March 2004

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PROCESSING

SOLUTIONS FOR THE PROCESS INDUSTRIES

Mag drive pumps for treatment plants

WATER/WASTEWATER, PG 16

Heavy-duty, magnetically driven process pumps are designed for chemical feed applications in water and wastewater treatment plants. Tefzel®-lined unit handles the most caustic, corrosive fluids safely, reliably and at a minimum operational cost. Model 3298.

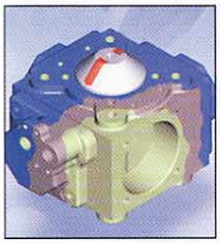
Goulds Pumps, ITT Industries
800-734-PUMP
Circle 711

FM-approved level gauge

FM-approved level gauge with two-wire TDR technology is ideally suited for liquid and solid applications in chemical, water and wastewater and other process industries. It is easy to install and commission and, with no moving parts, is virtually maintenance free. Microflex BM 102.

KROHNE, INC.
800-FLOWING, info@krohne.com
Circle 712

Quarter-turn rack and pinion actuator



Quarter-turn rack and pinion pneumatic actuator provides more than double the torque achieved by single- and double-turn rack and pinion actuators. It is compact and energy efficient, creating a fast-responding, trouble-free, high-cycle lifespan. Stop by **Booth 2730** at the Pharmaceutical Show. Compact II.

Compact, Inc.
201-523-6066
Circle 713

New flexible screw conveyor

Flexible screw conveyor features a UHMWPE tube and steel spiral that can be easily disassembled and cleaned with little downtime to reduce product contamination when moving and switching products. Conveyor is easily controlled with an integrated pre-programmed PLC or by existing facility controllers.

Spiroflow Systems Inc.
704-291-9595, info@spiroflowsystems.com
Circle 714

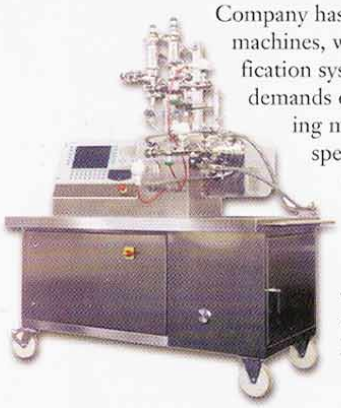
FOCUS: FILTRATION/SEPARATION, PAGE 8

Water filter eliminates maintenance and downtime

Tekleen automatic self-cleaning water filters are low-cost, high-quality stainless steel filters sold at carbon steel prices. The filters save money spent every day in the labor of cleaning, maintaining and replacing cartridges, bags, screens, spray nozzles, molds, chillers, heat exchangers, tubes and valves. They are easy to install on new systems or as a retrofit. Company also offers new screen cleaning technology called Tekrinse. It cleans the screen with inlet water pressure alone. Rotating vacuum nozzles save up to 90 percent of the rinse water (only 2 gallons per rinse). It is available in filter sizes from 1" to 24". CD-ROM available.

Automatic Filters, Inc.
800-336-1942,
info@tekleen.com
Circle 715

Size reduction equipment for sanitary applications on display at Interphex



Company has redesigned and reengineered its mixing and blending machines, wet grinding and dispersion mills, dry grinding and classification systems, and deaeration systems to meet the complex demands of the pharmaceutical and food industries. The fine grinding machines are specially designed for the most stringent specifications, including sterility, heat sensitivity and cleanability. Mills, dispersers and classifiers are all manufactured in accordance to FDA, cGMP and ISO standard... The machines are compact in design for quick and... cleaning between product batches. Typical pharm... cal applications for this equipment include oral... and injectable drugs. Stop by **Booth 2348** a... Pharmaceutical Show.

NET... ...ated
610-363-8010, gr... ...sa.com
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Controlling laboratory workstation exhaust at wastewater treatment facilities

SPOTLIGHT ON: WATER/WASTEWATER

Controlling laboratory workstation exhaust *at wastewater treatment facilities*

By Paul A. Tetley, Vice President/General Manager, Strobic Air Corp.

MIXED FLOW IMPELLER FANS WITH HEAT RECOVERY MODULES at the Theresa Street Wastewater Facility prevent laboratory workstation fume hood exhaust from reentering the building, eliminate neighborhood odors, and significantly reduce costs for heating fuel.

Most municipal wastewater facilities—and many industrial processing facilities as well—use research laboratory workstations to analyze their wastewater for a number of reasons. The Theresa Street Wastewater Facility in Lincoln, NE treats both municipal and industrial wastewater. Like many plants of its kind, Theresa Street depends on an advanced research laboratory for monitoring and pre-treating municipal and industrial wastewater, process control, and laboratory analysis of industrial effluent. This work is necessary to determine conformance to applicable codes and standards and also for the purpose of surcharging its customers.

According to Steve Crisler, the facilities maintenance coordinator, rates for users of the system are based upon the type of effluent being discharged, since the "wastewater facility must expend more effort to treat it and thus the surcharge."

Because of the wide variety of wastewater being analyzed and treated, the laboratory must occasionally deal with odoriferous (and possibly noxious or toxic) fumes from its workstation exhaust hoods which must be kept under negative pressure. In fact, the Theresa Street laboratory is a "closed loop", 100 percent make up air facility, and even incorporates a heat recovery system which extracts heat from the ambient air in the laboratory prior to fume hood exhaust into the atmosphere. This approach is responsible for saving many thousands of dollars each year in heating fuel costs.

To exhaust their laboratory workstation fume hoods, many wastewater treatment laboratories use traditional centrifugal-type, belt-driven fans. At the Theresa Street Wastewater facility, however, roof exhaust systems based on mixed flow impeller technology are employed instead.

"The mixed flow impeller fans here offer substantial advantages over centrifugal-type fans," according to Gary Thalken, a facilities sanitation engineer, since they "positively prevent exhaust emissions (and odors) from being re-entrained back into the building or adjacent buildings, and also disperse any odiferous exhaust in the atmosphere so as to eliminate the possibility of odor emissions in the neighborhood."

The Theresa Street facility is currently undergoing a $5 million expansion. When its research laboratories were upgraded, Crisler said that "the entire HVAC system for the laboratory was looked at quite carefully; certainly the fume hoods, the safety of the lab tech people, their day-to-day operation and testing in the labs, and the heating and ventilation system for the office spaces and the work spaces."

Other considerations included environmental control and maintaining proper temperature and humidity conditions in the laboratory.

"We decided to go with a 100 percent conditioned, or make up, air facility to eliminate all possibilities for pulling anything out of those fume hoods under every condition," Crisler said.

Thalken added that the goal was to "make the building positive (as much as possible). Since there are eight laboratory workstations and fume hoods there, with the ability for simultaneous operation of the fume hood exhaust systems, there was a great deal of makeup air required."

The Theresa Street facility is located near a large commercially de-

veloped area, and there are many residents close by.

"That's why it imperative that we prevent any possibilities of neighborhood odors emanating from the plant," Thalken said.

While there are many methods to prevent odor at wastewater treatment plants, mixed flow impeller technology is also gaining popularity for this application. At one of its complexes (the solids handling processing building), Crisler mentioned that he is looking into the possibility of a mixed flow impeller system to "collect the odors in that building, mix them with fresh air, and launch them upward to a certain velocity."

While roofline aesthetics often play a role in selection of a roof exhaust system, Crisler said that in the case of Theresa Street, there "were no community code requirements. We had some fairly high egg shaped anaerobic digesters on our site, so I don't think there would be any stack restrictions. One of the major benefits of mixed flow impeller technology, however, is its low profile design."

Mixed flow impeller technology has been gaining increased interest as a solution for many difficult wastewater treatment odor management problems. It works on the principal of mixing outside ambient air with odoriferous exhaust gases and sending the exhaust stream in a powerful, vertical "jet plume" up to 120-feet-high in a 10 MPH crosswind, thus effectively diluting and dissipating odors and preventing them from permeating the neighborhood, entering adjacent buildings, or reentering the source building. Mixed flow impeller fans draw in nearly twice the amount of fresh air (through base-mounted bypass dampers) as exhaust air into the fans' exhaust; their vertical "jet plumes" exit exhaust nozzles at up to 7000 feet-per-minute velocity. The jet velocity induces large amounts of outside air (up to 170 percent) to be drawn into the plume. This injection of fresh air causes immediate relief of odor perception by odor dilution. In most cases this system eliminates odor problems in the neighborhood; however, when it does not, combining dilution with one or more other available odor control methods should be considered.

THE THERESA STREET WASTEWATER FACILITY IN LINCOLN, NE treats municipal and industrial wastewater for a variety of area industries.

Defining odors

Exhaust emissions from wastewater treatment facilities may either be toxic or nontoxic, with toxic odors regulated by the Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), and other government agencies.

Treatment considerations

Among the many methods to manage wastewater treatment odors are those using chemical additives such as potassium permanganate, sodium hypochlorite, ferris chloride, chlorine, or other aggressive chemicals, as well as those employing precipitators, scrubbers, thermal oxidizers, charcoal filters, or other expensive hardware to treat process exhaust prior to discharge.

For most applications, mixed flow impeller technology prevents offensive odors from permeating neighboring buildings in particular and entire neighborhoods in general. It also prevents offensive odors (or toxic/noxious fumes) from being reentrained into the wastewater treatment facility — a critical issue. Because mixed flow impeller fans are low profile (typically about 15' high), they also eliminate the negative implications with regard to neighbors' perceptions of tall exhaust stacks on the roof as "pollution generators" — right or wrong. This is especially important at wastewater treatment facilities where employees or neighbors have

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previously complained of foul odor — a tall stack can be a daily reminder of the presence of the odor.

Other advantages

Another major consideration with regard to mixed flow impeller technology is the aesthetics associated with tall exhaust stacks on the roof. Mixed flow fans are substantially shorter than tall stacks typically used with traditional centrifugal-type fans for similar applications. Elimination of tall, unsightly stacks which are either prohibited by code or undesirable is an added benefit. In addition, low profile mixed flow impeller fans don't require structural reinforcements on the roof or complex, expensive mounting/stabilizing hardware such as elbows, flex connectors, guy wires, or spring vibration isolators, substantially reducing time and costs for installation. The reason for this, is because of lower vibration characteristics of mixed flow impeller systems vs. centrifugal-type fans. A mixed flow impeller fan's radial vibration parallels the building's roofline, resulting in a substantially lower axial component of vibration forced vertically onto the roof. Conversely, in a centrifugal system, the high radial component of vibration is forced directly down into the roof (moving vertically up and down on the roof) and thus requiring costly structural reinforcements with deteriorating system performance and potentially unsafe working conditions.

Mixed flow impeller fans also typically consume about 25 percent less energy than conventional centrifugal fans, with resultant faster pay back periods as well. Lower noise levels may also be (and usually are) advantageous in some locations. When noise is an issue, however, there are accessories available to deal with it including acoustical fences and acoustical silencer nozzles. In addition to odor generation noise pollution is also raising added concern in many communities; mixed flow impeller systems offer a variety of cost-effective, highly efficient methods of reducing noise if it is a problem - many times without affecting fan height above the roof line.

Conclusion

If you are dealing with a wastewater odor control problem - whether real or perceived by workers and/or neighbors — determining the best method for relief generally depends upon the compounds causing the odor and their concentrations as well as factors such as exhaust flow rates, atmospheric conditions, and building location and/or configuration. Based on the increasing popularity of mixed flow impeller technology for solving these problems, and the advantages this technology offers, it's time to give it equal consideration among the more traditional methods in making a prudent decision.

For more information, contact Strobic Air Corporation at 215-723-4700 or email tristack@strobicair.com.

Additional odor control considerations

When evaluating dilution, either alone or combined with other odor control technologies, consider these basic guidelines:

- Odor-laden air must be pointed upward with rain protection that prevents downward flow (no rain caps, goosenecks, or flapper dampers)
- Use as high a stack exit velocity as possible (at least 3000 ft/min)
- Locate exhaust fans on the highest usable roof with regard to duct connections
- Use a combination of extra fresh air from the roof into the stack flow along with stack height to achieve desired odor detection levels at the property line or supply air intakes

Keep in mind that dilution applies to the control of odor problems that are not subject to further regulatory requirements, such as standards for volatile organic compounds (VOCs) or hazardous air pollutants (HAPs). The cost for some types of control equipment depend on airflow rates (cfm). Thus, if additional controls are required, dilution could result in higher costs unless the other system is placed upstream of the dilution fan.

Other methods of odor control include:

- Prevention – eliminating the source of the odor or substituting a non-odor-causing material
- Minimization – reducing the amount of odor-causing material or causing it to evaporate at a slower rate
- Masking – adding a pleasant odor to the air to hide or mask the objectionable odor

Masking is usually too costly to be used very often in most facilities. Some specific prevention and minimization strategies include eliminating the source of the pollution, changing raw materials and/or fuels, modifying process operation, recycling exhaust rather than venting it to the atmosphere, minimizing entrainment of pollutants into the gas stream, reducing the number of points in the system where materials can become airborne, recycling a portion of process gas, and designing hoods to exhaust the minimum quantity of air necessary to ensure odoriferous pollutant capture.

Selecting an odor control technology depends on the compounds causing the odors and their concentrations, as well as the air stream flow rate, moisture content, and variability.