THE USE OF AN IMPROVED HYDROCYCLONE TO PROTECT PUMPS

by Dr D A Mashauri, University of Dar es Salaam

Hydrocylones in particular and cyclones in general have been used in the field of separation for a long time. The separation can be that of solid from solids, liquid from liquids or solids from liquids. The common denominator in these processes is that classification of materials is carried out by centrifugal acceleration which has different effects on the particles to be removed depending on their specific weights.

Since most of the water supplies in the tropics are from surface waters (ie rivers, ponds and dams) it is inevitable that the waters contain a lot of suspended solids. The suspended matter content is seasonal and depends on the stage of the stream and erosion of the banks, bed and catchment area. The solids eventually end up at the pumping station where water must be raised to the consumption points. Many pretreatment methods have been tried - for example rouging filters, hydrocyclones and vortex settlers. This papers deals with the design, improvements and performance of hydrocyclones.

To date various designs of hydrocyclones have emerged to suit individual separation tanks. In this Note an improved hydrocyclone is presented as a means to protect pumps. The protection is achieved by the removal of suspended solids (using the hydrocyclone) prior to reaching the suction side of the pump. Results obtained in a laboratory scale model show improved removal of suspended solids which are responsible for the pitting of pumps and their accessories. It is hoped that this type of hydrocyclone can be used effectively to deter solids from being sucked by the pumps.

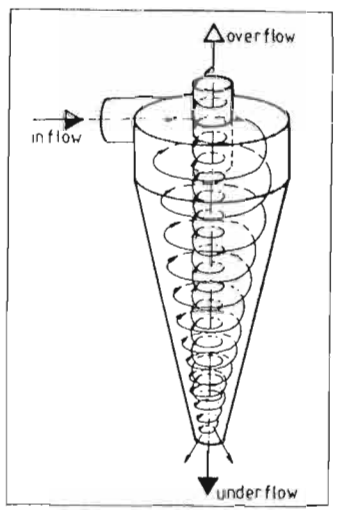
The task of providing a clean and dependable supply of water to the rural population of Tanzania lies squarely on the shoulders of the government. Since most of the population lives in the rural areas this declaration exerts considerable demands on the resources available. We want both safe water and cheap treatment, but it is not at all obvious that when we have achieved one we get the other. Surface water forms the biggest source of water for domestic use in Tanzania. However, its quality in terms of turbidity varies significantly especially during the rainy seasons.

A hydrocyclone has three main parts:

- the inflow at the top, where suspension is led tangentially into the cyclone;

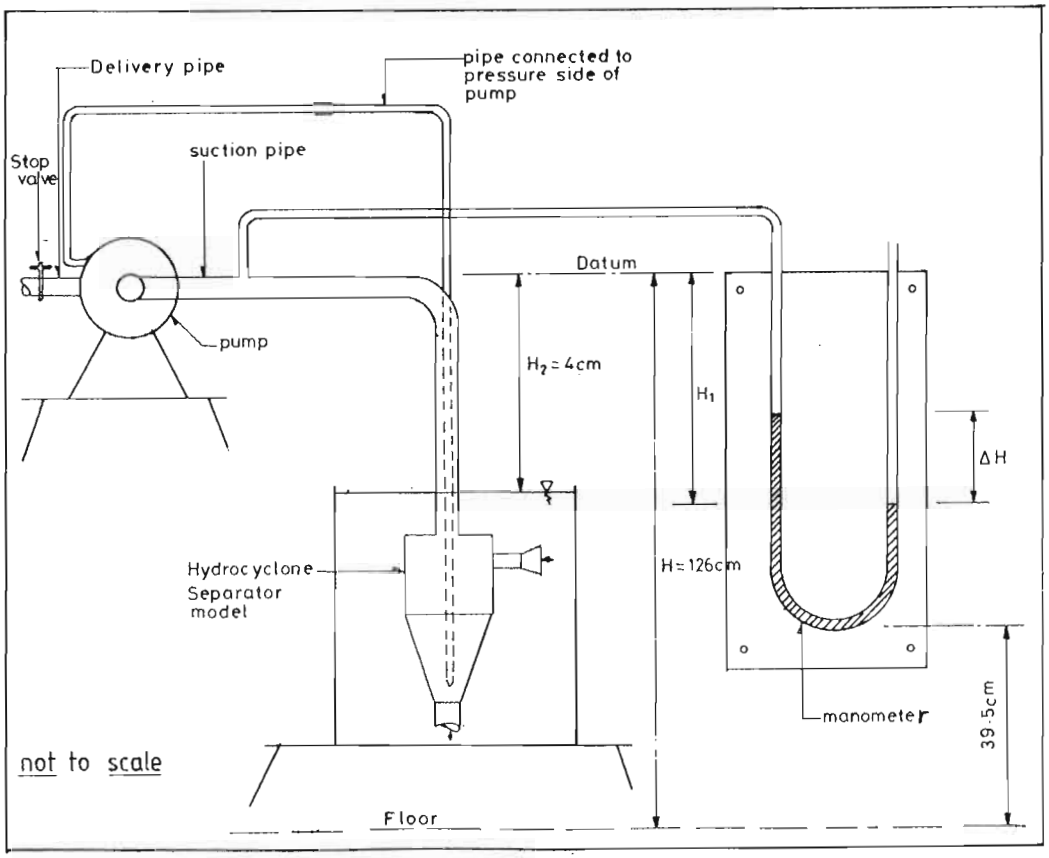
- the underflow at the bottom, where most of the solid particles (the separated fraction) and a small amount of water exit; and

- the overflow at the top, where the clarified water and a small fraction of the solids go through.



A modified hydrocyclone is introduced to remove the suspended solids often found in surface waters prior to reaching the pump or any other water raising machinery. The use of this hydrocyclone was tested in the hydraulics laboratories of the University of Dar es Salaam during the 1983/84 academic year. The results of the experiments show that this type of hydrocyclone can be used effectively in the removal of suspended solids.

In this research work the main improvement to the hydrocyclone was due to the provision of a connecting pipe from the delivery side of the pump to the hydrocyclone, as shown below. Note the size of the hydrocyclone relative to that of the pump.



This arrangement influenced the removal efficiency of the cyclone. The water "pushed" back into the hydrocyclone tended to increase the downward axial velocity of the solid particles. The particle removal is independent of gravitational forces.

The efficiency of the hydrocyclone was never below 60%. It is therefore hoped that the method will be utilized by others involved in the provision of water to rural areas, expecially where pumping is involved.