent relocation. Rather than equipment being installed on permanent monitoring masts, it is provided in a portable form for deployment by the drilling contractor or other parties on their behalf. Deployment involves mounting a microphone on a tripod and connecting it to the monitoring unit and takes less than 10 minutes. The unit is calibrated on site ensuring measurements are accurate. Data is measured and transmitted in real-time to the Noise Sentinel servers where it is processed according to the required legislation. In this way, understanding which levels are permissible is done automatically by Noise Sentinel leaving the contractor to focus on his drilling task.

Should levels approach compliance limits then the contractor is warned before a breach occurs, enabling them to change operations to bring the drilling back into noise compliance.

All this data is recorded and available in periodic reports that can be submitted daily or weekly to the city regulators. Reports can be compared to the ambient noise level survey.



The stakeholder web is ideal to share noise information with the community

Furthermore, a dedicated website called the Noise Sentinel stakeholder web is available and shows the current noise levels updated live to authorised users in the community or city. They can also look back over previous days and listen to any significant noise to determine its cause. This approach is an effective way to build trust with communities and regulators.

EXPERIENCE IN THE UNITED STATES

Since 2010, Brüel & Kjær noise monitoring terminals have been installed in the shale gas drilling market. Noise Sentinel has been active since 2010 and all equipment is operated by several companies providing services on behalf of the drilling companies involved.

For more information, see noisesentinel.bksv.com

www.bksv.com/whitepapers

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