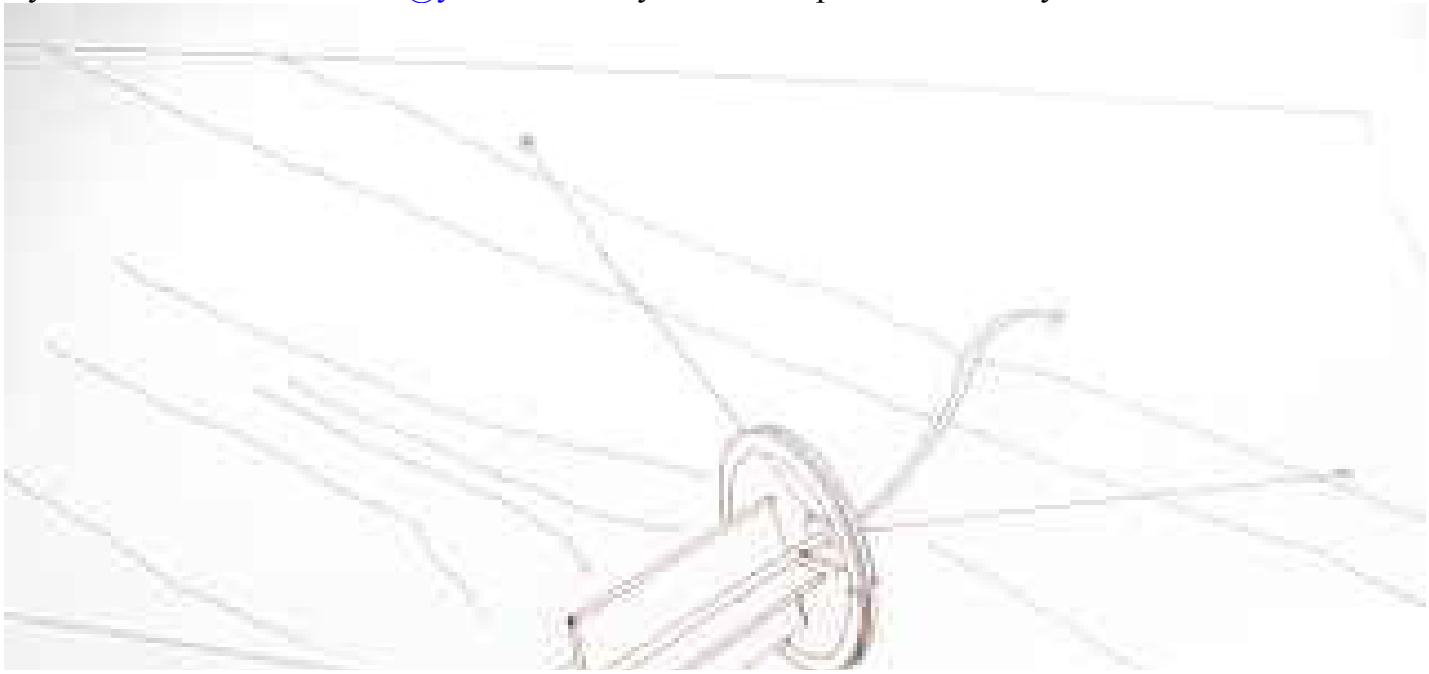
Home

HYDROSTATIC COIL PUMP a possible pump design for 3rd world use.

By Alex Weir alexweir1949@yahoo.com July 2001 and updated 2004 July



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on some shelf in the Library or Agric Eng Department at Morogoro.

ADVICE for feasibility study and/or design/construction:

1. The pump works best with about 5 coils less produces only small pumping heads and more produces no advantage but loses efficiency. Use the pump with about 45-50% immersion. More than 50% (i.e. pump axis centerline below water level) reduces maximum head. Less than 45% increases maximum head but reduces flow rate.

2. Pipe bore are best at or above 42mm (1.5 inch) . 28mm bore (1 inch) is possible but 21mm (3/4 inch) results in lowered maximum head and probably also efficiency. Out of interest we built the pump in a converted domestic galvanized steel water tank like you find in a house loft. 2 Wooden bearings held the steel water pipe shaft on which the coil was mounted. The pump was hand driven by a crank handle with no gearing. Larger bore is probably more cost effective - lower unit cost per water output rate. Up to 81 mm bore (3 inch) should be perfectly feasible. Maybe even much more.

3. The speed of the pipe entrance nozzle can be 0 3 metres/second. From 3-6 metre/second then maximum head reduces. Above 6 metre/second then flow probably stops. 3 m/sec will maximise water flow rate for the chosen coil diameter and pipe bore, therefore giving better economics.

4. A 1 metre diameter coil should produce 2 metre water column maximum left, which should be equivalent to 4 metre maximum lift because the output column is typically 50% water and 50% air (if the coil is 50% immersed in the water, i.e. the water level is at or near the coil centerline). A 2 metre diameter coil should give 3-6 metre maximum lift. A 3 metre diameter coil should give 4-8 metre maximum lift.

5. Disappointingly, with our relatively primitive equipment, we never managed to measure pump efficiency sorry. But I would guess 50% is realistic. Losses are in compressing and expanding the air columns inside the pump, temperature losses of that compressed air, friction between the water and the coils etc..

6. Think about using this pump as an anchored paddle-driven machine floating in a river (like the crude illustration above). Big rivers like you find in DRC Congo or Brasil could be very interesting. I calculated that paddle driven HCP would be economically feasible if the average stream velocity were 1 metre/second or greater.

7. There is only really one critical part the output seal from the rotating coil to the non-rotating feed pipe we used for this a standard pipe fitting rotating seal (I think) available off the shelf. But I know that Kamil Vanek made some changes and/or modifications to make it work better. Out of interest, immersing the pump say 55% - with the centerline just below the water level - may be advantageous in that the rotating seal will be under water, and may perform better. We didnt check that idea out at the time.

SUMMARY OF DIBWE/VANEK FINDINGS

8. Pipe bore of 21 and 28 mm were tested. Mean coil diameter 1.05 metre. Degrees of immersion from 25% to 45%. Inlet velocities 0-3 metres/second. Number of coils 1-6. With and without a reducing coupling at the inlet end of the coils to try to boost flow rate.

9. Maximum lift increased with more coils and slower inlet velocity.

10. Discharge coefficient remained about 1.0 until max head or overvelocity was reached.

11. Decreased coil immersion produced higher maximum lifts, but of course the output column had a higher proportion of air than water.

12. Max lift obtained was about 6 metres (must have been with 25% immersion - my comment year 2001).

SOURCES OF MORE INFO

13. Anyone interested can have my 106 page report in JPG format on CD at cost, or better still a photocopy plus airmail charge (since I have not yet photographed or scanned the paper report).

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Below is stuff from 2004 - Jonathen Thorpe from New Zealand has developed a very exciting and working version of the HCP, paddle driven

-----Original Message----- From: JAM [mailto:jmthorpe@pmbx.net] Sent: Friday, July 09, 2004 4:34 PM To: alex weir; Dale Fritz Cc: Corsont@aol.com; dbengulescu@pcnet.ro Subject: coil pump progress

Hi all,

Summer has been busy here in Osh Kg. We have completed the big pump, which delivers 16 l/min up to 25m ht. With paddle size 0.5 x 0.5m it takes quite some stopping in the 1.5m/s stream current.

Hopefully I can increase the delivery flow to 20 l/min, by placing a scoop on the inlet.... there still seems to be some spare power in the paddle.

See photo attached.

I will be wrapping up here in kg, and going back to NZ in August, but there is someone else who will be continuing the work when I am gone. Will keep in touch.

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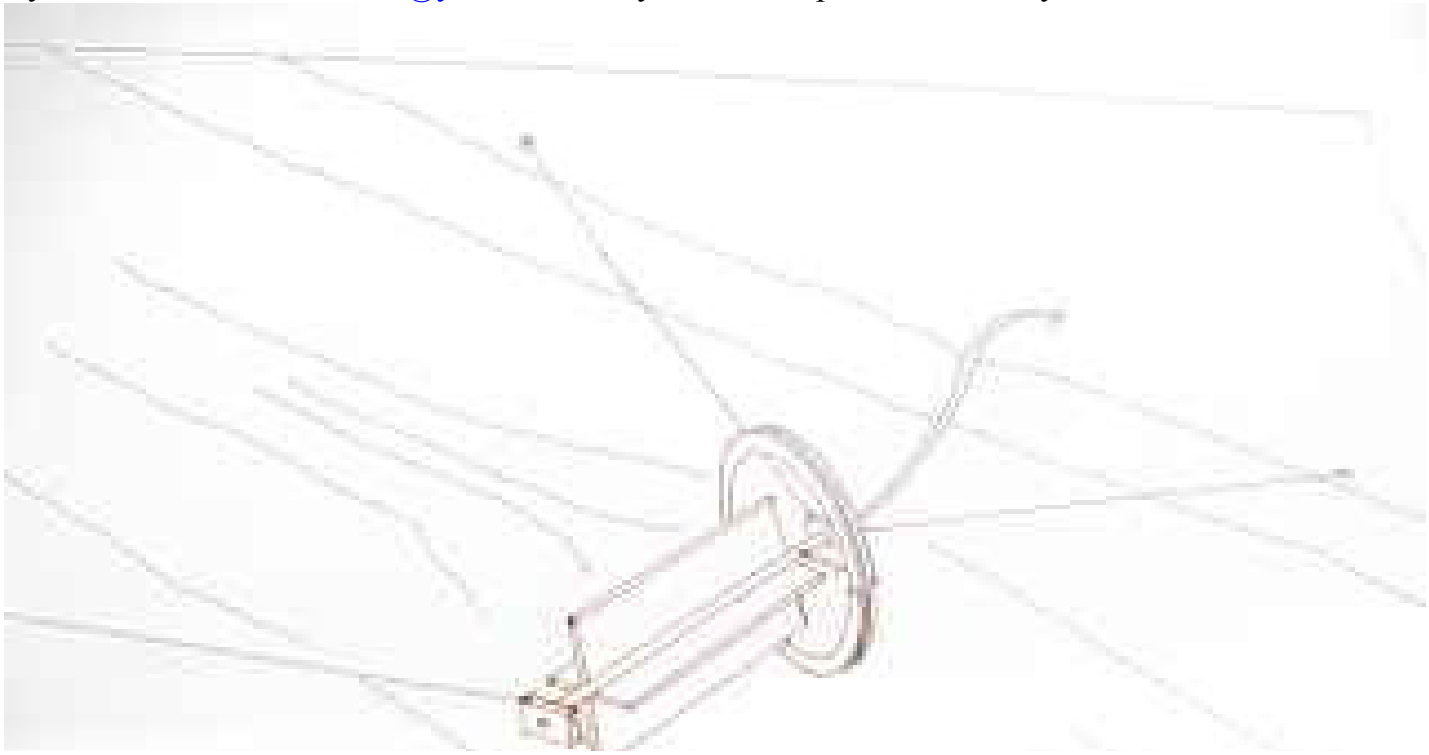

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