ANALYSIS OF DIFFERENT PROTECTION METHODS AGAINST WATER HAMMER ON WATER SUPPLY NETWORK (CASE STUDY-ASSIUT CITY NETWORK)

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Abstract:

ABSTRACT The effect of using different protection devices on water hammer phenomenon to provide an acceptable level of protection against system failure due to pipe collapse or bursting is presented. Water Hammer and Mass Oscillation (WHAMO) software is used in the analysis which uses the implicit finite difference scheme for solving the momentum and continuity equations at unsteady state case. Assiut city water supply network is used. The network is supplied from two points at pump No. 36 and pump No. 37. Flow of pipe network is studied under steady normal case, without any protection case against water hammer phenomenon, and the model under different operation cases; with a transient protection device(s) such as non-return valve, open surge tank, air chamber and pressure relief valve (PRV). The results are performed for three scenarios; the first is the normal operation of pump 36 and failure of pump 37, the second is the normal operation of pump 37 and failure of pump 36, and finally failure of pumps 36 and 37 together. The results showed that using of open surge tank or air chamber with non-return valve protects the pipe network effectively from the harm of water hammer. Also, using PRV with non-return valve protects the pipe network from extreme pressures. Although using non-return valve only doesn't have a great effect on the maximum pressure head than the normal case, it protects the network from the more low pressures than without protection one. All protection cases safeguard the pipe network from the extremes of water hammer, but increase the water hammer wave period. Finally, the sudden shut down of the pumps 36 and 37 together has the large effect on the pressure heads than the shut down of any of them only.

Keywords:

Water Hammer, Pipes Network, Protection devices, Assiut city

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