Mobile discharging of PAC from bulk bags helps solve pesticide overload

Transvac has deployed its mobile TransPAC dosing systems in a number of UK water treatment works for pesticide concentration emergencies, or taste or odour problems. The systems act as an alternative to traditional PAC (powder activated carbon) batch dosing systems. The TransPAC mobile powder handling and carbon dosing system includes a bulk bag discharger and two flexible screw conveyors from Flexicon Europe, and Transvac's ejector system for mixing and injecting a slurry of PAC into the municipal water stream.

When a water treatment works in northern England faced a spike in pesticide concentration exceeding the allowable concentration limit for the incoming water, the site was forced to shut down. The company then had to divert water from a regional water treatment works in order to provide clean drinking water to its customers until the problem could be solved.

The solution arrived in the form of a mobile, lorry-mounted carbon dosing system, housed in a 6.0 m long steel shipping container that was delivered and activated within one day, without costly and time-consuming site preparation, construction or complex components.

Supplied by Transvac Systems, the TransPAC mobile powder handling and carbon dosing system includes a bulk bag discharger and two flexible screw conveyors from Flexicon Europe, and Transvac's ejector system for mixing and injecting a slurry of PAC into the municipal water stream.

The mobile unit requires only connections to an electric power supply, the municipal water stream, and an external water supply. Environmental impact and site preparation are minimised, as well as the need for maintenance and planning permission. The system is safe to operate, and simple to control.

The water treatment works was restored to compliance as the dosed carbon successfully removed pesticide traces from the main water stream. Dosing is accurate and steady without over-dosing or wastage.

From the BFF-C-X Bulk-Out™ split-frame bulk bag discharger, PAC is automatically transferred from a half tonne bulk bag through a flexible screw conveyor to a surge hopper from which a second flexible screw conveyor meters the powder into the Transvac ejector.

Split-frame discharger fits inside container

A forklift loads the 1.8 m high bag-loading frame and 500 kg bulk bag onto the 0.9 m high stationary discharger frame inside the shipping container. Once the bag spout is untied, the powder flows into a 5.0 m long, 80 mm diameter flexible screw conveyor leading to the 930 ℓ capacity surge hopper. A second 3.5 m long, 67 mm diameter flexible screw conveyor moves the carbon powder from the hopper outlet to the intake of the ejector that accurately doses the PAC into the municipal water stream.

The conveyors are curved to fit the tight space within the shipping container.

From the control panel, the operator sets the speeds of the conveyor drives to automatically dose the proper amount of PAC according to the site water flow. Low and high level sensors in the surge hopper signal the controller to start or stop flow through the first flexible screw conveyor when the hopper contents reach low or high levels.

The carbon dosing portion of the TransPAC system includes a header tank for incoming water, a booster pump and the ejector. The velocity of the water flowing through a venturi creates a low pressure zone in the ejector that entrains the carbon powder into the treated water stream at a rate set at the control panel. The unit operates with no moving parts.

PAC handling problems

Powdered activated carbon adsorbs the pesticide on its surface, while the carbon and adsorbed material are subsequently removed as sludge in the flocculation process. However, the extremely fine powder, with an average particle size of only 20 µm and a bulk density of 230 kg/m^3, is prone to dusting.

Above: *The bulk bag and lifting frame of the BFF-C-X Bulk Out™ split-frame bulk bag discharger are forklifted onto the stationary discharger frame inside the container.*

Left: *TransPAC mobile powder handling and carbon dosing system houses a split-frame bulk bag discharger, two flexible screw conveyors, a control panel and the Transvac ejector.*

The 5.0 m long flexible screw conveyor from the bulk bag discharger moves the carbon powder to the surge hopper (left), from which the second 3.5 m long flexible screw conveyor moves the powder to the intake of the Transvac ejector (right).

Both the bulk bag discharger and flexible screw conveyors prevent dusting. The bag outlet spout is connected to the feeder by a Spout-Lock™ clamp ring, which creates a secure, dust-tight connection between the clean side of the bag spout and clean side of the spout interface.

Each flexible screw conveyor consists of a stainless steel screw rotating inside a durable polymer tube that contains the fine powder as it is conveyed. The conveyor discharge is likewise dust-free, as powder exits through a transition adapter located forward of the drive at the discharge end, thereby preventing powder from contacting bearings or seals.

Extra fine powdered activated carbon is prone to dusting, but is contained by the flexible screw conveyors and dust-tight connection at the discharger's bag spout interface.

Transvac has deployed its mobile TransPAC dosing systems in a number of UK water treatment works for similar emergencies for pesticide, taste or odour problems and as an alternative to traditional PAC batch dosing systems, which are large, complex, costly and require long lead times by comparison. ❑

Overloaded pump station upgraded

Veolia Water Technologies recently revamped Ncandu pump station near Newcastle in KwaZulu-Natal, leaving it suitable to accommodate future growth.

Veolia Water Technologies South Africa was recently contracted by the Newcastle Municipality to upgrade the Ncandu pump station in KwaZulu-Natal. The existing outdated pump station, situated five kilometres from the town, was unable to meet high sewage capacities, overloaded by Municipal housing and downstream industrial businesses.

The existing old pumps were prone to tripping and often flooded the pump station, so the first step of the project saw Veolia cleaning the pumping station, situated 15 m below ground. This included removing the sump, scraping the walls and rehabilitating the existing infrastructure for the new, larger pumps.

Veolia replaced the aged pumps with two new Sulzer pumps, imported from Germany, that were integrated into the existing pipework infrastructure. Sulzer is one of the Veolia Group's international strategic suppliers for pumps. The two submersible Sulzer XFP high-capacity sump pumps are capable of processing 220 ℓ of raw sewage per second at a 27 m elevation.

"The pumps are set at a standby duty configuration to ensure system reliability. This means that when the first pump reaches 60% capacity, the second pump will automatically switch-on to ensure demand is met and that no flooding or overflow discharge occurs," comments Blake Cooley, project engineer, Veolia Water Technologies, South Africa.

"In addition, this standby configuration also ensures that if either pump malfunctions or requires servicing, it gives the pumping station a four to eight hour buffer period before breakdown or overflow." These Sulzer pumps, however, would continue to operate in the unlikely case of overflow due to their submersible designs.

Early in the installation, the existing pumps failed and flooded the entire pumping station. In addition to cleaning the waste, Veolia installed a temporary T8 pump to ensure that no effluent would be discharged during the installation period. "As this was a live operation, we had to bypass the Ncandu pump station using a temporary solution so that the pumping of the sewage to the wastewater plant could continue uninterupted," comments Cooley.

To ensure the maintainability of the pump station, Veolia installed a penstock stainless steel gate to effectively isolate the pumps from each other. This means that when one pump requires cleaning or maintenance, the gate will isolate the sewage flow to the functioning pump only. Prior to this, the operators relied on manually handled sand bags, which proved extremely laborious and often ineffective.

In order to power the two 71 kW pumps, Veolia was also contracted to upgrade the transformer and Motor Control Centre (MCC) panels with the help of external instrumentation and control suppliers. "These MCCs provide variable speed and soft-starting pump performance ensuring that their operating capacity matches the sewage demand of the time," adds Cooley.

These intelligent systems will also immediately alert the operator, via SMS, to any potential pump tripping or overloading. Veolia also installed a precautionary one-kilometre air raid siren to alert the operator of pump station overload or failure.

Sulzer XFP pumps (shown left) wait to pump 220 ℓ of sewage every second (above).

"These safety systems, in addition to our operator training on MCC usage and proper maintenance practices, aim to reduce the chances of any sewage discharge from this pump station in the future," concludes Cooley. ❑