Bill Noakes of Atlantic Pumps discusses the problems caused by airborne dust to quarry operators, an area increasingly being focussed on by the H.S.E., and looks at some of the solutions available.

**What’s the Problem?**

The dust caused by quarrying activities is a major headache for the quarry operator for two main reasons: the effect of dust pollution on the nearby communities, and the impact of the dust on the health and welfare of the quarry workers.

If your quarry creates levels of dust that could cause damage to property, or disturbance to the surrounding community, your local council’s environmental health department can place restrictions on your operations or require you to take steps to reduce the nuisance. Levels of dust pollution can also affect planning permission and operating licences. As cities grow closer to quarries, and environmental regulation increases, this problem is likely to be an increasing one in the future.

The dust generated on your quarry will also be inhaled by your quarry operatives. Depending on what you are quarrying and what mineral type your quarry has, the impact of this can range from a nuisance to a serious health hazard. Health hazards include asthma, COPD (Chronic Obstructive Pulmonary Disease), silicosis and lung cancer. The effect of this is increased sick leave and exposure to claims for industrial disease. Your quarry will have to comply with health & safety legislation, with the H.S.E particularly focusing on the potential for long-latency disease from exposure to respirable crystalline silica.

A further consideration is the impact of dust on the operation of your quarry, for example through reduced visibility, smeary windscreens and dirty office accommodation.

**How does Quarrying Cause Dust?**

Many of the processes in a quarry can cause the disturbed material to become airborne. The extraction of minerals, especially if done by blasting, is a major cause of dust. Processing of the minerals, particularly crushing and screening, is another source. Many quarries have vehicles running on unsealed roads, which can cause widespread dust, sometimes close to the communities bordering the site.

**How Can Dust be Controlled?**

There are only three options available: dust can be extracted, contained or suppressed. Dust extraction is possible if processes are indoors, but is much more difficult in an open-air environment. Dust containment is only effective where a process can be enclosed, for example by boxing-in a fixed conveyor. This leaves dust suppression as the primary method of dust control in most quarries.
How does Dust Suppression work?

Dust suppression involves spraying water to either wet the material being processed, to capture airborne dust, or both. The use of water sprays is popular because this method is both economical and effective, and can be rapidly implemented. Installation is straight-forward and with regular maintenance it offers you a long-term solution. Wetting of the material is possibly the simplest solution, the quarry product can be sprayed both when static and when being moved. Roadways can be sprayed before vehicles use them. Sometimes surfactants are added to the water to lower the surface tension of the water, which spreads the water droplets further and increases the penetration of the water into the material pile.

An alternative to wetting the material is to spray very fine water droplets into the dust after it has become airborne. The water and dust collide, forming a heavier agglomerate which falls to the ground, removing the dust from the air. An advantage of this method is that very little water comes into contact with the material or your operators, it is sometimes marketed as a “dry” method of dust suppression. The size of the water droplet is critical, because if they are bigger than the dust particles, the dust is likely to flow round the water rather than collide with it.

Typical Installation

Dust suppression systems typically consist of a permanent installation of a high-pressure ring main with numerous spray heads. These heads are located wherever dust is likely to be generated. Careful planning needs to go into the length of pipe used, the number of heads, the distance the water has to be pumped and the diameter of the pipe. Mobile mist cannons are available for more temporary requirements, or if the solution is required to be portable to accommodate mobile site operations or dust emission points. Mist cannons use electrical oscillation and turbofan propulsion of finely-atomised water droplets to cover large open areas, without excessive water usage. Some mist cannons can take recycled water which means less dependence on potable water supply.

Water Source

It is important there is a regular supply of clean or filtered water for your dust suppression system. An ideal source is to re-use the water from dewatering your quarry, from the lagoon at the bottom of your quarry or from a borehole on site. In some cases it is necessary to use water from the mains but this is the most expensive and least environmentally-friendly source.

Pumping water out of your lagoon involves an industrial submersible pump in the lagoon feeding a storage tank. Water is drawn off the storage tank using high pressure multi-stage pumps which fill the ring main at the required pressure. Often the water being drawn from the lagoon is clean enough to use without any strainers or filters because quarry residue will have settled on the bottom of the lagoon. Specialist bore-hole pumps are available which can draw clean water directly from an on-site borehole to a storage tank, or directly into the system. These pumps can supply the water at high pressure, so there is often no need for a multi-stage pump if the water is being fed straight into the ring-main. Mains water is typically fed into a storage tank, and a booster pump will be required to produce the required pressure.

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