ABSTRACT

This research investigates the effect of end conditions on the vibration characteristics of a pipe conveying fluid with different cross sections such as (sudden enlargement and sudden contraction). Several end pipe supports (flexible, simply and rigid) were adopted to investigate the natural frequencies and their corresponding mode shapes.

Also, the effect of some design parameters like pipe diameter, length, pipe material, and the effect of fluid velocity were investigated.

Two different system pipe diameters were investigated, model-1 [12.7mm, 25.4mm, 12.7mm] and model-2 [6.35mm, 12.7mm, 6.35mm] with length [0.25m, 0.5m, 0.25m] and model-3 with same diameter for model-1 but with length [0.5m, 0.5m, 0.5m]. Three pipe materials were tried, copper, aluminum and steel. The effect of Reynolds number between 500 to 1500 was also investigated.

The dynamic behavior of a pipe conveying fluid is described by means of transfer matrix approach. A computer program has been developed in this study using [Matlab **R2007**] language to predict the vibration response and to embrace the theoretical work.

From the results, it is concluded that the values of natural frequencies in rigid support case are higher than those in flexible and simply supports, because the overall stiffness of the system is higher. As well as, the natural frequency is affected by the diameter size for all kinds of selected supports, the decrease in the system pipe diameter to a half of this value will reduce values of the natural frequencies about 50 %, because increase the moment of inertia of the system. The study shows that the change of selected pipe length makes difference on the natural frequencies values for all kinds of supports. This is because the change in pipe length adds mass, and this will give very little effect on the stiffness and

therefore the natural frequency. This study indicates that the natural frequencies values of aluminum pipe are higher than those of copper pipe with a percent ranging from [27% - 32%] and steel with a percent ranging from [0.63% - 17%] for all kinds of supports due to the physical properties. Also, the study shows that the natural frequencies values remain constant with increasing of fluid velocity or Reynolds number.

The results of **Matlab** program were compared with those for **ANSYS-11** software and it is found that there is a good agreement between them.