Miha Ulčar:

MERITVE NA VODOVODNIH SISTEMIH IN OCENA MERILNE NEGOTOVOSTI

Mentor: prof.dr. Franci Steinman
Somentor: doc.dr. Primož Banovec
zagovor: januar 2006

Povzetek

Cilj naloge je bila analiza merilnega sistema na vodovodnem sistemu Ljubljana-Brod za pridobitev podatkov o delovanju, o požarni varnosti in linijskih izgubah v sistemu. Obravnavana je tudi problematika reducirnih zasunov in postopki iskanja lokacij puščanja z akustičnimi instrumenti. Merilna negotovost, definirana z območjem vrednosti, v katerem naj bi se dejanska vrednost izmerjene količine nahajala, je bila določena po standardu ISO-5168, ki določa postopke za izračun negotovosti pri meritvah pretoka tekočin. Podrobneje so opisani principi delovanja merilnih naprav za merjenje tlaka in pretoka, ki jih pri meritvah uporablja Služba vzdrževanja omrežja javnega podjetja VO-KA. Opravljene so bile meritve tlaka na šestih točkah in meritve pretoka na treh točkah vodovodnega sistema Ljubljana-Brod. Rezultati meritev pretoka so pokazali veliko občutljivost merilnikov pretoka na pogosto neznane vhodne podatke o dejanskih, hidravličnih dimenzijah cevovoda, kar je lahko vzrok za neuspelo meritev. Meritve tlaka so bile uspešno izvedene in so potrdile pričakovanja o varnosti delovanja. V zaključku naloge so podane izboljšave obstoječega načina merjenja in predlog rešitve ugotovljenega problema reducirnega zasuna.

Ključne besede: meritve, vodovodni sistem, merilna negotovost, merilne naprave, standard ISO -5168

Abstract

The aim of the project was to analize a measuring system for the Ljubljana-Brod water supply system that would provide data about operation, fire safety, and head losses in the system. Problems associated with reduction valves and procedures used to find water-pipe leakage with acoustic instrumentation is also described. Uncertainty of measurement, defined by the interval of values, within the true value of data has been calculated in accordance with the ISO-5168 standard, which defines the procedures for the evaluation of uncertainties in measurement of fluid flow. The basic principles of operation with pressure and flow instruments used in the maintenance of the water supply system by the public company VO-KA are also described in the project. Measurement of pressure was made at six points in the system, while measurement of flow was made at three points in the system. The results of the measurement showed the large sensitivity of flow meters in relation to input data that caused a measurement failure. Measurements of flow were made successfully and confirmed the predicted results. In conclusion, some proposals for improvement of the measuring system and reduction valves are given.

Key words: measurements, water supply system, evaluation of uncertainties, measurement instruments, standard ISO-5168