

# Controlling Odor and Improving Air Quality

Odors generated in the rendering sector can be variable in terms of load and composition and therefore difficult to treat. When a plant is located in a busy city with close neighbors, the problem can become even more challenging. This was the obstacle facing a United Kingdom (UK)-based rendering business with the added complication of limited space availability that ruled out the staple biofilter design traditionally used in rendering plants.

The initial project was to provide both an odor control system and improve the working conditions of operators within the fallen stock reception building. This facility receives 95 metric tons per day of cow carcasses from farmers where the cows have died inexplicably in the field. The carcasses arrive in various stage of decomposition and are dumped in the reception area before being lifted by a mechanical grab and hoisted into the checking area where brain samples are taken before the carcass is fed whole into the macerating plant. The macerated feedstock is then fed into a separate process area where the tallow and bone meal are recovered.

The fallen stock reception building was highly odorous and even short-term exposure would leave operators' and visitors' clothes badly contaminated and requiring immediate laundering upon exit. The search began for a solution and an operator found, during a visit to a food waste facility elsewhere in the UK, the Terminodour ionization system designed, supplied, and installed by CSO Technik.

CSO had been designing and supplying odor control solutions to the wastewater and food processing sector since 1995, but had never before designed a system for a rendering facility. However, the company had previously supplied a similar system to Croda Colloids, which produced photographic-quality gelatin from cowhides at its facility in North London. The process required boiling the hides that gave rise to odor release, and the plant was located in a built-up residential area creating great sensitivity to odor nuisance. The system was installed and eliminated odor complaints. The success of this project provided CSO with the confidence needed to review the rendering site application and make a technical proposal.

Following a site visit, CSO's technical staff reviewed the application and the previous odor survey and reports

commissioned by the plant owner. As expected, the gas chromatography/mass spectrometry survey revealed the odor cocktail to be a complex mix of reduced sulfur compounds such as dimethyl sulfide, dimethyl disulfide, methyl mercaptans, and a range of volatile organic compounds, including indoles and butanoic acids. The odor cocktail shared many similarities with old food waste so CSO determined there was nothing in the cocktail that would present any major challenges to the Terminodour system successfully treating the odors. A proposal was made to the client and an order was awarded in quick succession.

The total system design was carried out by CSO Technik utilizing their three-dimensional AutoCAD MEP software. The Terminodour air handling unit (AHU) was manufactured and shipped to site. The ductwork design, which is critical to system performance, was designed by CSO and installed by a local heating, ventilation, and air conditioning contractor. CSO went to the site and commissioned the entire plant within a few days of installation. Within hours of commissioning the plant, the odor was significantly reduced and, within 24 hours, the system was up to full operational performance levels. The change was so dramatic that the office workers complained, saying that the working environment in the carcass reception hall was better than that of the offices. A small bleed system was subsequently run off the main system to feed the offices and provide a sweeter-smelling environment.

Following the success of the initial Terminodour system in the carcass reception building, a further system was ordered for a different part of the rendering process and has now been delivered to site and commissioned.

The Terminodour process utilizes negatively charged ions of oxygen to oxidize odors. The oxygen ions are created in a section of the AHU that also contains the fan, filtration section, and instrumentation. Air is drawn into the AHU through a vermin-proof louver and filtration section by way of a fan. The filtered ambient air is then passed into the plasma reaction chamber where a series of corona discharge tubes create a plasma field through which the air must pass. As the air moves through the field, the oxygen molecules receive an electrical charge, the corona discharge tubes are operated with an alternating current, and consequently both

negative and positively charged oxygen ions are produced. The oxygen ions are then fed into the building via a carefully designed ductwork system to ensure the ions are properly distributed to the right areas. Once in contact with the malodorous air, the

**Table 1. Costs associated with various odor control systems**

	Terminodour	Biofilter/Activated Carbon	Chemical Scrubber
Capital cost*	\$200,000	\$380,000	\$450,000
Design abatement efficiency (odor units)	99%	99%	99%
Power demand (horsepower per hour)	11.5	59.0	35.0
Water consumption (gallons per day)	0	500	n/a
Chemical consumption (gallons per day)	0	0	700
Footprint (square feet)	100	1,103	650

\*All prices quoted in United States dollars are for the supply of the principal equipment excluding field ductwork.

oxygen ions oxidize the odor in situ, thus providing not only an odor control solution but a significant improvement in the working environment.

### Project Delivery

CSO Technik carried out the process system design, manufacture, and supply of the Terminodour AHU and designed the ductwork system to provide the local installer with sufficient information to equip and fit the ductwork. CSO then carried out the system setup and commissioning prior to handover to the client. The AHU is located externally with just the ductwork requiring installation within the building. The entire project took four months from placement to startup with minimal disruption to operational activities.

### Cost/System Comparisons

Phase 1 of the odor control system for the rendering plant comprised of a building volume of just over 100,000 cubic feet. The Terminodour AHU measured 9.5 feet by 10.5 feet by 5 feet with a fan size of 11.5 horsepower. The AHU, detailed CAD ductwork design drawings, control panel, and commissioning cost in the region of \$200,000.

As a supplier of a wide range of odor control systems, CSO reviewed the key parameters of the appropriate technologies to the specific application and determined that Terminodour would offer the client both the lowest capital and operational costs along with the smallest footprint (see table 1). No water, chemicals, or media are required, ensuring the operational costs are very low and the system is easily maintained by unskilled operational staff with no special tools or knowledge required. The only outside utility needed is power and due to the fact that the fan is not working against a closed head, the power consumption is considerably less than any extract and treat system, be it a wet or dry chemical system of biofiltration.

The client has shown the system to colleagues in the rendering sector, which has already resulted in a number of inquiries for new schemes that are currently in early design stages.

### Health and Safety

One frequently asked question by many clients relates to health and safety concerns. The Terminodour system has been thoroughly tested on operational sites for the presence of harmful by-products, including ozone, nitrogen oxide, sulfur dioxide, and sulfur trioxide. There was no detectable trace of any of these gases.

### Related Projects

CSO Technik has also recently supplied a large Terminodour system for a UK company called ReFood, which is part of the SARIA Group, one of the largest rendering and food processing groups in Europe. The ReFood plant in Widnes annually recycles 90,000 metric tons of commercial and domestic food waste through an anaerobic digestion plant and cleans up the resulting biogas to a standard suitable for injecting directly into the national gas grid system. The plant has sufficient capacity to power 8,000 homes.

The Terminodour system treats all odors emanating from the waste food, which includes meat and dairy products, in

the waste reception building where the material is separated from its packaging. The overall area of the building treated is 490,000 cubic feet, which is treated by two AHUs with an overall footprint of 18 feet by 10 feet by 5.5 feet with two 10-horsepower fans. The system provides a pleasant working environment for staff and eliminates odors externally.

Also on the same site is a small 80-cubic-foot digestate building used for dewatering sludge that presents an ammonia-based odor. This building is also treated using a small Terminodour system with a 0.75-horsepower fan.

Animal cadaver stations used in Switzerland for the collection of roadkill and other larger dead animals frequently use ionization systems to prevent odor release while the material awaits collection for further processing. These plants are generally run by the local municipality rather than private companies.

The Terminodour system is suitable for any size plant from the smallest of animal collection stations to larger projects like the ReFood site or even larger ones. The modular AHU system employed by CSO Technik for its process, along with the zonal ductwork designs employed by CSO, allow the system to be scaled up and down to suit any size building.

CSO Technik has been working in the field of odor control for 15 years providing a full range of odor control systems to cover most applications, including where a Terminodour system would not be the most appropriate solution.

The Terminodour is exclusively distributed in North America by Kusters Water.

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Terminodour distribution ductwork at the ReFoods site.



A typical Terminodour air handling unit.