Executive Summary

Background

This report presents the findings of Stage 3 of the UKWIR Project “Brass Fittings – A Source of Lead in Drinking Water” and builds on Stages 1 and 2, reported in 2014 and 2015 respectively.

It presents the findings of long-term experiments undertaken to determine the leaching behaviour of lead, nickel and other metals of interest (copper, zinc, iron, aluminium and manganese) from various brass fittings in hard/soft, phosphate dosed/non-phosphate dosed waters.

Objectives

The overall objectives of Stage 3 are:

a) To improve understanding of the long term leaching behaviour of lead and nickel from the brass fittings (by continuing to operate and sample test rigs from April 2015 to March 2016).

b) To improve understanding of the seasonal leaching behaviour of lead and nickel relating to changes in water temperature.

c) To examine the leaching behaviour from brass fittings of other metals of interest to the water companies and the Drinking Water Inspectorate, by analysing samples for copper, zinc, aluminium, iron and manganese.

Conclusions

The majority of brass fittings have exhibited a steady but low rate of metal leaching throughout the year with yields from individual fittings after 8-hour stagnations not exceeding PCVs.

Phosphate dosed waters

Phosphate dosing continued to suppress the leaching of lead and nickel, as observed in Stages 1 and 2.

The presence of phosphate significantly reduced copper and zinc leaching in soft water conditions, and to a lesser extent in hard water. It was found to have no significant effect on iron, manganese and aluminium.
Over the long term, lead and nickel yields from the test fittings were either stable or declined over the two years in operation on the hard water rigs and three years on the soft water rigs.

Non phosphate dosed waters

Lead yields were generally stable in non-phosphate dosed hard water with most exhibiting a decline over the long term. In non-phosphate dosed soft water most fittings exhibited a decline in lead yield over the long term.

The yields of lead from combinations of some fittings have shown the potential in some circumstances to cause a regulatory failure, of marginal magnitude, in a Random Daytime Sample. This would require stagnation of 8 hours or greater and a combination of high brass fittings exposed to non-phosphate dosed waters.

Nickel yields from the brass fittings in non-phosphate dosed hard water indicated a stable long-term leaching behaviour.

Fairly stable nickel leaching behaviour was observed in soft water across all test fittings in non-phosphate dosed water; however yields were higher than in phosphate dosed water.

Overall project conclusions

Stage 3 concludes research covering over 2 years, monitoring the leaching of lead and nickel from brass fittings and one year's data on other metals. Overall, this research has shown that:

- Brass fittings can cause PCV failures for lead & nickel after initially being installed but leaching of these metals diminishes dramatically by 30 days in service with the flushing protocols used in this research.

- All low lead fittings tested showed significantly less lead and nickel leaching compared with their leaded brass counterparts (UKWIR, 2014).

- Neither seasonal, nor stagnation temperatures appeared to significantly contribute to the leaching for the metals of interest in the project.

- Phosphate dosing is effective and considerably reduces the leaching of lead and nickel from the brass fittings tested (UKWIR, 2014).

- When phosphate dosing is stopped there is a short lived period, of less than a day, prior to leaching commencing once more (UKWIR, 2015).

- The yields from combinations of several brass fittings (“under the sink” and “in the road”) are capable of causing lead and nickel PCV failures in certain circumstances, significantly contributing to their concentration in water.

- The use of low lead brass fittings would reduce the likely hood of currently sold brass fittings contributing significantly to the PCV of UK households.
Other metals of interest such as copper, zinc, aluminium, manganese and cadmium did not cause PCV failures, from either individual or cumulative test fittings.

Phosphate dosing can also suppress the leaching of zinc and copper in both hard and soft water.

**Benefits**

This study conducted on the contribution of brass fittings to lead and nickel concentrations in drinking water at customers’ taps has;

- Increased our understanding of how brass fittings may contribute to lead and nickel concentrations in drinking water;
- Assessed the likely impact that brass fittings may have if plumbosolvency treatment is removed;
- Assist in future assessments of the potential risks to lead and nickel compliance from brass fittings:
- Provided information to better inform and improve investigations carried out by water companies following failures due to lead (or nickel) standards or carry out other risk assessments related to lead levels in drinking water.