

Committee(s):	Date(s):
Markets	30 November 2015
Subject: Smithfield Market – Condenser Water Cooling System – update	Public
Report of: The City Surveyor (Ref. CS 362/15)	For Information
<p>Summary</p> <p>This report provides a summary of three operating incidents that occurred on the Smithfield Market condenser water cooling system in July, August and September 2015. It describes the further actions being taken to improve reliability in the light of these incidents.</p> <p>Since mid-September the cooling system has operated normally with no further incidents recorded.</p> <p>This report also introduces an on-going project taking place to review the overall management of the condenser water cooling system in its entirety, including: emergency procedures, out of hours cover, communications and departmental management responsibilities.</p> <p>The report also covers the outcome of the meeting held with the Smithfield Market Tenants Association (SMTA) on 20 August 2015.</p> <p>The City will continue to monitor the system closely.</p> <p>Recommendation(s)</p> <p>Members are invited to note the contents of this report.</p>	

Main Report

Background

1. The Market's condenser water cooling system removes waste heat from 120 tenants' refrigeration units in East, West and Poultry Markets and dissipates it to the atmosphere via five cooling towers located in the Poultry Market. The system is operated and maintained by the City Corporation as Landlord.
2. Earlier this year the City Corporation completed a programme of works to improve the water circulation in the three Markets and remove dirt contamination in the system.
3. Reliability of the system has been a cause for concern and there have been a number of issues and problems over the years.

Current Position

4. Since mid-September the system has been operating normally without problem, supplying water at 20°C to tenants' refrigeration equipment.

Recent incidents

5. Between the report to your Committee in July and mid-September there were three serious incidents affecting the operation of the system. The details are given below. None of these were weather-related.
6. On the evening of 22 July, a failure of East Market pumps occurred. As a result, East Market fridges tripped out and it took the on-site maintenance team, working into the night, around five hours to carry out a temporary repair and restore the service. The fault was caused by the failure of a component within the main East Market electrical supply panel, power being lost to all plant fed from it.
7. The City's specialist controls systems contractor examined the panel and submitted a report on its condition with recommendations for repairs. This work was completed on 6 November, and included modifications to duplicate control circuitry to increase reliability in the future.
8. On 28 August, there was a failure of the cooling system circulation in West Market, caused by a large amount of air within the system. Most fridges in South-West quadrant tripped out as a result of the loss of circulation. It took the site maintenance team around four hours to vent all the air out and restore operation.
9. Air in the system has not previously been a problem and it is not clear how this quantity came to be in the system. Scale sludge at critical points in the system could have caused or contributed to it by blocking pipework and fittings, alternatively maintenance work may have inadvertently allowed air to be drawn in. From July there had been an intermittent problem with the water softener, which provides softened make-up water to the cooling system, and

significant scale sludge had been found in tenants' condensers. The softener itself was repaired on 14 August 2015. The use of untreated mains water for make-up had led to a similar large build-up of scale in the system on a previous occasion.

10. On 9 September, there was a further failure of the circulation in West Market, on this occasion found to be due to severe blockage of the main filters installed last year in the basement plantroom. Fridges on North West quadrant tripped out as a result of the reduced circulation.
11. During the week before this the cooling towers had undergone routine cleaning. A large amount of sludge had been found in their sumps and removed. It seems likely that scale elsewhere within the system could have been dislodged, swept round the pipework and trapped by the filters, which had only been cleaned the previous week. Following this, the frequency of filter cleaning was stepped up from monthly to weekly.
12. Both the last two incidents seem related to operation of the water softener which has been recognised as a particularly critical item of plant, as any failure leads to rapid scale formation. The softener has very heavy use because of the very high water demand as a result of the artificially low operating temperature at which the system is set. Since the repairs the water quality has reverted to normal and the system has operated without problem.
13. Following these incidents proposals are being developed to improve the reliability of the system in the future, detailed under paragraphs 20-27 of this report.
14. An insurance claim has been opened to cover all call-out costs arising from these incidents. The costs are being assessed.

Meeting with the Smithfield Market Tenants Association (SMTA)

15. The City Surveyor's report on the cooling system, providing a written description of the system, its history, with an analysis of its current performance, together with a copy of the refrigeration database compiled by the City, was issued by the Superintendent to the SMTA on 7 July.
16. The planned meeting with the SMTA to discuss the report was held on 20 August 2015.
17. The meeting discussion covered the recent contamination problems, design aspects and future work plans for the system, the capacity of the Poultry Market cooling circuit, and the option of re-engaging an independent expert to review system operation. The City resisted the latter suggestion. The City agreed to circulate details of the system water temperature measured since 1 July with a view to determining whether the current setting of 20°C could be increased over the winter.
18. It was agreed the meeting would re-convene in late spring once the City had developed its plans for the future replacement of pumps, which should take place in the winter of 2016/17.

Stall 25 refrigeration issues

19. There has been no response from the Tenant to the City's last letter of 24 February 2015 (See May 2015 and earlier reports to Markets Committee for details).

Proposals

20. The recent incidents and performance of the system have been reviewed by the Market Superintendent, Property Facilities Manager and Principal Engineer.
21. Proposals are being developed to improve the reliability of the system in the future. These comprise two elements: additional equipment to increase resilience of the system and enhanced management responses to address such incidents in the future.
22. To increase the resilience of the system it is intended to install further back-up equipment as follows:
 - A water hardness monitor. This automated unit will provide continuous monitoring of total calcium and magnesium hardness levels within the make-up supply to the cooling towers. It will have an alarm function which is activated should pre-set levels be reached, linked to the City's Building Management System.
 - An additional water softener. The current softener will be duplicated in order to give an immediate alternative at times of malfunction of the duty softener. Operation of the two units will be alternated every week.

In addition, critical spares for the softener will be ordered and held on site. In total these measures will cost around £15,000.
23. It is also intended to proceed with a small scheme to facilitate routine changeover of pumps. To date, this has not been possible on the larger cooling tower and Poultry Market pumps without interrupting the flow.
24. Until now, the City's response to most system failures and breakdowns has followed a call-out to the fridge maintenance contractors to investigate a stall temperature alarm. If they find fridges have tripped due to insufficient water flow, and local strainers are clean, they then alert the Market Constabulary who in turn call out the City's own in-house maintenance staff.
25. The City's Building Management System (BMS) monitors the operational status of all plant, in addition to temperatures and pressures, and initiates an alarm at the local terminal in the event of a malfunction. However, the out-of-hours response to BMS alarms requires updating, and this is being addressed as part of the review below.
26. In addition to the above a review of how the entire system is managed is underway. The system can be broken down into several component parts: water hygiene and cooling towers; pipework, pumps, valves and motors, the system controls and BMS, and the meat traders' own equipment forming part of the system. All these areas carry different responsibilities and have

different teams or contractors working on them at present, which may not be the most efficient way to manage the system. The Facilities Manager, Superintendent and Principal Engineer have identified the key risks to managing the system and are reviewing options for the overall management of the system in the future.

27. Currently the system operating temperature is being maintained at 20°C. Following appropriate consultation with the Tenants, the Superintendent now intends to write to the SMTA stating that the City plans to raise the temperature in stages to 24°C from January. This will reduce the demand on the City's cooling towers, reducing operating and maintenance costs, and likelihood of breakdown. As the fridges were seen to be capable of working with water up to 26°C in the summer, and the original specification was for water supplied at 28.5 or 30.0°C, this should not be a problem.

Corporate & Strategic Implications

28. The system supports the following Strategic Aims:
- To provide modern, efficient and high quality local services and policing within the Square Mile for workers, residents and visitors with a view to delivering sustainable outcomes.
 - To provide valued services to London and the nation.

Implications and Risks

29. The cooling system operated by the City provides a critical service for Tenants' refrigeration equipment. A failure of the system could expose the City to claims for loss or damage suffered by Tenants if refrigeration equipment then ceases to operate.
30. The actions proposed will reduce the likelihood of future problems with the water softener and will enable the City to provide a better response to a system malfunction.
31. The review of the overall management of the system will increase efficiency, ensure there are a robust contingency plan, clear communications and out of hours cover, and will also make clear the responsibility for management of every part of the system, including the tenants' responsibility for their own equipment.

Conclusion

32. Since mid-September the cooling system has operated normally with no further incidents recorded.
33. Following the incidents during the summer, further actions are being taken to improve reliability of the water softener, and develop enhanced responses to system alarms. The Property Facilities Manager will

produce a report for the next Markets Committee providing an update on the project reviewing the overall management of the system.

34. With the onset of winter it is an appropriate time to increase the operating temperature of the system above 20°C.
35. The City will continue to monitor the system closely, and respond to Tenants' request for advice concerning refrigeration and cooling matters.

Background Papers:

Report of the City Surveyor (ref CS217/15) dated July 2015 to Markets Committee: 'Smithfield Market – Condenser Water Cooling System - update'

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