

Manned pop-pop boat. Dream on!

The pop-pop engine is an engine with external combustion, and due to that it can use many different fuels. This leads some people dreaming of sailing around the world without fuel problems because wherever they would be, they could use butane, oil, methyl alcohol... even wood. As many pop-pop enthusiasts I would have liked to sail on a boat propelled by a pop-pop engine, but such a project is unrealistic for the many following reasons:

- **To deliver an acceptable thrust would require a gigantic pop-pop engine.** According to our today's knowledge it is evident that we couldn't get the same thrust as with classic propulsion for less weight. The biggest working engine that we know is 4 meter long, weights approx 10 kilograms (with water) and delivers a thrust lower than 200mN. It is 1000 times less than what a rower can do. If we extrapolate what is known, to get a thrust corresponding to the one delivered by a 3kW (4HP) engine at a few knots would require a single pipe pop-pop engine with a pipe diameter of more than 100 m (> one hundred meters!). And its weight, including water, would be more than 15 000t (> fifteen thousand tons!). Though theoretically it could be lighter with multiple engines, I let you imagine for instance (for the same thrust) how to locate on the stern of the small boat 10 000 pipes of internal diameter 10mm, and the associated evaporators inside.
- **Enormous amount of fuel.** The efficiency of a pop-pop engine is pathetic: lower than 0.1%. Even if some weight could be saved on the engine itself, think about the enormous amount of fuel (whatever it is) that the boat will have to carry.
- **Impossible to live on board.** Stifling atmosphere and enormous surrounding temperature. For instance, for a propulsive power of 4kW (5.4HP) the combustion would produce more than 400m³ of carbon dioxide per hour, and the heating power would suffice to supply several hundreds of individual houses during the coldest winter days.

Any of the above mentioned reasons should suffice to stop immediately the project. Nevertheless, if you think you can bypass them, we can list other reasons:

- **The attainable speed is very slow.** As per today's knowledge no engine -whatever its size- is able to deliver the least thrust above 4 knots, and no hull -whatever its dimensions- powered by a pop-pop engine could reach 1m/s; which is very slow. Less than 2 knots.
- **What about using raw water** (worse would be sea water) inside the engine? When you know the water treatment and water quality that are required in a water/steam process...
- **What about reversing to maneuver?** Reversing would require either bending the pipe while sailing or adding a reversing bucket as on the classic waterjets, but without disturbing the relaxation phase.
- **What about burn out phenomenon?** At the time you need the most the engine it could stop, and the restarting procedure is sometimes long.
- **Would you like being shaken?** The pop-pop engine is reciprocating engine acting on a pulsed jet. Would you be happy to live on a boat that is shaking day and night as a pneumatic hammer?

The pop-pop engine is and will remain a toy.