Dust Extraction Energy Saving

Dust extraction systems can be expensive to buy and run. However, a well designed system can cost less by using lower levels of extraction, require less power to operate and offer re-cycling to reduce energy losses.

One of the most fundamental points in any dust extraction system is the capture of the dust. This affects both the effectiveness of the design and the running costs. The design of the hood, in terms of concept and position, has an impact. Hood design broadly follows one of three concepts; to entrain the dust (draw it in), to capture an emitted dust (as from a grinding wheel) or enclose the dust source and prevent egress. It will normally be the case that an enclosed design will require the lowest air volume and be the most efficient in terms of control. For entrainment and capture hood designs there are a number of guidelines available however the application is also important.

The diagram below shows the impact of the position of the extraction hood relative to the dust emission source and then the benefit of using an enclosure.

Hood design diagram
As can be seen, halving the distance, between the dust source and hood face reduces the extraction volume for effective control to 25%, whereas using an enclosure reduces it still further, to just 10%. As an example this is extreme although a great many installations could benefit to some degree by applying this approach and have a big impact on the operating cost.

As an extension to this aspect, adding a flange to the face of any hood improves the performance by causing all of the air drawn in to be from the front, the flange preventing air being drawn in from behind the face.

Once an air volume has been calculated the next step is to design the ducting network and quite simply the higher the velocity used the greater the energy use. Fan Laws used in these designs show the relationship between the velocity and motor power to be proportional by the relationship:

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\text{Increase in velocity} = \text{Increase}^3 \text{ in power}
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So adding 10% to the speed requires a corresponding increase of 33% in power! Reducing the speed will have the contrary effect.

Once these various aspects of design; hood type, position, flanging and duct velocities are all combined the impact on the running cost and extraction performance can be considerable. They are also often not easy to redress once the installation has been completed. A good dust extraction system design will use these design aspects to ensure good capture performance, the minimum air flow and correctly sized ducting network.

Further considerations on the dust filter air-to-cloth ratio and control of the compressed air cleaning system will also affect the energy use. Recyling the filtered air back inside to the workplace is then a significant step in energy reduction alleviating the need to heat the replacement air make-up otherwise occurring.