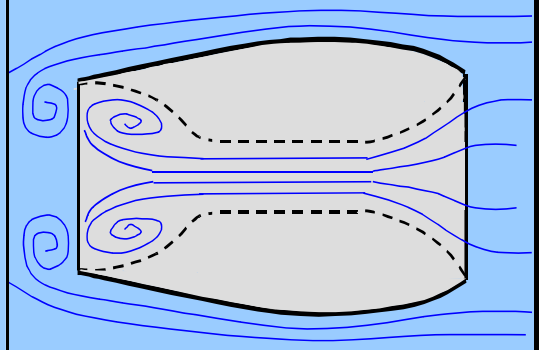
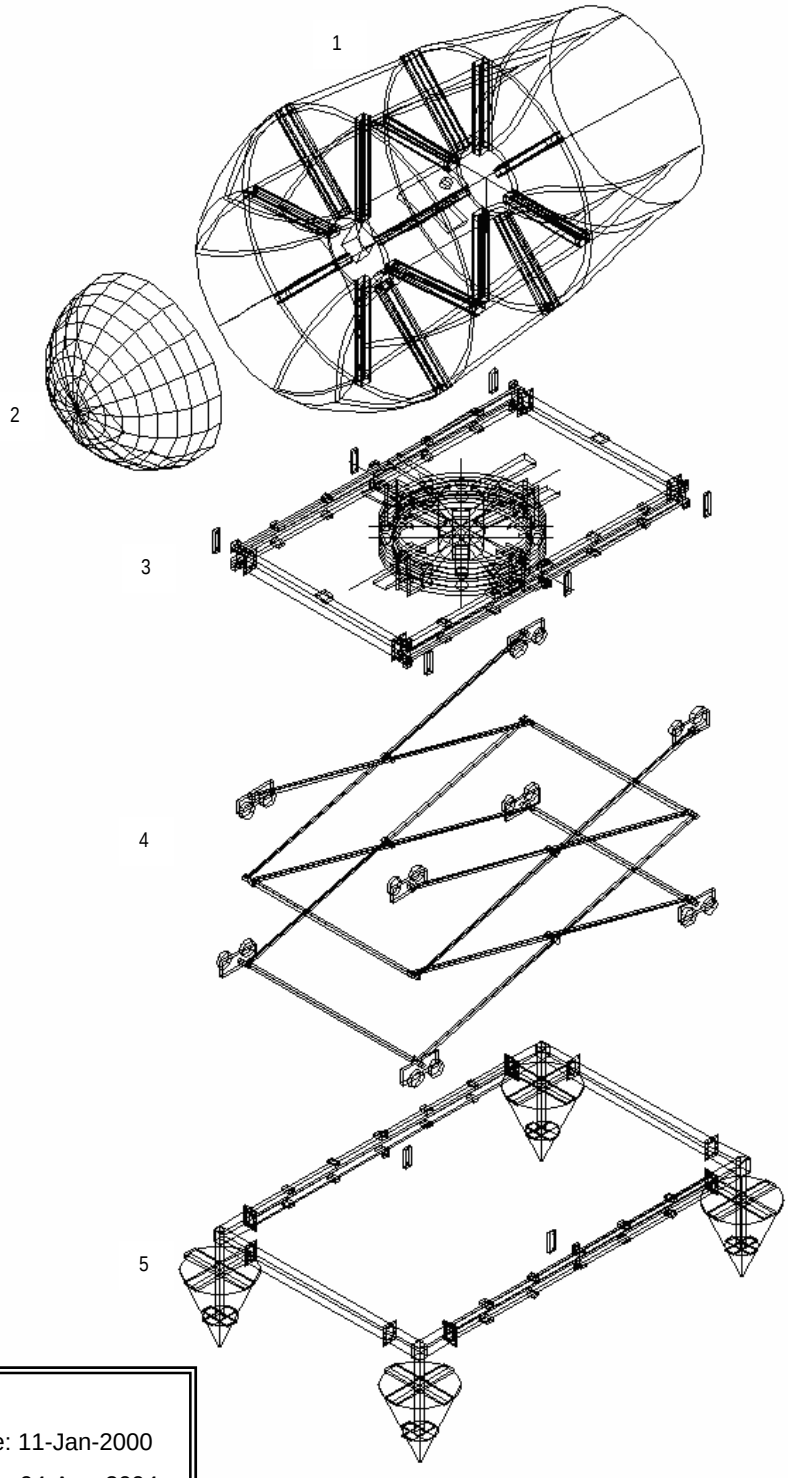
Hydroreactor Stream Accelerators

Comprising a Cylindrical Symmetry Duct to promote power extraction from run-of-river tidal and marine streams





Legend:

1 - cylindrical symmetry duct with “hidroreactor” profile

2 - selective grid at the duct inlet to avoid entrance objects bigger than a specific size

3 - elevating platform to which the duct is attached by means of a bearing device

4 - Extensible part connecting the elevating platform to the inert base

5 – Inert base anchored to the riverbed or seafloor

Patents:

EP – 0924426 / Date: 11-Jan-2000

US – 6013955 / Date: 04-Ago-2004

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Application:

Under-Water System to be installed in places of streams with relative depth at big rivers, inlets or the sea, where marine traffic may exist.

Advantages:

- Use of a highly efficient stream accelerator consisting of a duct with *"hidroreactor"* profile, that introduces a significant net head generating a flow of higher loading than the stream - promotes power extraction from streams on a higher number of sites
- The duct has an helm that directs it autonomously according to the stream direction and way of flow by using the stream strength - enables to profit from marine and tidal streams
- The duct stays at some depth bellow water surface being its position signalled by a buoy connected with a cable with some allowance to it - doesn't cause any barriers to marine traffic
- The duct can be lifted above the water surface by an embarkation - enables to perform maintenance from outside of water
- Practical installation / de-installation - enables to easily change the place of installation

In the narrower channel zone works a **low pressure - high speed axial flow turbine**

that drives

a **synchronous electrical generator** housed in one impervious chamber located inside the duct edge at the channel intermediate zone

Experimental results from testing scale models with a channel narrower diameter of 300 mm have shown that:

The flow velocity through the narrower channel zone in the absence of any flow constraints is about 40% higher than the outside stream velocity, meaning that the available loading there is about 2 times higher than the stream loading and thus the available power flux density is about 2.75 times higher

Conversion of Power is possible for stream velocities above 1 knot (0.5 m/s)

The ratio between the flow velocity through the channel narrower zone and the stream velocity, in the absence of any flow constraints, remains constant for typical streams velocities – The accelerator acts with the same performance in places of high streams

The adopted duct is more than a simple Ventury, because outlet depression is not only created from diffusion of the inside flow but also from the suction effect created by auxiliary vortex rotation of the outside stream nearby the channel outlet

Narrower Channel diameter (Turbine diameter)	Border external surface Maximum diameter	Duct length	Nominal Power at 4 knots (2 m/s) stream	Nominal Power at 6 knots (3 m/s) stream
1 m	4.6 m	7 m	8.5 kW	29 kW
1.5 m	6.75 m	10.5 m	19 kW	65 kW
2 m	9 m	14 m	34 kW	115 kW
1.2 m	5.4 m	8.4 m	12 kW	42 kW

The first commercialised units will contain a turbine with 1.2m diameter and a nominal power of 30 kW expected for a 5.5 knots (2.75 m/s) stream