

Committee(s):	Date(s):
Markets	22 July 2015
Subject: Smithfield Market – Condenser Water Cooling System – update	Public
Report of: The City Surveyor (Ref. CS 217/15)	For Information

Summary

This report provides Members with an update on the Smithfield Market condenser water cooling system since the last report to Markets Committee in May 2015.

The performance of the cooling system since the last report has been satisfactory with no significant incidents recorded.

The operating temperature of the cooling system remains set at 20°C. The hot weather experienced from 28 June has caused the water temperature from the cooling towers to rise to 26.5°C, but to date this has not resulted in fridge operating problems.

The City's report for the Smithfield Market Tenants Association (SMTA) providing a description of the operation of the system explaining its current state and analysing its performance has been issued to the Association. Their response is awaited.

The City will continue to monitor the system closely, and respond to Tenants' request for advice concerning refrigeration and cooling matters.

Recommendation(s)

Members are invited to note the contents of this report.

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.
2. Over the last five years the City Corporation has been undertaking a programme of works in the three Markets to improve the water circulation and address dirt contamination in the system, which is now complete.
3. At this stage the City had hoped to increase the operating temperature of the cooling system, currently 20°C, by 4 to 5°, in order to reduce its operating costs and reduce wear to cooling tower components. However, the SMTA has requested that no changes be made to the system without first understanding the conditions under which it is operating and clarification of the available water supply.

Current Position

4. The cooling system is currently working well and supplying water to the Tenants' fridge condensers. There have been no significant operating issues to report since the last report to your Committee in May 2015. Hot weather from 28 June to 3 July caused the water temperature from the cooling towers to rise, reaching 26.5°C on 1 July, but to date this has not led to fridge operating problems. There were two fridge trips on 1 and 2 July, attributable to blocked strainers, which were dealt with in the normal way. The hot weather will have caused more airborne dirt to be entrained at the cooling towers.
5. Following a trial in May, the speed of West Market pumps was increased on 8 June from 50 Hertz AC mains frequency to 52 Hertz. This has increased the volume flow by around 4% and the flow meter is now recording a maximum flow of 30.9 litres/sec to West Market at peak times. This slightly higher flow may have helped West Market fridges cope in the hot weather conditions.
6. As explained in the last report, it is believed that East and West pumps are showing some indications of wear after 18-20 years' service and the City is therefore proposing to bring forward their planned replacement to FY 2016/17. Larger pumps will be considered. Funds for the replacement (and also that of the main pipework) have been bid for under the Additional Works Programme.
7. The position on other matters is described below.

Report on cooling system for the SMTA

8. 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, was issued by the Superintendent to the SMTA on 7 July. A full copy of the report

and database may be seen on the City's IS system at W:\File Transfer\Smithfield Market - Refrigeration & Condenser Water Cooling System and a summary of the conclusions is given at Appendix 1.

9. It is anticipated that the SMTA will wish to discuss the report at a meeting of the Joint Specification Committee, and their response is awaited.

Meetings with Tenants

10. Since the last report there have been no further meetings requested by Tenants to discuss refrigeration matters.

Condenser upgrades

11. Following the seven condenser replacements carried out, there are no further replacements planned.

Stall 25 refrigeration

12. There has been no response from the Tenant to the City's last letter of 24 February 2015.

Proposals

13. It is anticipated that a formal meeting of the Joint Specification Committee will be convened with the SMTA to discuss the refrigeration report.
14. For the time being, the system operating temperature will continue to be set at 20°C.
15. A future strainer inspection and cleaning regime is being set up by the Property Facilities Manager with the fridge maintenance companies to ensure strainers are monitored and cleaned as necessary.
16. Further replacements of fridge condensers by Tenants' contractors will be monitored and encouraged.
17. Preparations for the planned replacement of East and West pumps in FY 2016/17 will be commenced later this year.

Corporate & Strategic Implications

18. 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

19. 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 ceased to operate as a result.
20. Operation of the cooling system at 20°C for the time being will assist fridge operation in warmer weather and reduce the risk of fridge problems, albeit incurring higher operating costs.

Conclusion

21. Since the last report in May the performance of the condenser water cooling system has been satisfactory. In recent hot weather the water temperature has reached 26.5°C but this does not seem to have led to any significant fridge problems. This suggests that fridges should be capable of working with water supplied above the current setting of 20°C.
22. Whether the system operating temperature can be raised is likely to be resolved following a review of the report by the Joint Specification Committee. For the time being, the system operating temperature will be maintained at its current setting of 20°C at the request of the SMTA.
23. 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 CS129/15) dated May 2015 to Markets Committee: 'Smithfield Market – Condenser Water Cooling System - update'

Appendix 1: Refrigeration Report by City Surveyor's Department - Summary of conclusions

Andrew Crafter

Principal Mechanical Engineer, Operations Group, City Surveyor's Department

T: 020 7332 1252

E: Andrew.Crafter@Cityoflondon.gov.uk

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In general the system is operating to the best of its ability providing a reasonable service to the fridges.

Condensers

Where there is evidence of high refrigerant pressure/temperature, and the cooling supply is sufficient, the fridge condenser should be replaced with a larger unit. Where this has already been done, fridge performance has improved and operating problems have been overcome.

System capacity

The system has the capacity to remove the required heat load from the condensers currently in use and reject it from the cooling towers provided the operating temperature is 25°C or less.

Although the system cannot circulate a greater volume of water with the current pumps, the system has capacity to remove more heat from condensers if they are able to return water at a warmer temperature, which is achieved by larger condensers.

Water temperature

The system can maintain the water supply temperature at 20°C for most of the year and at no more than 25-26°C at peak summer conditions. This is sufficient to meet all fridge design specifications. Compared to the original design specification of 30°C the reduced temperature compensates for more fridges running concurrently than assumed in the design.

The water temperature returned from fridges is lower than desirable in some cases. A higher return temperature, achieved by installing larger condensers, would provide greater heat rejection.

Water flow and pressure

The flows to each market are set to their maximum. The flow to West Market has recently been increased by setting pumps to run above normal speed.

The water flow to East Market is slightly above its design figure. There are signs that system pressure on NE deck may be a little low at times, although deck pressures are generally good.

The water flow to West Market is mostly lower than its design figure. As the pump head (pressure) is also slightly low, West Mkt pumps appear to be operating below their design specification. It is possible that performance has declined due to impeller wear.

To address these issues, the impellers, or complete pumps, should be replaced. At this time the opportunity should be taken to review the basis of sizing, adopting a more conservative (higher) diversity factor.

The measured water flow to certain fridges is low but they will not take any more water. Where not already replaced, pipe connections should be checked for flow restrictions. If clear, the condenser itself may be imposing too much resistance and a larger condenser should resolve this.

Water distribution

Water distribution on the four fridge decks is generally adequate but would be improved by use of a 'reverse return' configuration which should be considered when pipework is due for renewal. Such a system would give an equal pressure drop at each branch.

Diversity Factor

The pump duties originally specified for East and West Markets were based on a diversity factor reflecting maximum numbers of fridges expected to run at any time. Observations made suggest slightly higher figures would have been more appropriate. This will be taken into account in the selection of new pumps.