

Cleanliness. One of the secrets of performing pop-pop engines

There is a need of heat exchange to vaporize and condense water inside a pop-pop engine. To vaporize, a very hot spot can suffice, for instance the flame of a birthday candle on a thin steel sheet. But in the other way, to condense the same mass of water a large cold surface is needed. In a pop-pop engine, this surface is generally the inner surface of the pipe(s) along the place run by the interface (or meniscus).

At the top dead center this surface is in contact with liquid water. When the interface climbs down, a more or less thin layer of (rather) cold water is deposited. This layer is in contact with steam. Simultaneously, the steam condenses and heats this water film. And if this latter is too thin it could disappear by vaporization.

How to get the best condensing effect is the part of the pop-pop cycle which is the most difficult to manage. Similar engines, and sometimes the same engine at different times, could have very different performances because the water layers are different. The wettability of the inner surface of the tube is very important. The wettability of a surface is its ability to attract a liquid film. Water in case of a pop-pop engine. To do that, the material of the pipe is important, as well as the cleanliness. I came out with this theory based on my many experiments. For instance, with the same dimensional characteristics a tube made of rilsan is less performing than a metallic one, and the same tube gives bad results when greasy. I'm going to complete with examples from 2 excellent pop-pop engine builders: Guus (in the Netherlands) and Daryl (in Canada).

- To cope with that need of water layer adhesion, Guus who built coil engines made of glass got the best results when they were cleaned with phosphoric acid. (Caution! Very dangerous product!).
- With more classic materials (copper, brass and aluminum), Daryl builds the best engines I know for their size. His design is the result of a long trial and error process. But another key factor of the success is the cleanliness. To improve the wettability Daryl uses muriatic acid (diluted hydrochloric acid. Dangerous too!).

Next time you build an engine, and particularly if you reuse old pieces of pipes, think about inside cleanliness!