

Dusting off better control practices

Recent developments for dealing with dangerous dust and fumes on plant are proving themselves in industry – and saving time and money. Dr Tom Shelley reports

It is one thing to extract and trap dust and fumes, but quite another to do so efficiently and at minimum cost. But that's what we have to do: it is important to minimise energy and consumables usage, as well as complying with health and safety regulations. The problem is that since, at first sight, every application is different, establishing rules for which technologies to use, under what conditions, isn't trivial.

The good news, however, is that pioneering plant engineers have been installing clever solutions, and discerning readers are bound to see similarities with their own applications. So what follows is their stories, which we hope will help you with your choices.

First, Lafarge Aggregates in Leicestershire is using ultrasonic sensors, from Malvern-based Pulsar Process Measurement, to switch dust suppressing chemical spray systems on and off in its railway wagon loading bay and conveyor transfer point. For the wagons, Pulsar supplied a control unit with a 10m range transducer, which trips during stone filling operations once the wagon is full, initiating the

spray system. The system prevents the stone from being sprayed until it sees a full level, and also switches off spraying between wagons.

The equipment on the conveyor transfer point is similar, except that the transducer, installed above the spray bar, has a range of three metres to detect the presence or absence of stone in the detected distance range 50 to 100mm. Dust suppressant is then metered on to the stone as it passes

along the conveyor. Lafarge engineers report that the ultrasonic approach is a significant improvement, in terms of reliability and accuracy, over other technologies it tried, including load sensors on the conveyor and optical sensors in the railway wagons.

Moving on, Doncaster-based BLP, which makes MDF-wrapped mouldings and membrane-pressed cabinet doors for furniture manufacturing, reckons it is saving about £120,000 in its woodworking shops by installing variable speed drives and closing off dust extraction heads when machines are idle.

"There was the best part of 1,000kW of installed motor power and this basically ran constantly, eating power day and night," explains engineering manager Dave White. "Effective dust extraction is critically important to our business, for health and safety and maintaining product quality, so we had to devise a project that let us improve the existing system, while not compromising standards or disrupting production."

Variable-speed solution

Each of its moulding machines has eight cutting spindles, with individual forced draught extraction heads feeding a series of manifolds into a central air handling system. Machines have an average downtime of 30–40% and, even when they are running, don't necessarily use all spindles. White called in advisors from Mitsubishi Electric, which ran trials based on blanking off nozzles and ramping down motor speeds. Those demonstrated that supply frequencies, which control speed, could be reduced from 50Hz full power to 37Hz, without

Pointers

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loss of performance, equating to energy savings of about 50%. So a pilot project followed on a pair of moulding machines.

Says White: "We used pneumatic valves to close off individual suction heads and the Mitsubishi drive to reduce motor speeds or isolate the entire machine's extraction, while meeting operational requirements. We saved £10,000 of energy in the first 12 months, which more than paid back capital costs, so I was confident when I went back to the board suggesting we implement the scheme across all buildings."

As the installation grew, greater control was required, and the system now has four supervisory PLCs (programmable logic controllers) and three HMIs (human machine interfaces) for local control. Communications around the system are based on CC-Link, an open protocol system developed by Mitsubishi. Adds White: "We've almost completed installation in our moulding shops and the savings already exceed projections. Upgrading the door pressing shop is now a priority."



our hopper," explains Lionel Cieutat, head of industrial methods at Pall Exekia. "Not only was it a challenge to lift the bags safely, but the powder needed to be very carefully poured into the hopper to prevent spillage." Hence Piab, and Cieutat says: "The conveyor is completely enclosed, so we can rest assured that our workers are protected from inhaling any potentially harmful ingredients."

Incidentally, if bulk solids are your problem and you can't find a commercial solution, the Wolfson Centre for Bulk Solids Handling on the University of Greenwich campus at Chatham has specialised in solving such materials handling problems since 1973. The centre began researching problems associated with pneumatic conveying of powders and granular solid material in pipelines, and has since expanded its interests to include hopper and silo design, and instrumentation and control of bulk solids handling systems. 

Left: ultrasonics at Lafarge Aggregates

Keep it simple

Meanwhile, Daido Industrial Bearings Europe in Ilminster, Somerset, went for Melton Mowbray-based Flextraction's exhaust ventilation equipment to handle its lead/copper dust and fume extraction requirements. Its system comprises 1.5m diameter galvanised mild steel ductwork, a 30kW fan/air mover, a cartridge filter/air cleaner and six secondary filters in-line, extracting from nine points with various hoods.

Alan Riste, Daido's health and safety co-ordinator, says: "Previously, we had a 24in square ductwork system, with in-line fans extracting contaminants to atmosphere, and it became clear we needed a new system, primarily to meet the environmental standards for our 600mm diameter high cover stack system with a jet cowl.

"Also, we had to continually maintain the air flows of the old system to control the hazard of lead to operators. Since the new system was installed, personal air monitoring in the area has shown our lowest levels of lead."

Finally, one solution to dust is to avoid creating it by using vacuum conveyors – particularly for bulk solids. French Pall Exekia, which makes ceramic membranes for separation processes, went for Swedish Piab and its IC33 industrial vacuum conveyors, claimed to consume less energy than any other compressed air-driven technology, because of its patented COAX multi-stage ejectors, and capable of conveying two tonnes per hour.

"A major part of our production process included hoisting 25kg bags of alumina powder up 7m to

Computer-aided duct design

For those who want design dust or fume extraction systems as quickly and inexpensively as possible, CAD software helps. Micro Application Packages in Blackpool is an independent software house that has developed CAD-Duct, for all AutoCAD and ADT systems. All ductwork drawn can be passed to two other packages developed by the same company: CAM-Duct for automatic manufacturing and EST-Duct for costing.

Some companies that manufacture ducting offer 3D CAD design as part of their service. One such is Kirk & Blum, based in North Carolina, which specialises in a quick-to-assemble, clamp-up, field-adjustable ducting system in galvanised or stainless steel in one-inch diameter increments from 3 in (76mm) to 24 in (610mm).

Accessories include in-line mist accumulators, industrial grade blast gates, swivelling ball joints, sweeps and hoods. The company says it can produce 3D models from hand sketches, or a 'drag and drop layout planner', available over the Internet.