The Benefits of Planned Maintenance for Waste Water Odour Control Systems

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ABSTRACT

This paper summarises ERG's experience in the first three years of their odour control maintenance framework agreement with Southern Water and ERG's perceptions of the benefits Southern Water has derived from this agreement.

KEY WORDS

Planned maintenance, odour control, chemical scrubbing, bio-filters, carbon filters, waste water.

INTRODUCTION

ERG (Air Pollution Control) Ltd was awarded the first framework odour control maintenance contract to be placed in the UK by Southern Water in the summer of 2004. The contract started on the 1st September 2004 and has now been operating for over 3 years.

The contract was initially to maintain 14 of Southern Water's most sensitive sites which all have chemical scrubbing as their principal odour control technology. The contract was extended in September 2006 to include a further 80 sites which use other technologies such as biological and dry media treatment.

Southern Water considers employing a specialist framework supplier to manage their odour control maintenance as a success, both in terms of meeting their obligation not to cause a public nuisance and in managing their odour control assets effectively.

This paper outlines the main benefits to Southern Water of using a framework supplier as perceived by ERG. In order to put these benefits in context it is important to understand Southern Water's odour strategy.

SOUTHERN WATER'S STRATEGY FOR ODOUR CONTROL

This odour strategy with regard to maintenance is based around the following concepts

- planned preventative maintenance using a framework supplier working in partnership with site operators,
- liaison with local population through site specific odour management plans agreed with the relevant local authority,
- comprehensive containing of each odour emitting processes and then venting to centralized odour control systems whenever practical, each with a single stack which is continuously monitored for H_2S,
- fast reaction to odour complaints using the services of the framework supplier,
- standardization of new odour control equipment by compliance to Southern Water's MED and PSWWT specifications

All water companies have the obligation to maintain their odour assets properly and to demonstrate to the Statutory Regulator that this obligation is being fulfilled in a suitable and appropriate manner.

The most efficient way of fulfilling this obligation is to avoid having odour complaints. Any complaints, whether they are deemed to be a public nuisance or not, inevitably require senior management and are highly disruptive at all levels resulting in lengthy and costly investigation. Southern Water has realized that the hidden costs of poor odour management are considerable. The company has therefore decided that it is far better to have a properly planned, proactive approach than a reactive approach. They are now leading the way in the UK for a planned, proactive approach to odour management in order to meet the stringent demands of their densely populated area.

DEFINING MAINTENANCE

The framework maintenance work that ERG carries out is broken down into specific defined tasks and procedures. For example, at Eastbourne WwTW, which is an underground force ventilated works and has a chemical scrubbing system treating 200,000m^3/hr of odorous air, there are 133 specific maintenance tasks to be carried out, of which 10 are required on a monthly basis, 20 are bi-annual and the rest are carried out annually.

This attention to detail by Southern Water in specifying the maintenance work has meant that all Southern Water's odour control systems are thoroughly mechanically and electrically checked at least once a year and their odour removal performance confirmed as compliant to the site odour management plan.

The emphasis of the framework is on carrying out physical actions rather than just inspecting. So for example, electrical circuits are tested, ductwork is re-balanced, scrubbers are cleaned internally, mist eliminators are removed and cleaned, fans have their vibration and temperature checked monthly and are periodically dismantled, inspected and cleaned, instruments are checked and re-calibrated, pump seals are changed and drain lines are cleaned, to name a few of the activities.

IMMEDIATE REDUCTION IN COMPLAINTS

From the 1st month after the chemical scrubber maintenance framework odour began, complaints were reduced. An important part of the framework agreement required the framework supplier to hold in stock consumable spares such as pH probes, Redox probes and fan belts. On the initial visits the key actions identified and performed were:

- About 10% of the pH and Redox probes were replaced which immediately improved scrubbing performance and in some cases reduced chemical consumption
- Several scrubbers were no longer operating as intended and needed immediate re-commissioning
- The ductwork extraction system had become incorrectly balanced over time resulting in too much extraction from certain areas at the expense of others causing fugitive odour emissions to escape from poorly extracted, covered sources

Within a few months, all the chemical scrubbing systems across the 14 sites were under control and operating effectively.

TAKING CONTROL THROUGH PREVENTATIVE MAINTENANCE

Prior to the award of the maintenance framework contract, Southern Water audited all the 14 sites and established a comprehensive record of the minor defects at each site. ERG, working with Southern Water's framework manager, prioritized these defects and agreed an action plan for the rectification work. Implementing this plan took about 12 months and at the end of it, all the more serious defects had been rectified.

At the same time as sorting out these higher priority defects, ERG implemented the specified plan for maintenance. This detailed plan of activity over 12 months meant that all the 14 sites' odour control packages were brought under rigorous control and planned and budgeted activity could then proceed.

REALIZING THE BENEFITS OF CENTRALISED ODOUR CONTROL SYSTEMS

Southern Water's decision many years ago to select chemical scrubbing as the principal method of odour control is proving to be both effective at preventing complaints and economic. Dry media odour control systems cost about 3 times more than chemical scrubbers to run and both dry systems and biological systems are often unsuitable for centralized and continually monitored odour control.

Several other UK water companies have adopted a piece-meal approach minimizing their ductwork extraction system by having numerous stand alone biological and dry media systems at their highly sensitive works. The drawn back on this approach is that it an enormous challenge to maintain and control such disjointed system. For example one works in the UK has 20 dry media odour control systems each with duty standby fans. Southern Water's approach has been to have a single system per site which is continually monitored for H_2S and so in comparison is relatively simple and easy to maintain. The key advantage of a single centralized system is that it is easy to identify faults with the system so they can be rectified quickly.

Odour control is only as good as the weakest link in the chain. If a standby fan or pump fails at a Southern water site it is readily identified and fixed as a matter of urgency. If at the site mentioned above, which has 20 odour control systems, a standby fan fails, it is one of 20 standby fans and so such a failure is 20 times more likely to occur, 20 times more difficult to identify and consequently far more likely to result in odour control site failure.

Southern Water's densely populated area and the location of its works in urban areas has meant that a single, unified, continually monitored odour control system is the only feasible approach. Many other water companies may well follow suit in the next 10 years as their works become increasingly encroached on by new housing and a more vociferous local population whose net wealth is dominated by the value of their home.

TAKING A PRIDE IN ODOUR CONTROL

The draw back of this centralized chemical scrubbing until now for Southern Water is that chemical scrubbing by its nature has a degree of hazard and operators understandably were wary of getting involved unless absolutely necessary. What the framework has done is to break down a lot of the uncertainties of the technology and enable the operators to gain in confidence about the equipment on their site and to take a real pride in its performance and maintenance.

Southern Water regularly invites members of the local population into their works to show them their odour control systems. All these odour control systems are integrated into the site SCADA system and locals can see the complete control the company has on its odour management.

A STITCH IN TIME SAVES NINE

This saying is particularly relevant to large centralized chemical scrubbing systems. A leaking pipe with dilute hypochlorite liquor as well as being a health hazard rapidly corrodes steelwork and foundations. A fan which is starting to vibrate or overheat if it is dealt with promptly and has been properly maintained will last 30 plus years while a fan which is un-maintained, poorly lubricated with worn out bearings and dirty impeller and casing will last less than 10 years. Equally a pump that has its seals looked after and is properly maintained will last well over its design life of 20 years.

If Southern Water site owners become aware of faults on their odour control system, which is outside the scope of the odour framework, they are able to raise a work order with a suitable priority status directly with ERG. High priority orders are fixed within approximately 3 days while less critical faults can be programmed to be fixed when ERG is next on site thus minimizing the cost.

SPREADING THE SUCCESS

Expanding the odour maintenance framework to now include the 80 sites without chemical scrubbers has meant all Southern Water's odour control assets are correctly maintained and the responsibility for odour maintenance is allocated to the framework supplier.

The non chemical systems are generally at less sensitive sites where, for example, the odorous processing of secondary sludge treatment is a less central activity to the works.

The framework requires ERG to visit the dry media odour control systems once a year and the biological odour control systems twice a year and to carry out a specific range of tasks. This is proving a reasonable regime which keeps control of these important assets.

Inevitably, on certain unmanned sites, the odour control systems have been low on the priority for operators, so having a dedicated framework supplier maintaining these units is proving valuable to Southern Water.

Many of the issues that affect the chemical scrubbing systems are equally relevant for the non chemical systems, in particular, the need to rebalance the extraction system. In many cases although the equipment was functioning correctly, the standby equipment was found in need of repair or replacement.

Bi-annual visits to Southern Water's 20 biological filters is proving particularly useful as often relatively simple adjustments such as decreasing and or increasing the wetting rate of the bio-media can enhance performance and increase bed life.

Many of these sites do not have continuous outlet H_2S monitoring so ERG checks the performance of the odour control equipment using Drager tubes and a Jerome H_2S analyzer.

An advantage that is emerging is that the maintenance activity for these types of system can be planned. Bed life of biological filters can be readily estimated as the rate of degradation of the bio-media can be monitored. Based on this information, bio-media changes can be budgeted and programmed for. This activity can involve taking the bio-filter off line for up to 2 weeks, so this is a significant event which needs careful consideration under the site odour management plan. This is equally true of some of the larger dry media systems.

Another benefit is that several of these assets have over time degraded and started to show signs of dilapidation particularly on the electrical side such as corrosion of electrical installations, cabling and connections, so ERG has been collecting and compiling this information so that a plan can be made to rectify this situation.

STANDARDISATION

As the framework supplier, ERG has been in the unique position of being able to assess the performance of a wide range of equipment and systems. For example Southern Water over time has purchased a number of scrubbers which control the dosing of sodium hypochlorite addition using a chlorine analyzer. On all these sites this particular instrument was giving problems in terms of sustained reliability, so ERG has been able to persuade Southern Water to standardize on Redox control instead which is proving far more reliable and less costly to maintain.

Another example is related to Southern Water's sludge strategy which is based on using direct fired sludge dryers to convert their dewatered sludge into dried pellets for use as agricultural fertilizer. Southern Water has 5 operational dryer sites which all have slightly different odour control systems. As ERG is maintaining these systems, ERG has been able to identify the difficulties experienced when treating dryer exhaust gases in the same scrubbing systems as the

rest of the works extraction. Working with Southern Water, ERG has developed a gas cleaning system which is now working successfully at one site and is now being implemented on a second site. The intention is that over a period of 5 years all the dryer exhaust systems will be standardized.

Another example of standardization Southern Water is adopting as a result of liaison with the framework supplier is to ensure that chemical dosing is controlled by local controllers rather than by the main PLC. This means the maintenance contractor can make minor adjustments without interfering with the main control system.

Taking the successful odour control practices from one works and passing these practices onto other works is an important benefit of having a framework supplier.

Standardization is an on-going process which is moved forward by regular quarterly meetings between the framework supplier and Southern Water.

NIPPING THE PROBLEM IN THE BUD

A crucial part of the framework service provided by ERG is that a suitable staff member is on standby 24 hours a day 365 days a year to give telephone advice or if necessary attend site within 4 hours (or 6 hours if the incident is on the Isle of Wight).

Over the past 3 years, a full call out has only occurred about 5 times but telephone support has happened far more regularly. This support is invaluable to operators who now have the peace of mind of knowing they can take sensible action based on knowledgeable advice from an odour expert they know and trust.

In all cases when ERG has been called to support, ERG has been able to rectify the problem quickly. As ERG is maintaining the equipment it is thoroughly known to the engineer on call so the right action can be taken quickly. Being able to rectify the situation quickly means that any incident is rapidly bought under control and adverse publicity is minimized.

CONCLUSION

ERG thinks the model Southern Water has implemented for its odour strategy is likely to be leading the way for other water companies.

Water companies in the 21st century can no longer allow odour control assets to not work correctly. These assets can only do this if they are rigorously maintained in a planned manner.

The benefits Southern Water is now drawing from its framework agreement are summarized as follows:

- A marked reduction in odour complaints means staff at all levels can plan their activities and work efficiency without unforeseen disruption
- Running costs are reduced by the efficient use of consumables
- Asset life is increased by 30 to 50% which for Southern Water's odour assets of an estimated £30million plus is a significant saving in the long term
- Equipment is maintained in a safe and professional manner

- Future expenditure on maintenance can be planned more accurately
- Best odour control practices are more readily passed across the company
- Standardization of odour control equipment and practices can be implemented in a gradual and efficient manner
- Adverse publicity due to odour incidents is kept to a minimum by rapid response